a:care

MASTERCLASS 4

Digitalization and the role of innovation

Prof. John Piette

University of Michigan School of Public Health

Abbott

Proposed outline

1. What is “mobile health”?
2. Why does it matter?
3. Some important trials
4. Cutting-edge issues
5. Final thoughts


CENTER FOR MANAGING CHRONIC DISEASE
UNIVERSITY OF MICHIGAN
About
Research & Program Areas
Tools & Resources
Publications
CMCD Affiliates
Donate
EXPLORING NEW APPROACHES TO MANAGING DISEASE EFFECTIVELY
RESEARCH THAT EMPOWERS PATIENTS AND FAMILIES
LEARN MORE »
a:care

a:care

What is the center for managing chronic disease?

Research & program areas

Chronic physical and mental health conditions

Mobile technologies for improving self-care support

Populations in the US and Internationally

a:care

Mobile technologies for improving self-care support

Special devices

Smartphones

Automated calls (IVR)

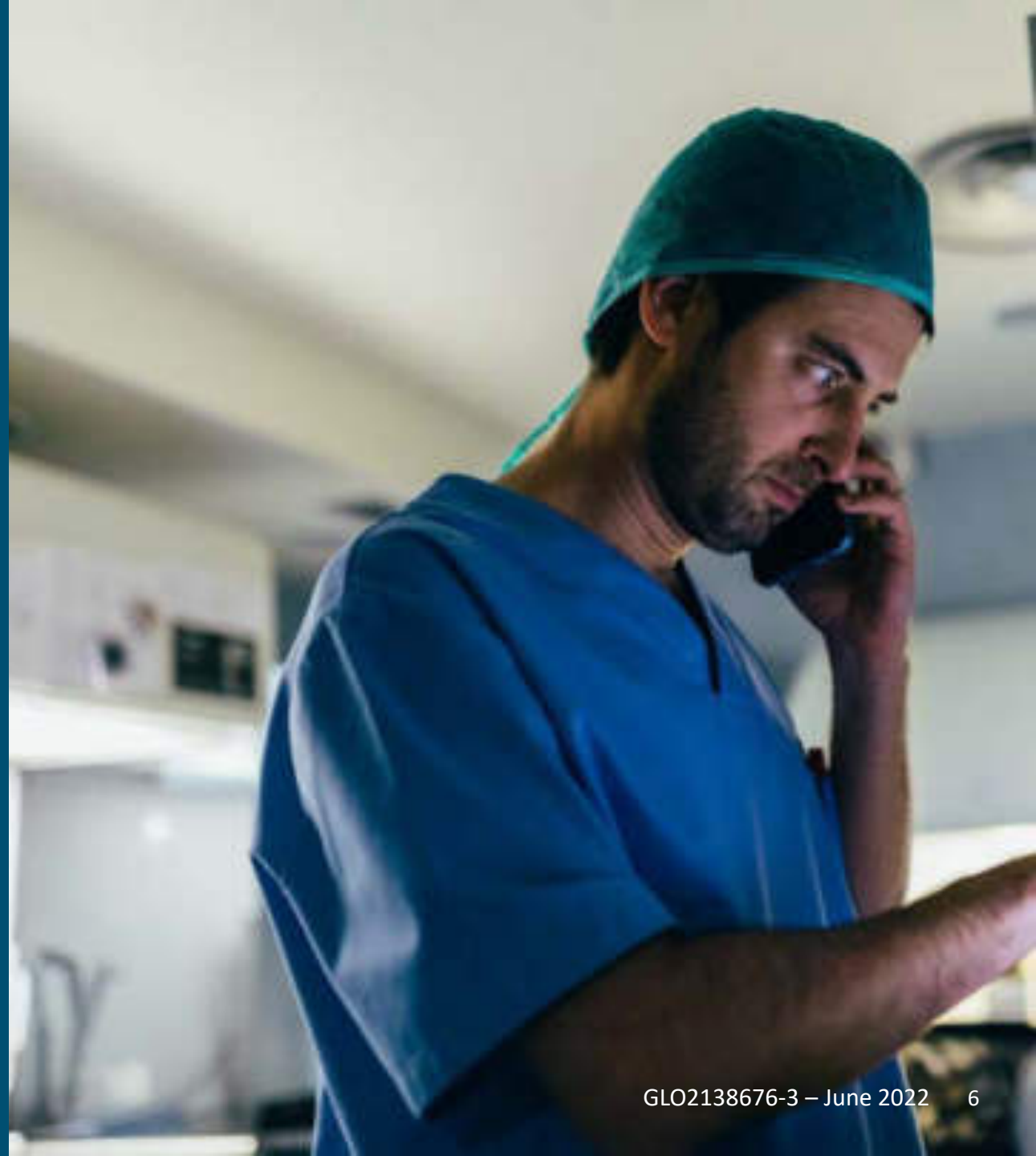
Text messages (SMS)

a:care

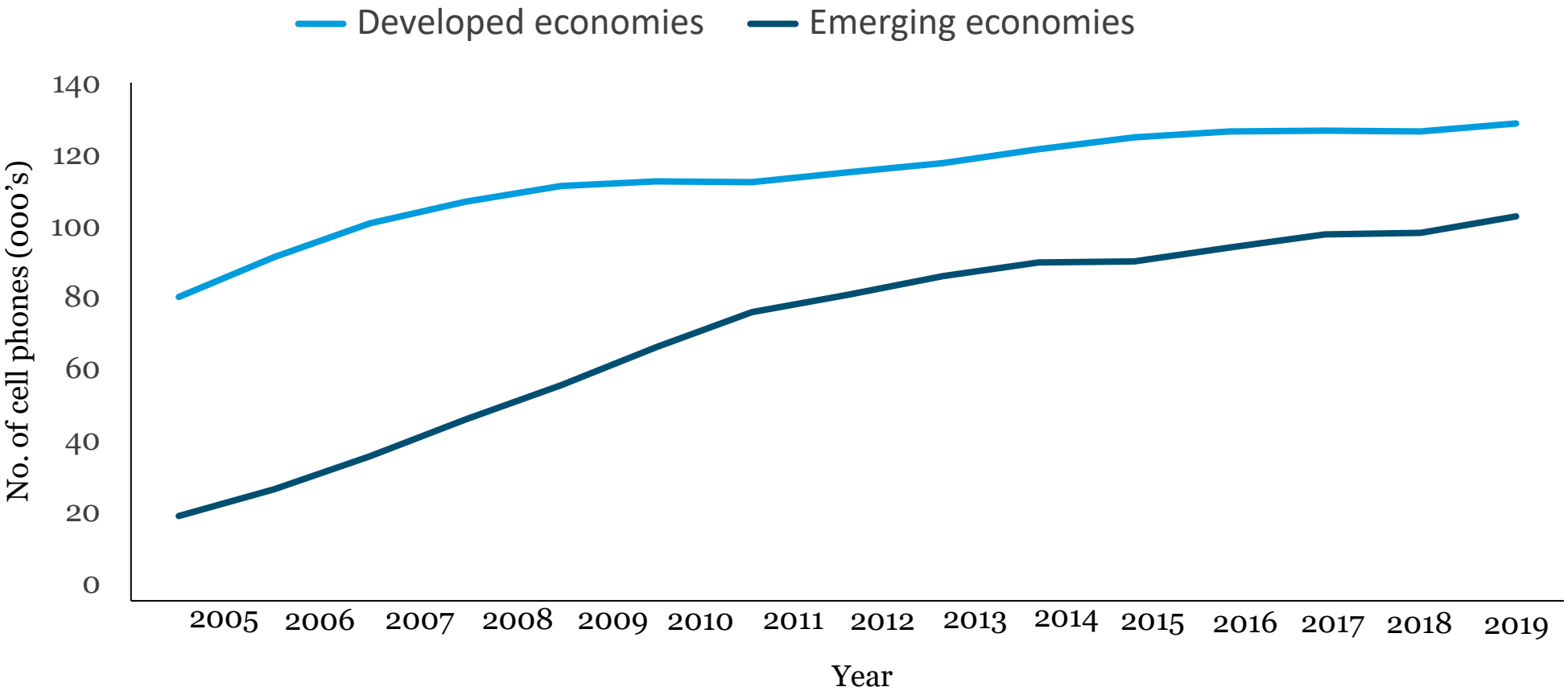
Why does mobile health matter?

