ConnectedHealth

November 20, 2017

Centers for Medicare & Medicaid Services
Department of Health and Human Services
Attention: CMS-5517-P P.O. Box 8013
Baltimore, Maryland 21244-8013

RE: Center for Medicare & Medicaide Services: Innovation Center New Direction

I. Introduction and Statement of Interest

ACT | The App Association's Connected Health Initiative (CHI) [1] hereby submits comments to the Department of Health and Human Services (HHS) Centers for Medicare & Medicaid Services (CMS) per its request for comments (RFC) on initiatives to test innovations in Center for Medicare and Medicaid Innovation (CMMI) Health Plan Innovation Model Concepts (RFI).[2]

CHI is the leading effort by stakeholders across the connected health ecosystem to clarify outdated health regulations, encourage the use of remote patient monitoring (RPM), and support an environment in which patients and consumers can see improvement in their health. We seek partnerships and actions that realize the benefits of an information and communications technology-enabled American healthcare system. CHI members and stakeholders actively participate in the administration of healthcare through connected technologies and medical devices. We strongly believe that through the use of connected health technologies, CMS can create a cost-effective, patient-centered, quality-driven healthcare system that is accessible to all Americans.

[1] http://www.connectedhi.com/

[2] https://innovation.cms.gov/Files/x/newdirection-rfi.pdf

A continually growing body of evidence demonstrates that the wide array of connected health technologies available today—whether called "telehealth," "mHealth," "store and forward," "remote patient monitoring," or other similar terms—improve patient care, reduce hospitalizations, help avoid complications, and improve patient engagement, particularly for the chronically ill.[3] These tools, which include wireless health products, mobile medical device data systems, telemonitoring converged medical devices, and cloud-based patient portals, are revolutionizing the medical care industry by incorporating patient-generated health data (PGHD) into the continuum of care. Yet, despite the benefits and opportunities presented to both Medicare and Medicaid by connected health technology; CMS and Medicaid authorities, historically, have not used these tools – available today – to improve patient outcomes and reduce program costs.

In its recent finalization of its CY 2018 Physician Fee Schedule, we note that CMS chose to unbundle CPT Code 99091 (Collection and interpretation of physiologic data [eg, ECG, blood pressure, glucose monitoring] digitally stored and/or transmitted by the patient and/or caregiver to the physician or other qualified health care professional, qualified by education, training, licensure/regulation [when applicable] requiring a minimum of 30 minutes of time) to support the use of remote monitoring of PGHD to treat chronic conditions in the Medicare system widely. Addtionally, CMS recognized concurrently that 99091 does not adequately encompass the range of connected health technology innovations available to improve patient care. Moreover, it further deferred to future code development within the AMA CPT code development process – the AMA's Digital Medicine Payment Advisory Group, where the CHI's Morgan Reed of which he is an appointed expert member.[4] Further, in its latest Quality Payment Program rulemaking, CMS has taken important steps to ensure connected health technology's central role in the future of Medicare through such steps as creating a Merit-based Incentive Payment System (MIPS) Improvement Activity with high weight and an Advancing Care Information (ACI) bonus for bringing PGHD into care for the purposes of beneficiary coordination.[5]

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[3] *See*, Hindricks, et al., The Lancet, Volume 384, Issue 9943, Pages 583 - 590, 16 August 2014 doi:10.1016/S0140-6736(14)61176-4.

[4] CMS, *Medicare Program; Revisions to Payment Policies under the Physician Fee Schedule and Other Revisions to Part B for CY 2018; Medicare Shared Savings Program Requirements; and Medicare Diabetes Prevention Program, available at* https://www.gpo.gov/fdsys/pkg/FR-2017-11-15/pdf/2017-23953.pdf

[5] https://static1.squarespace.com/static/57ed48b4f5e23125aa094623/t/59e7c6a9f09ca4a3a064c354/1508361898148/02282017_CHI-Submission_CMS-Call-MIPS-IA-Measures-Activities.pdf.a.

The recent advancements made by CMS through both its PFS and QPP are significant, but do not reduce the crucial role that CMMI plays (and will play) in exploring new innovations in Medicare and Medicaid. Nor do these changes alter the fact that, to date, the efforts of the CMMI in exploring the benefits of connected health technologies (both telehealth and remote monitoring) have been insufficient given the immense value these technologies provide. For this reason we applaud CMS's call for comments on the future direction of CMMI, and, as we describe below, urge CMMI to truly explore these technologies potential as soon as possible through its efforts, building on recent advancements made in the PFS and QPP. CMMI should be ahead of this curve and not behind it. CHI commits to assist CMMI in any way possible to get to CMMI to the forefront of innovation in delivering care to Medicare and Medicaid beneficiaries.

