

Appendices/Literature Review

Personal Connected Health: The State of the Evidence and a Call to Action

Summer 2017



**Personal Connected
Health Alliance**

APPENDIX 1

Details of Database Search and Results

PubMed

www.ncbi.nlm.nih.gov/pubmed

(((((("fitness tracker"[All Fields] OR "remote patient monitoring"[All Fields]) OR "patient generated health data"[All Fields]) OR "smart clothing"[All Fields]) OR "mobile application"[All Fields]) OR "personal connected health"[All Fields]) OR ("telemedicine"[MeSH Terms] OR "telemedicine"[All Fields] OR "mhealth"[All Fields]) AND evidence[All Fields])) AND ("health"[MeSH Terms] OR "health"[All Fields]) AND (("2013/01/01"[PDAT] : "2017/12/31"[PDAT]) AND English[lang])

1373 CITATIONS RETRIEVED

(((((("fitness trackers"[MeSH Terms] OR "remote sensing technology"[MeSH Terms]) OR "telemedicine"[MeSH Terms]) OR "computers, handheld"[MeSH Terms]) OR "patient portals"[MeSH Terms]) OR "mobile applications"[MeSH Terms]) AND (((("health behavior"[MeSH Terms] OR "evidence-based practice"[MeSH Terms]) OR "outcome assessment (health care)"[MeSH Terms]) OR "self care"[MeSH Terms])) AND "health"[MeSH Terms] AND (("2013/01/01"[PDAT] : "2017/12/31"[PDAT]) AND English[lang])

57 CITATIONS RETRIEVED

ClinicalTrials.gov

clinicaltrials.gov

"fitness tracker" OR "remote patient monitoring" OR "patient generated health data" OR "smart clothing" OR "mobile application" OR "personal connected health" OR "telemedicine" OR "mhealth" | Studies With Results | Studies received from 01/01/2013 to 04/08/2017

21 CITATIONS RETRIEVED

Cochrane Reviews

www.cochranelibrary.com

("fitness tracker" OR "remote patient monitoring" OR "patient generated health data" OR "smart clothing" OR "mobile application" OR "personal connected health" OR "telemedicine" OR "mhealth") AND evidence AND health in Title, Abstract, Keywords in Cochrane Reviews'

11 CITATIONS RETRIEVED

Commonwealth Fund

www.commonwealthfund.org/publications/view-all-publications

("fitness tracker" OR "remote patient monitoring" OR "patient generated health data" OR "smart clothing" OR "mobile application" OR "personal connected health" OR "telemedicine" OR "mhealth") AND evidence AND health

5 CITATIONS RETRIEVED

TABLE 1
Criteria for Article Selection

SELECTION	EXCLUSION
<ul style="list-style-type: none"> • Peer-reviewed journal • Published after 01/01/2013 • Measurement health outcomes as part of the study • Published in peer-reviewed journal 	<ul style="list-style-type: none"> • Editorials or policy statements • Validation or usability of a new technology • Technology designed to enhance communication or performance for health care providers (no patient involvement) • Cost analysis with no health outcomes • Process evaluation • Review or meta-analysis • Design and testing of new technology • Study protocols (no results) • Sample size less than 100 individuals

FIGURE 1
Citation Review and Selection Process

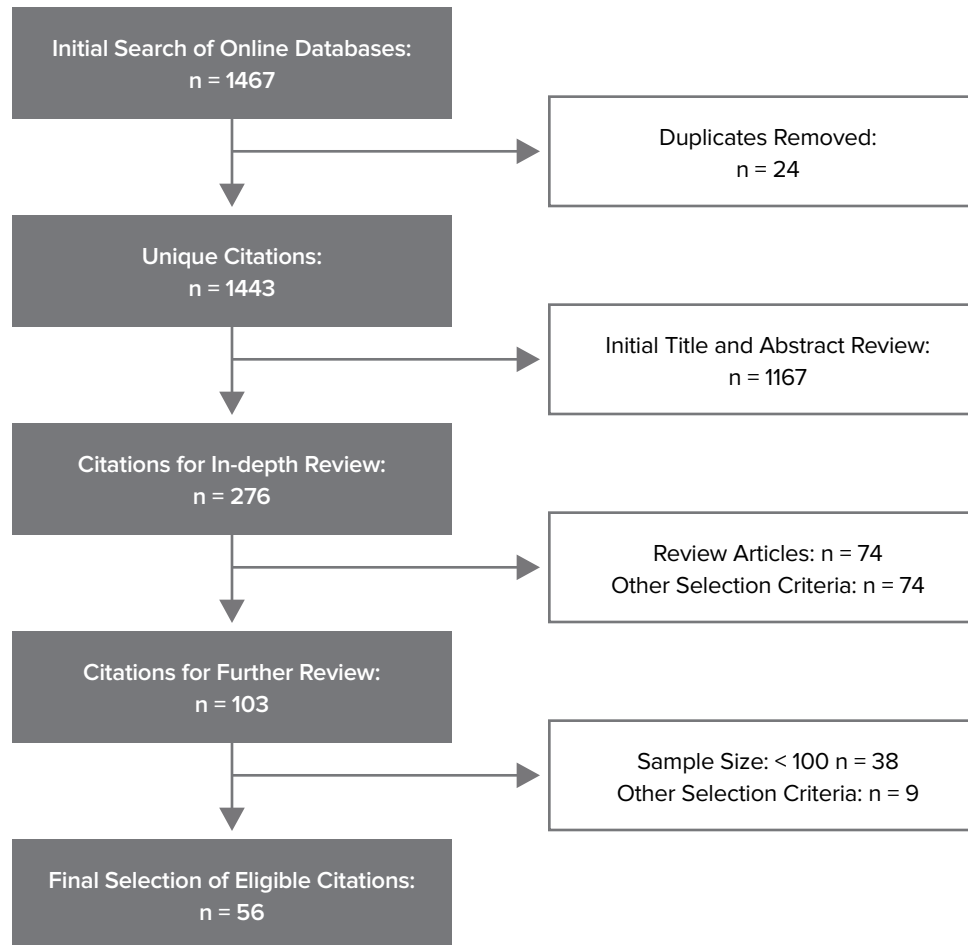


TABLE 2
Summary of Systematic Review Results

FUNCTIONAL THEME	DESCRIPTION	NUMBER OF STUDIES	NUMBER OF PUBLICATIONS
Remote Patient Monitoring	Quantitative data collection on patient health indicators, such as blood pressure, weight, or blood sugar	9	9
Behavior Change/Self-Care	Interventions intended to encourage behavior change and motivation to make healthy choices	34	35
Remote Counseling and Mental Health	Interventions providing advice, guidance or qualitative monitoring by health professionals through technology in the patient’s home (telemedicine, video conferencing)	10	12
TOTAL		53	56

TABLE 3
Summary of Remote Patient Monitoring Publications

FIRST AUTHOR	PUB YEAR	TITLE	LOCATION	POPULATION	OUTCOME MEASUREMENTS	SAMPLE SIZE
Agboola, S. ¹	2015	Heart Failure Remote Monitoring: Evidence from the Retrospective Evaluation of a Real-World Remote Monitoring Program	North America	Patients with heart failure	Mortality and hospitalizations	348
Akar, J. G. ²	2015	Use of Remote Monitoring is Associated with Lower Risk of Adverse Outcomes Among Patients with Implanted Cardiac Defibrillators	North America	Patients with implantable cardio-defibrillators	All-cause mortality and re-hospitalization	37742
Albini, F. ³	2016	An ICT and Mobile Health Integrated Approach to Optimize Patients' Education on Hypertension and its Management by Physicians: The Patients Optimal Strategy of Treatment (POST) Pilot Study	Europe	Hypertensive patients with high blood pressure, av age 57	Blood pressure values	690
Ishani, A. ⁴	2016	Telehealth by an Interprofessional Team in Patients with CKD: A Randomized Controlled Trial	North America	Patients with chronic kidney disease	Mortality and hospitalizations	601
Kim, Y. N. ⁵	2015	RCT to Assess the Effectiveness of Remote Patient Monitoring and Physician Care in Reducing Office Blood Pressure	Asia	Patients with hypertension	Blood pressure values	374
Moffet, H. ⁶	2015	In-Home Telerehabilitation Compared with Face-to-Face Rehabilitation After Total Knee Arthroplasty: A Noninferiority Randomized Controlled Trial	North America	Patients recovering from total knee arthroplasty	Osteoarthritis score	205
Ong, M. K. ⁷	2016	Effectiveness of Remote Patient Monitoring After Discharge of Hospitalized Patients With Heart Failure: The Better Effectiveness After Transition — Heart Failure (BEAT-HF) Randomized Clinical Trial	North America	Patients over 50 recovering from heart failure	Re-hospitalization rates	1437
Shea, S. ⁸	2013	Social Impact Analysis of the Effects of a Telemedicine Intervention to Improve Diabetes Outcomes in an Ethnically Diverse, Medically Underserved Population	North America	Adults over 55 with diabetes	Glycated hemoglobin levels	1,665
Upatising, B. ⁹	2013	Effects of Home Telemonitoring on Transitions Between Frailty States and Death for Older Adults: A Randomized Controlled Trial	North America	Adults over 60 with high risk of hospitalization	Frailty score	205

