

The Outcomes of Implementing and Integrating Comprehensive Medication Management in Team-Based Care: A Review of the Evidence on Quality, Access and Costs, October 2020

DEVELOPED BY THE EVIDENCE BASED-RESOURCES SUBGROUP OF THE GTMRX PRACTICE AND CARE DELIVERY TRANSFORMATION WORKGROUP:

M. Shawn McFarland, Pharm.D., FCCP, BCACP, *National Clinical Pharmacy Practice Program Manager, Clinical Practice Integration and Model Advancement, Clinical Pharmacy Practice Office, Pharmacy Benefits Management Services, Veterans Health Administration*

Marcia Buck, Pharm.D., FCCP, FPPAG, BCPPS, *Director, Clinical Practice Advancement, American College of Clinical Pharmacy*

Lori Armistead, Pharm.D., MA, *Senior Research Associate, Clinical Coordinator, Center for Medication Optimization, University of North Carolina School of Pharmacy*

Judith Jacobi, Pharm.D., FCCP, MCCM, BCCCP, *Senior Consultant, Visante Inc.*

Mary Ann Kliethermes, Pharm.D., FAPhA, FCIOM, *Director, Medication Safety and Quality, Office of Practice Advancement, American Society of Health-System Pharmacists*

Annually, over \$528 billion is wasted, and 275,000 lives are lost due to non-optimized medication use.¹ Misuse, overuse or underuse of medication therapy can lead to treatment failure, a new medical problem or both. With over 80% of Americans taking at least one medication per week and an increased percentage of hospital readmissions associated with a medication related problem, a strategy must be integrated that can ensure patients “get the medications right”.^{2,3} Comprehensive medication management (CMM) is a patient centered approach to optimizing medication use and improving patient health outcomes that is delivered by a clinical pharmacist working in collaboration with the patient and other health care providers. This care process ensures each patient’s medications (whether prescription, nonprescription, alternative, traditional, vitamins or nutritional supplements) are individually assessed to determine that each medication has an appropriate indication, is effective for the medical condition and achieving defined patient and/or clinical goals, is safe given the comorbidities and other medications being taken and that the patient is able to take the medication as intended and adhere to the prescribed regimen.⁴

CMM integration and implementation as part of the patient care experience where the patient is working

along with the team providing the care holds great value. This value can be quantified by the overall effect of CMM supporting the quadruple aim of health care to improve the patient experience, provide better care, reduce cost and to improve the provider experience.⁵

Is there research that supports the benefits of CMM integration surrounding the quadruple aim of health care? The short answer is yes. Although a review of the data surrounding CMM can reveal different nomenclature and descriptions, the answer is unequivocally supported in the primary literature that CMM does improve and support the quadruple aim. As the fidelity around the model of the provision of CMM increases,⁶ findings in the primary literature for CMM are increasing at an exponential rate.

This document summarizes key findings from published CMM literature supporting the quadruple aim of health care. The studies reviewed have integrated CMM into team based care in a myriad of different health care systems spanning the spectrum from individual provider offices with privately insured patients to nonprofit value based payment health care systems and government run health care systems. **Regardless of the system, findings are consistent that when CMM is integrated, care improves, cost decrease and the patient and provider experience increase.**

I. Summary of Data on Cost Outcomes from CMM

Best practices: improving patient outcomes and costs in an ACO through comprehensive medication therapy management

- Since 1998, pharmacists at the Fairview Health System have cared for more than 20,000 patients and resolved more than 107,000 medication-related problems which, if left unresolved, could have led to hospital readmissions and emergency department visits. Fairview Pharmacy Services utilized 23 CMM pharmacists (approximately 18 full-time equivalents) working in 30 locations, who conduct pharmacotherapy workups as part of the medication optimization services.
 - Approximately 27% of patients needed additional drug therapy and medication dosages increased.
 - Thirteen percent of the drug therapy problems were the result of unnecessary drug therapy and inappropriately high dosages.
 - **Reduced costs:** Fairview MTM showed a 12:1 ROI when comparing the overall health care costs of patients receiving services to patients who did not receive those services.
 - Total health expenditures decreased from \$11,965 to \$8,197 per person (n = 186, P < 0.0001).
 - Pharmacist estimated cost savings to the health system over the 10-year period were \$2,913,850 (\$86 per encounter), and the total cost of CMM was \$2,258,302 (\$67 per encounter), for an estimated ROI of \$1.29 for every dollar spent.