II. CHI Urges CMMI's Focused Examination of the Benefits of Digital Health Solutions for Healthcare Services

CHI commends CMS for its continued interest in exploring innovative technological healthcare delivery mechanisms. A 21st century healthcare system should embrace the array of innovative technologies available, such as remote patient monitoring technologies and asynchronous store-and-forward methods, which enable the delivery of healthcare solutions beyond the four walls of a hospital room or doctor's office. Connected health technology provides the ability to reach each of the proposed guiding priniciples put forward by CMS in its RFC. We are troubled by CMS' omission of any discussion of connected health technologies and their benefits in the RFC.

The potential cost savings benefits have also been closely noted, most recently in a study predicting that remote monitoring will result in healthcare savings of $36 billion globally by 2018, with North America accounting for 75 percent of the savings.[6] The use and integration of PGHD also puts patients at the center of their own care, which can lead to improved lifestyle choices and overall health.[7] The CMMI models will be integral to exploring and supporting these connected health technologies in the future of the American healthcare system. We encourage CMS to review the appended a list of studies we have curated that demonstrate the benefits of remote monitoring technologies.

[6] *See* Juniper Research, *Mobile Health & Fitness: Monitoring, App-enabled Devices & Cost Savings 2013-2018* (rel. Jul. 17, 2013), available at http://www.juniperresearch.com/reports/mobile_health_fitness.

[7] *See, e.g.*, Sanjena Sathian, "The New 21st Century House Call," Boston Globe (July 29, 2013), *available at* http://www.bostonglobe.com/lifestyle/health-wellness/2013/07/28/century-house-call/tdupWvOQI6b3dKdKcEgdGM/story.html.

CHI has often expressed concern with the statutory burdens that "limit the range of remote access technologies that may be offered," and have long hindered progress in the connected health space. A notable example, Section 1834(m) of the Social Security Act, has resulted in arduous restrictions on telehealth services.[8] Members of the digital health manufacturing, vendor, and supplier community urge CMS and other federal actors to utilize every opportunity to remove barriers to the use of advanced technologies within a connected healthcare system. Specifically, CMMI already has the authority in 42 U.S.C. § 1315a(d)(1) to waive 1834(m)'s burdensome restrictions in order to adequately explore, track, and release data in a timely fashion through CMMI innovation grants regarding telehealth utilization.

Progress made in the PFS and QPP are crucial steps that CMMI must build upon as it explores additional innovative model concepts. Going forward, CHI urges CMS to consider the following factors as it develops a model test that allows medical plans to include a broader range of remote monitoring technologies across Medicare and Medicaid:

- **Add an Additional Guidling Principle for Exploration of Connected Health Technology Innovations:** CHI appreciates the new CMMI guiding principles proposed by CMS and, as we discuss throughout this document, believes that connected health technology can and should play a role in addressing each of the principles. However, it is essential that CMMI stay ahead of the curve in leveraging advanced connected health technology, be it in prevention or in treatments, and that CMS memorialize its commitment to this goal. Therefore we strongly urge CMS to add an additional CMMI guiding principle supporting the exploration of connected health technologies across Medicare and Medicaid. We propose that the text of this new guiding principle be:"Connected Health Technolgies – explore the benefits and opportunities offered by the use of connected health technologies to Medicare and Medicaid, notably the improvement of patient outcomes, enhanced engagement in care by patients, and reduced programmatic costs."

[8] *See* 42 CFR § 410.78.

- **Reduce Regulatory Burden and Ensure Alignment Across Payers:** In addition to recognizing the statutory burden of 1834(m), CMMI should work to reduce the burdens for potential applicants. CMMI should articulate consistent requirements that are applicable to all models being tested, rather than developing separate requirements for each. The burden for applicants and participants could be reduced through uniform processes, expectations, principles, and rules that span models like population health and chronic conditions that are being tested. To align payers with the goals of the CMMI models and incent their participation, CMS should build upon the QPP to encourage the development of models that are based on existing structures and payment models, and allow existing networks to apply as Advanced APMs to make these entities eligible for Medicare bonuses and programs like MIPS and the QPP. In exploring the benefits of telehealth as defined in 1834(m), CMS should use its established authority to waive the backwards-facing and outdated restrictions. CMMI should also focus on exploring new and innovative remote monitoring technologies (which are not telehealth under 1834(m) and therefore do not face its geographic, originating site, etc. restrictions). We further urge CMMI to build upon the successes of the Veterans Health Administration in its use of connected health technologies.

- **Utilize Existing Quality Outcomes and Metrics and Build Upon the Growing Body of Research Demonstrating the Benefits of Remote Access Technologies:** CMS can consult with an extensive list of clinical studies in the areas of chronic condition management, heart failure management, diabetes management, and medication adherence for chronic conditions, that meet the stringent review standards and have demonstrated the benefits of non-synchronous telehealth and remote patient monitoring. In the attached appendix, CHI provides a list of clinical studies that can inform CMS' exploration of the benefits of remote access technologies. CHI urges CMS to ensure CMMI models build upon the growing body of evidence that demonstrates the benefits of remote patient monitoring technologies.

