

# **In-Home Internet Use Increases as the Number of Internet Users in the Household Increases**

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# Disclosure

Mark Lockwood, Ph. D., R.N., C.C.R.C.

I do not have any relevant relationships with Industry.

This study was supported by the 2015 International Transplant Nurses Society Research Award



# Objectives:

- Define information and communication technology
- Discuss previous ICT study (2012)
- Discuss ICT trends from 2012-2016
- Discuss current study (2016)
- Discuss implications for nursing



# What is Information and Communication Technology?

- ICT reference more prominent outside the United States<sup>1</sup>
- More than just devices and software
- Includes the competencies and skills required to use these technologies
- \$38 billion investment in health information technology authorized under the American Recovery and Reinvestment Act of 2009<sup>2</sup>

<sup>1</sup>Zuppo (2012) International Journal of Managing Technology

<sup>2</sup>Lustria et al. (2012)



# Why is it important to understand?

## The Digital Divide



- A digital divide is an economic and social inequality with regard to access to, use of, or impact of information and communication technologies (ICT)

U.S. Department of Commerce, National Telecommunications and Information Administration (NTIA). (1995)



# 2012 Technology Assessment

## Kidney transplant and the digital divide: is information and communication technology a barrier or a bridge to transplant for African Americans?

**Context**—Barriers to kidney transplant for African Americans are well documented in the literature. Little information on ownership of information and communication technology and use of such technology in transplant populations has been published.

**Objective**—To characterize racial differences related to ownership and use of information and communication technology in kidney transplant patients.

**Design**—A single-center, cross-sectional survey study.

**Setting**—An urban Midwestern transplant center.

**Participants**—78 pretransplant patients and 177 transplant recipients.

**Main Outcomes Measures**—The survey consisted of 6 demographic questions, 3 disease-related questions, and 9 technology-related questions. Dichotomous (yes/no) and Likert-scale items were the basis for the survey.

**Results**—Cell phone use was high and comparable between groups (94% in African Americans, 90% in whites,  $P = .22$ ). A vast majority (75% of African Americans and 74% of whites) reported being “comfortable” sending and receiving text messages. Computer ownership (94.3% vs 79.3%) and Internet access (97.7% vs 80.7%) were greater among whites than African Americans (both  $P < .01$ ). Fewer African Americans were frequent users of the Internet (27.1% vs 56.3%) and e-mail (61.6% vs 79.3%) than whites (both  $P < .01$ ). More African Americans than whites preferred education in a classroom setting (77% vs 60%;  $P < .005$ ) and educational DVDs (66% vs 46%;  $P < .002$ ).

**Conclusion**—The use of cell phone technology and text messaging was ubiquitous and comparable between groups, but computer and Internet access and frequency of use were not. Reaching out to the African American community may best be accomplished by using cell phone/text messaging as opposed to Internet-based platforms. (*Progress in Transplantation*. 2013;23:xxx-xxx)

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Lockwood et al. (2013) *Progress in Transplantation*

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# Technological Capabilities of Pre and Post Renal Transplant Patients for Telecommunications (2012)

**Study design:** Cross-sectional survey study of 228 pre-and post kidney transplant patients

**Specific aim:** Describe use of information and communication technologies among a sample of urban pre-and post-kidney transplant patients in the United States.



# Sample Characteristics (2012)

- Mostly African American (62%)
- Male (56%)
- Mean age (50.2 years)
- On dialysis (74%)
- Having kidney disease more than 5 years (57%)
- Median income \$47,996
- Education evenly divided





# Significant Contributions

- Whites much more likely to own computers
- Whites much more likely to have access to the Internet
- Text messaging use high in both groups
- Patients reported being comfortable using cellphone and text messaging
- Text messaging could provide a much needed bridge to transplantation for underserved populations
- Two-thirds of patients use the Internet less than 5 hours/ week



## Secondary Analysis (2013)

### Determinants of frequent Internet use in an urban kidney transplant population in the United States: characterizing the digital divide

**Context**—The Internet is a staple of electronic communication and is essential to the emerging telemonitoring and health information technology interventions for adults with chronic diseases.