Brummel, A., Lustig, A., Westrich, K., Evans, MA., Plank GS., Penso J., and Dubois RW. Best Practices: Improving Patient Outcomes and Costs in an ACO Through Comprehensive Medication Therapy Management. J of Managed Care and Specialty Pharmacy. 2014. (20): 12.

A sustainable business model for comprehensive medication management in a patient-centered medical home

- In a collaboration between the Kennedy Pharmacy Innovation Center (KPIC) at the University of South Carolina College of Pharmacy and Palmetto Primary Care Physicians (PPCP), a clinical pharmacist providing CMM was integrated into a PCMH practice.
 - **Improved access to care:** The pharmacist was able to increase patient visits to an average of 11 per day, which was 72% of their capacity based on hours worked during the day.
 - **Reduced costs:** The estimated cost avoidance provided by the pharmacist was \$164,551.50 per month and more than \$1.9 million annually.

Fabel PH, Wagner T, Ziegler B, et.al. A sustainable business model for comprehensive medication management in a patient-centered medical home. J Am Pharm Assoc. 2019;59:285-90.

Budget impact analysis of a pharmacist-provided transition of care program

- Synergy Pharmacy Solutions (SPS) initiated a pharmacist-provided transition of care program for adult members of Kern Health Systems (KHS) managed Medicaid health plan who were classified as high risk using the Johns Hopkins Adjusted Clinical Groups (ACG) predictive model. High-risk patients admitted to participating hospitals were referred to the SPS TOC program and contacted via telephone within two to four days after discharge. Once a referred patient agreed to participate, the SPS team provided CMM.

continued

continued

- **Reduced costs:** A budget impact analysis was conducted using a decision-tree model developed and built from the payer perspective. This tool was used to evaluate the impact of the program expansion to additional participating hospitals on total health care costs, including inpatient, outpatient, medication and emergency department costs, in six-month increments up to two years.
 - The budget impact model showed that in the first six months, the CMM program resulted in cost avoidance of over \$4.3 million in total health care costs to the plan, which corresponded to \$3 per member per month.
 - By the end of year two, the savings reached over \$4 per member per month, for a total of \$25.6 million.

Ni, W., Colayco, D., Hashimoto, J., Komoto, K., Gowda, C., Wearda, B., McCombs, J. Budget Impact Analysis of a Pharmacist-Provided Transition of Care Program. Journal of Managed Care & Specialty Pharmacy. Feb 2018.

Clinical and economic outcomes of medication therapy management services: The Minnesota experience

- Adults with two or more chronic conditions who are likely to benefit from medication optimization were observed over the course of one-year. Patients were enrolled in the Blue Plus plan of BCBS of Minnesota and received medical care from Fairview Health Services clinics.
 - **Better Care:** Healthcare Effectiveness Data and Information Set (HEDIS) criteria for hypertension were met by 71% of patients receiving medication management services versus 59% in the comparison group ($p = 0.03$). HEDIS criteria for high cholesterol were met by 52% of patients receiving MTM services versus 30% in the comparison group ($p = 0.001$).
 - **Reduced Costs:** Medication management services were associated with a 31.5% reduction in health care costs, with a mean reduction of approximately \$3,700 per person per year ($p < 0.001$).
 - A 57.9% reduction was noted in facility costs, with an 11.1% reduction in professional claims and a 19.7% increase in prescription drug expenditures.
 - The total cost of providing medication optimization services was estimated at \$66 per patient per year, providing a 12:1 ROI.

Isetts BJ, Schondelmeyer SW, Artz MB, et al. Clinical and economic outcomes of medication therapy management services: The Minnesota experience. Journal of the American Pharmacists Association. 2008;48(2):203-211. doi: 10.1331/JAPhA.2008.07108.

A systematic review and meta analysis of medication optimization using medication therapy management

- The heterogeneity amongst medication management services was evaluated as heterogeneity in service limits the ability to observe clear outcomes associated with CMM. The aggregated data found the need for a clear, profession-wide definition of CMM—consistently implemented—for its impact to be accurately measured.
 - **Better Care:** Overall, improved medication appropriateness was noted (4.9 vs 0.9 point improvement over 12 months on the medication appropriateness index, $P < .001$). On average more patients achieved threshold adherence level (ORs from 0.99 to 5.98), a reduction in medication dosing (-2.2 doses) and reduced odds of hospitalization for diabetes (ORs from 0.91 to 0.93) or hazards of heart failure (hazard ratios 0.55).

continued

continued

- **Reduced Costs:** Lower mean hospitalization costs for diabetes (range from –\$363.45 to –\$398.98).