- **Build on Successful Medicaid Models Supporting the Use of Connected Health Technology:** CMMI should recognize and build upon the incredible successes of some Medicaid systems, such as the University of Mississippi Medical Center and the University of Virginia's Karen S. Rheuban Center for Telehealth. In these states (and some others), Medicaid programs have taken steps to support not only telehealth but (more importantly) remote monitoring innovations that bring PGHD into the continuum of care based on demonstrated improvements to patient outcomes and significant cost savings. CMMI can and should play a crucial role on proliferating these successes.

- **Focus on Exploration of Connected Health Technolgies' Role in the Success of Future QPP Alternative Payment Models:** CHI supports Congress's goal of realizing innovative alternative payment models (APMs) and continues to work with stakeholders to find eligible alternatives to MIPS. At a minimum, we strongly believe that APMs must affect the utilization of connected health technology in a significantly expanded way. APMs, with their financial and operational incentives, should demonstrate the best uses of remote monitoring or telehealth tools. To date, CMS has not discussed telehealth and remote monitoring's key role in the success of APMs. CHI maintains that this glaring oversight forces eligible clinicians, as well as other key stakeholders and organizations, to conclude that telehealth and remote monitoring do not have a role in APMs. We call on CMS to provide this crucial commentary and insight in the final QPP rule. Such a step would also be consistent with CMS endorsement of telehealth and remote monitoring in MIPS. CMMI should take a lead in funding new explorations of connected health tech in QPP APMs, including the use of large-scale waivers of restrictions in 1834(m) on telehealth as well as the use of remote monitoring technology innovations.

III. Conclusion

CHI strongly advocates for connected health solutions to modernize the delivery of care and extend healthcare beyond hospital walls. In this effort, we encourage CMS to allow and incentivize the use of remote access technologies at every opportunity.

Sincerely,

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Key Clinical Studies Demonstrating the Benefits of Connected Health Technologies

CHRONIC CONDITION MANAGEMENT

Audit of the Veterans Health Administration Home Telehealth Program: Over 15,000 patients

On March 09, 2015 the VA Office of Inspector General released an Audit which showed that the Home Telehealth Program increase patient access and reduced costs by reducing the number of admissions. For example, before the program there were 2,365 admissions over six months by the over 15,000 patients who participated in the Home Telehealth Program. After the program there were 1,773 admissions for the following six months. This equates to about 8 fewer hospital admissions for every 100 patients in this program.

http://www.va.gov/oig/pubs/VAOIG-13-00716-101.pdf

Telehealth and the VA - FY2013 Report

In FY2013, **608,900 (11%)** of veterans received some element of their health care via telehealth. This amounted to **1,793,496** telehealth episodes of care. **45%** of these patients lived in rural areas.

Home Telehealth Services: Helps patients with chronic conditions

- Provided care for 144,520 veterans
- 59% reduction in bed days of care
- 35% reduction in hospital readmissions
- Saves $1,999 per annum per patient
- 84% patient satisfaction

Store-and-Forward Telehealth: Remote scanning, then send to specialist

- Served 311,396 veterans
- 95% patient satisfaction
- Saves $38.41 per consultation

Clinical Video Telehealth: Real-time video consultation that covers over 44 specialties

- 94% patient satisfaction
- Saves $34.45 per consultation

TeleMental Health

- Over 278,000 encounters to 91,000 patients
- 1.1 million patient encounters since FY2003
- Reduced bed days of care by 38%
- Nearly 7,500 patients with chronic mental health conditions are now living independently thanks to TeleMental Health

The number of veterans receiving care through telehealth is climbing by **22%** each year.

http://ehrintelligence.com/2014/06/23/va-reduces-admissions-by-35-due-to-telemedicine-services/
http://c.ymcdn.com/sites/www.hisa.org.au/resource/resmgr/telehealth2014/Adam-Darkins.pdf
http://www.va.gov/health/NewsFeatures/2014/June/Connecting-Veterans-with-Telehealth.asp

Veterans Administration: Study Size: Over 17,000 patients

"Routine analysis of data obtained for quality and performance purposes from a cohort of 17,025 CCHT patients shows the benefits of a 25% reduction in numbers of bed days of care, 19% reduction in numbers of hospital admissions, and mean satisfaction score rating of 86% after enrolment into the program. The cost of CCHT is $1,600 per patient per annum, substantially less than other NIC programs and nursing home care. VHA's experience is that an enterprise-wide home telehealth implementation is an appropriate and cost-effective way of managing chronic care patients in both urban and rural settings." "Care Coordination/Home Telehealth: the systematic implementation of health informatics, home telehealth, and disease management to support the care of veteran patients with chronic condition"