Reason #1:

Everybody’s got a phone



Number of cell phones (in thousands) per 100,000 population[1]



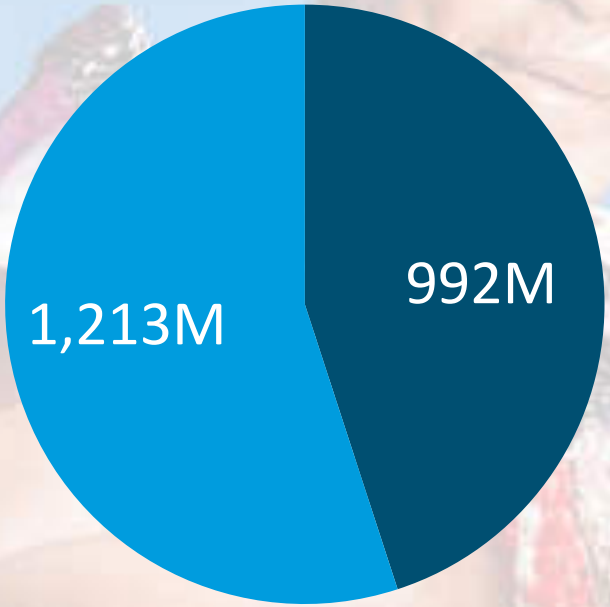
ITU: International Telecommunication Union

1. Measuring the Information Society Report, ITU, 2014 [Accessed 02 September 2020], https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2014/MIS2014_without_Annex_4.pdf

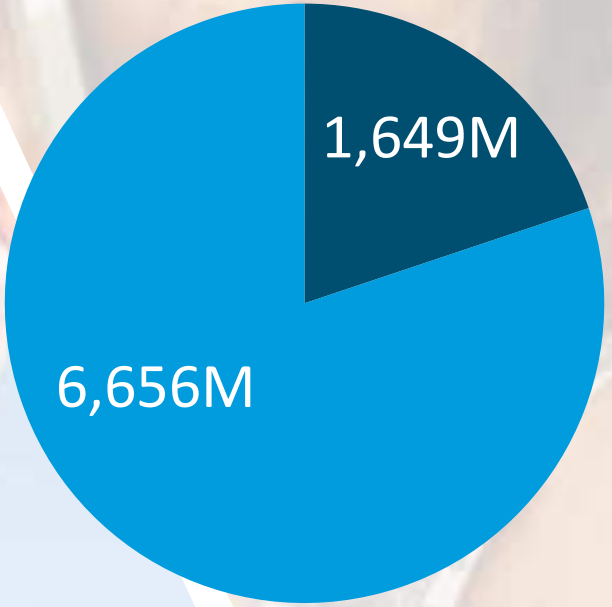
a:care

International Telecommunication Union world telecommunication/ Information and Communication Technologies indicators database

2005 (2,205M phones)[2]



2019 (8305M phones)[2]

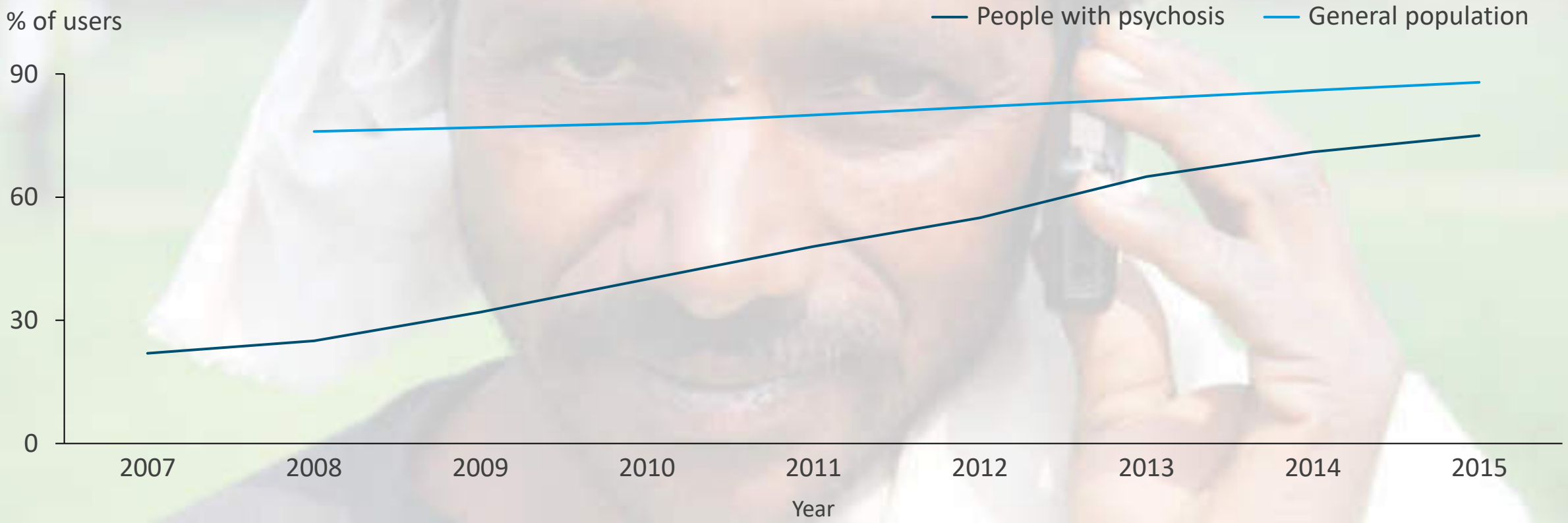


Developed Economies Emerging Economies

2. ITU: ITU-D ICT Statistics Individuals using the Internet 2005-2019, 2020, [Accessed 02 September 2020] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx


a:care

Even the most vulnerable populations have phones[3]



3 . J. Firth, J. Cotter et al: Mobile Phone Ownership and Endorsement of "mHealth" Among People With Psychosis: A Meta-analysis of Cross-sectional Studies. Schizophr Bull 42(2):448-455, September 2015, [Accessed 02 September 2020] , https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4753601/

a:care

Why does mobile health matter?

Reason #2:

There’s not enough time during face-to-face encounters[4,5]

4. Yarnall, Kimberly SH, et al: Primary care: is there enough time for prevention? American journal of public health 93(4):635-641, May 2003, [Accessed 02 September 2020], https://www.researchgate.net/publication/10835865_Primary_Care_Is_There_Enough_Time_for_Prevention

5. Østbye, Truls, et al: Is there time for management of patients with chronic diseases in primary care? Annals of Family Medicine 3(3):209-214, May 2005, [Accessed 02 September 2020], https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1466884/

a:care

Why does mobile health matter?

Reason #3:

mHealth interventions (can) be effective

a:care

Monitoring

a:care

Concordance of patients' SMS-reported home urine protein test results with same day in-clinic tests[6].

``	Same-day clinic urinalysis results			
SMS home urinalysis results	Negative / Trace	1+	2+	3+
Negative/Trace				
1+				
2+				1
≥3+				

6. Chia-shi Wang & al, Text Messaging for Disease Monitoring in Childhood Nephrotic Syndrome, Kidney Int Rep (2019) 4, 1066–1074, May 2019, [Accessed 02 September 2020], https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6698307/

a:care

Concordance of patients' SMS-reported home urine protein test results with same day in-clinic tests[6].

	Same-day clinic urinalysis results			
SMS home urinalysis results	Negative / Trace	1+	2+	3+
Negative/Trace	67	2	1	4
1+	4	6	4	2
2+	2	0	5	10
≥3+	0	1	0	27

6. Chia-shi Wang & al, Text Messaging for Disease Monitoring in Childhood Nephrotic Syndrome, Kidney Int Rep (2019) 4, 1066–1074, May 2019, [Accessed 02 September 2020], https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6698307/

a:care

Concordance of patients' SMS-reported home urine protein test results with same day in-clinic tests[6].