Viswanathan M, Kahwati LC, Golin CE, et al. Medication therapy management interventions in outpatient settings: A systematic review and meta analysis. *JAMA Internal Medicine*. 2015;175(1):76– 87. doi:10.1001/jamainternmed.2014.5841.

Comprehensive Medication Management Results in Improved Care and Cost Savings in Mental Health System

- Psychiatric patients have multiple risk factors for chronic medical conditions and their need for multiple medications increases the risk of adverse events, drug interactions and poor adherence. This retrospective study of CMM assessed the quality of the service provided and patient outcomes within a mental health system through initial and follow-up visits focused on chronic medical conditions and psychiatric therapy.
- **Better care:** Complex patients were referred to the CMM clinic with a mean of 13.7 medications and 10.1 medical conditions per patient. Providers found an average of 5.6 medication-related problems per patient were identified, the most common being adverse drug reactions, unnecessary medications, inappropriate doses and poor adherence. Overall, clinical status improved in 52% of patients.
- **Reduced Costs:** The service projected a net cost avoidance of \$90,484 over 2.25 years, or \$586.55 per patient from avoidance of hospitalization or emergency department visits (33.7%) and savings in medication costs (66.3%). This resulted in an ROI of \$2.80 per dollar spent.
- **Improved patient satisfaction:** A patient satisfaction survey indicated that 93% of patients felt the service was 'extremely' or 'very helpful', noting the positive changes made to their medication regimens. The majority of patients (89%) would refer friends or family for a medication review.

Cobb CD. Optimizing medication use with a pharmacist-provided comprehensive medication management service for patients with psychiatric disorders. *Pharmacotherapy*. 2014;34:1336-1340. doi.org/10.1002/phar.1503.

II. Summary of Data on Better Quality, Improved Access to Care and Patient/ Provider Satisfaction from CMM

Evaluation of pharmacist care for hypertension in the Veterans Affairs patient-centered medical home: a retrospective case-control study

- A 3:1 case-controlled study that details the impact of referral to a pharmacist-led hypertension management clinic in the Veterans Affairs system patient-centered medical home model.
- **Better care:** Multivariate regression modeling identified significantly lower systolic blood pressure at both six and 12 months (risk ratios 9.7; 95% CI 2.7-35.3 and 20.3; CI 4.1-99.2, $p < 0.01$ for both comparisons) in the patients managed by clinical pharmacists compared to controls and significantly lower diastolic blood pressure at 12 months (risk ratio 2.9; 95% CI 1.2–7.1, $p < 0.01$).

Zillich AJ, Jaynes HA, Bex SD, et al. Evaluation of pharmacist care for hypertension in the Veterans Affairs patient-centered medical home: a retrospective case-control study. *American Journal of Medicine* 2015;128:539.e1-539.e6. doi: 10.1016/j.amjmed.2014.11.027.

Perceptions of integration of the clinical pharmacist into the PCMH model by the PCMH team

- Integration of CMM by a clinical pharmacist in a Department of Veterans Affairs facility was rated by the primary care team (physicians, nurses and staff) for seven domains.
 - **Better care:** 80% of responses rated the ability of the pharmacist to evaluate medication therapy and monitor the effectiveness and safety of medication therapy as a highly positive benefit.
 - **Improved access to care:** 87% of physicians and nurse practitioners responded that CMM integration by a clinical pharmacist increased access to their clinic by decreasing the time patients had to wait for primary care services.
 - **Improved provider work life:** 93% of physicians and nurse practitioners responded that CMM integration by a clinical pharmacist improved their job satisfaction.

McFarland, S., Lamb, K., Hughes, J., Thomas, A., Gatwood, J., Hathaway, J. Perceptions of Integration of the Clinical Pharmacist into the PCMH Model by the PCMH Team. Journal for Healthcare Quality. 2017. doi:10.1097/JHQ.000000000000114.

Medication therapy management: 10 years of experience in a large integrated health care system

- Assessment of the clinical, economic and humanistic outcomes of 10 years of experience with medication optimization within Minnesota's Fairview Health Services utilizing medication therapy management (a precursor to CMM). Data from 33,706 patient encounters were included in the evaluation.
 - **Better care:** 85% of patients had at least one medication therapy problem identified. Of those, 29% had 5 or more problems identified. The most frequent issues were the need for an additional medication (28.1%) and adjustment of a subtherapeutic dose (26.1%). 55% of patients not at goal at the time of enrollment in the program improved after their medication regimens were optimized.
 - **Reduced costs:** The program produced an average cost savings per encounter of \$86. Average cost to provide the service was \$67 per encounter, producing an estimated return on investment of \$1.29 per \$1 spent in administrative cases.
 - **Improved patient satisfaction:** 95.3% of patients surveyed gave a rating of agree or strongly agree to the statement that their overall health and well-being had improved as a result of the service.