Darkins A, Ryan P, Kobb R, Foster L, Edmonson E, Wakefield B, Lancaster AEs, Telemed J E Health. 2008 Dec;14(10):1118-26. doi: 10.1089/tmj.2008.0021.
http://online.liebertpub.com/doi/pdf/10.1089/tmj.2008.0021.
Supplemented with further data by Darkins, available at
http://c.ymcdn.com/sites/www.hisa.org.au/resource/resmgr/telehealth2014/Adam-Darkins.pdf

Primary Care E-Visit v. Physician Office Visit: Study Size 8,000 Office and E-Visits

From The Washington Post, 1/21/2013: "A new study suggests that "e-visits" to health-care providers for sinus infections and urinary tract infections (UTIs) may be cheaper than in-person office visits and similarly effective."

[Ateev Mehrotra, MD; Suzanne Paone, DHA; G. Daniel Martich, MD; Steven M. Albert, PhD; Grant J. Shevchik, MD, JAMA Intern Med. 2013;173(1):72-74. doi: 10.1001/2013.jamainternmed.305] http://archinte.jamanetwork.com/article.aspx?articleid=1392490

Randomized Control Trial of Telehealth and Telecare: Study Size 6,191 patients, 238 GP practices

"The early indications show that if used correctly telehealth can deliver a 15% reduction in A&E visits, a 20% reduction in emergency admissions, a 14% reduction in elective admissions, a 14% reduction in bed days and an 8% reduction in tariff costs. More strikingly they also demonstrate a 45% reduction in mortality rates."

"Whole System Demonstrator Programme, Headline Findings – December 2011", Department of Health, United Kingdom] http://www.telecare.org.uk/sites/default/files/file-directory/secure_annual_reports/Publications/Effect%20of%20Telehealth%20on%20use%20of%20secondary%20care%20and%20mortality%20findings%20from%20the%20WSD%20cluster%20randomised%20trial.pdf

Reduced Hospitalizations of Nursing Facility Residents

A study that introduced telemedicine in a Massachusetts for-profit nursing home chain, during the period October 2009 – September 2011, demonstrates the cost-effectiveness of utilizing telemedicine to reduce potential re-hospitalizations for nursing facility patients. The study's findings show that savings to Medicare from using telemedicine to reduce re-hospitalizations for nursing facility patients exceed the investment in the telemedicine equipment.

- The findings of the study suggest that the nursing facilities that were more engaged in off-hours telemedicine coverage could generate cost savings for Medicare that exceeded the facility's investment in the telemedicine service.
- The average savings to Medicare for a nursing facility that participated and was engaged with telemedicine, was $151,000 per nursing facility per year, relative to the less-engaged facilities.
- During the two-year period, the rate of hospitalizations per 1,000 resident days declined across the pre- and post-intervention periods for both the treatment and the control groups.
- The difference in the hospitalizations in the treatment group was 4.4 percentage points lower.

David C. Grabowski and A. James O'Malley, "Use of Telemedicine Can Reduce Hospitalizations of Nursing Home Residents and Generate Savings for Medicare*," Health Affairs*, 33, no. 2 (2014): 244-250.

Integrated Telehealth And Care Management Program For Medicare Beneficiaries With Chronic Disease Linked To Savings

A study from the Health Affairs found significant savings among patients who used the Health Buddy telehealth program, which integrates a telehealth tool with care management for chronically ill Medicare beneficiaries. Specifically, patients who utilized the Health Buddy Program saw spending reductions of approximately 7.7–13.3 percent ($312–$542) per person per quarter.

September 2011: http://content.healthaffairs.org/content/30/9/1689.abstra

Rural Hospitals and Communities Save Money Through Telemedicine Program

A report from NTCA-The Rural Broadband Association explores how much money a rural hospital and community can save by using a telemedicine program. The report analyzes savings in travel costs, lost wages, hospital workers' wages, and lab and pharmacy revenues that can stay local by allowing patients to stay in their own communities rather than travel to larger metropolitan areas for care.

The report finds that on average a rural community can save $31,000 in travel costs and lost wages, per hospital per year. Rural hospitals can on average save more than $81,000 a year in doctors' wages, while generating revenue through local MRIs, and other lab and pharmacy work.

March 2017:
http://www.frs.org/images/AnticipatingEconomicReturnsOfRuralTelehealth.pdf

Telemedicine Saves Patients Time and Money

Scholars at the University of California Davis studied results and data of 18 years of inpatient and outpatient visits, ending in 2013. The scholars found that the 19,246 interactive video visits over 18 years saved patients approximately nine years of travel time, 5 million miles, and $3 million in related costs. Each patient using telemedicine for treatment saved on average four hours driving time, 278 miles and $156 in travel costs over the period studied.