	Same-day clinic urinalysis results			
SMS home urinalysis results	Negative / Trace	1+	2+	3+
Negative/Trace	67	2	1	4
1+	4	6	4	2
2+	2	0	5	10
≥3+	0	1	0	27

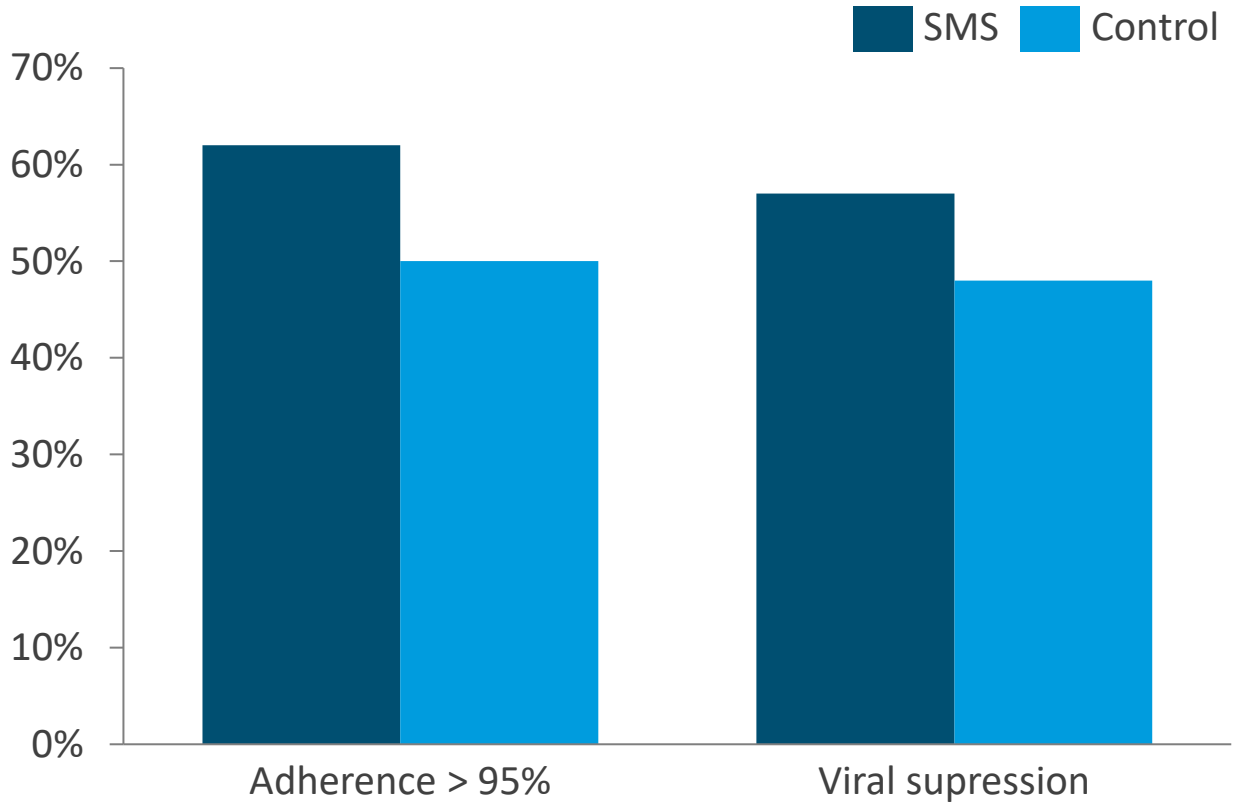
6. Chia-shi Wang & al, Text Messaging for Disease Monitoring in Childhood Nephrotic Syndrome, Kidney Int Rep (2019) 4, 1066–1074 , May 2019, [Accessed 02 September 2020], https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6698307/

a:care

Medication use

a:care

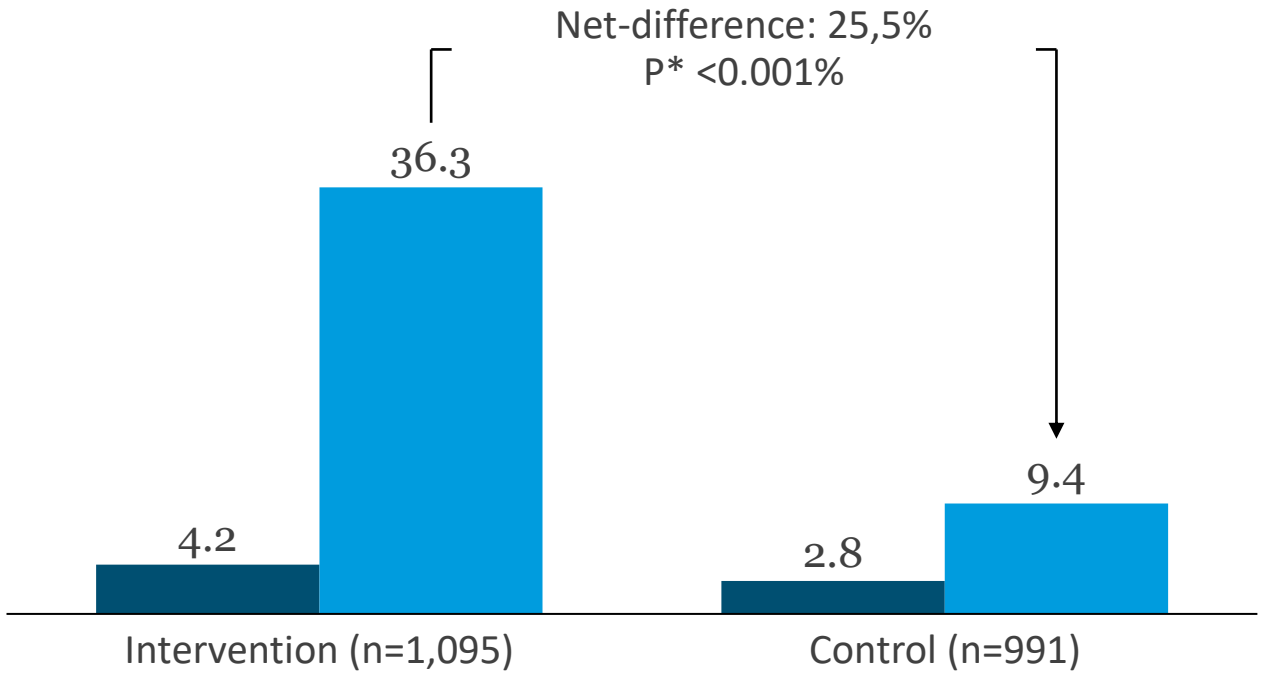
Impact of SMS in care of patients with HIV in Kenya[7]



7. Lester RT, et al: Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya. The Lancet 376(9755): 1838-45, November 2010, [Accessed 02 September 2020], https://pubmed.ncbi.nlm.nih.gov/21071074/

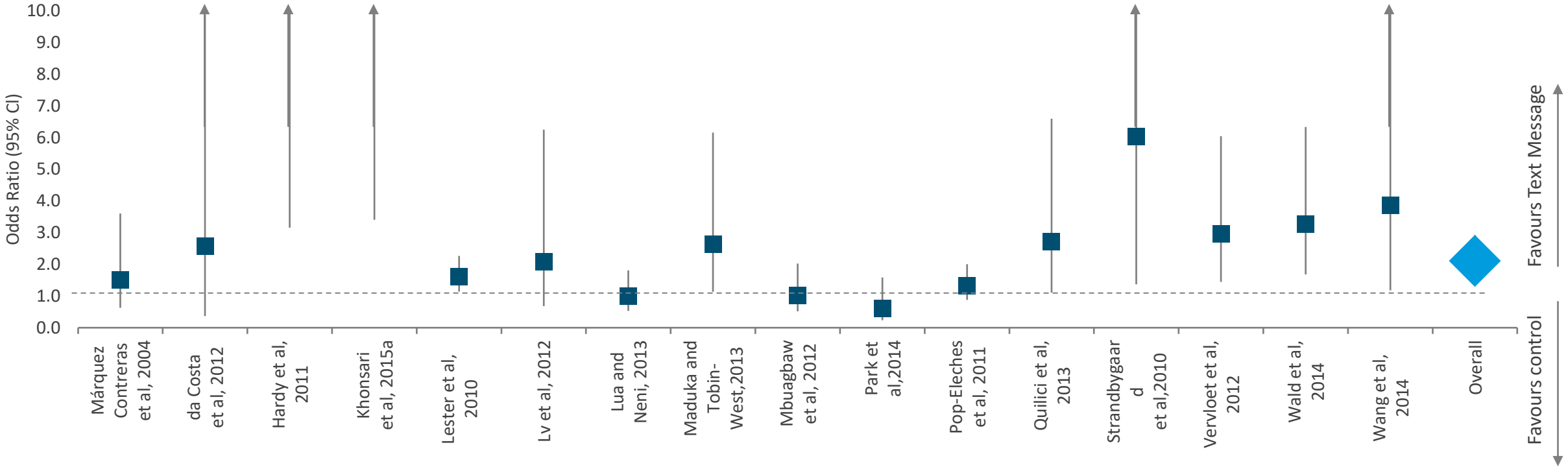
a:care

Anti-hypertensive medication use in the past month(%)[8]



8. Tian et al.: A cluster randomized controlled trial of a simplified multifaceted management program for individuals at high cardiovascular risk (SImCard Trial) in rural Tibet, China, and Haryana India. Circulation 1;132(9):815-24, September 2015 [Accessed 02 September 2020], https://pubmed.ncbi.nlm.nih.gov/26187183/

