Educating Chronic Kidney Disease Patients Through Health Information Technology:

Can They Hear You Now?

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October 2013

Chronic Kidney Disease (CKD)

Table 3. Prevalence of Chronic Kidney Disease (CKD) Stages in US Adults Aged 20 Years or Older Based on NHANES 1988-1994 and NHANES 1999-2004

CKD Stage[a]	Prevalence, % (95% CI) NHANES 1988-1994	Prevalence, % (95% CI) NHANES 1999-2004	Prevalence Ratio for NHANES 1999-2004 to 1988-1994 (95% CI)	Estimated No. of US Adults in 2000, No. in Millions (95% CI)
1	1.71 (1.28-2.18)	1.78 (1.35-2.25)	1.05 (0.85-1.30)	3.6 (2.7-4.5)
2	2.70 (2.17-3.24)	3.24 (2.61-3.88)	1.21 (1.03-1.41)	6.5 (5.2-7.8)
3	5.42 (4.89-5.95)	7.69 (7.02-8.36)	1.42 (1.25-1.62)	15.5 (14.1-16.8)
4	0.21 (0.15-0.27)	0.35 (0.25-0.45)	1.70 (1.11-2.51)	0.7 (0.5-0.9)
5	NA	NA	NA	NA
Total	10.03 (9.16-10.91)	13.07 (12.04-14.10)	1.30 (1.19-1.43)	26.3 (24.2-28.3)

Abbreviations: CI, confidence interval; NA, data not included because patients with CKD stage 5 were excluded; NHANES, National Health and Nutrition Examination Surveys.

[a] Defined based on standard criteria[1]: stage 1, persistent albuminuria with glomerular filtration rate (GFR) higher than 90 mL/min/1.73 m^2; stage 2, persistent albuminuria with GFR of 60 to 89 mL/min/1.73 m^2; stage 3, GFR of 30 to 59 mL/min/1.73 m^2; stage 4, GFR of 15 to 29 mL/min/1.73 m^2. The age-adjusted prevalence rates for CKD stages 1, 2, 3, and 4 in 1988-1994 adjusted to the 1999-2004 age distribution in Table 1 are 1.7%, 2.8%, 5.6%, and 0.2%, respectively, for a total of 10.3%.

Coresh J, et al. *JAMA.* 2007.