Impact of a University-Based Outpatient Telemedicine Program on Time Savings, Travel Costs, and Environmental Pollutants
Dullet, Navjit W. et al.
Value in Health , Volume 0 , Issue 0 ,
http://www.valueinhealthjournal.com/article/S1098-3015(17)30083-9/fulltext

Telehealth Clinical Studies pettaining to Home Dialysis

For patients receiving dialysis, almost $3 billion is spent annually on transportation. Teleconsultation was conducted in a shorter average period of time (22 versus 33 min), was effective, significantly reduced hospitalization rates, but slightly more expensive

(198 versus 177 euro or $233 versus $208) when compared with hospital consultation. However, annual savings of $46,613 USD and annual cost of $79,489 when videoconferencing for daily visits.

Perspectives from the Kidney Health Initiatibe on Advancing Technologies to Facilitate Remote Monitoring of Patient Self-Care in RRT
(Remote Monitoring of Dialysis Patients)
Mitchell H. Rosner, et al.
Clinical Journal of the American Society of Nephrology
https://www.asn-online.org/membership/BlastEmails/files/KHI_RemoteMonitoring_Publication_July2017.pdf

Dementia Care in an Underserved Retirement Community, thanks to Telemedicine Sample Size: 78 total with 33 Completing Satisfaction Exit-Interviews

"Prior to 2013, a neurologist from USC commuted every weekend from Los Angeles to Palm Desert (120 miles, 2 h each way) to asses and manage patients. It became apparent that this setup was not sustainable as clinic wait0time lengthened to 6+ months."
"In our experience, over the past 3 years, telemedicine poses no barrier to accurate evaluation and is as effective as a meeting in person."

In 2012, USC-EMC MAC was only able to bring in under 20 people. After telemedicine was implemented, by 2014, they were able to increase intake to around 85 new patients per year.

Satisfaction:
- Overall Satisfaction with the clinic of 4.84 out of 5
- General satisfaction with the neurologist at 4.88 out of 5
- Satisfaction with the telemedicine system at 4.65 out of 5

A Multidisciplinary Model of Dementia Care in an Underserved Retirement Community, Made Possible by Telemedicine
Jason V. Tso, Roxanna Farinpour, Helena C. Chui and Collin Y. Liu
Frontiers in Neurology
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5179531/

Cleveland Alzheimer's Managed Care Outcomes: Study Size: 89 Patients

"The Cleveland Alzheimer's Managed Care Demonstration is one of the few studies of dementia care that gather data directly from patients, particularly information regarding their perception of symptoms and care".

“Overall, findings show that care consultation delivered within a partnership between Kaiser Permanente of Ohio and the Cleveland Area Alzheimer’s Association is a promising strategy for improving outcomes for patents with memory problems”.

Outcomes for Patients with Dementia from the Cleveland Alzheimer’s Managed Care Demonstration
P.A. Clark, D.M. Bass, W.J. Looman, C.A. McCarthy & S. Eckert
Aging & Mental Health, January 2004; 8(1): 40-51
http://www.tandfonline.com/doi/abs/10.1080/13607860310001613329?journalCode=camh20

North Dakota Assistance Program For Dementia Caregivers Lowered Utilization, Produced Savings, and Increased Empowerment

“These changes saved an estimated 179,580 days in long-term care (average:7.7 years per person with dementia), which translated into $39.2 million in potential cost savings during the forty-two-month period”.

This program also drastically decreased hospital stays, ambulance uses, emergency department visits and 911 calls at a relatively steady rate over a year and a half.

- For example, Hospital stays – in months 1-3, the rate of event per person was .754 and when the months reached 16-18, the rate was a measly .071.

North Dakota Assistance Program For Dementia Caregivers Lowered Utilization, Produced Savings, And Increased Empowerment
Marilyn G. Klug, Gwen Wagstrom Halaas, and Mandi-Leigh Peterson
Health Affairs 33, no. 4 (2014): 605-612
http://content.healthaffairs.org/content/33/4/605.abstract

HEART FAILURE MANAGAGEMENT

Remote Patient Monitoring of Heart Failure Patients, Meta analysis: Study Size 4,264 patients

“Remote monitoring programmes reduced rates of admission to hospital for chronic heart failure by 21% (95% confidence interval 11% to 31%) and all-cause mortality by 20% (8% to 31%); of the six trials evaluating health related quality of life three reported significant benefits with remote monitoring.”

Telemonitoring or structured telephone support programmes for patients with chronic heart failure: systematic review and meta-analysis, Robyn Clark, Sally Inglis, Finlay McAlister, John Cleland, Simon Stewart, MJ (British Medical Journal), doi:10.1136/bmj.39156.536968.55 (published 10 April 2007)]
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1865411/

Remote Patient Monitoring of Heart Failure Patients: Meta analysis: Study Size 6,258/ 2,354 Patients

“RPM convers a significant protective clinical effect in patients with chronic HF compared with usual care.”