**Objective**—To identify determinants of frequent Internet use in an urban kidney transplant population in the United States.

**Design**—A single center, cross-sectional survey study

**Setting**—An urban Midwestern transplant center

**Participants**—78 pretransplant and 177 posttransplant patients

**Main Outcome Measures**—Frequent Internet use, defined as using the Internet more than 5 hours per week.

**Results**—Only 38% of participants reported being frequent Internet users. Non-Hispanic blacks and participants who reported their race/ethnicity as “other” were significantly less likely than whites to report being frequent Internet users.

Women were 59% less likely than men to be frequent users of the Internet. Those who reported having kidney disease for more than 3 years were more likely to report being frequent Internet users. As education increased, Internet use increased. As age increased, Internet use decreased.

**Conclusion**—Alternatives to electronic information sources and/or additional resources should be considered for those who may fall in the so-called digital divide. (*Progress in Transplantation*. 2015;25:9-17)

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Lockwood et al. (2015) *Progress in Transplantation*



## Secondary Analysis (2013)

**Study design:** Cross-sectional survey study of 248 pre-and post kidney transplant patients

**Specific aim:** Describe determinants of Internet use among a sample of urban pre-and post-kidney transplant patients in the United States.

# Significant Contributions

- Frequent users younger, male, educated, white patients
- Those who had kidney disease more than three years
- The decline in Internet use began in the 40-54 year old age group
- Web-based platforms may be challenging to implement broadly

# 2015 International Transplant Nurses Society Research Grant Award

## Determining Predictors of In-home Internet Access in an Urban End Stage Kidney Disease (ESKD)/Post-kidney Transplant Population in the United States

**Specific aim #1:** To determine if competition for the Internet within households is a barrier to Internet use



"Tonight, daddy's going to teach you how to stay safe on the internet - now where's the on off switchy thing?"



# Self-reported Internet Use Increases as the Number of Internet Users in the Household Increases among Pre- and Post-kidney Transplant Patients

Mark B. Lockwood, PhD, RN CCRC,<sup>1</sup> Karen Dunn-Lopez, PhD, MPH, RN,<sup>2</sup> Larisa Burke, MPH,<sup>1</sup>  
Yolanda T. Becker, MD,<sup>3</sup> Milda Saunders. MD, MPH<sup>4</sup>

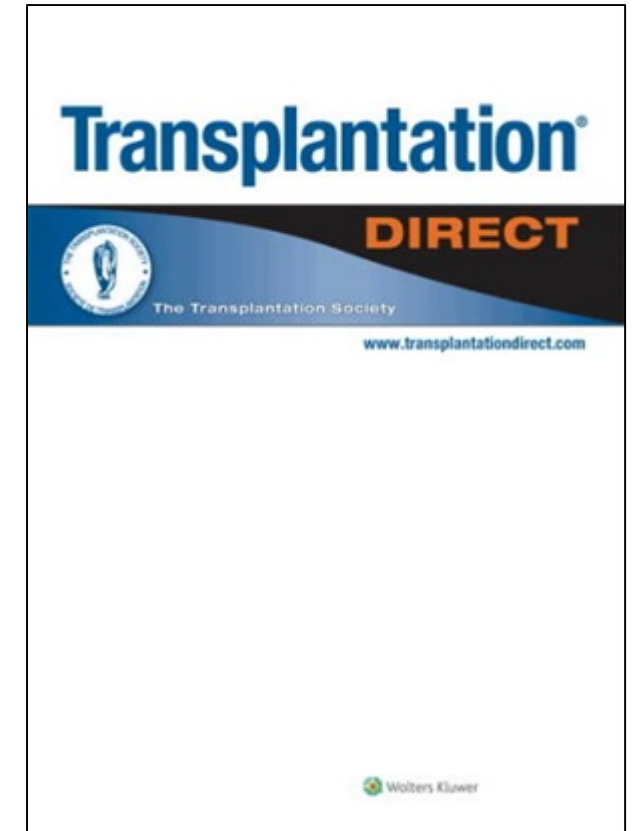
## Abstract

**Background:** As health-related communications become digitized, strategies to increase adoption of these web-based platforms are needed. Multiple studies have demonstrated that access to technology is not predictor of technology adoption. The purpose of this study was to assess facilitators and barriers to in-home Internet use among pre- and post-kidney transplant patients.

