Providing a Continuum of Care in CKD through Telehealth

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Disclosures

- Industry-Supported Research:
  -Bayer
  -Astra Zeneca
- Nothing to disclose related to this talk

Providing a Continuum of Care in CKD through Telehealth

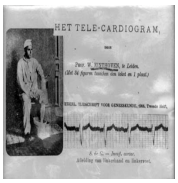
- I. Telehealth: definition, modalities and technology used
- II. Telehealth and Kidney Disease Continuum:

1- CKD
2-RRT: In-Center HD, HHD, PD, Transplantation, AKI.

- III. Benefits , challenges and limitations of telehealth care of kidney diseases

I. Telehealth/Telemedicine: a-Definitions

- Telemedicine→ mid- to late-19th century,
- In its modern form→ 1960s, driven by the military / space technology .
- **Literal definition: "Healing at a distance"**
- "The use of electronic information and communication technologies to provide and support health care when distance separates participants". *Institute of Medicine, 1996.*
- "The use of medical information exchange from one site to *another* via electronic communications to improve a patient's clinical health status". *American Telemedicine association, 2013*
- Telemedicine typically describes direct clinical services
- Telehealth refers to a broader range of health- related services such as patient care, education, remote monitoring, and provider-to-provider consultation.



1906

- Dutch physician and physiologist Dr. Willem Einthoven
- First successful telephonic transmission of electrocardiogram images

I. Telehealth:

b- Modalities

- Real-time: Patient/surrogate audiovisual with health Care Provider (HCP).
- Store and forward: Electronic transmission of medical information through secure portals
- Remote monitoring : Collection of a patient's medical data then transmitting to HCP at a remote location (PO, HR, BP, BS)

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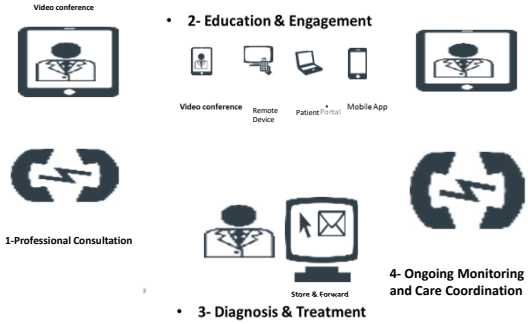
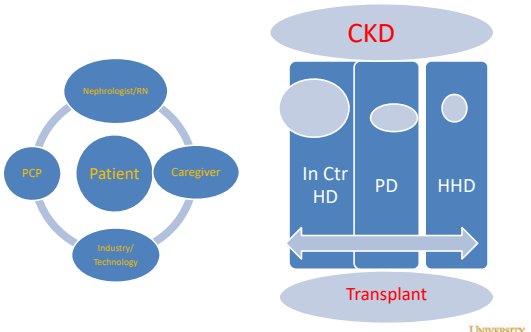
I. Telehealth:

c- Technology & Uses



II. Kidney disease Continuum Stakeholder



II. Kidney disease Continuum

1. CKD

Telehealth use in CKD

- **Patients' education, evaluation and management** → Improve health outcome
- **Better coordinated care:** Coordination with PCP
- **Lowers costs:**

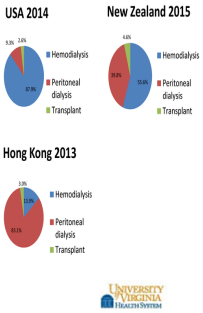
-Decrease number of clinic visits

-Decrease intensive post-hospital discharge monitoring-→ avoiding readmissions and unplanned visits.

A. Telehealth and CKD: Provider-Patient Interaction

Provider-Patient Interaction: A-Educatation

- CKD → increased mortality/ morbidity
- → cost $30.9 billion USD representing 20.1% of all Medicare parts A, B, and D spending.
- Poor health literacy → adverse outcomes; increase risk of hospitalization and mortality in the patient with CKD.
- Incomplete RRT education →under-utilization of Home dialysis and transplantation.