J Am Coll Cardio: 2009;54:1683-94
http://content.onlinejacc.org/article.aspx?articleid=1140154

Telehome Monitoring Program: 1,000 Patients Enrolled

“Research at the Heart Institute has shown telehome monitoring at the Heart Institute has cut hospital readmission for heart failure by 54 percent with savings up to $20,000 for each patient safely diverted from an emergency department visit, readmission and hospital stay.”

University of Ottawa Heart Institute, February 24, 2011, Press Release.
http://www.heartandlung.org/article/S0147-9563(07)00084-2/fulltext

Remote Patient Monitoring at St. Vincent's Hospital

"Impact: In less than two years, preliminary results show that the care management program implemented by St. Vincent Health and facilitated by the Guide platform reduced hospital readmissions to 5 percent for patients participating in the program – a 75 percent reduction compared to the control group (20 percent), and to the national average (20 percent)."

St. Vincent's Hospital Reduces Readmissions by 75 percent with a Remote Patient Monitoring-Enabled Program, Case Study by Care Innovations, an Intel GE Company] http://www.careinnovations.com/data/sites/1/downloads/Guide_product/guide_stvincent_profile.pdf

Program Evaluation of Remote Heart Failure Monitoring: Healthcare Utilization Analysis in a Rural Regional Medical Center

Background: Remote monitoring for heart failure (HF) has had mixed and heterogeneous effects across studies, necessitating further evaluation of remote monitoring systems within specific healthcare systems and their patient populations. ''Care Beyond Walls and Wires,'' a wireless remote monitoring program to facilitate patient and care team co-management of HF patients, served by a rural regional medical center, provided the opportunity to evaluate the effects of this program on healthcare utilization.

Materials and Methods: Fifty HF patients admitted to Flagstaff Medical Center (Flagstaff, AZ) participated in the project. Many of these patients lived in underserved and rural communities, including Native American reservations. Enrolled patients received mobile, broadband-enabled remote monitoring devices. A matched cohort was identified for comparison.

Results: HF patients enrolled in this program showed substantial and statistically significant reductions in healthcare utilization during the 6 months following enrollment, and these reductions were significantly greater compared with those who declined to participate but not when compared with a matched cohort. Conclusions: The findings from this project indicate that a remote HF monitoring program can be successfully implemented in a rural, underserved area. Reductions in healthcare utilization were observed among program participants, but reductions were also observed among a matched cohort, illustrating the need for rigorous assessment of the effects of HF remote monitoring programs in healthcare systems.

William T. Riley, PhD., et al. DOI: 10.1089/tmj.2014.0093. Vol. 21 No. 3, March 2015

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4365431/

DIABETES MANAGEMENT

Early Results Support Efficacy and Clinical efficiency of Diabetes Management Decision support software for Blood Glucose Control: Two cohorts of 43 comparative cases

Preliminary results from an ongoing study by Rimidi indicate that the decision support software, Diabetes+Me, helps to ensure a safe but meaningful reduction in A1c and therefore reduction in event rate as well as overall healthcare costs. Diabetes+Me has not only lead to improved benefits to patients, but has also allowed Desert Oasis healthcare, the facility who is conducting the study, to expand the scalability of its already successful diabetes management program without having to make the expensive investment of hiring additional healthcare providers.

Mobile Phone Personalized Behavior Coaching for Diabetes: Study Size 163 patients over 26 Practices

"Conclusions – The combination of behavioral mobile coaching with blood glucose data, lifestyle behaviors, and patient self-management individually analyzed and presented with evidence-based guidelines to providers substantially reduced glycated hemoglobin level over 1 year."

Cluster-Randomized Trial of a Mobile Phone Personalized Behavioral Intervention for Blood Glucose Control, Charlene Quinn, Michelle Shardelll, Michael Terrin, Eric Barr, Soshana Ballew, Ann Gruber-Baldini, Diabetes Care. Published Online July 25, 2011: http://care.diabetesjournals.org/content/34/9/1934.long

Mobile Phone Diabetes Management: Study Size 30 patients from 3 group practices

"Conclusions: Adults with type 2 diabetes using WellDoc's software achieved statistically significant improvements in A1c. HCP and patient satisfaction with the system was clinically and statistically significant."

WellDoc™ Mobile Diabetes Management Randomized Controlled Trial: Change in Clinical and Behavioral Outcomes and Patient and Physician Satisfaction, Charlene Quinn, Suzanne Sysko Clough, James Minor, Dan Lender, Maria Okafor, Ann Gruber-Baldini, Diabetes Technology & Therapeutics, Vol 10, Number 3, 2008, pps 160-168. http://online.liebertpub.com/doi/pdf/10.1089/dia.2008.0283

Testing Diabetic Retinopathy with Telemedicine Found Successful

A study in *JAMA Internal Medicine* finds that telemedicine is an effective method to test for diabetic retinopathy (DR) in Los Angeles. The practice of teleretinal DR screening was applied in the Los Angeles County Department of Health Services, the largest publicly operated county safety net in the United States. The use of telemedicine for DR screening kept patients from needing approximately 14,000 specialist visits, wait times decreased by 89.2 percent and DR screening annual rates increased by more than 16 percent.