Ramalho de Oliveira D, Brummel AR, Miller DB. Medication therapy management: 10 years of experience in a large integrated health care system. Journal of Managed Care Pharmacy 2010;16(3):185-95. doi: 10.18553/jmcp.2010.16.3.185.

Primary care providers believe that comprehensive medication management improves their work-life

- Part of a larger study of CMM implementation in Minnesota and North Carolina, this series of structured interviews was conducted with 16 primary care providers (PCPs) to identify the impact of CMM on their work life. Responses were then categorized to develop common themes.
 - **Better care:** Participants reported increased satisfaction that their patients were receiving better care and highlighted increased achievement of quality measures.
 - **Improved provider work life:** In addition to citing a decreased workload, PCPs reported a decrease in mental exhaustion related to the reassurance of having a clinical pharmacy colleague and enhanced

continued

continued

opportunities for professional learning. This beneficial impact of team-based clinical pharmacist-provided CMM aligns with previously identified methods for decreasing burnout and engagement among primary care providers.

Funk, K., Pestka, D., McClurg, M., Carroll, J., Sorensen, T. Primary Care Providers Believe That Comprehensive Medication Management Improves Their Work-Life. *Journal of American Board of Family Medicine*. 2019; 32(4): 462-473. doi: 10.3122/jabfm.2019.04.180376.

The effect of clinical pharmacist-led comprehensive medication management on chronic disease state goal attainment in a patient-centered medical home

- A retrospective comparison study of the effect of pharmacist-led CMM on achievement of chronic diabetes treatment goals. This study took place in 11 clinics within a primary care network designated as a patient-centered medical home and affiliated with a large academic medical center. Achievement was defined as reaching a combined goal of a hemoglobin A1c < 8%, blood pressure < 140/90, and placement on statin therapy for dyslipidemia.
 - **Improved outcomes:** 40% of patients receiving CMM reached the combined treatment goal versus only 12% of patients in the control group ($p < 0.001$) over the 13-month study. Patients receiving CMM also had significantly greater improvement in individual assessments of A1C, blood pressure and use of a statin from their baseline to the completion of the study.

Prudencio, J., Cutler, T., Roberts, S., Marin, S., Wilson, M. The Effect of Clinical Pharmacist-Led Comprehensive Medication Management on Chronic Disease State Goal Attainment in a Patient-Centered Medical Home. *Journal of Managed Care & Specialty Pharmacy*, 24 (5): 423-429. 2018. doi: 10.18553/jmcp.2018.24.5.423.

Reductions in medication-related hospitalizations in older adults with medication management by hospital and community pharmacists: a quasi-experimental study

- Implementation of a medication optimization program that incorporated a pharmacist hand-off at the transition of care from hospital to home for geriatric patients revealed a significant benefit in high-risk patients, compared to hospitals within the same state where the program had not yet been implemented.
 - **Better care:** Medication optimization and communication between hospital and community pharmacists were associated with an estimated 36% reduction in future medication-related hospitalizations.
 - **Reduced costs:** An annualized cost avoidance of avoided future hospital admissions was estimated to be \$6.6 million, while the estimated annual cost of the program was \$1.8 million, resulting in a 2.6:1 return on investment.

Pellegrin KL, Krenk L, Oakes SJ, et al. Reductions in medication-related hospitalizations in older adults with medication management by hospital and community pharmacists: a quasi-experimental study. *Journal of the American Geriatrics Society* 2017;65:212-219. doi: 10.1111/jgs.14518.

Optimizing the primary care clinical pharmacy specialist: increasing patient access and quality of care within the Veterans Health Administration

- The Department of Veterans Affairs has integrated the PCMH model as the delivery method of primary care since 2010. The VA Clinical Pharmacy Specialist (CPS) Provider practicing CMM in primary care is a

continued

continued

large component of the ability for the VA to increase access and the quality of care for Veterans. Currently, there are over more than 1,850 CPS practicing CMM in primary care. In fiscal year 2019, patient aligned care team CPSs documented 2,561,124 CMM interventions during 1,248,635 patient care encounters.