**Methods:** A single center, cross-sectional survey of 240 consecutive patients of all levels of technological proficiency who presented to an urban transplant center in the United States. The Patient Information and Technology Assessment (PITA) consists of six demographic questions, three disease-related questions, and eight technology related questions.

**Results:** A majority of the sample were African American men, with a mean age of 51 years, and median income of \$53,800/year. Logistic regression analysis was undertaken and after adjusting for covariates we found Smart phone ownership (OR 4.94, 95% CI 2.32-10.52), a higher number of Internet users in the home (OR 2.00, 95% CI 1.11-3.62), and having an education of College and beyond (OR 4.88 95% CI 2.03-11.74) increased the likelihood of being a frequent Internet user. African American or Hispanic/Latino patients were less likely to be frequent Internet users compared to White patients (OR 0.26, 0.24 compared to Whites, all  $p < 0.05$ ). As the total number of people in the household increased, frequent Internet use decreased ((OR 0.52, 95% CI 0.29-0.92). As age increased reports of frequent Internet use decreased.

**Conclusion:** Lower rates of Internet use among African Americans and Hispanic/Latinos in urban areas in the United States remains a problem despite a significant increase in access to the Internet and Smartphone ownership. The finding that Internet use increases as the number of Internet users in the household increases indicates that leveraging the patient's social support network may aid with patient's adoption of health technology and patient engagement in self-care.



In press; Accepted for publication 8/2017



# Study Design

- Cross-sectional Survey
- All adult pre and post kidney transplant patients
- In person survey allowed all patients to participate

# Instrument Development

## **Multidisciplinary team**

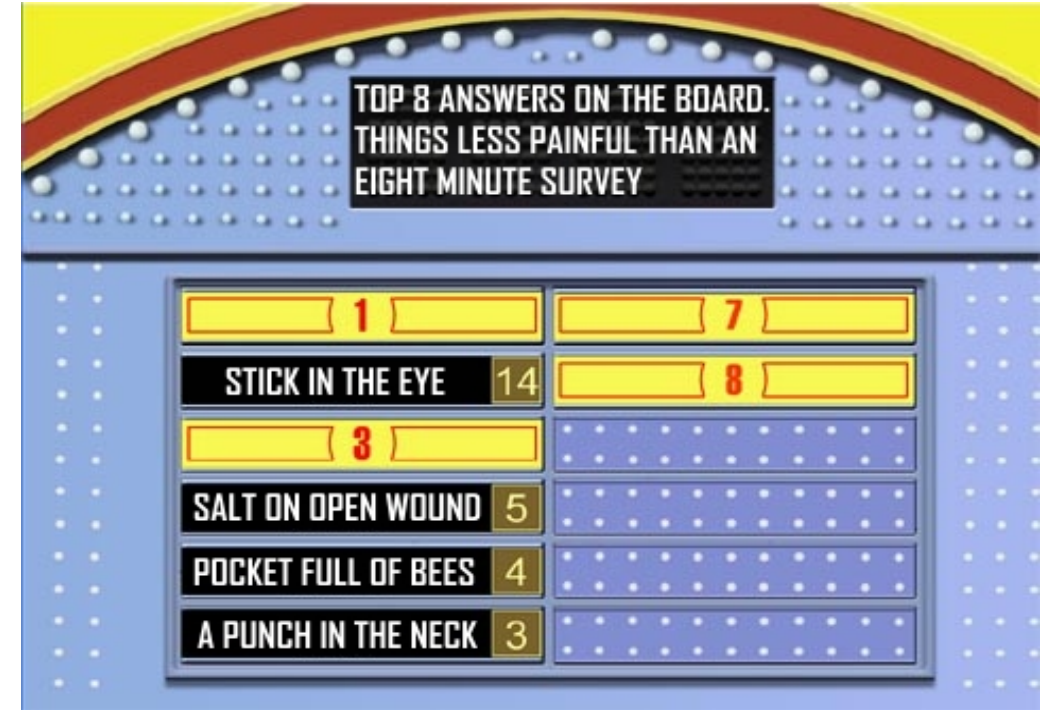
- Pre and post nurse coordinators
- Transplant nephrologists
- Transplant surgeons
- Living donor advocate
- Research nurse
- Patients