Daskivich LP, Vasquez C, Martinez C, Tseng C, Mangione CM. Implementation and Evaluation of a Large-Scale Teleretinal Diabetic Retinopathy Screening Program in the Los Angeles County Department of Health Services. *JAMA Intern Med.* Published online March 27, 2017. doi:10.1001/jamainternmed.2017.0204 http://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2612116

RESPIRATORY AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE MANAGEMENT

Content-Driven Telehealth System Coupled with Care Management: Study Size Medicare patients enrolled in CMS' Health Buddy Program demonstration from 2006-2010

The Health Buddy Program is a content-driven telehealth system combined with care management designed to enhance patient education, self-management, and timely access to care. "The Health Buddy Program was associated with 23% lower quarterly all-cause hospital admissions and 40% lower quarterly respiratory-related hospital admissions compared to baseline for intervention beneficiaries vs. controls. In subgroup analyses, patients who engaged in the intervention during the study period (n=247) demonstrated significantly lower quarterly hospital admissions for chronic obstructive pulmonary disease exacerbations.

CONCLUSIONS: A content-driven telehealth system combined with care management has the potential to improve health outcomes in Medicare beneficiaries with chronic obstructive pulmonary disease."

Au, DH, Macaulay, DS, et al. Impact of a telehealth and care management program for patients with chronic obstructive pulmonary disease. *Ann Am Thorac Soc.* 2015 Mar;12(3):323-31. Doi: 10.1513/AnnalsATS.201501-042OC. http://www.ncbi.nlm.nih.gov/pubmed/25642649

Home Telehealth for Patients with Severe COPD: 60 patients

Telehealth is an important part of the need for innovative models of care for patients with severe COPD and frequent acute exacerbations. In a cluster assignment, controlled trial study design, 60 patients were recruited: 30 in home telehealth (TH) and 30 in conventional care (CC). Results: "After 7-months of monitoring and follow-up, there was significant reduction in ER visits (20 in HT vs 57 in CC), hospitalizations (12 vs 33), length of hospital stay in (105 vs 276 days), and even need for non-invasive mechanical ventilation (0 vs 8, all $p < 0.05$)

Segrelles CG, et al. A home telehealth program for patients with severe COPD: the PROMETE study. *Respir Med.* 2014 Mar; 108(3):453-62. Doi: 10.1016/j.med.2013. 12.003. Epub 2013 Dec 16. http://www.ncbi.nlm.nih.gov/pubmed/?term=A+home+telehealth+program+for+patients+with+COPD%3A+The+PROMETE+study

Tele-assistance (TA) in chronic respiratory failure patients: 240 patients (101 with COPD)

Chronic respiratory patients requiring oxygen or home mechanical ventilation experience frequent exacerbations and hospitalizations with related costs. Patients were randomized into two groups: an intervention group (1-year TA) and control group (conventional care). “Compared with controls, the TA group experienced significantly fewer hospitalizations (-36%), fewer GP calls (-65%) and acute exacerbations (-71%). After deduction of TA costs, the average overall cost for each patient was 33% less than for usual care.”

Vitacca M, Bianchi L, et al. Tele-assistance in chronic respiratory failure patients: a randomized clinical trial. *Eur Respir J.* 2009 Fed:33(2):411-8. Doi: 10.1183/09031936.00005608. Epub 2008 Sep 17. http://www.ncbi.nlm.nih.gov/pubmed/18799512

Home telemonitoring program: 369 patients with at least one COPD exacerbation per year prior to enrollment

The study was designed to evaluate the effects of home telemonitoring on healthcare utilization in patients with COPD. “Of these, 71.5% had a reduction in number of ED visits and exacerbations requiring hospitalization after enrollment in the program. The average number of hospital admissions, ED visits, and total exacerbations were all reduced (0.41 ± 1.68, 0.15 ± 1.65, and 0.56 ± 2.3, respectively; all with $p < 0.01$).”

Alrajab S, Smith TR, et al. A home telemonitoring program reduced exacerbation and healthcare utilization rates in COPD patients with frequent exacerbations. *Telemed J E Health.* 2012 Dec; 18(10):772-6. Doi: 10.1089/tmj.2012.0005. Epub 2012 Oct 19. http://www.ncbi.nlm.nih.gov/pubmed/?term=Alrajab+S%2C+Smith+TR%2C+et+al

Telehealth Program for CPAP Adherence: 122 patients

This study evaluated the effectiveness of coaching labor requirements of a web-based automated telehealth (TH) messaging program compared with standard of care (SOC) in newly diagnosed patients with obstructive sleep apnea. “There was a significant reduction in the number of minutes coaching [by respiratory therapists] required per patient in the TH vs SOC group (23.9 ± 26 vs. 58.3 ± 25, 59% reduction; $p < 0.0001$).”