Provider-Patient Interaction: A- Education

- Educate patients early about kidney care and later about RRT options
- Incident dialysis patients survey (n=427)→ <1/3 of patients knew of other options (Mehrota R et al, 2005)
- Education of CKD patients vs no education → increase choice of Home Dialysis & Transplant Evaluation:
- -Choice of PD increased from 50% to 82% (Manns BJ et al, 2005)
- -Multi-Center trial 2010-2012, Spain. Choice PD increased from 6.5% to 47.8% (Prieto-Velasco M et al, 2015)
- -Transplant evaluation increased by 40% at one year (Patzer RE, 2012)

- Online Sources:
- Patients: www.nkdep.nih.gov
- VA: ckd.vacloud.us; Safe Kidney Care: www.safekidneycare.org).
- Empowering Patients on Choices for Renal Replacement Therapy (EPOCH-RRT) decision aid (www.choosingdialysis.org

Provider-Patient Interaction: B- Consult

- Consult patients about ongoing concerns
- →Access to nephrology specialty care may not be readily available
- → Decrease time and cost expense of travel to a nephrologist.
- →Avoid transportation barriers
- →Improve attendance to Clinics

Provider-Patient Interaction: B-Consult

- Retrospective : 238 patients enrolled in a telenephrology program at the Bronx Veterans Affairs Hospital
- 121 living within 10 miles (Closer) of the Medical Center vs 117 living an average of 64 miles (Remote) away
- → Providing care through telemedicine improved attendance at appointments for the Remote patients.
- Rohatgi R, JASN, 2015

Provider-Patient Interaction: B-Consult

- RCT:

451 veterans with eGFR< 60 mL/min followed by bidirectional home monitoring device
- → passing CKD education materials to patients
- → receiving vital signs

vs 150 patients followed in a conventional clinic (12 months)

- **Engagement in telehealth by patients was high:**

→ Increased monthly frequency of participant BP measurement
→ Increased days interacting with an educational module
→ Increased mean number of virtual visits conducted over the study period

- No difference in primary outcome,
- Signal of benefit for rural Veterans.

Ishani A et al, AJKD, 2016

Provider-Patient Interaction: C- Support

- The Internet →Social support systems for CKD patients.
- → VC and virtual group education classes
- → Education, collaborative problem solving and self-reflection.
- Trial comparing virtual diabetes classes to in-person classes → equal improvements in glycemic control among participants. (NKF/KDOQI, AJKD 2002)

B. Telehealth and CKD: Provider to Provider Communication

Provider to provider: Co-ordination of care

- Coordination of care → Different professional groups work together to positively impact health care'
- Coordination of care and interactive communication between PCP and subspecialists
- → Improve health outcomes
- → earlier consultation for nephrology care
- →reduced morbidity and mortality
- →reduced healthcare utilization and costs

(Gordon et al, NDT 2013)

PROVIDER TO PROVIDER: METHODS

- Real-time videoconferencing PCPs in rural areas with specialists)
- Electronic consultation ("e-Consult") : PCP ask a focused clinical question, to be answered by a specialist within 3 business days.
- →Increase PCP satisfaction.
- →Expedite both diagnostic testing and treatment
- Crowley et al, Adv CKD, 2017
- Online sources:
- Providers: uptodate.com
- Renal fellows: http://renalfellow.blogspot.com
- NephMadness: http://www.tourneytopia.com/ajkd/nephmadness

II. Kidney disease Continuum

2- RRT




A-In-Center HD

- Videoconference Norway Hospital and two satellite dialysis centers, all using a common EMR system and dialysis monitoring software were used (n=9)
- → Technical (28%) and logistical problems (10%)
- **→Five hospitalizations and one-third of the planned visiting rounds were avoided.**
- **→Annual savings US$46,613**
- **→Increase RN satisfaction**
- Rumpsfeld M et al, J Telemed Telecare, 2005

A- In-Center HD

- → Compare the health and care utilization of patients (n=19) Pre (12 months) vs Post (12 months) of receiving tele-hemodialysis services in two communities (Canada).
- →Quality of care provided within recognized good practice guidelines.
- →Repeated measures → significant decrease in the monthly number of medication changes over time (P < 0.01).

- Sicotte C, et a l, J Telemed Telecare, 2011

B- Home hemodialysis (HHD)

- Retrospective cohort study:
- → Compare risks of death, transplant and technique failure in Nx2me users (n=626) vs matched control patients.
- →Use of Nx2me was associated with lower risk of Death/Transplant (AHR 0.8), lower risk of technique failure (AHR 0.7)

- Weinhandl ED et al, Hemod Int, 2017

C. PD

- Telemedicine can be a useful tool for PD therapy
- Improve education to patients and care giver
- Support network
- More interaction with Nephrologist
- More frequent nursing virtual support
- → Collect data about catheter exit site, compliance with dialysis prescription, body weight, BP, compliance with medication