TABLE 4
Summary of Behavior Change/Self-Care Publications

FIRST AUTHOR	PUB YEAR	TITLE	LOCATION	POPULATION	OUTCOME MEASUREMENTS	SAMPLE SIZE
Allman-Farinelli, M. ¹⁰	2016	A Mobile Health Lifestyle Program for Prevention of Weight Gain in Young Adults (TXT2BFIT): Nine-Month Outcomes of a Randomized Controlled Trial	Australia	Over-weight 18–35 year olds	Change in weight	250
Ambeba, E. J. ¹¹	2015	The Use of mHealth to Deliver Tailored Messages Reduces Reported Energy and Fat Intake	North America	Obese adults	Changes in dietary intake (recall)	210
Bobrow, K. ¹²	2016	Mobile Phone Text Messages to Support Treatment Adherence in Adults with High Blood Pressure (SMS-Text Adherence Support [StAR]): A Single-Blind, Randomized Trial	Sub Saharan Africa	Patients with hypertension	Change in blood pressure	1372
Bolier, L. ¹³	2013	An Internet-Based Intervention to Promote Mental Fitness for Mildly Depressed Adults: Randomized Controlled Trial	Europe	Adults with depression	Mental health and well-being scores	284
Buller, D. B. ¹⁴	2015	Evaluation of Immediate and 12-Week Effects of a Smartphone Sun-Safety Mobile Application: A Randomized Clinical Trial	North America	Adults with smartphones	Self reported sun-exposure behavior change and time in the sun	202
Buller, D. B. ¹⁵	2015	Smartphone Mobile Application Delivering Personalized, Real-Time Sun Protection Advice: A Randomized Clinical Trial	North America	Adults with smartphones	Self reported sun-exposure behavior change and time in the sun	604
Buller, D. B. ¹⁶	2014	Randomized Trial of a Smartphone Mobile Application Compared to Text Messaging to Support Smoking Cessation	North America	Adult smokers 19–30 years old	Smoking cessation or quitting behavior	102
Carter, M. C. ¹⁷	2013	Adherence to a Smartphone Application for Weight Loss Compared to Website and Paper Diary: Pilot Randomized Controlled Trial	Europe	Overweight adults	Change in weight	128
Coleman, J. ¹⁸	2017	Effectiveness of an SMS-Based Maternal mHealth Intervention to Improve Clinical Outcomes of HIV-Positive Pregnant Women	Sub Saharan Africa	Pregnant HIV-pos women	Antenatal care visits, birth outcomes, infant HIV status	235

TABLE 4**Summary of Behavior Change/Self-Care Publications** (continued)

FIRST AUTHOR	PUB YEAR	TITLE	LOCATION	POPULATION	OUTCOME MEASUREMENTS	SAMPLE SIZE
Corbett, A. ¹⁹	2015	The Effect of an Online Cognitive Training Package in Healthy Older Adults: An Online Randomized Controlled Trial	Europe	Adults over 50	Activities of daily living score	6742
DiClemente, R. J. ²⁰	2014	Efficacy of a Telephone-Delivered Sexually Transmitted Infection/ Human Immunodeficiency Virus Prevention Maintenance Intervention for Adolescents: A Randomized Clinical Trial	North America	African-American girls ages 14–20	STI infection rate	701
Domek, G. J. ²¹	2016	SMS Text Message Reminders to Improve Infant Vaccination Coverage in Guatemala: A Pilot Randomized Controlled Trial	Latin America	Parents of infants 1–14 weeks old	Child vaccination rate	370
Ebert, D. D. ²²	2016	Self-Guided Internet-Based and Mobile-Based Stress Management for Employees: Results of a Randomised Controlled Trial	Europe	Adult workers with elevated levels of stress	Levels of perceived stress	264
Evans, W. ²³	2015	Dose-response Effects of the text4baby Mobile Health Program: Randomized Controlled Trial	North America	Pregnant military health beneficiaries	Health behavior change	943
Fjeldsoe, B. S. ²⁴	2016	Evaluating the Maintenance of Lifestyle Changes in a Randomized Controlled Trial of the 'Get Healthy, Stay Healthy' Program	Australia	Adults motivated to lose weight	Self-reported weight, dietary and physical activity behaviors	228
Kamal, A. K. ²⁵	2015	A Randomized Controlled Behavioral Intervention Trial to Improve Medication Adherence in Adult Stroke Patients with Prescription Tailored Short Messaging Service (SMS) — SMS4Stroke Study	South Asia	Patients recovering from stroke	Medication adherence	200
Kim, H. ²⁶	2017	Mobile But Connected: Harnessing the Power of Self-Efficacy and Group Support for Weight Loss Success through mHealth Intervention	North America	Adults motivated to lose weight	Self-efficacy score, weight	384
King, A. C. ²⁷	2014	Exercise Advice by Humans Versus Computers: Maintenance Effects at 18 months	North America	Adults over 50	Physical activity score	148

TABLE 4**Summary of Behavior Change/Self-Care Publications** (continued)

FIRST AUTHOR	PUB YEAR	TITLE	LOCATION	POPULATION	OUTCOME MEASUREMENTS	SAMPLE SIZE
Kinney, A. Y. L. ²⁸	2014	Telehealth Personalized Cancer Risk Communication to Motivate Colonoscopy in Relatives of Patients with Colorectal Cancer: The Family Care Randomized Controlled Trial	North America	Relatives of colorectal cancer patients	Colorectal cancer screening rate	481
Lau, A. Y. ²⁹	2015	Why Didn't it Work? Lessons From a Randomized Controlled Trial of a Web-based Personally Controlled Health Management System for Adults with Asthma	Australia	Adults with asthma	Asthma symptoms and creation of an asthma action plan	330
Ledford, C. J. ³⁰	2016	Mobile Application as a Prenatal Education and Engagement Tool: A Randomized Controlled Pilot	North America	Pregnant women	Gestational age, birthweight	173
Liu, W. ³¹	2016	Endocrinology Telehealth Consultation Improved Glycemic Control Similar to Face-to-Face Visits in Veterans	North America	Veterans with diabetes	Glycated hemoglobin levels	189
Lund, S. ³²	2014	Mobile Phone Intervention Reduces Perinatal Mortality in Zanzibar: Secondary Outcomes of a Cluster Randomized Controlled Trial	Sub Saharan Africa	Pregnant women	Perinatal mortality	2550
Manicavasagar, V. ³³	2014	Feasibility and Effectiveness of a Web-Based Positive Psychology Program for Youth Mental Health: Randomized Controlled Trial	Australia	Youth ages 12–18	Depression and well-being scores	235
Naughton, F. ³⁴	2017	Large Multicentre Pilot Randomised Controlled Trial Testing a Low-Cost, Tailored, Self-Help Smoking Cessation Text Message Intervention for Pregnant Smokers (MiQuit)	Europe	Pregnant women smokers	Smoking cessation or quitting behavior	407
Nevedal, D. C. ³⁵	2013	Effects of an Individually Tailored Web-Based Chronic Pain Management Program on Pain Severity, Psychological Health, and Functioning	North America	Adults with chronic pain	Pain score	645
Palermo, T. M. ³⁶	2016	Internet-Delivered Cognitive-Behavioral Treatment for Adolescents with Chronic Pain and Their Parents: A Randomized Controlled Multicenter Trial	North America	Adolescents 11–17 years old with chronic pain	Daily activity scores	273

TABLE 4**Summary of Behavior Change/Self-Care Publications** (continued)

FIRST AUTHOR	PUB YEAR	TITLE	LOCATION	POPULATION	OUTCOME MEASUREMENTS	SAMPLE SIZE
Pfamatter, A. ³⁷	2016	mHealth Intervention to Improve Diabetes Risk Behaviors in India: A Prospective, Parallel Group Cohort Study	South Asia	Adults with diabetes	Changes in diet and exercise	1243
Rini, C. ³⁸	2015	Automated Internet-Based Pain Coping Skills Training to Manage Osteoarthritis Pain: A Randomized Controlled Trial	North America	Patients with Osteoarthritis	Pain score	113
Sepah, S. C. ³⁹	2015	Long-Term Outcomes of a Web-Based Diabetes Prevention Program: 2-Year Results of a Single-Arm Longitudinal Study	North America	Patients with pre-diabetes	Self-reported weight	342
Shaw, R. J. ⁴⁰	2013	Mobile Health Messages Help Sustain Recent Weight Loss	North America	Adults motivated to lose weight	Change in weight	120
ter Huurne, E. D. ⁴¹	2013	Web-Based Treatment Program Using Intensive Therapeutic Contact for Patients with Eating Disorders: Before-After Study	Europe	Adults with eating disorder	Eating disorder scores	165
Umapathy, H. ⁴²	2015	The Web-Based Osteoarthritis Management Resource My Joint Pain Improves Quality of Care: A Quasi-Experimental Study	Australia	Adults over 50 with osteoarthritis	Osteoarthritis scores	195
van Drongelen, A. ⁴³	2014	Evaluation of an mHealth Intervention Aiming to Improve Health-Related Behavior and Sleep, and Reduce Fatigue Among Airline Pilots	Europe	Airline pilots	Fatigue scores	502
Van Reijen, M. ⁴⁴	2016	The "Strengthen Your Ankle" Program to Prevent Recurrent Injuries: A Randomized Controlled Trial Aimed at Long-Term Effectiveness	Europe	Athletes with ankle sprain	Ankle injury incidence rates	220