More than 2 million patients on continuous positive airway pressure (CPAP) for obstructive sleep apnea (OSA) are being monitored at home using AirView. Key parameters of treatment effectiveness can be determined remotely at the patient level to adjust therapy or troubleshoot and correct device problems, or at the population level to efficiently measure adherence levels and track frequency of complications like mask leak. Adherence to therapy can be significantly improved through the use of remote patient monitoring and patient engagement technologies.[1,2,3]

1 Munafo D, Hevener W, et al. A telehealth program for CPAP adherence reduces labor and yields similar adherence and efficacy when compared to standard of care. *Sleep Breath.* 2016 May;20(2): 777-85. doi: 10 10.1007/s11325-015-1298-4. Epub 2016 Jan 11.
http://www.ncbi.nlm.nih.gov/pubmed/?term=Munafo+D%2C+Hevener+W%2C+et+al.

2 Crocker M, Lynch S, Willes L, *et al.* A Propensity-Adjusted Comparative Analysis of PAP Adherence Associated With Use of Myair. CHESTAnnual Meeting 2016.

3 Chang J, Liang J, Becker K, *et al.* Impact of Interactive Web-based Education and Automated Feedback Program on CPAP Adherence for the Treatment of Obstructive Sleep Apnea (Tele OSA). SLEEP Annual Meeting 2016

Telemedicine Versus Face-to-Face Evaluations by Respiratory Therapists

The study aimed to determine how well respiratory assessments for ventilated neonates and children correlated when performed simultaneously by 2 RTs face-to-face and via telemedicine.

"Telemedicine evaluations highly correlated with face-to-face for 10 of 14 aspects of standard bedside respiratory assessment."

Bell, RC, Yager PH, et al. Telemedicine Versus Face-to-Face Evaluations by Respiratory Therapists of Mechanically Ventilated Neonates and Children: A Pilot Study. http://rc.rejournal.com/content/61/2/149:abstract

MEDICATION ADHERENCE FOR CHRONIC CONDITIONS

Case Study: Mobilizing Your Medications: An Automated Medication Reminder Application for Mobile Phones and Hypertension Medication Adherence in a High-Risk Urban Population

Background: Hypertension frequently accompanies diabetes mellitus, worsening prognosis and complicating medical care for patients. Low medication adherence with multiple medications is a major factor in the inadequate achievement of blood pressure treatment goals. Widespread access to mobile phones offers a new opportunity to communicate with patients and enhance disease self-management.

Methods: We recruited 50 high-risk urban patients with hypertension, who are using at least two prescription medications for hypertension, into an open-label trial using medication reminder software on a mobile phone. Medication adherence was assessed by review of pharmacy refill rates before, during, and after availability of the medication reminder software (pre-activation, activation, and post-activation phase, respectively).

Results: Forty-eight patients completed the study. All subjects were insured by Medicaid, 96% were African-American, and the majority had diabetes mellitus. The proportion of days covered for each study phase was as follows: pre-activation phase =

0.54, activation phase = 0.58, and post-activation phase = 0.46. A significant difference was found between the activation and post-activation phases (p = .001). The increase in measured adherence between the pre-activation and activation phases approached significance (p = .057). Forty-six patients completed the pre- and post-Morisky medication adherence survey. The median score rose from 2.0 at baseline to 3.0 at study completion (p < .001). Average blood pressure and level of control during study period improved significantly after initiation of the study and remained improved from baseline through the course of the study. The 48 subjects who completed the study reported a high level of satisfaction with the medication reminder application at the final study visit.

Conclusions: A mobile-phone-based automated medication reminder system shows promise in improving medication adherence and blood pressure in high-cardiovascular-risk individuals.

Samir Patel, M.D., et al. Journal of Diabetes Science and Technology Volume 7, Issue 3, May 2013

https://www.ncbi.nlm.nih.gov/pubmed/23759395

BLOOD PRESSURE MANAGEMENT

Using simple telehealth in primary care to reduce blood pressure: a service evaluation (n=364) with 124 intervention patients. “Conclusions: Simple telehealth is acceptable and effective in reducing patients’ BP. In future, poorly controlled patients could be targeted to maximize BP reductions or broader use could improve diagnostic accuracy and accessibility for patients who struggle to regularly attend their GP surgery.”

[Elizabeth Cottrell, Ruth Chambers, Phil Connell. BMJ Open. 2012;2:e001391. Doi:10.1136/bmjopen-2012-001391]
http://bmjopen.bmj.com/content/2/6/e001391