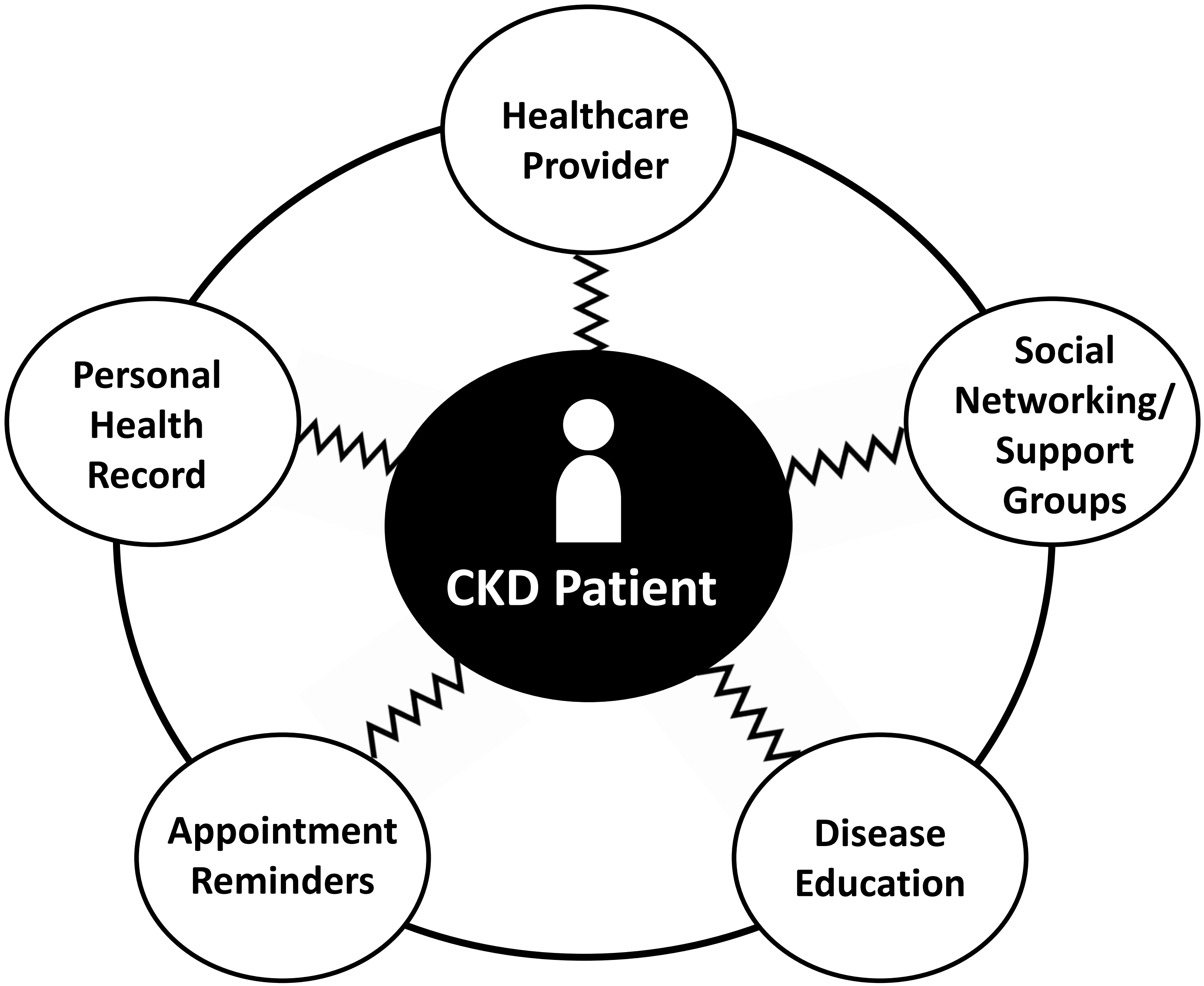
CKD Care Barriers

- Low patient awareness
- Limited health literacy
- Poor patient-provider communication
- Low self-reported medication adherence
- Differential outcomes for ethnic/racial minorities

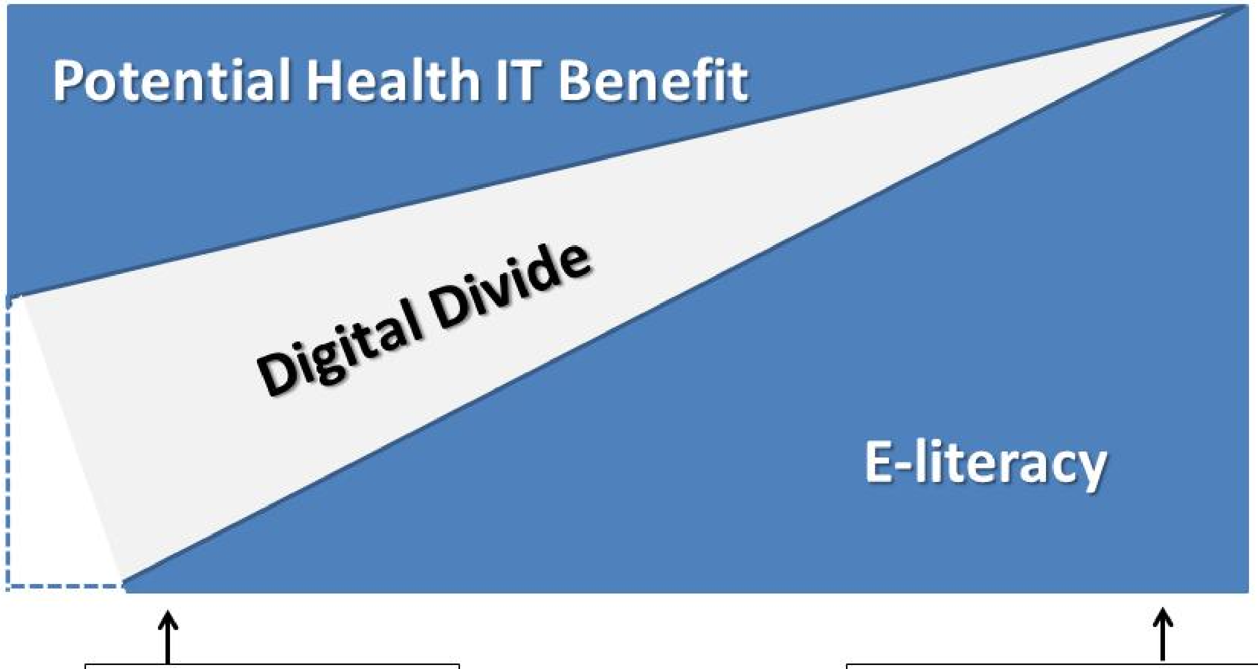
Patient Safety

- Reduced GFR affects drug clearance
- Significant comorbidity burden
- Frequent outpatient and inpatient encounters
- Polypharmacy

Patient-centered Health IT



Digital Divide in CKD



- **CKD Patients**
- Elderly
- Low SES
- Minority

- Healthy
- Young
- Socially Acculturated
- Affluent

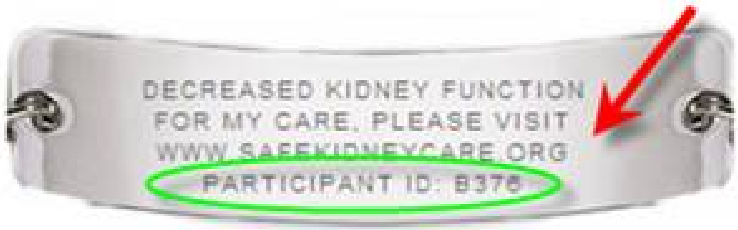
Does under-recognition of kidney disease affect patient safety?