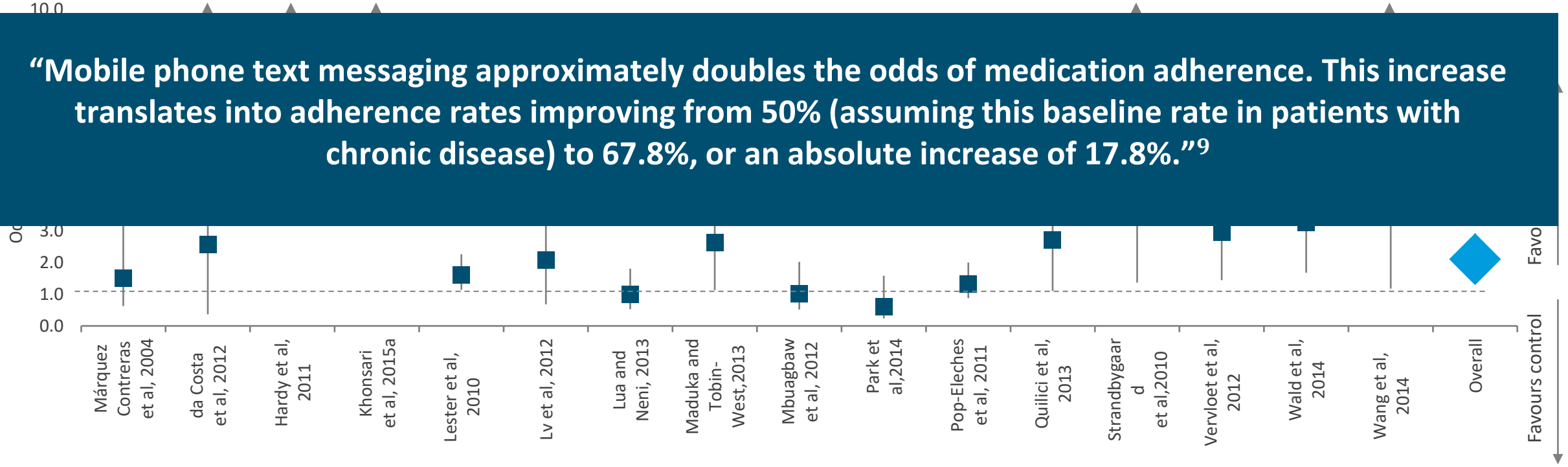
Mobile telephone text messaging for medication adherence in chronic disease a meta-analysis[9]



9. Jay Thakkar, Rahul Kurup et al: Mobile Telephone Text Messaging for Medication Adherencein Chronic Disease A Meta-analysis JAMA Intern Med. 2016;176(3):340-349, 2016, [Accessed 02 September 2020], https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2484905#:~:text=Conclusions%20and%20Relevance%20Mobile%20phone,an%20absolute%20increase%20of%2017.8%25.

Mobile telephone text messaging for medication adherence in chronic disease a meta-analysis[9]

"Mobile phone text messaging approximately doubles the odds of medication adherence. This increase translates into adherence rates improving from 50% (assuming this baseline rate in patients with chronic disease) to 67.8%, or an absolute increase of 17.8%."[9]



9. Jay Thakkar, Rahul Kurup et al: Mobile Telephone Text Messaging for Medication Adherencein Chronic Disease A Meta-analysis JAMA Intern Med. 2016;176(3):340-349, 2016, [Accessed 02 September 2020], https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2484905#:~:text=Conclusions%20and%20Relevance%20Mobile%20phone,an%20absolute%20increase%20of%2017.8%25.

a:care

Lifestyle behaviors

Txt2Stop: Texting doubles smoking cessation rates[10]

	Intervention (SE)	Control (SE)	Relative risk (95% CI)	p value
Primary outcome				
Biochemically verified abstinence at 6 months	10·7% (0·6)	4·9% (0·4)	2·20 (1·80–2·68)	<0·0001
Secondary outcomes (4 weeks)				
Self-reported no smoking in past 7 days	28·7% (0·8)	12·1% (0·6)	2·37 (2·11–2·66)	<0·0001
Secondary outcomes (6 months)				
Self-reported 28-day continuous abstinence	19·8% (0·8)	13·5% (0·7)	1·47 (1·30–1·66)	<0·0001
Self-reported no smoking in past 7 days	24·2% (0·8)	18·3% (0·8)	1·32 (1·19–1·47)	<0·0001
Self-reported involvement in vehicle crashes	4·5%(0·4)	3·8% (0·4)	1·16 (0·89–1·51)	0·269
Pain in thumb while texting	4·5% (0·4)	4·5% (0·4)	1·00 (0·78–1·28)	0·985

Data are percentage (SE) or relative risk (95% CI). Multiple imputation by chained equations (number of imputations=100)

10. Caroline Free, Rosemary Knight, Steven Robertson, et al: Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomized trial, June 2011 [Accessed 02 September 2020], https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2484905#:~:text=Conclusions%20and%20Relevance%20Mobile%20phone,an%20absolute%20increase%20of%2017.8%25.

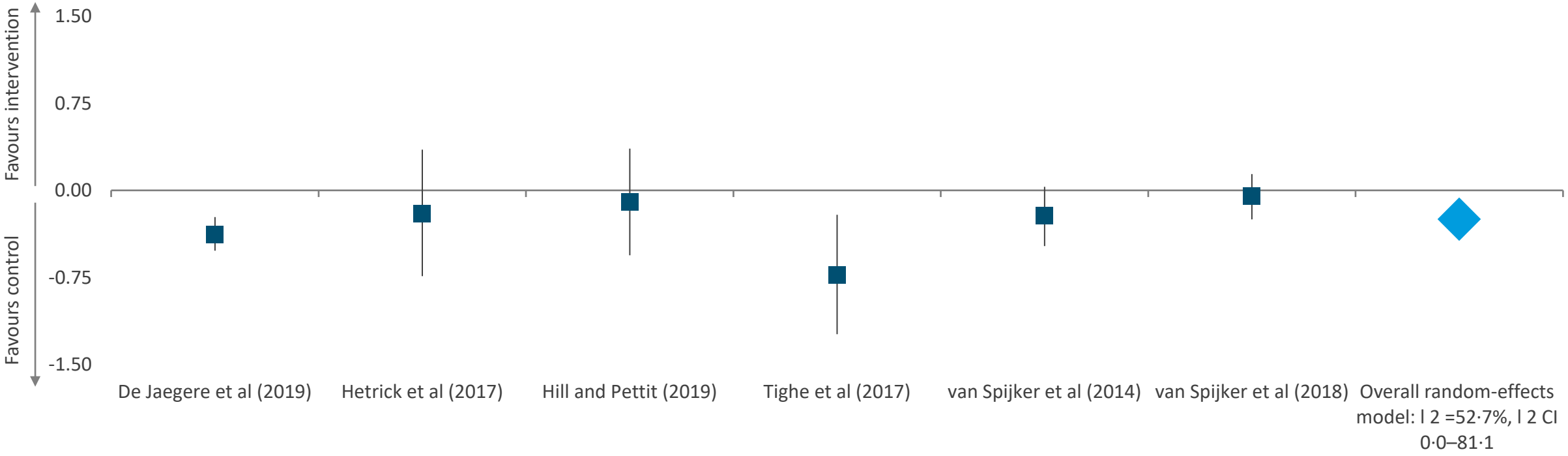
Effect of lifestyle-focused text messaging on risk factor modification in patients with coronary heart disease: A randomized clinical trial[11]

Mean (95% CI)

Parameter	Intervention	Control	Mean difference (95% CI)	pValue
LDL-C, mg/dL	79 (76 to 82)	84 (81 to 87)	−5 (−9 to 0)	.04
Systolic blood pressure, mm Hg	128.2 (126.7 to 129.8)	135.8 (134.3 to 137.3)	−7.6 (−9.8 to −5.4)	<.001
BMI	29.0 (28.8 to 29.3)	30.3 (30.1 to 30.5)	−1.3 (−1.6 to −0.9)	<.001
Physical activity, MET min/wk	936.1 (69.6)	642.7 (68.1)	293.4 (102.0 to 484.8)	.003
Smoking, No./ (%)	88/339 (26.0)	152/354 (42.9)	RR, 0.61 (0.48 to 0.76)	<.001