TABLE 5

Summary of Remote Counseling and Mental Health Publications

FIRST AUTHOR	PUB YEAR	TITLE	LOCATION	POPULATION	OUTCOME MEASUREMENTS	SAMPLE SIZE
Aburizik, A. ⁴⁵	2013	A pilot randomized controlled trial of a depression and disease management program delivered by phone	North America	Veterans with diabetes/hypertension, chronic pain and depressive symptoms	Change in depression score	133
Acierno, R. ⁴⁶	2016	Behavioral Activation and Therapeutic Exposure for Posttraumatic Stress Disorder: a Noninferiority Trial of Treatment Delivered in Person Versus Home-Based Telehealth	North America	Combat veterans with PTSD	Clinical PTSD score	265
Bannink, R. ⁴⁷	2014	Effectiveness of a Web-based tailored intervention (E-health4Uth) and consultation to promote adolescents' health: randomized controlled trial	Europe	Secondary school students	Changes in mental health scores and health behaviors	1256
Choi, N. G. ⁴⁸	2014	Six-month Post-Intervention Depression and Disability Outcomes of In-Home Telehealth Problem-Solving Therapy for Depressed, Low-Income Homebound Older Adults	North America	Low-income homebound adults over 50 years old with depression	Depression score	158
Crisp, D. ⁴⁹	2014	An Online Intervention for Reducing Depressive Symptoms: Secondary Benefits for Self-esteem, Empowerment and Quality of Life	Australia	Adults with signs of psychological distress	Depressive symptoms, loneliness, quality of life	298
Egede, L. E. ⁵⁰	2015	Psychotherapy for Depression in Older Veterans via Telemedicine: a Randomised, Open-Label, Non-Inferiority Trial	North America	Veterans over 58 years with major depression	Depression score	241
Egede, L. E. ⁵¹	2016	Psychotherapy for Depression in Older Veterans via Telemedicine: Effect on Quality of Life, Satisfaction, Treatment Credibility, and Service Delivery Perception	North America	Veterans over 58 years with major depression	Quality of life score	241
Egede, L. E. ⁵²	2017	Trajectory of Cost Overtime After Psychotherapy for Depression in Older Veterans via Telemedicine	North America	Veterans over 58 years with major depression	Overall cost	241
Hungerbuehler, I. ⁵³	2016	Home-Based Psychiatric Outpatient Care Through Videoconferencing for Depression: A Randomized Controlled Follow-Up Trial	Latin America	Adults with mild depression	Depression score	107

TABLE 5**Summary of Remote Counseling and Mental Health Publications** (continued)

FIRST AUTHOR	PUB YEAR	TITLE	LOCATION	POPULATION	OUTCOME MEASUREMENTS	SAMPLE SIZE
Morland, L. A. ⁵⁴	2015	Telemedicine Versus In-Person Delivery of Cognitive Processing Therapy for Women with Posttraumatic Stress Disorder: a Randomized Noninferiority Trial	North America	Women with PTSD	PTSD symptoms	126
O'Neil, A. ⁵⁵	2015	Long-Term Efficacy of a Tele-Health Intervention for Acute Coronary Syndrome Patients with Depression: 12-Month Results of the MoodCare Randomized Controlled Trial	Australia	Cardiac patients with depression	Depression score	121
Parks, M. J. ⁵⁶	2016	Interpersonal Communication and Smoking Cessation in the Context of an Incentive-Based Program: Survey Evidence from a Telehealth Intervention in a Low-Income Population	North America	Adult smokers	Smoking cessation or quitting behavior	970

APPENDIX 2

References Cited

- ¹ Agboola S, Jethwani K, Khateeb K, Moore S, Kvedar J. (2015) Heart failure remote monitoring: Evidence from the retrospective evaluation of a real-world remote monitoring program. *J Med Internet Res.* 17(4):e101.
- ² Akar JG, Bao H, Jones PW, Wang Y, Varosy PD, Masoudi FA, Stein KM, Saxon LA, Normand SL, Curtis JP. (2015) Use of remote monitoring is associated with lower risk of adverse outcomes among patients with implanted cardiac defibrillators. *Circ Arrhythm Electrophysiol.* 8(5):1173-1180.
- ³ Albini F, Xiaoqiu L, Torlasco C, Soranna D, Faini A, Ciminaghi R, Celsi A, Benedetti M, Zambon A, di Rienzo M, Parati G. (2016) An ICT and mobile health integrated approach to optimize patients' education on hypertension and its management by physicians: The patients optimal strategy of treatment (POST) pilot study. *Conf Proc IEEE Eng Med Biol Soc.* 2016:517-520.
- ⁴ Ishani A, Christopher J, Palmer D, Otterness S, Clothier B, Nugent S, Nelson D, Rosenberg ME, Center for Innovative Kidney Care. (2016) Telehealth by an interprofessional team in patients with CKD: A randomized controlled trial. *Am J Kidney Dis.* 68(1):41-49.
- ⁵ Kim YN, Shin DG, Park S, Lee CH. (2015) Randomized clinical trial to assess the effectiveness of remote patient monitoring and physician care in reducing office blood pressure. *Hypertens Res.* 38(7):491-497.
- ⁶ Moffet H, Tousignant M, Nadeau S, Merette C, Boissy P, Corriveau H, Marquis F, Cabana F, Ranger P, Belzile EL, Dimentberg R. (2015) In-home telerehabilitation compared with face-to-face rehabilitation after total knee arthroplasty: A noninferiority randomized controlled trial. *J Bone Joint Surg Am.* 97(14):1129-1141.
- ⁷ Ong MK, Romano PS, Edgington S, Aronow HU, Auerbach AD, Black JT, De Marco T, Escarce JJ, Evangelista LS, Hanna B, Ganiats TG, Greenberg BH, Greenfield S, Kaplan SH, Kimchi A, Liu H, Lombardo D, Mangione CM, Sadeghi B, Sadeghi B, Sarrafzadeh M, Tong K, Fonarow GC, Better Effectiveness After Transition-Heart Failure (BEAT-HF) Research Group. (2016) Effectiveness of remote patient monitoring after discharge of hospitalized patients with heart failure: The better effectiveness after transition — heart failure (BEAT-HF) randomized clinical trial. *JAMA Intern Med.* 176(3):310-318.
- ⁸ Shea S, Kothari D, Teresi JA, Kong J, Eimicke JP, Lantigua RA, Palmas W, Weinstock RS. (2013) Social impact analysis of the effects of a telemedicine intervention to improve diabetes outcomes in an ethnically diverse, medically underserved population: Findings from the IDEATel study. *Am J Public Health.* 103(10):1888-1894.
- ⁹ Upatising B, Hanson GJ, Kim YL, Cha SS, Yih Y, Takahashi PY. (2013) Effects of home telemonitoring on transitions between frailty states and death for older adults: A randomized controlled trial. *Int J Gen Med.* 6:145-151.
- ¹⁰ Allman-Farinelli M, Partridge SR, McGeechan K, Balestracci K, Hebden L, Wong A, Phongsavan P, Denney-Wilson E, Harris MF, Bauman A. (2016) A mobile health lifestyle program for prevention of weight gain in young adults (TXT2BFIT): Nine-month outcomes of a randomized controlled trial. *JMIR Mhealth Uhealth.* 4(2):e78.
- ¹¹ Ambeba EJ, Ye L, Sereika SM, Styn MA, Acharya SD, Sevick MA, Ewing LJ, Conroy MB, Glanz K, Zheng Y, Goode RW, Mattos M, Burke LE. (2015) The use of mHealth to deliver tailored messages reduces reported energy and fat intake. *J Cardiovasc Nurs.* 30(1):35-43.
- ¹² Bobrow K, Farmer AJ, Springer D, Shanyinde M, Yu LM, Brennan T, Rayner B, Namane M, Steyn K, Tarassenko L, Levitt N. (2016) Mobile phone text messages to support treatment adherence in adults with high blood pressure (SMS-text adherence support [StAR]): A single-blind, randomized trial. *Circulation.* 133(6):592-600.
- ¹³ Bolier L, Haverman M, Kramer J, Westerhof GJ, Riper H, Walburg JA, Boon B, Bohlmeijer E. (2013) An internet-based intervention to promote mental fitness for mildly depressed adults: Randomized controlled trial. *J Med Internet Res.* 15(9):e200.
- ¹⁴ Buller DB, Berwick M, Lantz K, Buller MK, Shane J, Kane I, Liu X. (2015) Evaluation of immediate and 12-week effects of a smartphone sun-safety mobile application: A randomized clinical trial. *JAMA Dermatol.* 151(5):505-512.