SAFE KIDNEY CARE™

PI: Jeff Fink, MD, MS | **RO1 DK084017** | **July 1, 2010 – June 30, 2015**

Safe Kidney Care Medical ID Bracelet

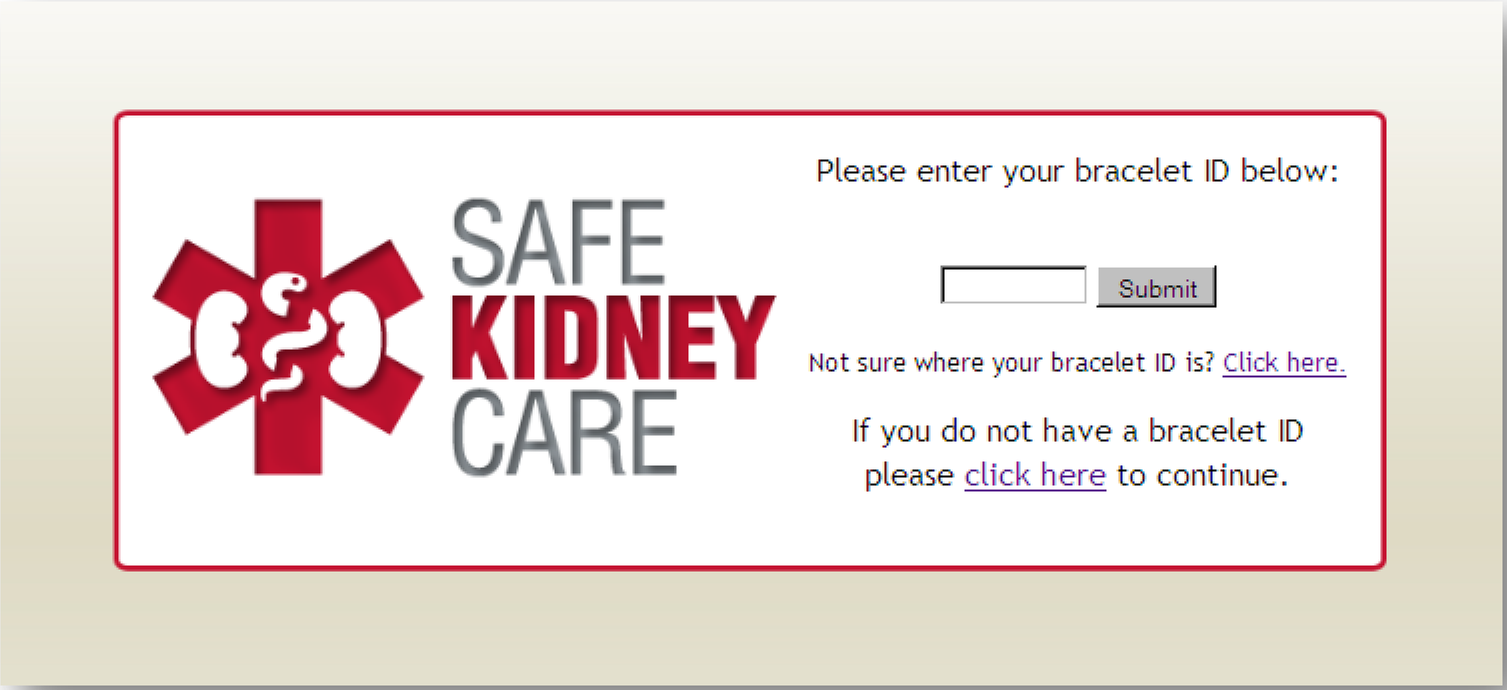
Front



Back

Safe Kidney Care Homepage

Safe Kidney Care Login Page

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What is Chronic Kidney Disease?
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Usability Testing

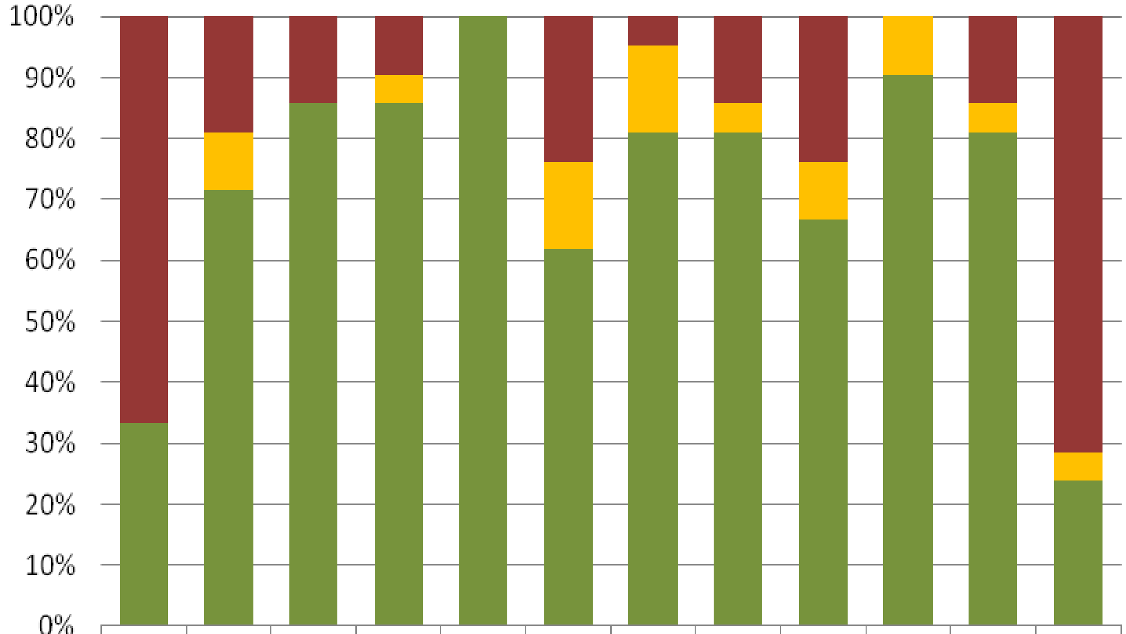
Task Completion Categories

Type of Error	All * (N=12) # Tasks (%)	Frequency of Computer Use	
		Daily (N=8)	< Daily or Never (N=4)
Total Tasks	252	168	84
Critical Errors	55 (21.8)	16 (9.5)	39 (46.4)
Non-Critical Errors	16 (6.3)	10 (6.0)	6 (7.1)
Easily Completed	181 (71.8)	142 (84.5)	39 (46.4)