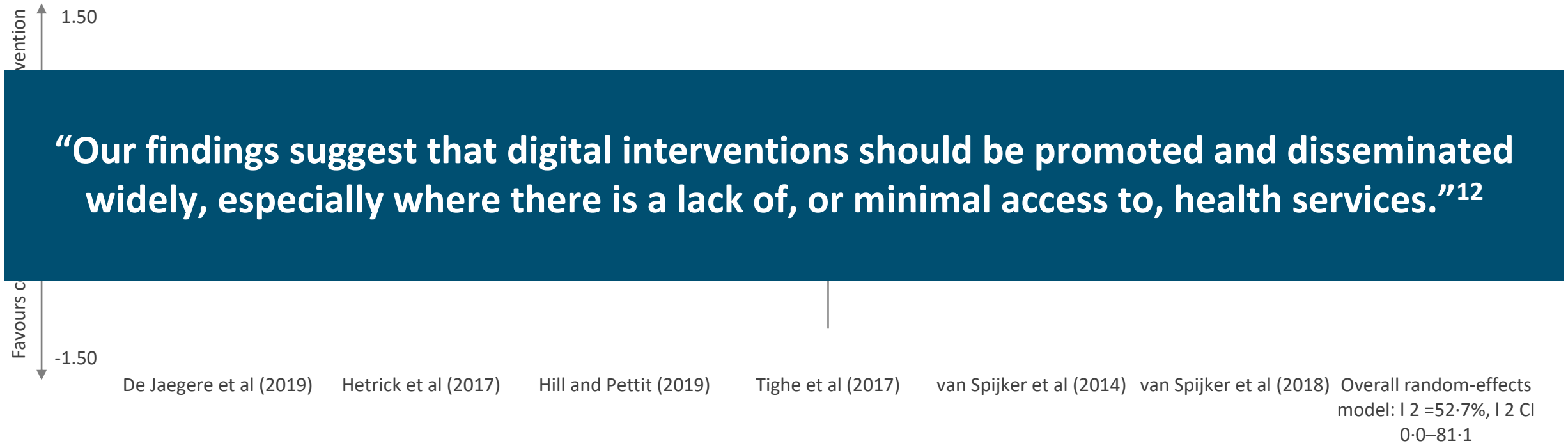
11.Clara K. Chow, Julie Redfern, Graham S. Hillis, et al: Effect of Lifestyle-Focused Text Messaging on Risk Factor Modification in Patients With Coronary Heart Disease A Randomized Clinical Trial, JAMA 314(12):1255-1263, 2015, [Accessed 02 September 2020], https://jamanetwork.com/journals/jama/fullarticle/2442937.

Suicide prevention using self-guided digital interventions: A systematic review and meta-analysis of randomized controlled trials[12]



12. Michelle Torok, Jin Han, Simon Baker, Aliza Werner-Seidler, et al: Suicide prevention using self-guided digital interventions: a systematic review and meta-analysis of randomised controlled trials. The Lancet Digital Health 2(1), 2020, [Accessed 02 September 2020], https://www.mendeley.com/catalogue/744e6160-f478-38ad-8c36-01bba572dc7e/

Suicide prevention using self-guided digital interventions: A systematic review and meta-analysis of randomized controlled trials[12]



"Our findings suggest that digital interventions should be promoted and disseminated widely, especially where there is a lack of, or minimal access to, health services."[12]

12. Michelle Torok, Jin Han, Simon Baker, Aliza Werner-Seidler, et al: Suicide prevention using self-guided digital interventions: a systematic review and meta-analysis of randomised controlled trials. The Lancet Digital Health 2(1), 2020, [Accessed 02 September 2020], https://www.mendeley.com/catalogue/744e6160-f478-38ad-8c36-01bba572dc7e/

a:care

The carepartner program

a:care

The CarePartner Program

1

Patient receives a call from the system and reports information regarding their health. Based on the responses, the patient receives information to improve their self-care

2

Clinic receives alerts about the patients' worrisome signs and symptoms

3

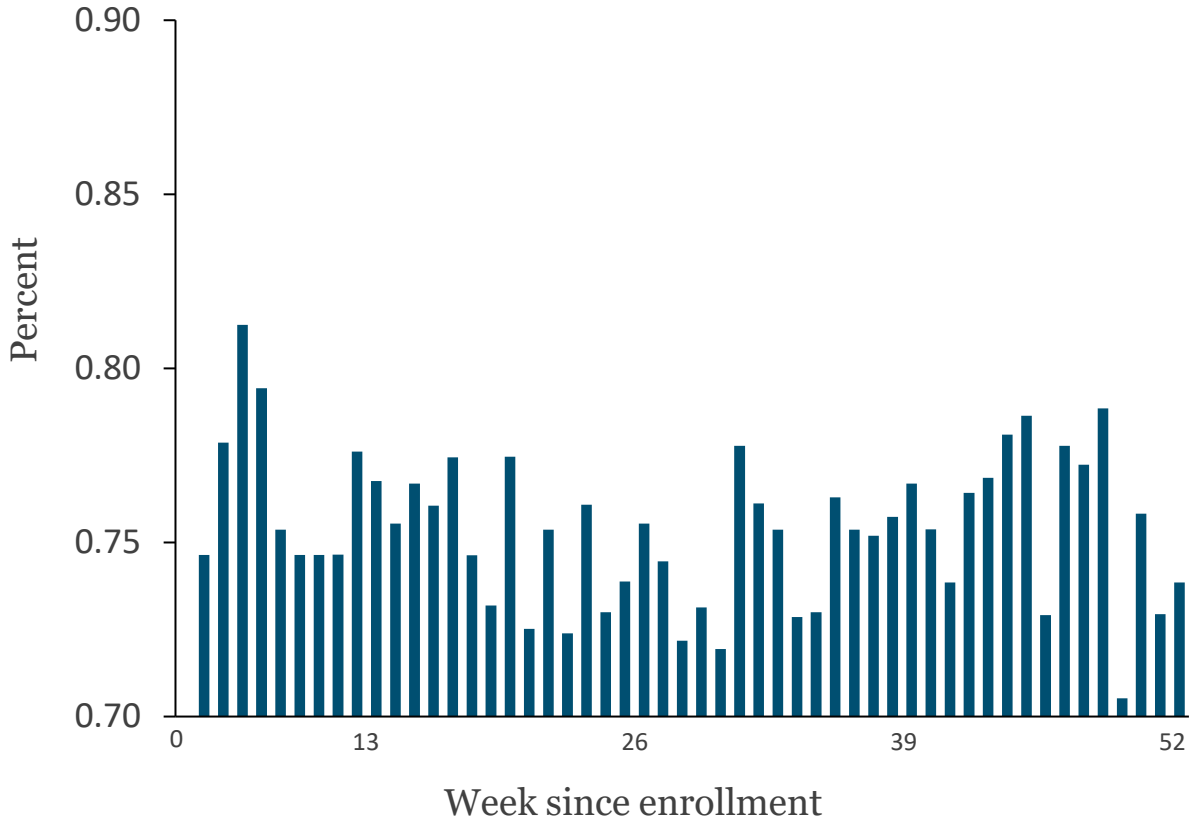
Family member or friend receives an email, IVR call, or SMS with updates on the patient's status

a:care

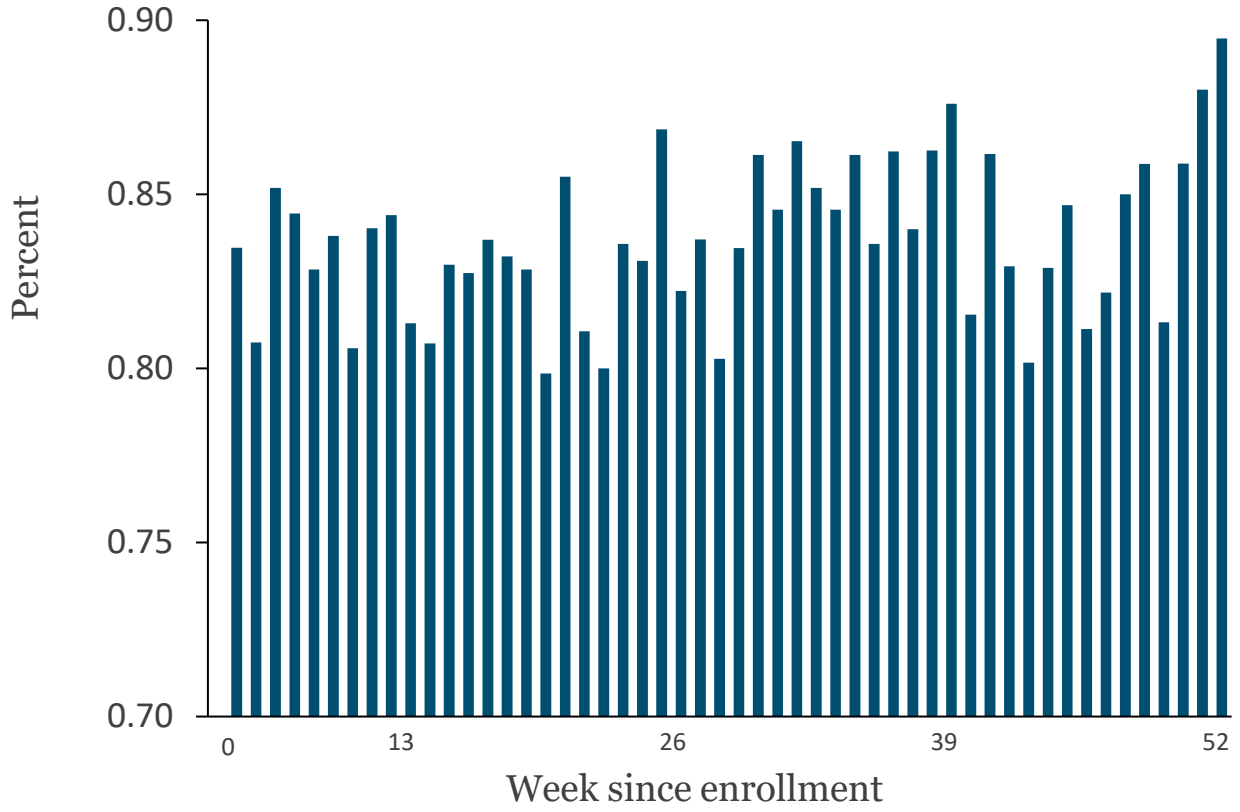
A randomized comparative effectiveness trial of patients with heart failure