APPENDIX 2

References Cited (continued)

- ¹⁵ Buller DB, Berwick M, Lantz K, Buller MK, Shane J, Kane I, Liu X. (2015) Smartphone mobile application delivering personalized, real-time sun protection advice: A randomized clinical trial. *JAMA Dermatol.* 151(5):497-504.
- ¹⁶ Buller DB, Borland R, Bettinghaus EP, Shane JH, Zimmerman DE. (2014) Randomized trial of a smartphone mobile application compared to text messaging to support smoking cessation. *Telemed J E Health.* 20(3):206-214.
- ¹⁷ Carter MC, Burley VJ, Nykjaer C, Cade JE. (2013) Adherence to a smartphone application for weight loss compared to website and paper diary: Pilot randomized controlled trial. *J Med Internet Res.* 15(4):e32.
- ¹⁸ Coleman J, Bohlin KC, Thorson A, Black V, Mechael P, Mangxaba J, Eriksen J. (2017) Effectiveness of an SMS-based maternal mHealth intervention to improve clinical outcomes of HIV-positive pregnant women. *AIDS Care.* 1-8.
- ¹⁹ Corbett A, Owen A, Hampshire A, Grahn J, Stenton R, Dajani S, Burns A, Howard R, Williams N, Williams G, Ballard C. (2015) The effect of an online cognitive training package in healthy older adults: An online randomized controlled trial. *J Am Med Dir Assoc.* 16(11):990-997.
- ²⁰ DiClemente RJ, Wingood GM, Sales JM, Brown JL, Rose ES, Davis TL, Lang DL, Caliendo A, Hardin JW. (2014) Efficacy of a telephone-delivered sexually transmitted infection/human immunodeficiency virus prevention maintenance intervention for adolescents: A randomized clinical trial. *JAMA Pediatr.* 168(10):938-946.
- ²¹ Domek GJ, Contreras-Roldan IL, O'Leary ST, Bull S, Furniss A, Kempe A, Asturias EJ. (2016) SMS text message reminders to improve infant vaccination coverage in Guatemala: A pilot randomized controlled trial. *Vaccine.* 34(21):2437-2443.
- ²² Ebert DD, Heber E, Berking M, Riper H, Cuijpers P, Funk B, Lehr D. (2016) Self-guided internet-based and mobile-based stress management for employees: Results of a randomised controlled trial. *Occup Environ Med.* 73(5):315-323.
- ²³ Evans W, Nielsen PE, Szekely DR, Bihm JW, Murray EA, Snider J, Abroms LC. (2015) Dose-response effects of the text4baby mobile health program: Randomized controlled trial. *JMIR Mhealth Uhealth.* 3(1):e12.
- ²⁴ Fjeldsoe BS, Goode AD, Phongsavan P, Bauman A, Maher G, Winkler E, Eakin EG. (2016) Evaluating the maintenance of lifestyle changes in a randomized controlled trial of the 'get healthy, stay healthy' program. *JMIR Mhealth Uhealth.* 4(2):e42.
- ²⁵ Kamal AK, Shaikh Q, Pasha O, Azam I, Islam M, Memon AA, Rehman H, Akram MA, Affan M, Nazir S, Aziz S, Jan M, Andani A, Muqeet A, Ahmed B, Khoja S. (2015) A randomized controlled behavioral intervention trial to improve medication adherence in adult stroke patients with prescription tailored short messaging service (SMS)-SMS4Stroke study. *BMC Neurol.* 15:212-015-0471-5.
- ²⁶ Kim H, Faw M, Michaelides A. (2017) Mobile but connected: Harnessing the power of self-efficacy and group support for weight loss success through mHealth intervention. *J Health Commun.* 1-8.
- ²⁷ King AC, Hekler EB, Castro CM, Buman MP, Marcus BH, Friedman RH, Napolitano MA. (2014) Exercise advice by humans versus computers: Maintenance effects at 18 months. *Health Psychol.* 33(2):192-196.
- ²⁸ Kinney AY, Boonyasiriwat W, Walters ST, Pappas LM, Stroup AM, Schwartz MD, Edwards SL, Rogers A, Kohlmann WK, Boucher KM, Vernon SW, Simmons RG, Lowery JT, Flores K, Wiggins CL, Hill DA, Burt RW, Williams MS, Higginbotham JC. (2014) Telehealth personalized cancer risk communication to motivate colonoscopy in relatives of patients with colorectal cancer: The family CARE randomized controlled trial. *J Clin Oncol.* 32(7):654-662.
- ²⁹ Lau AY, Arguel A, Dennis S, Liaw ST, Coiera E. (2015) "Why didn't it work?" Lessons from a randomized controlled trial of a web-based personally controlled health management system for adults with asthma. *J Med Internet Res.* 17(12):e283.

APPENDIX 2

References Cited (continued)

- ³⁰ Ledford CJ, Canzona MR, Cafferty LA, Hodge JA. (2016) Mobile application as a prenatal education and engagement tool: A randomized controlled pilot. *Patient Educ Couns.* 99(4):578-582.
- ³¹ Liu W, Saxon DR, McNair B, Sanagorski R, Rasouli N. (2016) Endocrinology telehealth consultation improved glycemic control similar to face-to-face visits in veterans. *J Diabetes Sci Technol.* 10(5):1079-1086.
- ³² Lund S, Rasch V, Hemed M, Boas IM, Said A, Said K, Makundu MH, Nielsen BB. (2014) Mobile phone intervention reduces perinatal mortality in Zanzibar: Secondary outcomes of a cluster randomized controlled trial. *JMIR Mhealth Uhealth.* 2(1):e15.
- ³³ Manicavasagar V, Horswood D, Burckhardt R, Lum A, Hadzi-Pavlovic D, Parker G. (2014) Feasibility and effectiveness of a web-based positive psychology program for youth mental health: Randomized controlled trial. *J Med Internet Res.* 16(6):e140.
- ³⁴ Naughton F, Cooper S, Foster K, Emery J, Leonardi-Bee J, Sutton S, Jones M, Ussher M, Whitmore R, Leighton M, Montgomery A, Parrott S, Coleman T. (2017) Large multicentre pilot randomised controlled trial testing a low-cost, tailored, self-help smoking cessation text message intervention for pregnant smokers (MiQuit). *Addiction.* Feb 26 e-pub ahead of print.
- ³⁵ Nevedal DC, Wang C, Oberleitner L, Schwartz S, Williams AM. (2013) Effects of an individually tailored web-based chronic pain management program on pain severity, psychological health, and functioning. *J Med Internet Res.* 15(9):e201.
- ³⁶ Palermo TM, Law EF, Fales J, Bromberg MH, Jessen-Fiddick T, Tai G. (2016) Internet-delivered cognitive-behavioral treatment for adolescents with chronic pain and their parents: A randomized controlled multicenter trial. *Pain.* 157(1):174-185.
- ³⁷ Pfammatter A, Spring B, Saligram N, Dave R, Gowda A, Blais L, Arora M, Ranjani H, Ganda O, Hedeker D, Reddy S, Ramalingam S. (2016) mHealth intervention to improve diabetes risk behaviors in India: A prospective, parallel group cohort study. *J Med Internet Res.* 18(8):e207.
- ³⁸ Rini C, Porter LS, Somers TJ, McKee DC, DeVellis RF, Smith M, Winkel G, Ahern DK, Goldman R, Stiller JL, Mariani C, Patterson C, Jordan JM, Caldwell DS, Keefe FJ. (2015) Automated internet-based pain coping skills training to manage osteoarthritis pain: A randomized controlled trial. *Pain.* 156(5):837-848.
- ³⁹ Sepah SC, Jiang L, Peters AL. (2015) Long-term outcomes of a web-based diabetes prevention program: 2-year results of a single-arm longitudinal study. *J Med Internet Res.* 17(4):e92.
- ⁴⁰ Shaw RJ, Bosworth HB, Silva SS, Lipkus IM, Davis LL, Sha RS, Johnson CM. (2013) Mobile health messages help sustain recent weight loss. *Am J Med.* 126(11):1002-1009.
- ⁴¹ ter Huurne ED, Postel MG, de Haan HA, Drossaert CH, DeJong CA. (2013) Web-based treatment program using intensive therapeutic contact for patients with eating disorders: Before-after study. *J Med Internet Res.* 15(2):e12.
- ⁴² Umopathy H, Bennell K, Dickson C, Dobson F, Fransen M, Jones G, Hunter DJ. (2015) The web-based osteoarthritis management resource my joint pain improves quality of care: A quasi-experimental study. *J Med Internet Res.* 17(7):e167.
- ⁴³ van Drongelen A, Boot CR, Hlobil H, Twisk JW, Smid T, van der Beek AJ. (2014) Evaluation of an mHealth intervention aiming to improve health-related behavior and sleep and reduce fatigue among airline pilots. *Scand J Work Environ Health.* 40(6):557-568.
- ⁴⁴ Van Reijen M, Vriend I, Zuidema V, van Mechelen W, Verhagen EA. (2016) The “strengthen your ankle” program to prevent recurrent injuries: A randomized controlled trial aimed at long-term effectiveness. *J Sci Med Sport.* Dec 9.
- ⁴⁵ Aburizik A, Dindo L, Kaboli P, Charlton M, Dawn K, Turvey C. (2013) A pilot randomized controlled trial of a depression and disease management program delivered by phone. *J Affect Disord.* 151(2):769-774.