# Instrument Development (cont.)

## Final instrument make up

- Five demographic questions
- Five disease-related questions
- Eight technology/Internet related questions
- Yes/No and Likert-type questions used





# Sample Characteristics (2016)

- Mostly African American (56%)
- Male (67%)
- On dialysis (86%)
- Mean age 51 years
- Having kidney disease more than 5 years (75%)
- Median income \$53, 800/year
- Education evenly divided





## Internet Enabled Device Ownership

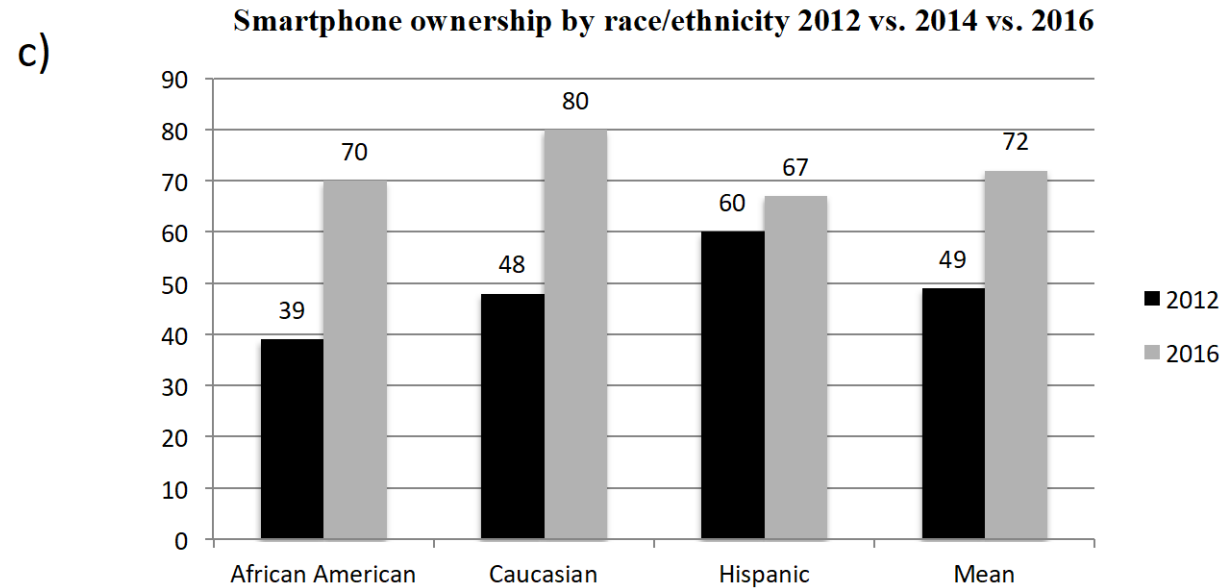
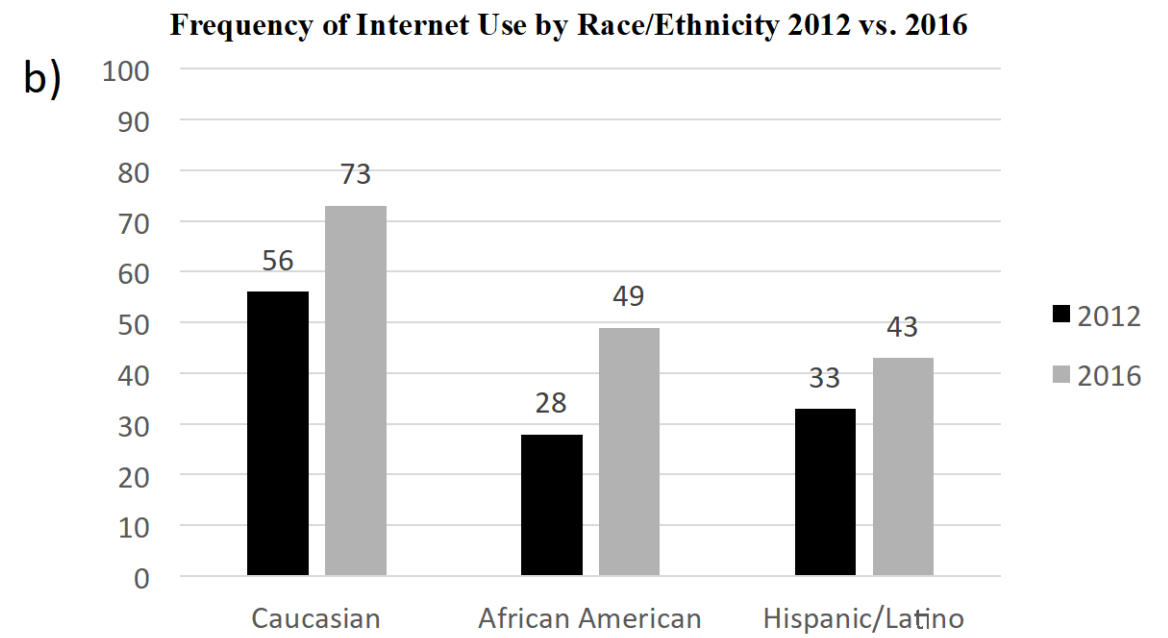
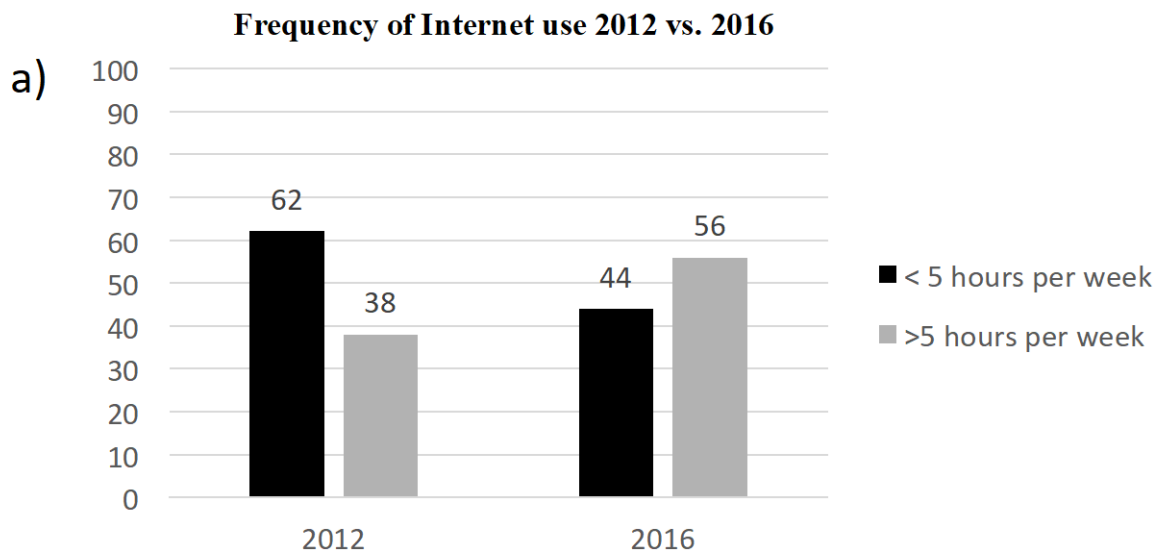
	<u>2012</u>	<u>2016</u>
• Desktop computer	85%	57%
• Laptop computer	NA	65%
• Tablet computer	NA	52%
• Smartphone	42%	73%
• Internet	87%	95%