*21 tasks per participant

Diamantidis CJ, et al. *Clin J Am Soc Nephrol.* 2012

Task Classifications by Participant



	P1*	P2	P3	P4	P5	P6*	P7	P8	P9*	P10	P11	P12*
Critical Error	14	4	3	2	0	5	1	3	5	0	3	15
Non-Critical Error	0	2	0	1	0	3	3	1	2	2	1	1
Easily Completed	7	15	18	18	21	13	17	17	14	19	17	5

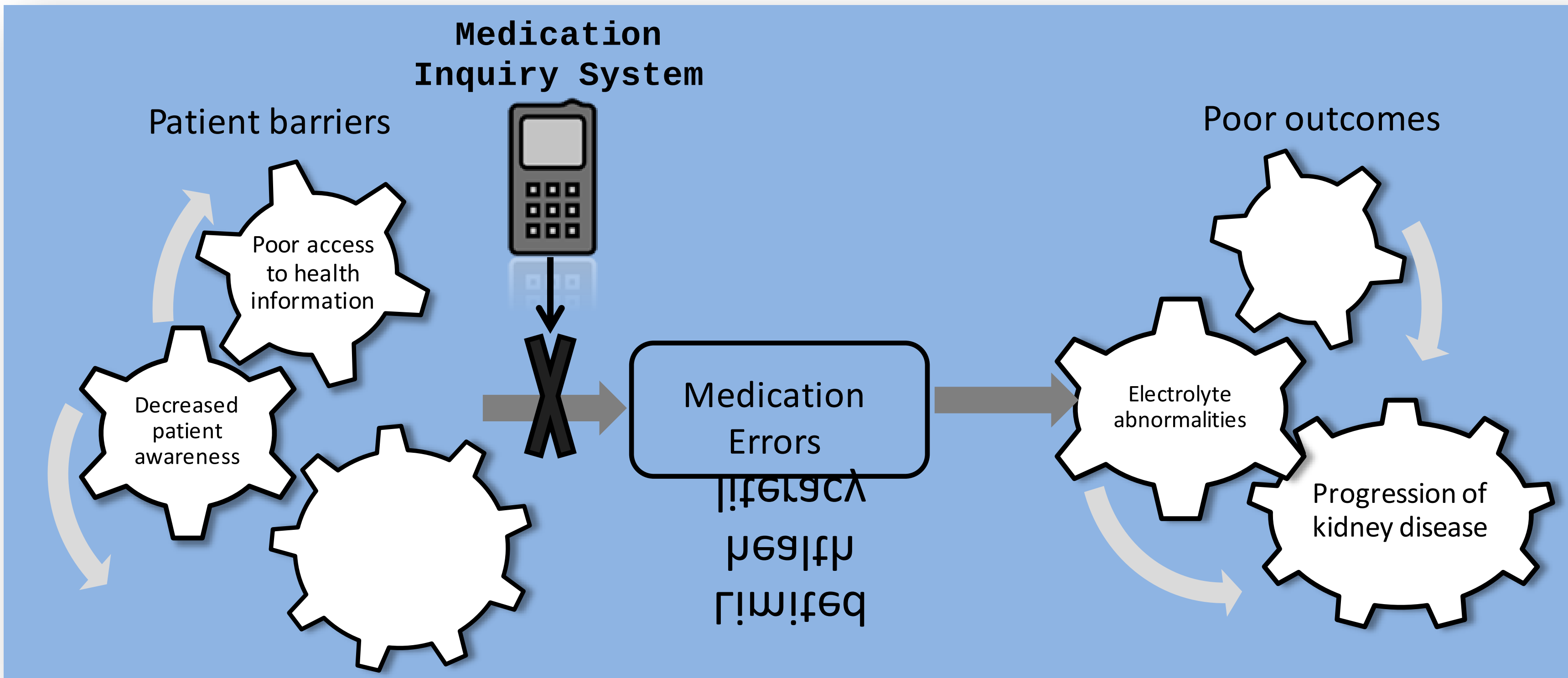
*Occasional/Never Computer Users

Diamantidis CJ, et al. *Clin J Am Soc Nephrol.* 2012

Most common Web pages visited:

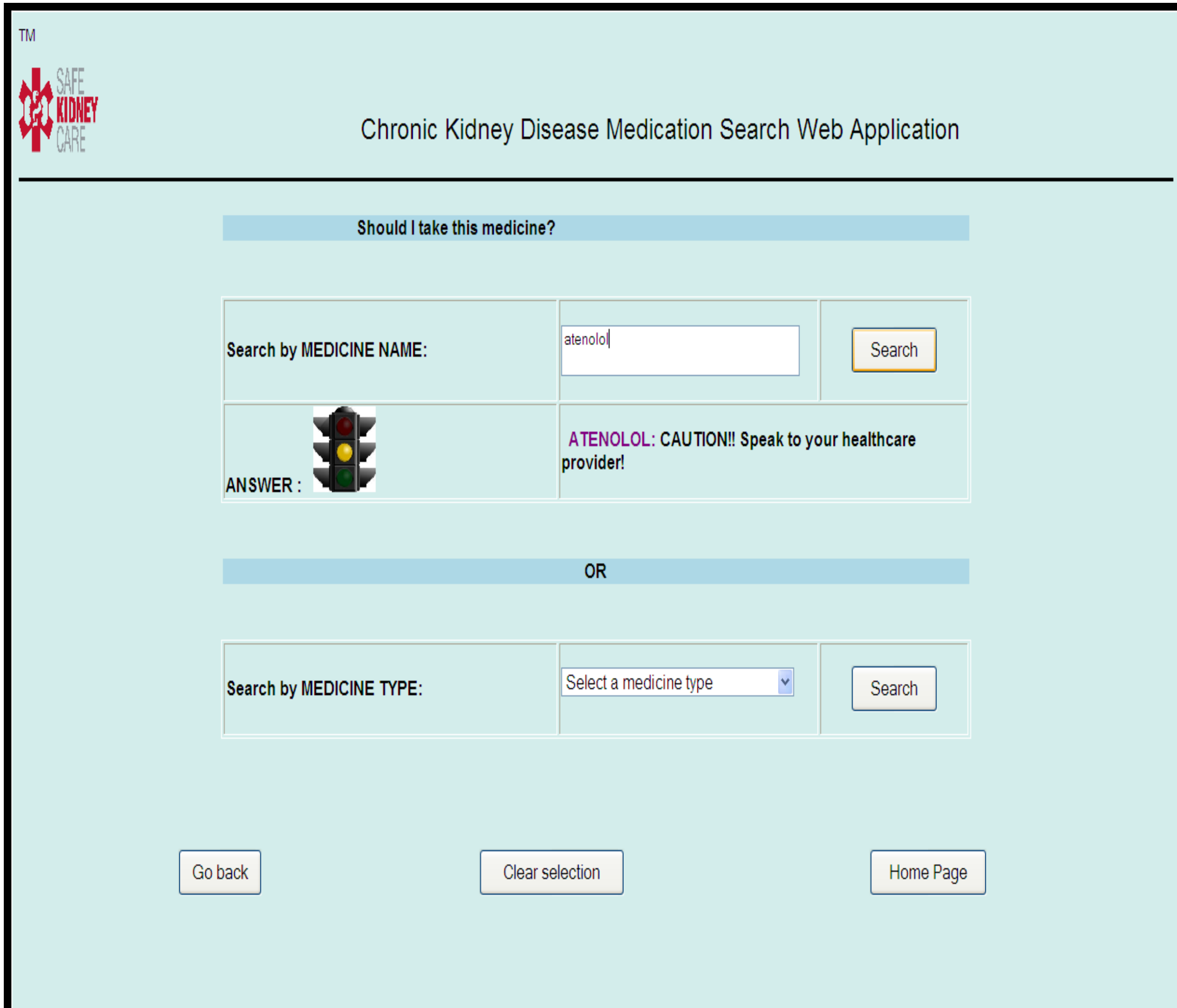
- "Renal function calculator"
- "Pills to avoid"
- "Foods to avoid"

Medication Inquiry System



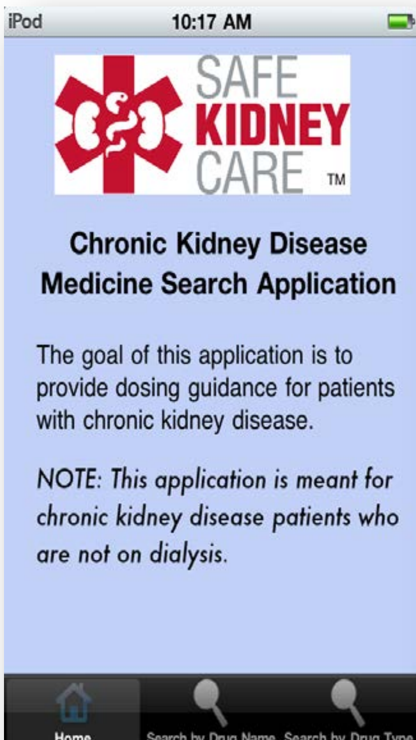
- Safe usage of commonly used medications in kidney disease
- Input medication name:
  - **NOT SAFE**
  - CAUTION
  - **SAFE**