APPENDIX 2

References Cited (continued)

- ⁴⁶ Acierno R, Gros DF, Ruggiero KJ, Hernandez-Tejada BM, Knapp RG, Lejuez CW, Muzzy W, Frueh CB, Egede LE, Tuerk PW. (2016) Behavioral activation and therapeutic exposure for post-traumatic stress disorder: A noninferiority trial of treatment delivered in person versus home-based telehealth. *Depress Anxiety*. 33(5):415-423.
- ⁴⁷ Bannink R, Broeren S, Joosten-van Zwanenburg E, van As E, van de Looij-Jansen P, Raat H. (2014) Effectiveness of a web-based tailored intervention (E-health4Uth) and consultation to promote adolescents' health: Randomized controlled trial. *J Med Internet Res*. 16(5):e143.
- ⁴⁸ Choi NG, Marti CN, Bruce ML, Hegel MT, Wilson NL, Kunik ME. (2014) Six-month postintervention depression and disability outcomes of in-home telehealth problem-solving therapy for depressed, low-income homebound older adults. *Depress Anxiety*. 31(8):653-661.
- ⁴⁹ Crisp D, Griffiths K, Mackinnon A, Bennett K, Christensen H. (2014) An online intervention for reducing depressive symptoms: Secondary benefits for self-esteem, empowerment and quality of life. *Psychiatry Res*. 216(1):60-66.
- ⁵⁰ Egede LE, Acierno R, Knapp RG, Lejuez C, Hernandez-Tejada M, Payne EH, Frueh BC. (2015) Psychotherapy for depression in older veterans via telemedicine: A randomised, open-label, non-inferiority trial. *Lancet Psychiatry*. 2(8):693-701.
- ⁵¹ Egede LE, Acierno R, Knapp RG, Walker RJ, Payne EH, Frueh BC. (2016) Psychotherapy for depression in older veterans via telemedicine: Effect on quality of life, satisfaction, treatment credibility, and service delivery perception. *J Clin Psychiatry*. 77(12):1704-1711.
- ⁵² Egede LE, Gebregziabher M, Walker RJ, Payne EH, Acierno R, Frueh BC. (2017) Trajectory of cost overtime after psychotherapy for depression in older veterans via telemedicine. *J Affect Disord*. 207:157-162.
- ⁵³ Hungerbuehler I, Valiengo L, Loch AA, Rossler W, Gattaz WF. (2016) Home-based psychiatric outpatient care through videoconferencing for depression: A randomized controlled follow-up trial. *JMIR Ment Health*. 3(3):e36.
- ⁵⁴ Morland LA, Mackintosh MA, Rosen CS, Willis E, Resick P, Chard K, Frueh BC. (2015) Telemedicine versus in-person delivery of cognitive processing therapy for women with post-traumatic stress disorder: A randomized noninferiority trial. *Depress Anxiety*. 32(11):811-820.
- ⁵⁵ O'Neil A, Taylor B, Hare DL, Sanderson K, Cyril S, Venugopal K, Chan B, Atherton JJ, Hawkes A, Walters DL, Oldenburg B, MoodCare Investigator Team. (2015) Long-term efficacy of a tele-health intervention for acute coronary syndrome patients with depression: 12-month results of the MoodCare randomized controlled trial. *Eur J Prev Cardiol*. 22(9):1111-1120.
- ⁵⁶ Parks MJ, Slater JS, Rothman AJ, Nelson CL. (2016) Interpersonal communication and smoking cessation in the context of an incentive-based program: Survey evidence from a telehealth intervention in a low-income population. *J Health Commun*. 21(1):125-133.

APPENDIX 3

Annotated Bibliography for Evidence Review

Full-text links are provided when available.

Remote Patient Monitoring

Agboola S, Jethwani K, Khateeb K, Moore S, Kvedar J. (2015) Heart failure remote monitoring: Evidence from the retrospective evaluation of a real-world remote monitoring program. *J Med Internet Res.* 17(4):e101.

Study to improve self-management for patients with heart failure. Retrospective study comparing patients receiving usual hospital care with patients enrolled in the Connected Cardiac Care Program (CCCCP) remote patient monitoring and education program. CCCC patients received bi-weekly telephone-based education sessions combined with remote data collected by in-home blood-pressure monitor, weight scale, blood pressure cuff, pulse oximeter device. Hospitalization rate and mortality were significantly lower in the CCCC patients during but not after program enrollment (4 months).

www.ncbi.nlm.nih.gov/pmc/articles/PMC4422937

Akar JG, Bao H, Jones PW, Wang Y, Varosy PD, Masoudi FA, Stein KM, Saxon LA, Normand SL, Curtis JP. (2015) Use of remote monitoring is associated with lower risk of adverse outcomes among patients with implanted cardiac defibrillators. *Circ Arrhythm Electrophysiol.* 8(5):1173-1180.

A retrospective study on remote patient monitoring of patients with implantable cardioverter defibrillators. All patient data included in the study had implantable cardioverter defibrillators, separated into patients who used the remote patient monitoring system and those who never transmitted any remote data from their implantable device. Patients who used the remote patient monitoring function had significantly lower 1- and 3-year mortality and all-cause re-hospitalization compared to non-users. However patients who use their remote patient monitoring device may be more engaged their health care in other ways.

Albini F, Xiaoqiu L, Torlasco C, Soranna D, Faini A, Ciminaghi R, Celsi A, Benedetti M, Zambon A, di Rienzo M, Parati G. (2016) An ICT and mobile health integrated approach to optimize patients' education on hypertension and its management by physicians: The patients optimal strategy of treatment (POST) pilot study. *Conf Proc IEEE Eng Med Biol Soc.* 2016:517-520.

Patients in Italy with uncontrolled hypertension were assigned to routine management with repeated office visits or to an integrated technology strategy involving home blood pressure monitoring remote transmission, use of a web-based patient management system and a smartphone app. The app included alarm reminders and educational modules. Users of the technology showed significantly lower blood pressure and greater control of blood pressure at 6 months.

Ishani A, Christopher J, Palmer D, Otterness S, Clothier B, Nugent S, Nelson D, Rosenberg ME, Center for Innovative Kidney Care. (2016) Telehealth by an interprofessional team in patients with CKD: A randomized controlled trial. *Am J Kidney Dis.* 68(1):41-49.

Patients with chronic kidney disease in the US received care from an interprofessional team delivered by touchscreen computer and monitored with associated blood pressure cuff, scale, glucometer, pulse oximeter, stethoscope, and web camera. Control patients received usual in-person care at the facility. There was no difference in health outcomes between the two groups.

Kim YN, Shin DG, Park S, Lee CH. (2015) Randomized clinical trial to assess the effectiveness of remote patient monitoring and physician care in reducing office blood pressure. *Hypertens Res.* 38(7):491-497.

Patients with hypertension in Korea were assigned to control group receiving usual clinical care with home blood pressure monitoring, a treatment group with remote blood pressure monitoring and in-person office follow-up, or a treatment group for patients to receive remote monitoring with physician follow-up via remote communication device. Final blood pressure showed no difference between the three groups, but the remote monitoring/in-person follow up group had greater success in achieving target blood pressure than control. (no full-text available: abstract)

www.ncbi.nlm.nih.gov/pubmed/25787041?dopt=abstract

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Moffet H, Tousignant M, Nadeau S, Merette C, Boissy P, Corriveau H, Marquis F, Cabana F, Ranger P, Belzile EL, Dimentberg R. (2015) In-home telerehabilitation compared with face-to-face rehabilitation after total knee arthroplasty: A noninferiority randomized controlled trial. *J Bone Joint Surg Am.* 97(14):1129-1141.

Patients recovering from total knee arthroplasty in Canada received 16 sessions of rehabilitation from a trained physical therapist either through a personal visit in their home or via internet-delivered video and audio sessions. There was no significant or clinical difference in the resulting recovery of the patients between the in-person and video rehabilitation groups.

Ong MK, Romano PS, Edgington S, Aronow HU, Auerbach AD, Black JT, De Marco T, Escarce JJ, Evangelista LS, Hanna B, Ganiats TG, Greenberg BH, Greenfield S, Kaplan SH, Kimchi A, Liu H, Lombardo D, Mangione CM, Sadeghi B, Sadeghi B, Sarrafzadeh M, Tong K, Fonarow GC, Better Effectiveness After Transition-Heart Failure (BEAT-HF) Research Group. (2016) Effectiveness of remote patient monitoring after discharge of hospitalized patients with heart failure: The better effectiveness after transition — heart failure (BEAT-HF) randomized clinical trial. *JAMA Intern Med.* 176(3):310-318.

Patients over 50 recovering from heart failure in California received health coaching telephone calls and telemonitoring. Telemonitoring used electronic equipment included a wireless transmission pod, a weight scale, and a blood pressure and heart rate monitor integrated with a device that could display text questions and send simple text responses. Devices automatically transmitted data back to central servers for telemonitoring review by telephone call center study nurses based at the primary study site that collected daily information about blood pressure, heart rate, symptoms, and weight. Centralized registered nurses conducted telemonitoring reviews, protocolized actions, and telephone calls. There was no significant difference in hospitalization rates among the intervention group and control group receiving regular care.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4827701

Shea S, Kothari D, Teresi JA, Kong J, Eimicke JP, Lantigua RA, Palmas W, Weinstock RS. (2013) Social impact analysis of the effects of a telemedicine intervention to improve diabetes outcomes in an ethnically diverse, medically underserved population: Findings from the IDEATel study. *Am J Public Health.* 103(10):1888-1894.

Diabetes patients in New York received a home telemedicine unit consisting of a computer, web camera, home glucose meter, blood pressure cuff, access to patients' own clinical data and access to a special educational Web page created for the project by the American Diabetes Association. The control group received usual care with some printed diabetes education materials. Result show that the patients in the telemedicine group and in the lowest-income level had the greatest reduction in A1c compared to usual care controls. Further analysis in older publication on the same intervention showed significant overall improvements in the treatment groups at 1 and 5 years.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3780722

Upatising B, Hanson GJ, Kim YL, Cha SS, Yih Y, Takahashi PY. (2013) Effects of home telemonitoring on transitions between frailty states and death for older adults: A randomized controlled trial. *Int J Gen Med.* 6:145-151.