- *Gallar et al, Nefrologia 2006;*,
- Nakamoto et al, PDI 2007;
- Struijk Contrib Nephrol 2012;
- Nayak Aet al, PDI 2012;
- Karopadi et al, Hong Kong J Nephrol 2013
- Nayak KS, PDI 2016

TABLE 2
Parameters of PD Exchanges to be Monitored

- Fill and drain volumes
- Fill and drain times
- Blood pressure
- Pulse
- Oxygen saturation
- Weight or bioimpedance
- Time/duration of treatment dwell
- Number of exchanges
- Prescription of dialysis
- Symptoms during therapy
- Alarms and patient response to alarms
- Activity during the day

PD = peritoneal dialysis.

c. PD and telehealth

- →India: Similar outcome of patients on PD in remote rural area (n=115) vs urban (n=131)

(Nayak KS, PDI 2016)

- →Italy: Telemedicine program → significant reduction in PD technique failure, no change in peritonitis and hospitalization rates (1 year observation). (Martino et al, Blood Purif 2014)
- →USA: No major adverse events (1172 exchanges over 251 days). (Harrington DM et al, Blood Purif 2014)

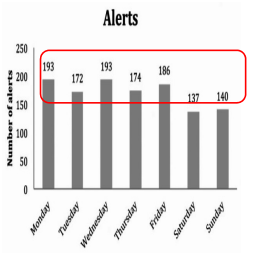
c. PD and telehealth

- Telehealth to PD patients:
- →Explore a- patient acceptability of technology
- b- evaluate Telehealth effect on clinical interventions and QOL in patients undergoing PD , (n=22)/61.6 yrs/342 days F/U.
- →PD patients were provided with computer tablets (PODs).
- →PODs contained a knowledge database with treatment- and symptom-based questionnaires that generated alerts for the clinical team.
- →Alerts were reviewed daily and followed up by a telephone call or clinic visit.
- →Data were recorded prospectively and quality of life and Quebec User Evaluation of Satisfaction with assistive Technology questionnaires evaluated at the start and end of the program
- Dey et al, SAGE open access, 2016

c. PD and Telehealth

- → **1195 alerts**
- → 1074 (89.9%) directly affecting clinical care
- → 121 (10.1%) related to diet and medication.
- → 562 alerts (47%) lead to an intervention
- → 36 admissions were avoided
- →Patients supported to self-manage on 154 occasions.
- →Satisfaction remained high

(Dey et al, SAGE open access, 2016)

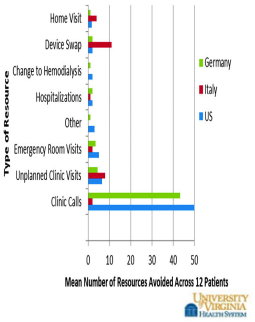


c. PD and telehealth: Cost saving (Makhija D et al, Telemed J E Health 2018)

- Telehealth vs no, 3 countries
- Telehealth could avoid use of 59, 49, and 16 resources in USA, Germany, and Italy
- Estimated reduced utilization across the three countries

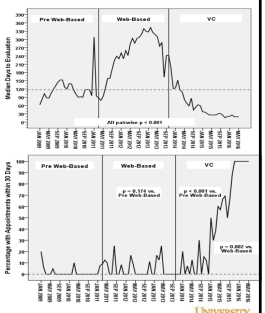
→1-2 hospitalizations; 1-4 home visits; 2-5 ER visits, 4-8 unplanned clinic visits.

- Total savings across all scenarios were US $23,364 , Germany $11,477 , Italy $7,088



D. Telehealth and Kidney Transplant

- Web-base for local VA centers to submit applications for transplant waitlist evaluation referrals to the VA National Transplant Program
- →Compare a-pre-web based submission (PWB), b-web-based submission (WB) and c-web-based submission and video-conference (VC) telehealth (n=835)
- → **The median days time to evaluation** (37 d VC vs 260 d WB and 116 d PWB)
- → **The median percentage of patients with appointments within 30 days** (100% VC vs 8% WB vs 0% PWB) ***p* < 0.001**
- Forbes RC et al, J Telemed and telecare, 2017



d. Telehealth and Kidney Transplant

- Compare costs throughout the evaluation process of kidney transplant (n=302) assessed initially by telehealth (n=143) vs seen in-person (n=159) March 2013 thru May 2016.
- → **Cost, time to initial evaluation and time needed to complete evaluation were significantly less in the telehealth cohort**.
- (Forbes RC et al,Transpl. 2018)