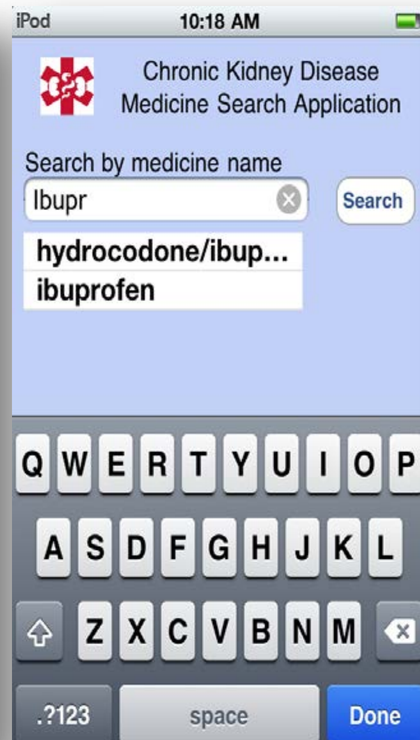
Web-based platform

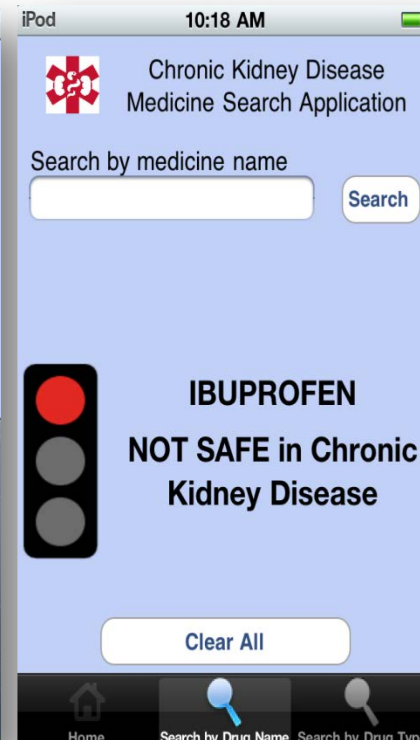


SMS text platform

Personal Digital Assistant (iPod Touch™) platform





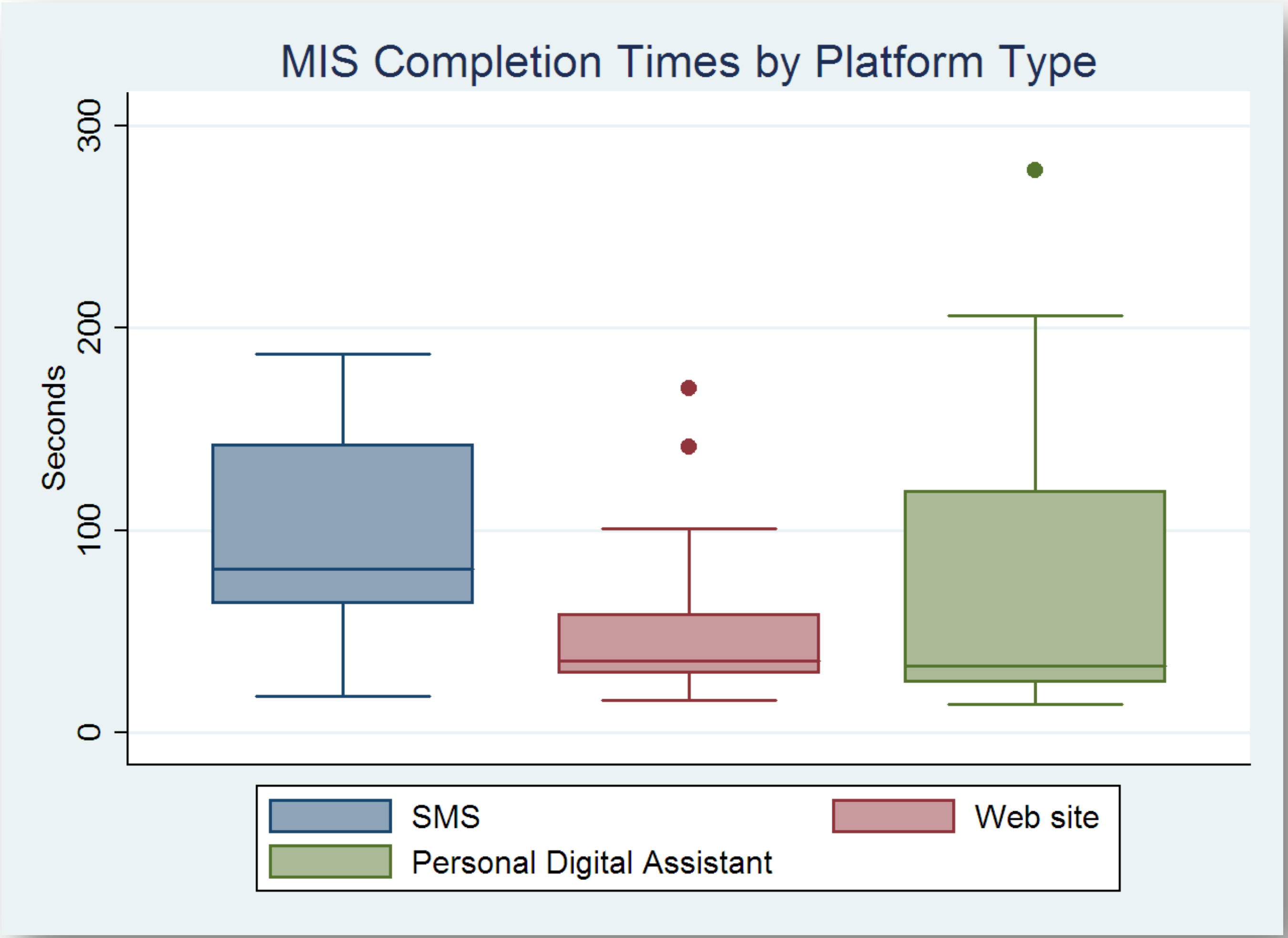


MIS Usability Testing

Cumulative Completion Rates (N=20)