Older adults were managed in-home with a telemedicine program aimed to prevent transition to frail state. A control group received usual care with periodic phone monitoring. A home health care group received regular visits from home health nurses and therapists. A telemedicine group included telemonitoring case management with peripheral equipment in a patient's home: blood pressure, pulse, oxygen saturation, blood glucose level, and weight were measured based on their medical condition. There was no difference in the rate of transition to frail state in the home-visit versus the telemonitoring groups.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3603330

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Behavior Change/Self-Care

Allman-Farinelli M, Partridge SR, McGeechan K, Balestracci K, Hebden L, Wong A, Phongsavan P, Denney-Wilson E, Harris MF, Bauman A. (2016) A mobile health lifestyle program for prevention of weight gain in young adults (TXT2BFIT): Nine-month outcomes of a randomized controlled trial. *JMIR Mhealth Uhealth*. 4(2):e78.

A study for over-weight 18-35 year olds in Australia using a combination of coaching phone calls by a dietician, personalized text messages, emails, apps, and downloadable resources to encourage healthy eating, exercise and weight loss. Control group participants received only one coaching call and four text messages over 12-weeks while treatment group received higher intensity interaction over 6-months. Treatment group had statistically significant lower weight than controls at 12-weeks and 9-months.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4935797

Ambeba EJ, Ye L, Sereika SM, Styn MA, Acharya SD, Sevick MA, Ewing LJ, Conroy MB, Glanz K, Zheng Y, Goode RW, Mattos M, Burke LE. (2015) The use of mHealth to deliver tailored messages reduces reported energy and fat intake. *J Cardiovasc Nurs*. 30(1):35-43.

Obese adults enrolled in weekly in-person group weight management sessions were assigned to either a paper food diary, the use of a personal digital assistant food diary, or PDA plus daily customized feedback text messages to promote healthy eating for weight management. The intervention group received tailored text messages showed statistically significant reductions in daily saturated fat and energy intake compared to other groups.

www.ncbi.nlm.nih.gov/pmc/articles/PMC5027143

Bobrow K, Farmer AJ, Springer D, Shanyinde M, Yu LM, Brennan T, Rayner B, Namane M, Steyn K, Tarassenko L, Levitt N. (2016) Mobile phone text messages to support treatment adherence in adults with high blood pressure (SMS-text adherence support [StAR]): A single-blind, randomized trial. *Circulation*. 133(6):592-600.

Patients in South Africa with high blood pressure received text messages to their mobile phones with messages about healthy lifestyle and diet choices. One group received usual care from their providers, a second group received reminder messages about medication and appointments and some education messages, while the third group received the same reminder and education messages with the option to respond to messages to change text message options or appointments. At 12 months mean blood pressure was lower for all groups but only marginally significant for the information-only compared to usual care group — no statistical significance was found for the text-response group.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4750295

Bolier L, Haverman M, Kramer J, Westerhof GJ, Riper H, Walburg JA, Boon B, Bohlmeijer E. (2013) An internet-based intervention to promote mental fitness for mildly depressed adults: Randomized controlled trial. *J Med Internet Res*. 15(9):e200.

The study uses a fully automated self-help intervention to improve well-being based on positive psychology for adult patients with depression. At two months the intervention group showed some difference from the wait-listed controls in one measure of well-being but not other well-being scores. They differed significantly in depressive symptoms as well. Adherence was not high and there was no “dose-response” relationship between number of modules completed and well-being score improvement.

www.ncbi.nlm.nih.gov/pmc/articles/pmid/24041479

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Buller DB, Berwick M, Lantz K, Buller MK, Shane J, Kane I, Liu X. (2015)

Evaluation of immediate and 12-week effects of a smartphone sun-safety mobile application: A randomized clinical trial. *JAMA Dermatol.* 151(5):505-512.

A smartphone app delivered messages aimed to improve sun-exposure behaviors in adults. Messages included reminders to engage in sun-protection behaviors and hourly UV index values. No statistically significant differences were measured between users and non-users.

www.ncbi.nlm.nih.gov/pmc/articles/PMC25629819

Buller DB, Berwick M, Lantz K, Buller MK, Shane J, Kane I, Liu X. (2015)

Smartphone mobile application delivering personalized, real-time sun protection advice: A randomized clinical trial. *JAMA Dermatol.* 151(5):497-504.

The first study of the same smartphone app (discussed above) to promote sun-exposure behavior change. No significant differences in sun-protection behavior were measured after use of the app.

www.ncbi.nlm.nih.gov/pmc/articles/PMC25629710

Buller DB, Borland R, Bettinghaus EP, Shane JH, Zimmerman DE. (2014)

Randomized trial of a smartphone mobile application compared to text messaging to support smoking cessation. *Telemed J E Health.* 20(3):206-214.

A study aimed at adult smokers assigned participants to a text message group that sent text messages with guidance and information aimed to promote smoking cessation behavior. The second group used a smartphone app that included smoking cessation messages along with features to set goals, utilize coping techniques and interact with the web-interface. Most participants in both groups reported smoking cessation attempts but at 6 weeks the text message-only group showed more success than the mobile app in maintaining cessation.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3934597

Carter MC, Burley VJ, Nykjaer C, Cade JE. (2013) Adherence to a smartphone application for weight loss compared to website and paper diary: Pilot randomized controlled trial. *J Med Internet Res.* 15(4):e32.

A smartphone weight loss app was compared to a paper-based calorie-counting booklet and a web-based weight loss interface for overweight adults in England. The app provides weight loss advice and options for self-monitoring of weight, food intake and exercise. Tailored text messages provided positive support. All three groups had access to a web-based social-support forum. The small sample sizes did not show statistically significant differences between the groups.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3636323

Coleman J, Bohlin KC, Thorson A, Black V, Mechael P, Mangxaba J, Eriksen J.

(2017) Effectiveness of an SMS-based maternal mHealth intervention to improve clinical outcomes of HIV-positive pregnant women. *AIDS Care.*:1-8.

A text message system sent messages to HIV-positive pregnant women in South Africa with twice-weekly maternal health information timed to pregnancy stage. Messages were aimed to improve women's self-monitoring during pregnancy and to understand their rights and available services regarding their HIV status. A control group received no text messages. The group that received the messages attended significantly more antenatal care visits.

Corbett A, Owen A, Hampshire A, Grahn J, Stenton R, Dajani S, Burns A, Howard R, Williams N, Williams G, Ballard C. (2015) The effect of an online cognitive training package in healthy older adults: An online randomized controlled trial. *J Am Med Dir Assoc.* 16(11):990-997.

A web-based training program for improving cognitive function in older adults was tested in the UK. One version of the on-line system delivered evidence-based reasoning and problem-solving cognitive training and a second version delivered general cognitive training. A control group participated in an internet-based cognition game. Both of the cognitive training groups had statistically significant improvements in self-reported activities of daily living scores compared to the control group.

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

DiClemente RJ, Wingood GM, Sales JM, Brown JL, Rose ES, Davis TL, Lang DL, Caliendo A, Hardin JW. (2014) Efficacy of a telephone-delivered sexually transmitted infection/human immunodeficiency virus prevention maintenance intervention for adolescents: A randomized clinical trial. *JAMA Pediatr.* 168(10):938-946.

African American girls 14–20 years old received a group training in STI/HIV prevention behaviors. One group of the participants also received follow-up phone calls providing short tailored sexual health counseling by a trained health educator every eight weeks for 36 months. The second group received phone calls covering general health promotion messages. Participants receiving more telephone calls, regardless of content, had fewer chlamydial infections. A small reduction in STI rates was measured in the group receiving the tailored sexual health counseling calls.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4496945

Domek GJ, Contreras-Roldan IL, O’Leary ST, Bull S, Furniss A, Kempe A, Asturias EJ. (2016) SMS text message reminders to improve infant vaccination coverage in Guatemala: A pilot randomized controlled trial. *Vaccine.* 34(21):2437-2443.

An automated text message system to remind parents of infants to attend infant vaccination appointments was tested in Guatemala. All parents received written reminders for their child’s next vaccination appointment. Parents in the intervention group also received text messages with specific name, date, and location information for their upcoming child vaccination appointment. Both groups showed high child vaccination rates at the end of the study and no statistical significance was observed between the groups.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4859823

Ebert DD, Heber E, Berking M, Riper H, Cuijpers P, Funk B, Lehr D. (2016) Self-guided internet-based and mobile-based stress management for employees: Results of a randomised controlled trial. *Occup Environ Med.* 73(5):315-323.

Work-related stress reduction through a self-guided internet-based stress management program. Participants could also choose to receive related text-messages with tips and suggestions for reducing stress. Participants showed statistically significant reduction in perceived stress compared to the wait-listed control group.

Evans W, Nielsen PE, Szekely DR, Bihm JW, Murray EA, Snider J, Abrams LC. (2015) Dose-response effects of the text4baby mobile health program: Randomized controlled trial. *JMIR Mhealth Uhealth.* 3(1):e12.

A large-scale text messaging program for pregnant women (txt4baby) is tested for behavior change effects. Women enrolled in the treatment group received usual prenatal care plus three text messages per week tailored to the date of enrollment and gestational age. Control group received usual care from their health care provider. Results show a dose-response effect of the text messages, with higher levels of text message exposure predicting lower self-reported alcohol consumption.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4327187

Fjeldsoe BS, Goode AD, Phongsavan P, Bauman A, Maher G, Winkler E, Eakin EG. (2016) Evaluating the maintenance of lifestyle changes in a randomized controlled trial of the ‘get healthy, stay healthy’ program. *JMIR Mhealth Uhealth.* 4(2):e42.