# Internet Use

## Most commonly used devices

- Smartphone 49%
- Laptop computer 19%
- Desktop computer 17%
- Tablet computer 12%
- Other (X box) 2%





**Figure 1.** Changes in self-reported Internet use over time among pre- and post-kidney transplant patients at an urban transplant center in the United States taken in 2012 and 2016. It should be noted that these data are not longitudinal, but rather data collected from two different samples at two different time points, however, both samples were drawn from the same population. A) Overall change in self-reported frequent (> 5 hours per week) Internet use taken in 2012 and 2016. b) Change in self-reported frequent Internet use by race/ethnicity. C) Smartphone data was collected from two different samples drawn from the same population of pre and post-kidney transplant patients (2012 n=256; 2016: n=240). Sample characteristics from the 2012 assessment can be found elsewhere.<sup>13,14</sup>

# Research Question

Are patients who live in multigenerational households less likely to be frequent Internet users due to competition for the Internet?



"In return for an increase in my allowance, I can offer you free unlimited in-home computer tech support."

# Logistic Regression Determinants of Frequent Internet Use

Table 3. Determinants of Frequent Internet Use Among Pre and Post kidney Transplant Patients (n=240)

	Unadjusted OR(95%CI), p-value	Adjusted OR(95%CI), p-value
<b>Race/ethnicity (relative to white, non-Hispanic)</b>		
African American	0.35(0.19-0.65),0.001	0.26(0.10-0.65), 0.004
Hispanic/Latino	0.28(0.10-0.76),0.012	0.24(0.06-0.91), 0.035
Other (Asian, Pacific Islander)	0.55(0.14-2.18),0.399	0.54(0.10-3.04), 0.503
<b>Gender (relative to male)</b>	1.59(0.92-2.76),0.099	1.68(0.80-3.50), 0.170
<b>Education (relative to high school or less)</b>		
Some College	2.44(1.30-4.64),0.006	2.14(0.95-4.81),0.065
College and beyond	5.54(2.76-11.10),<0.001	4.88(2.03-11.74),<0.001
<b>Age (Relative to 18-39 years old)</b>		
40-54 years old	0.30(0.12-0.71),0.006	0.25(0.10-0.70),0.009
55-64 years old	0.14(0.06-0.37),<0.001	0.15(0.49-0.44),0.001
65 years old and over	0.06(0.02-0.17),<0.001	0.08(0.02-0.28),<0.001
<b>Income (relative to &lt; \$25,000/year)</b>		
\$25,000-\$39,999	1.33(0.22-8.39),0.759	1.47(0.89-16.26),0.751
\$40,000-\$74,999	2.52(0.40-15.74),0.321	1.40(0.13-15.47),0.783
\$75,000 and up	2.25(0.34-15.01),0.402	0.38(0.29-4.87),0.456
<b>Dialysis status (relative to not yet on dialysis)</b>		
Hemodialysis	0.49(0.22-1.07),0.074	0.52(0.19-1.45),0.211
Peritoneal dialysis	0.99(0.22-2.54),0.981	1.50(0.26-3.17),0.88
<b>Transplant status (relative to pre-transplant)</b>	1.24(0.93-1.67),0.138	0.96(0.49-1.87),0.905
<b>Smartphone ownership (relative to no Smartphone)</b>	6.07(3.21-11.48),<0.001	4.94(2.32-10.52),<0.001
<b>Number of people in the household (continuous)</b>	1.10(0.88-1.27),0.546	0.52(0.29-0.92),0.026
<b>Number of Internet users in the household (continuous)</b>	1.36(1.12-1.657),0.002	2.00(1.11-3.62),0.022

Post hoc tests showed that sensitivity, specificity, and rate of correct classification were 82.22%, 72.38%, and 72.08% respectively. Logistic regression  $\chi^2=104.96$ . McFadden  $R^2=0.3191$ , area under receiver operating characteristic curve=0.8568. Hosmer-Lemeshow goodness of fit,  $p=0.4100$ .