IVR-Reported medication adherence[13]

Patients without CarePartner feedback



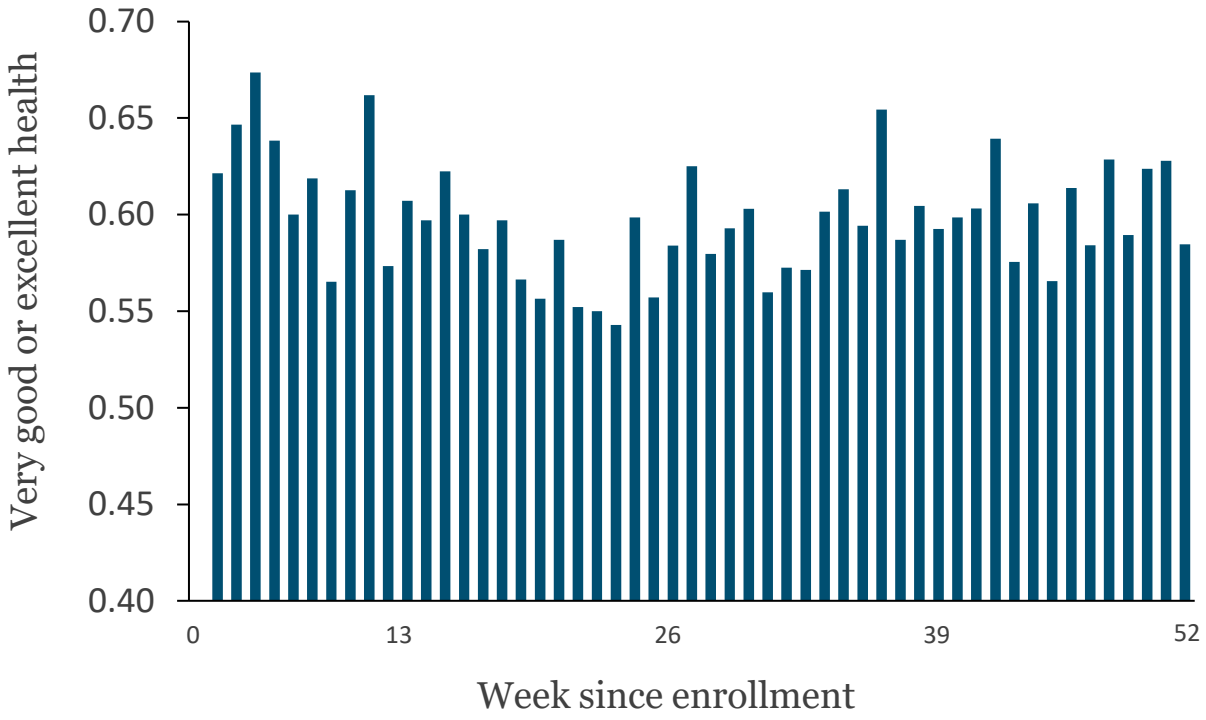
Patients with CarePartner feedback



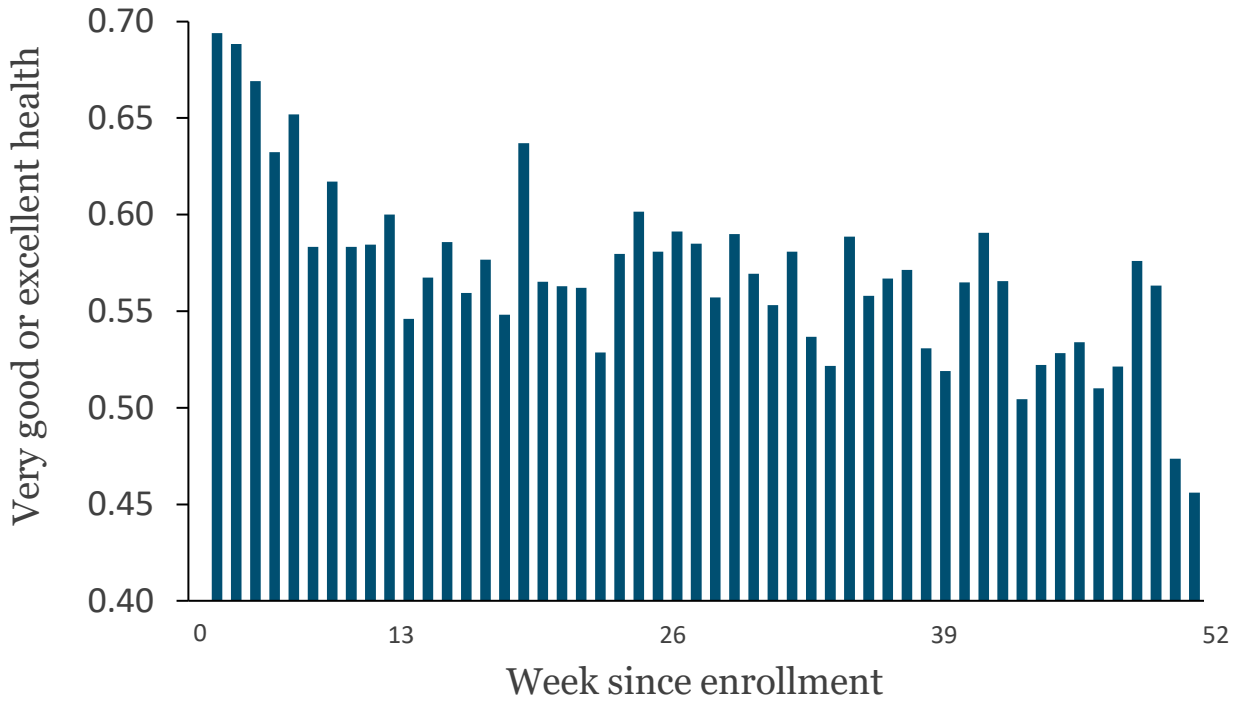
13. Piette, John D., Dana Striplin, Nicolle Marinec, Jenny Chen, Ranak B. Trivedi, David C. Aron, Lawrence Fisher, and James E. Aikens. "A mobile health intervention supporting heart failure patients and their informal caregivers: a randomized comparative effectiveness trial." Journal of medical Internet research 17, no. 6 (2015): e142.