All participants completed a 6-month lifestyle telephone coaching program in Australia. Participants in the intervention group received automated follow-up tailored text messages aimed to promote weight loss. Control group did not receive text messages. The text message group had statistically significant reduction in weight compared to controls but no difference in dietary behaviors.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4327187

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Kamal AK, Shaikh Q, Pasha O, Azam I, Islam M, Memon AA, Rehman H, Akram MA, Affan M, Nazir S, Aziz S, Jan M, Andani A, Muqteet A, Ahmed B, Khoja S. (2015) A randomized controlled behavioral intervention trial to improve medication adherence in adult stroke patients with prescription tailored short messaging service (SMS)-SMS4Stroke study. *BMC Neurol.* 15:212-015-0471-5.

Patients recovering from stroke in Pakistan received tailored prescription medication text reminders in addition to usual care. Participants were asked to respond to the text message to confirm that they took their medicine. Biweekly health education messages were also received. Control group receive usual care. The intervention group showed a statistically significant increase in medication adherence, however other factors such as high number of daily pills, cost of medicine and depression were associated with lower medication adherence regardless of treatment.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4618367

Kim H, Faw M, Michaelides A. (2017) Mobile but connected: Harnessing the power of self-efficacy and group support for weight loss success through mHealth intervention. *J Health Commun.* 1-8.

An app for promoting weight loss was studied for the specific app-related user activities that were associated with reduced weight outcomes. The app includes social support and food logging for dietary behavior change. A self-efficacy score was calculated based on user responses to an online survey and compared to the user's app profile and change in weight. Individual food logging and mobile group participation in the app significantly promoted weight loss during a six-month period.

King AC, Hekler EB, Castro CM, Buman MP, Marcus BH, Friedman RH, Napolitano MA. (2014) Exercise advice by humans versus computers: Maintenance effects at 18 months. *Health Psychol.* 33(2):192-196.

Adults over 50 in the US were assigned to a 12-month home-based physical activity promotion program delivered via a trained telephone counselor or a similar program delivered via an automated, computer-controlled interactive telephone system, or a general health education control. Both of the telephone counseling groups also received a pedometer. This study examined health outcomes six months after the study period. There was no difference in physical activity levels between the automated vs. live counseling groups and both treatment groups maintained improved average activity levels 6-months after the end of the program.

Kinney AY, Boonyasiriwat W, Walters ST, Pappas LM, Stroup AM, Schwartz MD, Edwards SL, Rogers A, Kohlmann WK, Boucher KM, Vernon SW, Simmons RG, Lowery JT, Flores K, Wiggins CL, Hill DA, Burt RW, Williams MS, Higginbotham JC. (2014) Telehealth personalized cancer risk communication to motivate colonoscopy in relatives of patients with colorectal cancer: The family CARE randomized controlled trial. *J Clin Oncol.* 32(7):654-662.

Relatives of colorectal cancer patients who are at-risk for the disease were provided counseling over the phone to promote colorectal cancer screening. The low-intervention group received printed brochures in the mail. The high-intervention group received printed material tailored with relevant messages as well as a phone call with a certified genetic counselor and printed personalized reminders. A statistically significant portion of the high-intervention group received colorectal screening in the 9-months after the study compared to the low-intervention group.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3927734

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Lau AY, Arguel A, Dennis S, Liaw ST, Coiera E. (2015) “Why didn’t it work?” Lessons from a randomized controlled trial of a web-based personally controlled health management system for adults with asthma. *J Med Internet Res.* 17(12):e283.

Adults with asthma in Australia were assigned to a control group to use a general website or the intervention group using a web-based personally controlled health management system with tailored modules on asthma management education and reminders. There were no significant differences in asthma indicators or asthma action plans between the two groups. Low use of the web-based program were noted.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4704895

Ledford CJ, Canzona MR, Cafferty LA, Hodge JA. (2016) Mobile application as a prenatal education and engagement tool: A randomized controlled pilot. *Patient Educ Couns.* 99(4):578-582.

Pregnant women were encouraged to use a mobile app patient for record-keeping and monitoring versus a spiral-notebook. No difference was measured in pregnancy health outcomes between the two groups but the mobile-app users rated a higher satisfaction with their care.

Liu W, Saxon DR, McNair B, Sanagorski R, Rasouli N. (2016) Endocrinology telehealth consultation improved glycemic control similar to face-to-face visits in veterans. *J Diabetes Sci Technol.* 10(5):1079-1086.

A comparison of diabetes counseling delivered to patients face-to-face or via telehealth technology. There was no difference in the glycosylated hemoglobin levels between the two groups. (no full-text available)

Lund S, Rasch V, Hemed M, Boas IM, Said A, Said K, Makundu MH, Nielsen BB. (2014) Mobile phone intervention reduces perinatal mortality in Zanzibar: Secondary outcomes of a cluster randomized controlled trial. *JMIR Mhealth Uhealth.* 2(1):e15.

Pregnant women in Zanzibar, Tanzania were provided with a mobile phone text message system that sent automated short message service and a mobile phone system that provided the opportunity of direct two-way communication with their primary health care providers. Intervention group showed a significant reduction in perinatal mortality compared to control.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4114456

Manicavasagar V, Horswood D, Burckhardt R, Lum A, Hadzi-Pavlovic D, Parker G. (2014) Feasibility and effectiveness of a web-based positive psychology program for youth mental health: Randomized controlled trial. *J Med Internet Res.* 16(6):e140.

An online positive psychology website for adolescents was presented to a general youth population in Australia. A control group used media and entertainment websites. Users of the website reported significantly lower depression and stress scores compared to controls; high frequency users (>3x week) also showed significant increase in well-being scores.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4071231

Naughton F, Cooper S, Foster K, Emery J, Leonardi-Bee J, Sutton S, Jones M, Ussher M, Whitemore R, Leighton M, Montgomery A, Parrott S, Coleman T. (2017) Large multicentre pilot randomised controlled trial testing a low-cost, tailored, self-help smoking cessation text message intervention for pregnant smokers (MiQuit). *Addiction.*

All participants received a smoking cessation brochure, while intervention participants also received a 12-week program of individually-tailored, automated, interactive, self-help smoking cessation text messages. Smoking cessation and quitting behavior was not significantly different in the text-message group compared to the control group.

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Nevedal DC, Wang C, Oberleitner L, Schwartz S, Williams AM. (2013) Effects of an individually tailored web-based chronic pain management program on pain severity, psychological health, and functioning. *J Med Internet Res.* 15(9):e201.

Participants were exposed to a tailored web-based chronic pain management program provided by a health insurance plan. The program promotes pain self-management. Users reported statistically significant improvements in pain scores compared to control.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3785999

Palermo TM, Law EF, Fales J, Bromberg MH, Jessen-Fiddick T, Tai G. (2016) Internet-delivered cognitive-behavioral treatment for adolescents with chronic pain and their parents: A randomized controlled multicenter trial. *Pain.* 157(1):174-185.

A web-based pain management education and counseling program for pediatric patients (and their parents) with chronic pain was tested. One group of participants used an education-only web-based program to learn how to manage chronic pain. A second group used a web-based program that included cognitive behavioral therapy and opportunities to communicate with a study coach. There was a small but significant difference in daily activity score improvements in the comprehensive group at the 6-month follow-up but not at the assessment at the end of the study period.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4852469

Pfammatter A, Spring B, Saligram N, Dave R, Gowda A, Blais L, Arora M, Ranjani H, Ganda O, Hedeker D, Reddy S, Ramalingam S. (2016) mHealth intervention to improve diabetes risk behaviors in India: A prospective, parallel group cohort study. *J Med Internet Res.* 18(8):e207.

Adult with diabetes in India received text messages on healthy lifestyle choices and diabetes management. Participants in the text message group reported significantly greater improvements in healthy eating and lifestyle than control.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4992169

Rini C, Porter LS, Somers TJ, McKee DC, DeVellis RF, Smith M, Winkel G, Ahern DK, Goldman R, Stiller JL, Mariani C, Patterson C, Jordan JM, Caldwell DS, Keefe FJ. (2015) Automated internet-based pain coping skills training to manage osteoarthritis pain: A randomized controlled trial. *Pain.* 156(5):837-848.

Patients with osteoarthritis were provided access to online pain management training modules. Control patients did not use the program. There were significant sex-treatment interactions, with women in the treatment group showing small but significant reductions in pain scores.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4402249

Sepah SC, Jiang L, Peters AL. (2015) Long-term outcomes of a web-based diabetes prevention program: 2-year results of a single-arm longitudinal study. *J Med Internet Res.* 17(4):e92.

An internet-based diabetes prevention and support program was provided for patients with pre-diabetes in the US. The on-line platform included social support components, education modules, weight tracking, and options to call a live coach. Participants who only completed four or fewer lessons were separate from those who completed more than nine. Program starters and completers both show significant reduction in weight loss and maintenance one year after the study period.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4409647

Shaw RJ, Bosworth HB, Silva SS, Lipkus IM, Davis LL, Sha RS, Johnson CM. (2013) Mobile health messages help sustain recent weight loss. *Am J Med.* 126(11):1002-1009.