	SMS Number of tasks = 380		**PDA Number of tasks = 440**		**Web Number of tasks = 380**	
N = 20 participants	Median per individual	Count per 100 person-task	Median per individual	Count per 100 person-task	Median per individual	Count per 100 person-task
Completed	18	90.5	22	93.2	18	90.2
Non-critical	0	2.1	0	1.6	0	2.4
Critical	0.5	7.4	0	5.2	1	7.4

Diamantidis, et al. *Am J Kidney Dis*. 2012



Diamantidis, et al. *Am J Kidney Dis*. 2012

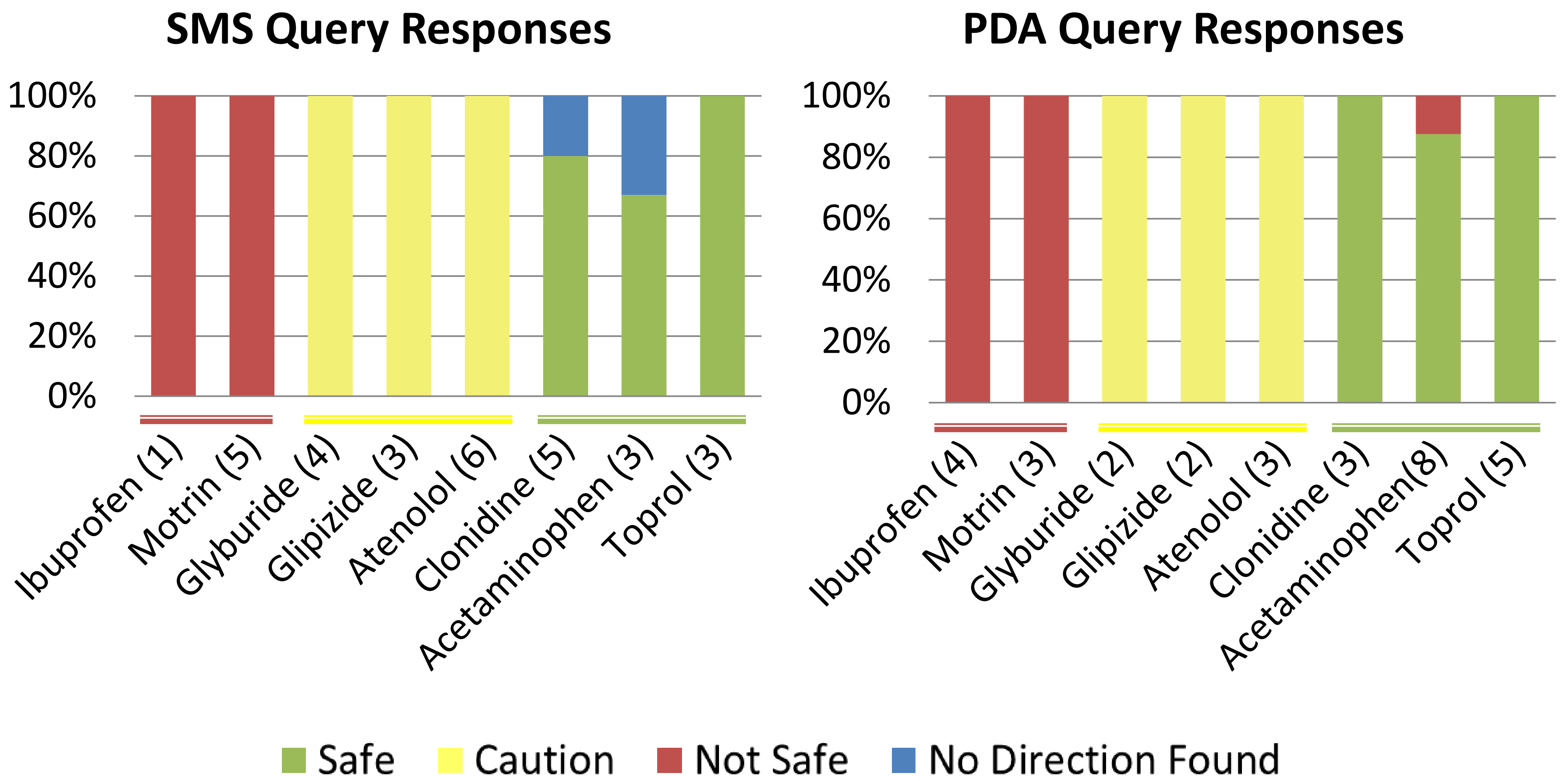
Device Preference (N=20)

	SMS n (%)	PDA n (%)	Web n (%)
Preferred Device	4 (20.0)	6 (30.0)	10 (50.0)

Remote Usability Testing

- 20 SKC participants
  - 10 randomized to SMS text
  - 10 randomized to iPod Touch
- Sent home with the device
- Sent 3 labeled pill bottles
- Satisfaction survey

