Editorial commentary: Re-inventing chronic disease management as a service – Medication adherence solutions are ground zero

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Medication adherence is the cornerstone of cardiovascular disease management. Poor medication adherence is a major barrier to improving care. Traditional interventions addressing non-adherence have not consistently demonstrated improvement in health care outcomes like readmission [1].

While drug therapies have radically improved survival, especially for heart failure (HF) management, it is difficult for patients to adhere to these therapies. One major predictor of non-adherence is the presence of concomitant co-morbidities. Approximately two thirds of HF patients take at least 6 medications daily [2,3]. Additionally, complex drug regimens, ineffective patient-physician communication, and a patient's lack of understanding of HF medications contribute to medication non-adherence [4]. Depression also has been shown to make patients twice as likely to forget to take and intentionally avoid taking their medication [5,6]. Lastly, medication non-adherence can be due to a lack of motivation and poor social support, impaired cognition, medication costs, and lower socioeconomic status [7–9]. Medication non-adherence is especially important after hospital discharge, and cannot predict rehospitalization [1].

The study by Omboni, et al, describes an Italian model of telemedicine for cardiovascular medication adherence and disease management that augments education and counseling, monitors side effects, and assures access to medications [10]. Telemedicine disease management studies in the broader literature have yielded mixed results [11,12]. For example, studies have shown that telepharmacies provide the same quality of care and safety to patients as conventional pharmacies but variable patient satisfaction. Applying this model broadly requires reliable technology and backup systems, and is limited by cost considerations and technology infrastructure [11–13]. In the published literature, there has not been one consistent model tested that shows an advantage over standard of care [11,12]. The model described in this paper, if superior to traditional care in Italy, still may not be generalizable to other countries [10].

Applying a single telepharmacy model in the U.S. would be very complex due to competing companies, our diverse payor system, and a large number of pharmacies. Yet, in terms of market size and population, the U.S. comprises over 45% of the global pharmaceutical market, with over 92 million Americans living with cardiovas-

cular disease [12]. If one or more telepharmacy models of cardiovascular disease management were demonstrated to be efficacious in the U.S., the potential to improve disease outcomes could be significant.

One alternative model of care and disease management that is maturing and very successful to date in the United States is retail healthcare. This is healthcare delivered within pharmacies and results in greatly reduced costs for medical care from the provider to the patient [14]. This model is expanding its influence in terms of types of services and payor integration. Retail healthcare increases retail sales by increasing traffic through the store and provides healthcare, pharmaceutical services and disease management. CVS pharmacies, the leader of retail care in the U.S., recently announced they are acquiring the health insurance company, Aetna. This acquisition creates an end-to-end model of healthcare independent of traditional care delivery systems. This model may be more amenable, in terms of scale, for cardiovascular disease management than a standalone telemedicine program. Ancillary mobile applications offer the ability to refill medications and pickup prescriptions, obtain education, and access some diagnostic services (e.g. blood pressure and blood glucose check). CVS currently has more than 5 million mobile app users [15]. Retail clinics have also formed partnerships with traditional care facilities to manage more complex patients.

Another limitation with the telemedicine model described is the lack of definition around how information flows, particularly to the patient's physicians. In our view, this is a major limitation to telepharmacy management. Telepharmacy has the potential to create a digital silos of care that cannot communicate with each other. This study also needs to acknowledge that patients themselves are key to leverage as they control and can distribute information related to their healthcare related data and management. This is because they are receiving information and services through software and other connected services [1].

Providing education, software, and services using current digital technology is promising because data collection and patient interactions can be liberated beyond traditional care model point visits. Digital tools provide the potential to collect and provide continuous healthcare information and services to patients anywhere, anytime, including services such as home delivery of medications. In this regard, companies that provide nutritional and pharmaceutical services are in a unique position to manage disease. For example, Amazon has partnered with JPMorgan Chase and Berkshire

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Hathaway, for their own large employee bases, with the goal to make insurance more affordable and improve cost transparency. Amazon also recently purchased the online pharmacy startup, PillPack. PillPack is a prescription medication sorting and door-delivery service that works directly with a patient's care team to manage refills and automates pharmacist tasks such as determining co-pays and confirming insurance [16]. Over 39 million Americans own a voice computer, giving Amazon the potential to leverage these services with in-home voice assistants for disease management [17]. This disruption has the potential to solve many of the key problems in medication adherence and disease management with a robust service model [18].

Both patients and providers are embracing these connected technologies and creating novel, digital models of care to improve healthcare delivery and outcomes. For example, USC's Virtual Care Clinic is a patient-facing care model that uses digital communication, implantable, body worn or smartphone based diagnostic sensors and cloud-based data storage to enable greater patient involvement in the health care interaction and remove the need for in-person patient visits [1]. Rigorous testing and validation of these new models of care need to be performed in order to demonstrate their effectiveness.