Adults in the US who completed a self-management class were randomized to receive one of three types of text messages: messages promoting physical activity, weight management and diet; messages promoting success and self-reward, or messages about preventing failure and avoiding temptation. A control group received general health messages. There was no significant difference in weight loss measure for participants in the three groups. There was a slight but significant difference in weight maintenance in the prevention-message group compared to the control.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3820279

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

ter Huurne ED, Postel MG, de Haan HA, Drossaert CH, DeJong CA. (2013) Web-based treatment program using intensive therapeutic contact for patients with eating disorders: Before-after study. *J Med Internet Res.* 15(2):e12.

Adults with eating disorder were given access to a web-based education and therapy program with support from a live therapist. Participants showed significant improvement in eating disorder scores and behaviors upon completion and at 6-week and 6-month follow-ups.

www.ncbi.nlm.nih.gov/pmc/articles/PMC3636210

Umapathy H, Bennell K, Dickson C, Dobson F, Fransen M, Jones G, Hunter DJ. (2015) The web-based osteoarthritis management resource my joint pain improves quality of care: A quasi-experimental study. *J Med Internet Res.* 17(7):e167.

Older adults in Australia with osteoarthritis were provided access to a website designed to foster self-management, improve education and pain management. Users could report weekly, monthly, and biannual pain, weight, treatments and medications, and quality of life. Users showed some significant improvements in some aspects of the score arthritis or quality of life indicators but not all (pre-post treatment).

www.ncbi.nlm.nih.gov/pmc/articles/PMC4526979

van Drongelen A, Boot CR, Hlobil H, Twisk JW, Smid T, van der Beek AJ. (2014) Evaluation of an mHealth intervention aiming to improve health-related behavior and sleep and reduce fatigue among airline pilots. *Scand J Work Environ Health.* 40(6):557-568.

An app to reduce fatigue and circadian disruption in airline pilots was made available to pilots in The Netherlands. The app included tailored information on flight schedules and personal characteristics and sent users reminders and alerts. The control group was given access to a general website with fatigue-related information. The intervention group significantly improved on fatigue scores and sleep quality compared to controls.

Van Reijnen M, Vriend I, Zuidema V, van Mechelen W, Verhagen EA. (2016) The “strengthen your ankle” program to prevent recurrent injuries: A randomized controlled trial aimed at long-term effectiveness. *J Sci Med Sport.* Dec 9.

Athletes who suffered ankle sprain were randomized to a control group receiving a print booklet on ankle strengthening or an intervention group provided with a mobile smartphone app with interactive schedule, tracking, education and training suggestions. Both groups received a balance board for home-based exercises. There was no measured reduction in subsequent ankle sprain rate between app users and brochure groups and no improved compliance with exercises.

Remote Counseling and Mental Health

Aburizik A, Dindo L, Kaboli P, Charlton M, Dawn K, Turvey C. (2013) A pilot randomized controlled trial of a depression and disease management program delivered by phone. *J Affect Disord.* 151(2):769-774.

Weekly phone visits for management of depression in patients with other chronic conditions. Treatments included weekly phone calls with trained counselors (“Illness Management”) or combined with psychotherapy (“Combined”). Both treatment arms showed improved depression scores compared to Usual Care controls.

Acierno R, Gros DF, Ruggiero KJ, Hernandez-Tejada BM, Knapp RG, Lejuez CW, Muzzy W, Frueh CB, Egede LE, Tuerk PW. (2016) Behavioral activation and therapeutic exposure for post-traumatic stress disorder: A noninferiority trial of treatment delivered in person versus home-based telehealth. *Depress Anxiety.* 33(5):415-423.

Home-based telehealth counseling sessions compared to in-office face-to-face treatment for returned combat veterans with PTSD. Weekly counseling was provided by trained counselors either in-office or via internet-based video communication technology. Both groups achieved similar reductions in PTSD scored symptoms showing that the video-delivered in-home counseling was as effective as in-person counseling.

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Bannink R, Broeren S, Joosten-van Zwanenburg E, van As E, van de Looij-Jansen P, Raat H. (2014) Effectiveness of a web-based tailored intervention (E-health4Uth) and consultation to promote adolescents' health: Randomized controlled trial. *J Med Internet Res.* 16(5):e143.

Delivery of web-based tailored messages to adolescent students in the Netherlands to promote healthy behavior change. The standard intervention included self-referral to health care providers, social media use. Treatment group also included nurse consultation for students at risk of mental health problems. Students in the standard intervention but not the intervention plus counseling showed improved condom use behaviors. The added counseling group showed improved mental health scores but a negative effect on drug use in boys. Overall effects were small and different for ethnic groups.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4060146

Choi NG, Marti CN, Bruce ML, Hegel MT, Wilson NL, Kunik ME. (2014)

Six-month postintervention depression and disability outcomes of in-home telehealth problem-solving therapy for depressed, low-income homebound older adults. *Depress Anxiety.* 31(8):653-661.

Problem-solving therapy targeting older adults with depression was delivered to two groups of homebound adults over 50 in Texas. One group received in-person sessions from a therapist and a second group received sessions delivered through internet-based video with a live therapist. A third group received non-specific support phone calls. Both the in-person and internet-video therapy groups showed significant improvements in depression scores compared to the non-specific support call group.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4122624

Crisp D, Griffiths K, Mackinnon A, Bennett K, Christensen H. (2014) An online intervention for reducing depressive symptoms: Secondary benefits for self-esteem, empowerment and quality of life. *Psychiatry Res.* 216(1):60-66.

The study compares the effect of an Internet Support Group, an automated internet-based training program for depression and a combination of these programs with use of a control website for adults showing signs of psychological distress in Australia. The group using both the support group and the training program showed a significant increase in self-esteem and quality of life scores.

Egede LE, Acierno R, Knapp RG, Lejuez C, Hernandez-Tejada M, Payne EH, Frueh BC. (2015) Psychotherapy for depression in older veterans via telemedicine: A randomised, open-label, non-inferiority trial. *Lancet Psychiatry.* 2(8):693-701.

Depression counseling was delivered to veterans in the US by traditional in-person sessions or in-home video conferencing. Changes in depression score outcomes did not differ between groups. (full-text not available)

Egede LE, Acierno R, Knapp RG, Walker RJ, Payne EH, Frueh BC. (2016) Psychotherapy for depression in older veterans via telemedicine: Effect on quality of life, satisfaction, treatment credibility, and service delivery perception. *J Clin Psychiatry.* 77(12):1704-1711.

Depression counseling was delivered to veterans in the US by traditional in-person sessions or in-home video conferencing. There was no difference in quality of life scores or satisfaction between the two groups. See two other Egede et al citations relating to the same trial.

Egede LE, Gebregziabher M, Walker RJ, Payne EH, Acierno R, Frueh BC. (2017) Trajectory of cost overtime after psychotherapy for depression in older veterans via telemedicine. *J Affect Disord.* 207:157-162.

Depression counseling was delivered to veterans in the US by traditional in-person sessions or in-home video conferencing. Mode of delivery of counseling had no effect on overall cost of the treatment.

APPENDIX 3

Annotated Bibliography for Evidence Review (continued)

Hungerbuehler I, Valiengo L, Loch AA, Rossler W, Gattaz WF. (2016)

Home-based psychiatric outpatient care through videoconferencing for depression: A randomized controlled follow-up trial. *JMIR Ment Health.* 3(3):e36.

Adults with mild depression in Sao Paulo, Brazil received in-person monthly psychiatric consultations or in-home consultations delivered via video conferencing. Medication was also delivered to the patient's home for the intervention group. Both groups showed statistically significant improvements in mental health and depression scores at the end of the study period. Participants in the in-person group spent on average 3 hours traveling to and from their appointments and had a greater rate of dropout and missed appointments.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4989121

Morland LA, Mackintosh MA, Rosen CS, Willis E, Resick P, Chard K, Frueh BC.

(2015) Telemedicine versus in-person delivery of cognitive processing therapy for women with post-traumatic stress disorder: A randomized noninferiority trial. *Depress Anxiety.* 32(11):811-820.

Women with PTSD in the US received evidence-based treatment counseling therapy either in-person traditional delivery or via video conferencing. Patients in both groups saw reductions in PTSD symptoms with no significant difference between the two delivery methods.

O'Neil A, Taylor B, Hare DL, Sanderson K, Cyril S, Venugopal K, Chan B, Atherton JJ, Hawkes A, Walters DL, Oldenburg B, MoodCare Investigator Team. (2015)

Long-term efficacy of a tele-health intervention for acute coronary syndrome patients with depression: 12-month results of the MoodCare randomized controlled trial. *Eur J Prev Cardiol.* 22(9):1111-1120.

Cardiac patients with depression in Australia were provided with 10-sessions of counseling by a trained psychologist via internet-based video. Control group patients received normal in-person care from their health care provider. Results show a significant improvement in depression scores for patients who had major depression but not for patients with mild depression as compared to the control group.

Parks MJ, Slater JS, Rothman AJ, Nelson CL. (2016)

Interpersonal communication and smoking cessation in the context of an incentive-based program: Survey evidence from a telehealth intervention in a low-income population. *J Health Commun.* 21(1):125-133.

A retrospective analysis of data from adult smokers in the US who received live telephone counseling to promote smoking cessation. Nicotine replacement therapy was available free of charge and some monetary incentives. There was no control group. There was no significant relationship between smoking cessation behaviors and the monetary incentives.

www.ncbi.nlm.nih.gov/pmc/articles/PMC4765727

Make health and wellness an effortless part of daily life.



**Personal Connected
Health Alliance**

4300 Wilson Boulevard, Suite 250
Arlington, VA 22203 USA
pchalliance.org | @pchalliance