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<b>Education (relative to high school or less)</b>		
Some College	2.44(1.30-4.64),0.006	2.14(0.95-4.81),0.065
College and beyond	5.54(2.76-11.10),<0.001	4.88(2.03-11.74),<0.001
<b>Age (Relative to 18-39 years old)</b>		
40-54 years old	0.30(0.12-0.71),0.006	0.25(0.10-0.70),0.009
55-64 years old	0.14(0.06-0.37),<0.001	0.15(0.49-0.44),0.001
65 years old and over	0.06(0.02-0.17),<0.001	0.08(0.02-0.28),<0.001
<b>Income (relative to &lt; \$25,000/year)</b>		
\$25,000-\$39,999	1.33(0.22-8.39),0.759	1.47(0.89-16.26),0.751
\$40,000-\$74,999	2.52(0.40-15.74),0.321	1.40(0.13-15.47),0.783
\$75,000 and up	2.25(0.34-15.01),0.402	0.38(0.29-4.87),0.456
<b>Dialysis status (relative to not yet on dialysis)</b>		
Hemodialysis	0.49(0.22-1.07),0.074	0.52(0.19-1.45),0.211
Peritoneal dialysis	0.99(0.22-2.54),0.981	1.50(0.26-3.17),0.88
<b>Transplant status (relative to pre-transplant)</b>		
	1.24(0.93-1.67),0.138	0.96(0.49-1.87),0.905
<b>Smartphone ownership (relative to no Smartphone)</b>		
	6.07(3.21-11.48),<0.001	4.94(2.32-10.52),<0.001
<b>Number of people in the household (continuous)</b>		
	1.10(0.88-1.27),0.546	0.52(0.29-0.92),0.026
<b>Number of Internet users in the household (continuous)</b>		
	1.36(1.12-1.657),0.002	2.00(1.11-3.62),0.022

Post hoc tests showed that sensitivity, specificity, and rate of correct classification were 82.22%, 72.38%, and 72.08% respectively. Logistic regression  $\chi^2=104.96$ . McFadden  $R^2=0.3191$ , area under receiver operating characteristic curve=0.8568. Hosmer-Lemeshow goodness of fit,  $p=0.4100$ .



# Logistic Regression Determinants of Frequent Internet Use

Table 3. Determinants of Frequent Internet Use Among Pre and Post kidney Transplant Patients (n=240)

	Unadjusted OR(95%CI), p-value	Adjusted OR(95%CI), p-value
<b>Race/ethnicity (relative to white, non-Hispanic)</b>		
African American	0.35(0.19-0.65),0.001	0.26(0.10-0.65), 0.004
Hispanic/Latino	0.28(0.10-0.76),0.012	0.24(0.06-0.91), 0.035
Other (Asian, Pacific Islander)	0.55(0.14-2.18),0.399	0.54(0.10-3.04), 0.503
<b>Gender (relative to male)</b>		
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# Significant Contributions (logistic regression)

- The digital divide among African Americans and Hispanic/Latinos remains a problem
- As age increases likelihood of frequent internet use decreases
- Those with Smartphones more than 5 times as likely to be frequent internet users
- For each additional Internet user in the household (holding all other variables constant), the odds of being a frequent Internet user increases 2-fold

# Conclusions

- The digital divide among African Americans and Hispanic/Latinos in urban areas in the United States remains a problem despite a significant increase in Smartphone ownership.
- The finding that Internet use increases as the number of Internet users in the household increases may indicate that identification of a “technology champion”, a family member in the household who is technologically savvy who can assist the patient, may aid with patient’s adoption of health technology.
- Nurses are uniquely positioned to advocate for patients and develop patient centered health technologies.



# Implications for Nursing

- Nurses should understand issue and advocate for those in the digital divide
- Nurses should be involved in the development of technology
- Use of “technology champions”
- Technology assessment at intake



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# Thank You for Your Time!

## Questions?

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