IVR-Reported shortness of breath[14]

Patients without CarePartner feedback



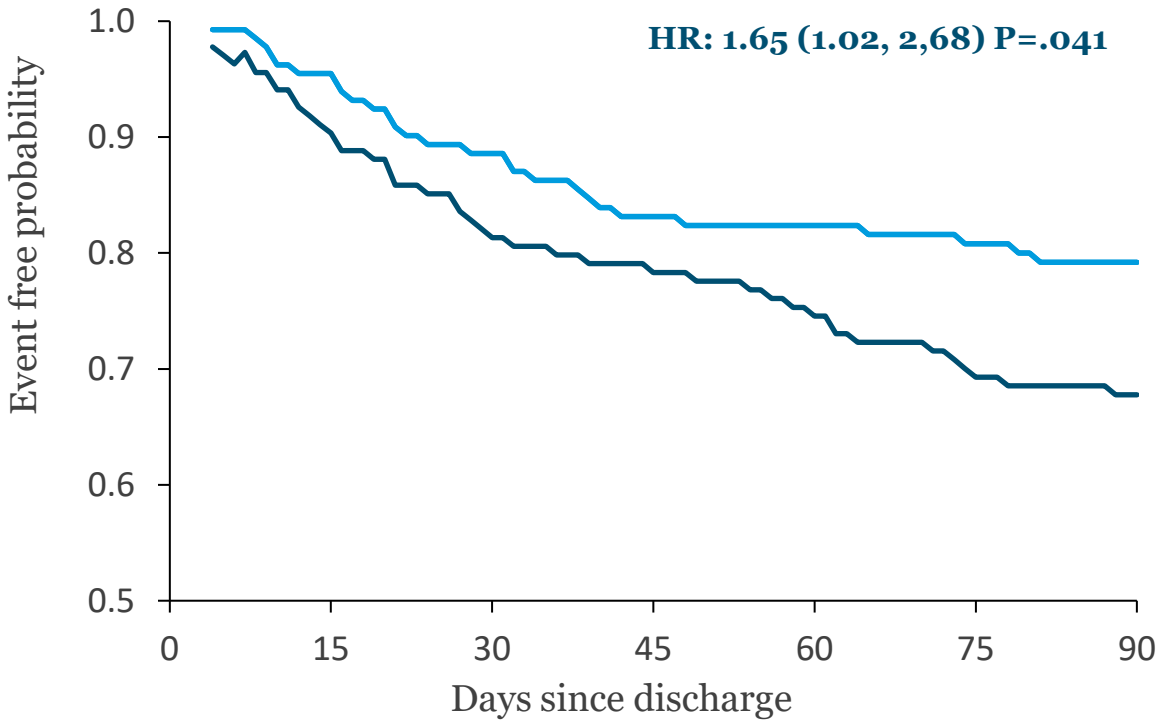
Patients with CarePartner feedback



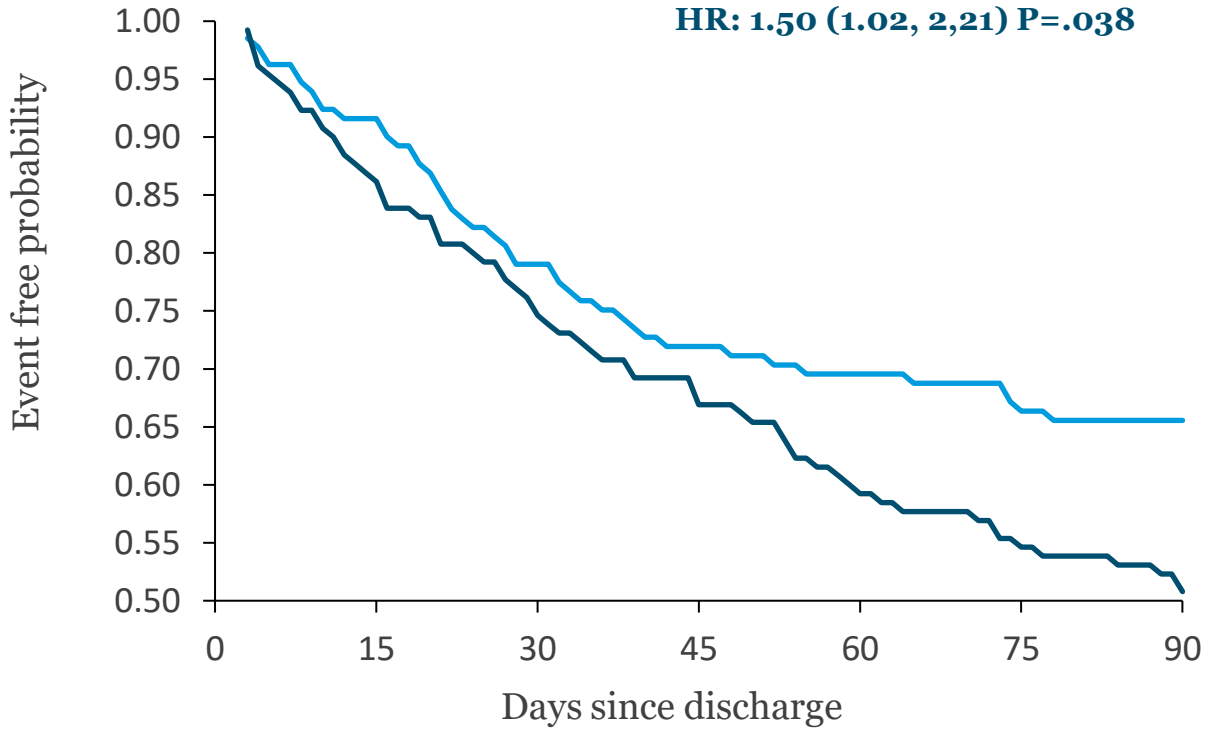
14. Piette, John D., Dana Striplin, Nicolle Marinec, Jenny Chen, Ranak B. Trivedi, David C. Aron, Lawrence Fisher, and James E. Aikens. "A mobile health intervention supporting heart failure patients and their informal caregivers: a randomized comparative effectiveness trial." Journal of medical Internet research 17, no. 6 (2015): e142.

CarePartner intervention decreases rehospitalization rates[15]

Time to first rehospitalization (all pts)



Time to first rehospitalization or ED visit



15. Piette JD, et al.: Impacts of Post-Hospitalization Accessible Health Technology and Caregiver Support on 90-Day Acute Care Use and Self-Care Assistance: a Randomized Clinical Trial. American J of Medical Quality, in press.

a:care

Caregivers felt less burden

a:care

What is Cognitive Behavioral Therapy for Chronic Pain?

- Skill-based treatment
- Informed by the biopsychosocial model
- Effective[16,17]
- Low risk
- Consistent with care for other chronic condition

16. Hoffman, Benson. M, Papas, Rebecca. K et al: Meta-analysis of psychological interventions for chronic low back pain. Health Psychol, 26, 1-9, 2007, [Accessed 02 September 2020], https://content.apa.org/record/2006-23340-001
17. Ostelo et al: Behaviorual treatment for chronic low-back pain. Cochrane Database of Systematic Reviews, January 2005, [Accessed 02 September 2020], https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD002014.pub2/information

a:care

Interactive voice response–based self management for chronic back pain. The Cooperative Pain Education and Self-management noninferiority randomized trial

Face to face CBT		IVR CBT
10 weekly sessions	⟷	10 weekly sessions
8 self-management skills	⟷	8 self-management skills
Therapist teaching	⟷	Handbook/IVR teaching
Assigned steps goals	⟷	Assigned steps goals
Pedometer logs	⟷	IVR reporting of steps for weekly pre-recorded feedback

a:care

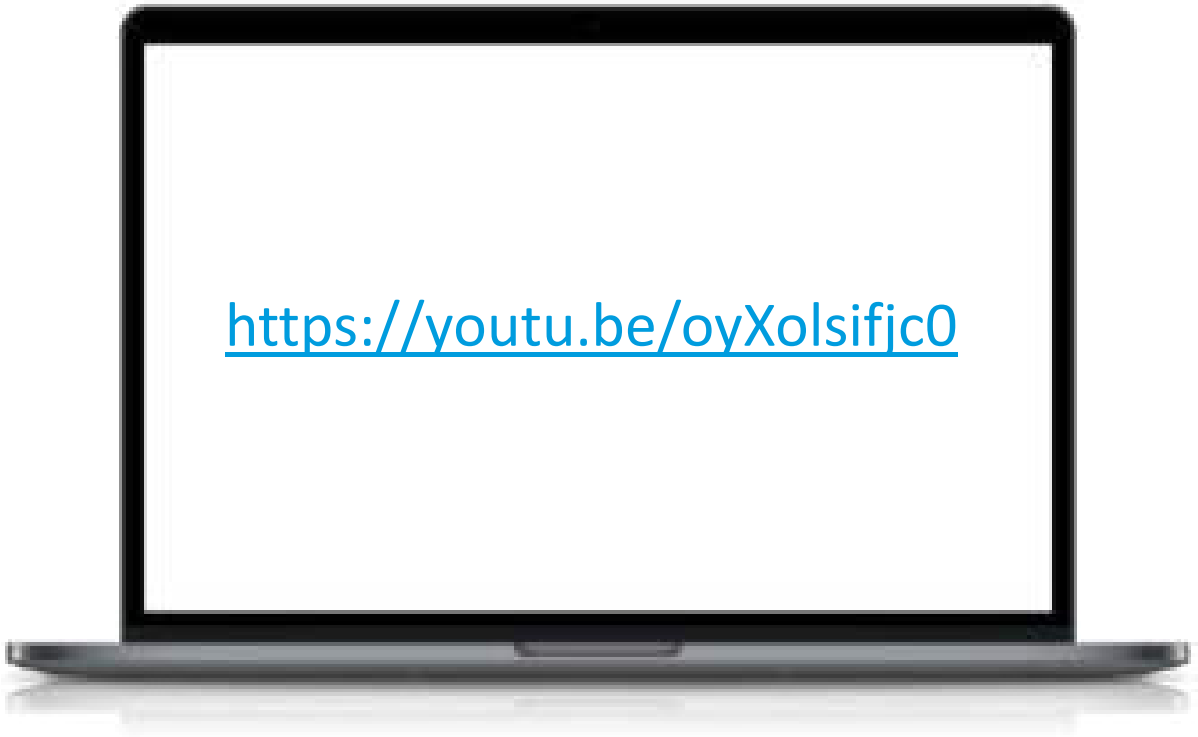
What is a good doctor like?