	Telehealth	In-person	*P*
No. patients (n)	143	159	
Age, y	62.4	57.4	<0.001
Body mass index, kg/m^2	30.9	29.6	<0.01
Not yet on dialysis (n)	22 (15.4%)	7 (4.4%)	<0.01
Diabetes mellitus (n)	101 (70.6%)	81 (50.9%)	<0.001
Coronary artery disease (n)	59 (41.3%)	51 (32.1%)	0.107
Peripheral vascular disease (n)	30 (21.0%)	24 (15.1%)	0.192
Cerebrovascular accident	25 (17.5%)	14 (8.8%)	<0.05
Limited mobility (n)	25 (17.5%)	10 (6.3%)	<0.01
Hepatitis C	17 (11.9%)	6 (3.8%)	<0.01

e. AKI and Telemedicine: War Zones

- In the Syrian armed conflict→ No nephrologists available, and the financial and logistic resources for RRT extremely limited
- Care for patients provided by:
- → training of second-year IM resident over a 1-day face-to-face course
- →Protocol for priming the extracorporeal circuit, fluid replacement, and anticoagulation were drafted by USA group of nephrologists of Syrian origin.
- →Followed by **real-time support with a video call through the Internet (Skype) before and during CVVH.**
- Rifai AO et al. KI 2015; 87:254-261

Benefits

- Increased access to healthcare services: extend nephrology consultation to rural and isolated communities
- Enhanced access to specialists: Nephrologist coordination/ education to PCP /Patients
- Improved quality of care
- Reduced hospitalizations/ER visits
- Cost-effective method of service delivery, no facility fees charged
- Allow providers to spend more time with the patient during telehealth encounters→ Patient and provider satisfaction
- Increase Home Dialysis volume→ More market share
- Providers may gain valuable insight into the home environment of home dialysis patients without home-visit.

Are stakeholders satisfied with Telehealth?

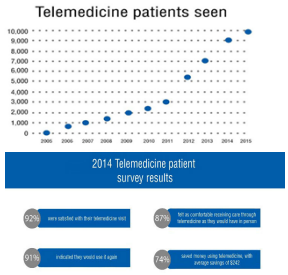
- Telemedicine clinics for f/U care

-2 RN at remote sites

-Nephrologist and RN at Ottawa hospital.

Patient, RN and MD satisfaction was high

Campbell M et al, J Telemed Telecare, 2012



Challenges

Challenges and limitations

- **Patients' issues:**

→The more the illness , the less patients use internet→ 68% with 1 chronic disease use internet vs 52 % with 2 or more. (Fox S, 2010)

→108 CKD patients→ only 28.7% visited an informational website about CKD safety after instruction on how to access the website. (Diamantidis et al, 2013)

→Patients may feel isolated, abandoned, or anxious about being at home without regular in-person visits.

- **Providers' issues:**

→Many providers like in-person patient interactions and fewer face-to-face patient-provider interactions could further provider burnout and dissatisfaction.

→Inability to fully examine patients, including physical evaluation of volume status and the dialysis access.

Challenges and limitations

- **Ethical issues** →equity, privacy, confidentiality, and informed consent.
- **Financial issues** → Half of US smartphone-users with no other access to the internet had to cancel/ shut off their cell phone service for a period of time due to financial concerns. (Smith A, 2015)
- **Technical difficulties**→ limited access to equipment, loss of signals
- **Administrative issues**→ need for credentialing, licensure, and front-end investments

Can we sustain the use of Telehealth?

- iNephro investigators distributed a free smartphone application to German-speaking CKD patients to assist them in medication adherence and documentation of BP.
- After 11,688 smartphone users downloaded the application, and demonstrated initial engagement→ significant **drop-off in use** of the application was reported at 2-months.
- Less than 1% (10/1095) used the application at least weekly one year after download.
- ?? Users may have found a different application
- ?? Application difficult to use
- ?? Limited value after mastering their medication regimen.
- ?? Seeking more inter-personal interactions.

Becker S et al, PLoS One 2013

Conclusion

- Telehealth can have a role along the spectra of CKD and RRT
- It can enhance kidney disease patients' education, care, outcomes and lower costs
- Data on outcomes associated with the use of telehealth in patients with kidney disease is lacking and large randomized trials are needed to further our knowledge base.


THANK YOU