Remote Usability Testing



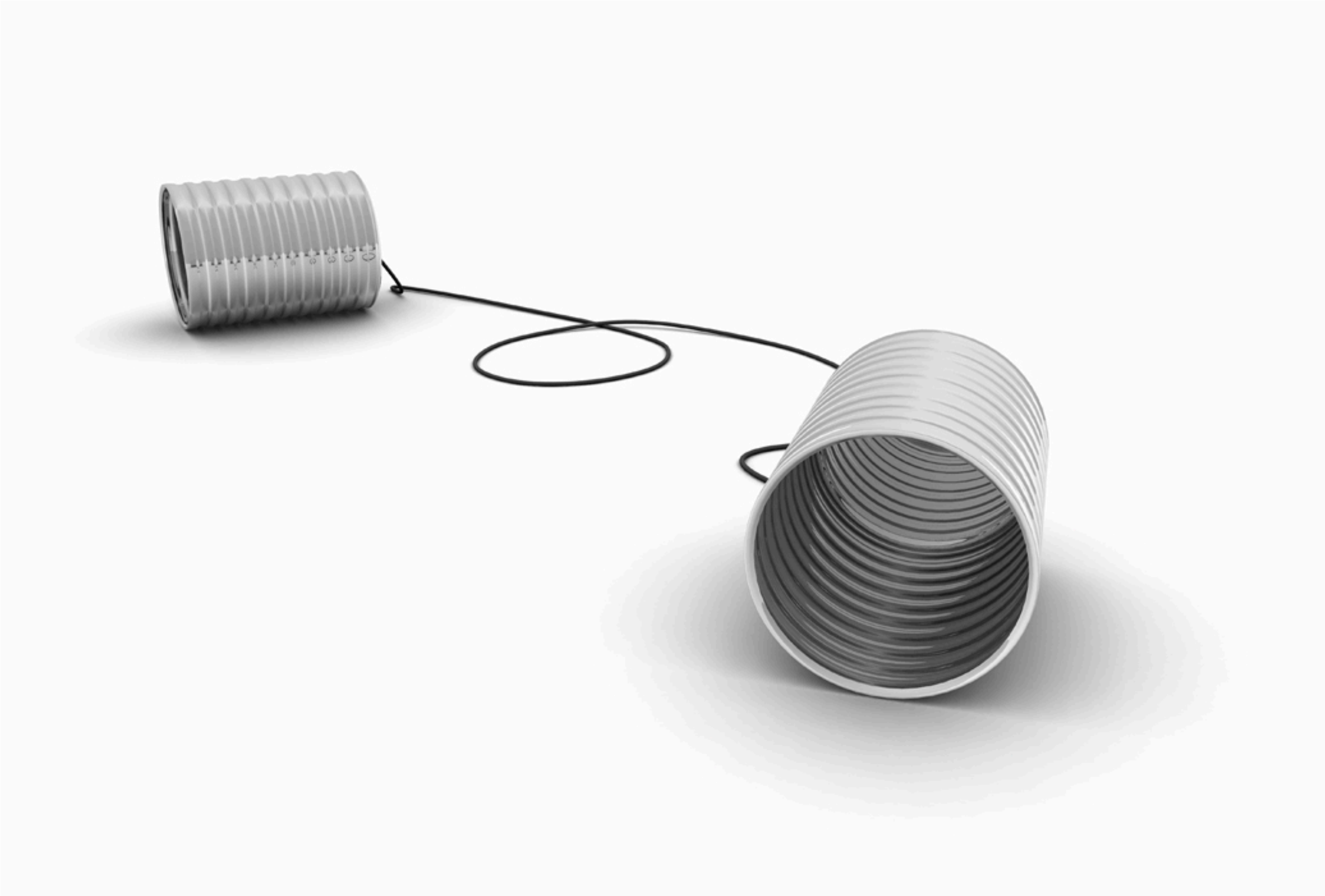
MIS Transplant

- Transplant medications
- Interaction-based approach
  - Immunosuppressives vs. other medications

Task accomplishment	All tasks (n=15)	Frequency of Text messaging	
		Daily (n=12)	< Daily or Never (n=3)
Total tasks	525	420	105
Critical errors	33 (6.3%)	19 (4.5%)	14 (13.3%)
Non critical errors	141 (26.9%)	116 (27.6%)	25 (23.8%)
Easily completed	351 (66.9%)	285 (67.9%)	66 (62.9%)

Interactive Voice Response System (IVRS)

- Spell medication
- Press corresponding numbers



Conclusion

- Limited health literacy, disease awareness, and patient safety are major problems in chronic diseases
- Novel tool development is needed to empower patients and enhance communication between providers and patients
- Health IT possibilities are as diverse as our patient populations
- Whether target populations will be accepting of these tools is yet to be determined

Acknowledgements

UNIVERSITY of MARYLAND
SCHOOL OF MEDICINE

- Jeffrey Fink, MD, MS
- Matthew Weir, MD

SAFE™ KIDNEY CARE

- Wanda Fink, RN
- Marni Zuckerman, MA
- Jennifer Ginsberg, MS
- Jingjing Chen, MD

CRIC CHRONIC RENAL INSUFFICIENCY COHORT STUDY

- Harold Feldman, MD, MSCE
- Raymond Townsend, MD
- James Lash, MD
- Lawrence Appel, MD, MPH


Thank You