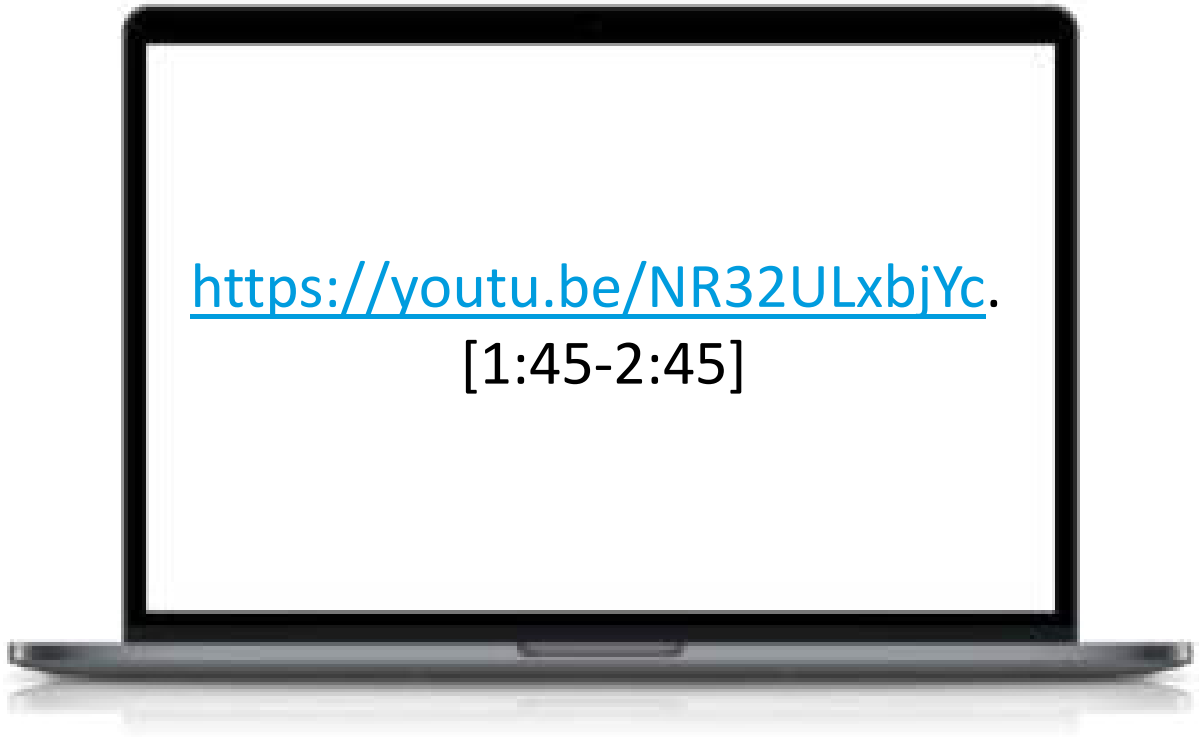
Good doctors make their assessments relevant to each patient's needs

Good doctors adapt treatment to each patient's needs

a:care

Two brief videos to illustrate a limitation of these current mobile health approaches and how AI can help





a:care

RESEARCH ARTICLE

Assessing the Effect of mHealth Interventions in Improving Maternal and Neonatal Care in Low- and Middle-Income Countries: A Systematic Review

Stephanie Felicia Victoria Sondaal[1]*, Joyce Linda Browne[1], Mary Amoakoh-Coleman[1,2], Alexander Borgstein[1], Andrea Soimes Miltenburg[3], Mirjam Verwijs[1,4], Kerstin Klipstein-Grobusch[1,5]

1 Julius Global Health, Julius Center for Health Sciences and Primary Care, University Medical Centre, Utrecht, The Netherlands, 2 School of Public Health, University of Ghana, Legon, Accra, Ghana, 3 Department of Community Medicine, Institute of Health and Society, University of Oslo, Oslo, Norway, 4 Afya Connect(A)Change, Change Lake Zone, Mwanza, Tanzania, 5 International Institute for Communication and Development, The Hague, The Netherlands, 6 Division of Epidemiology and Biostatistics, School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Mobile Text Messaging for Health: A Systematic Review of Reviews

Amanda K. Hall,[1] Heather Cole-Lewis,[2,3] and Jay M. Bernhardt[4]

[1]Department of Biomedical Informatics and Medical Education, University of Washington, School of Medicine, Seattle, Washington 98105; email: mandihall@uw.edu

[2]Department of Biomedical Informatics, Columbia University, New York, NY 10032; email: hc2441@columbia.edu

[3]ICF International, Rockville, Maryland 20850

[4]Center for Health Communication, Moody College of Communication, University of Texas, Austin, Texas 78712; email: jay.bernhardt@austin.utexas.edu

A review of reviews!!

Global Burden of Cardiovascular Disease

Mobile Health Devices as Tools for Worldwide Cardiovascular Risk Reduction and Disease Management

John D. Piette, PhD; Justin Lin, MD; Gurpreet K. Rana, MLIS; Whitney Townsend, MLIS; Dana Striplin, MHSA; Michele Heisler, MD, MPA

Abstract—We examined evidence on whether mobile health (mHealth) tools, including interactive voice response calls, short message service, or text messaging, and smartphones, can improve lifestyle behaviors and management related to cardiovascular disease throughout the world. We conducted a state-of-the-art review and literature synthesis of peer-reviewed and gray literature published since 2004. The review prioritized randomized trials and studies focused on cardiovascular diseases and risk factors, but included other reports when they represented the best available evidence. The search emphasized reports on the potential benefits of mHealth interventions implemented in low- and middle-income countries. Interactive voice response and short message service interventions can improve cardiovascular preventive care in developed countries by addressing risk factors including weight, smoking, and physical activity. Interactive voice response and short message service–based interventions for cardiovascular disease management also have shown benefits with respect to hypertension management, hospital readmissions, and diabetic glycemic control. Multimodal interventions including Web-based communication with clinicians and mHealth-enabled clinical monitoring with feedback also have shown benefits. The evidence regarding the potential benefits of interventions using smartphones and social media is still developing. Studies of mHealth interventions have been conducted in >30 low- and middle-income countries, and evidence to date suggests that programs are feasible and may improve medication adherence and disease outcomes. Emerging evidence suggests that mHealth interventions may improve cardiovascular-related lifestyle behaviors and disease management. Next-generation mHealth programs developed worldwide should be based on evidence-based behavioral theories and incorporate advances in artificial intelligence for adapting systems automatically to patients' unique and changing needs. (Circulation. 2013;132:2012-2027.)

BMC Public Health

RESEARCH ARTICLE Open Access

A systematic review of randomised control trials of sexual health interventions delivered by mobile technologies

Review

Fundamentals for Future Mobile-Health (mHealth): A Systematic Review of Mobile Phone and Web-Based Text Messaging in Mental Health

Disclaimer

This presentation is offered for educational purposes only, intended to serve as continuing medical education for health care professionals. The content of the presentation represents the views and opinions of the original creators of such content and does not necessarily represent the views or opinions of Abbott Products Operations AG or its affiliates (“Abbott”). The distribution of this presentation by Abbott, via its appearance on the a:care websites or any other means, does not constitute an endorsement by Abbott of such content. Abbott does not make any representation or warranty with respect to the accuracy, applicability, fitness, or completeness of the presentation content. Your use of any aspect of this presentation is at your own risk. Abbott cannot and does not accept any responsibility or liability for the consequences of any feature or content of the presentation, nor for any medical decision made based upon the educational content contained in the presentation. Downloading for further distribution or any form of reproduction of this presentation is not allowed.


Abbott