References

[1] Talmor G, Nguyen B, Keibel A, Temelkovska T, Saxon L. Use of software applications to improve medication adherence and achieve more integrated disease management in heart failure a review. Available from: https://doi.org/10.1016/j.tcm.2018.04.001.

[2] Lien CTC, Gillespie ND, Struthers AD, McMurdo MET. Heart failure in frail elderly patients: diagnostic difficulties, co-morbidities, polypharmacy and treatment dilemmas. Eur J Heart Fail [Internet]. Jan 2002;4(1):91–8. [cited 2018 Jul 26]. Available from: http://doi.wiley.com/10.1016/S1388-9842%2801%2900200-8.

[3] Martínez-Sellés M, Robles JAG, Muñoz R, Serrano JA, Frades E, Muñoa MD, et al. Pharmacological treatment in patients with heart failure: patients knowledge and occurrence of polypharmacy, alternative medicine and immunizations. Eur J Heart Fail [Internet]. Mar 2004;6(2):219–26. [cited 2018 Jul 26]. Available from: http://doi.wiley.com/10.1016/j.ejheart.2003.09.009.

[4] Brown MT, Bussell JK. Medication adherence: WHO cares? Mayo Clin Proc [Internet]. Apr 2011;86(4):304–14. [cited 2018 Jul 26]. Available from: https://www.sciencedirect.com/science/article/pii/S0025619611600074.

[5] Gehi A, Haas D, Pipkin S, Whooley MA. Depression and medication adherence in outpatients with coronary heart disease. Arch Intern Med [Internet]. Nov 2005;165(21):2508. [cited 2018 Jul 26]. Available from: http://archinte.jamanetwork.com/article.aspx?doi=10.1001/archinte.165.21.2508.

[6] Morgan AL, Masoudi FA, Havranek EP, Jones PG, Peterson PN, Krumholz HM, et al. Difficulty taking medications, depression, and health status in heart failure patients. J Card Fail [Internet]. Feb 2006;12(1):54–60. [cited 2018 Jul 26]. Available from: https://www.sciencedirect.com/science/article/pii/S1071916405008213.

[7] Dickson VV, Deatrick JA, Riegel B. A typology of heart failure self-care management in non-elders. Eur J Cardiovasc Nurs [Internet]. Sep 2008;7(3):171–81. [cited 2018 Jul 26]. Available from: http://journals.sagepub.com/doi/10.1016/j.ejcnurse.2007.11.005.

[8] Dunlay SM, Eveleth JM, Shah ND, McNallan SM, Roger VL. Medication adherence among community-dwelling patients with heart failure. Mayo Clin Proc [Internet]. Apr 2011;86(4):273–81. [cited 2018 Jul 26]. Available from: https://www.sciencedirect.com/science/article/pii/S0025619611600037.

[9] Piette JD, Heisler M, Wagner TH. Cost-related medication underuse among chronically ill adults: the treatments people forgo, how often, and who is at risk. Am J Public Health [Internet]. Oct 2004;94(10):1782–7. [cited 2018 Jul 26]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15451750.

[10] Omboni S, Tenti M. Telepharmacy for the management of cardiovascular patients in the community. Trends 2018.

[11] The 2017 Voice Report by Alpine (fka VoiceLabs) – Alpine.AI [Internet]. [cited 2018 Jul 26]. Available from: https://alpine.ai/the-2017-voice-report-by-alpine/.

[12] U.S. Pharmaceutical Industry - Statistics & Facts | Statista [Internet]. [cited 2018 Jul 26]. Available from: https://www.statista.com/topics/1719/pharmaceutical-industry/.

[13] Skrei A, Rundquist MM, Rundquist M. Advances in pharmacy: journal of student solutions to pharmacy challenges. Pharmacy 2017;1.

[14] Cassel CK. Can retail clinics transform health care? JAMA [Internet]. May 2018;319(18):1855. [cited 2018 Jul 27]. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29710326.

[15] J. Waldron. Tracking the evolution Of CVS Caremark's Mobile Successes [Internet]. [cited 2018 Jul 26]. Available from: https://etaileast.wbresearch.com/tracking-the-evolution-of-cvs-caremarks-mobile-successes.

[16] Our Service - PillPack [Internet]. [cited 2018 Jul 27]. Available from: https://www.pillpack.com/service.

[17] 39 million Americans now own a smart speaker, report claims | TechCrunch [Internet]. [cited 2018 Jul 27]. Available from: https://techcrunch.com/2018/01/12/39-million-americans-now-own-a-smart-speaker-report-claims/.

[18] Robert Langreth/Bloomberg. Amazon Buys Pharmacy Startup PillPack | Time [Internet]. Time. [cited 2018 Jul 26]. Available from: http://time.com/5324982/amazon-buys-pharmacy-startup-pillpack/.