- **Improved access to care:** VA Primary Care CPS demonstrated that 27% of primary care return appointments could be averted to a CPS.
- **Improved quality of care:** The most common disease states where interventions occurred in primary care were: type 2 diabetes (1,020,191 interventions), anticoagulation (353,829 interventions), hypertension (283,609 interventions), hyperlipidemia (135,384 interventions), tobacco cessation (67,224 interventions) and pain (27,901 interventions).
- **Better Care:** Multiple studies performed within the VA have shown improvement in specific quality indicators:
 - Significant reduction in median A1C values to 7.7% (interquartile range [IQR] (0.5); $P < .001$) from a baseline A1C of 10.0% (IQR + 0.7).
 - Significant reductions in median systolic blood pressure (SBP) and diastolic blood pressure (DBP) from a baseline of 142/83 (IQR + 10 for SBP and 8 for DBP) to 134/79 (IQR + 7 for SBP and 7 for DBP; $P < .001$).
 - CPSs coordinated follow-up post-COPD discharge from a hospital or an emergency department (ED) within 30 days. Patients had a 0% composite readmission rate to the ED or hospital for a COPD exacerbation within 30 days of discharge.

McFarland, MS, Nelson J, Ourth H, Groppi J and Morreale A. *Optimizing the primary care clinical pharmacy specialist: Increasing patient access and quality of care within the Veterans Health Administration. J Am Coll Clin Pharm. 2020;3:494-500.*

Impact of comprehensive medication management on hospital readmission rates

- The Fairview Health System implemented a formal care transitions process that included referrals to outpatient services provided by CMM pharmacists to determine whether or not a CMM visit with a CMM pharmacist within 30 days of hospital discharge decreased readmissions at 30 days post discharge when compared with patients who did not receive a CMM visit.
 - 1,291 hospitalizations had a CMM visit within 30 days of discharge.
 - **Better Care:** At 30 days post discharge, patients who received a CMM visit had a significantly lower rate of readmissions compared to the comparator cohort (4.2% lower, $P < 0.001$).
 - **Improved access to care:** 60% of patients received their CMM visit within seven days of hospital discharge.

Budlong, H, Brummel, A, Rhodes, A, Nici, H. *Impact of Comprehensive Medication Management on Hospital Readmission Rates. Population Health Management 2018. 21(5): 395-400.*

Attainment of health care goals with comprehensive medication management

- In 2008, Brazil's Ministry of Health established the Nucleo de Apoio a Saude da Familia (Family Support Teams), multidisciplinary teams consisting of pharmacists, nutritionists, physical therapists and social workers, to support the primary care physician and nurse. CMM services were assessed using a quasi-experimental study design in two community primary care clinics in Belo Horizonte over a two-year period.

continued

continued

- **Better care:** More than 50% of patients had more than four problems. Problems included subtherapeutic dosing (19.5%), need for additional medication (28%) and non-adherence (28.1%). The pharmacist resolved 43% of these interventions, 82.5% by personal interaction. Prescribers accepted 67.9% of recommendations.
- **Improved outcomes:** Median values for A1c, blood pressure, low-density lipoprotein cholesterol and high-density lipoprotein cholesterol showed statistically and clinically significant improvement.

Neves CM, Nascimento MMGD, Silva DAM, Ramalho-de-Oliveira D. Clinical results of comprehensive medication management services in primary care in Belo Horizonte. *Pharmacy (Basel)*. 2019;7:58. doi:10.2290/pharmacy/7020058.

Comprehensive medication management leads to improvements in diabetes, hypertension and dyslipidemia management

- The impact of CMM services in the Brazilian primary care model were investigated. Results from 1,057 patients covered by five clinicians providing CMM services over a two-year period were included.
 - **Improved outcomes:** The mean difference from initial to final values showed statistically significant improvement for A1c (-0.8 +/- 0.4), systolic and diastolic blood pressure (-3.3 +/- 1.5 and -1.4 +/- 1.0), low-density lipoprotein cholesterol (-19.5 +/- 6.0) and total cholesterol (-21.0 +/- 7.3).

Santos BD, Nascimento MMGD, de Oliveira GC, et al. Clinical impact of a comprehensive medication management service in primary health care. *Journal of Pharmacy Practice* 2019;0897190019866309. doi:10.1177/0897190019866309.

Comprehensive medication management prevents drug interactions in older adults

- The frequency of clinically significant drug interactions was assessed in patients over 60 receiving CMM services. Beers criteria (reflecting potentially serious interactions) and the Dumbreck systematic review of United Kingdom's national drug interaction guidelines were used to define drug interactions in patients. The majority of patients had three or more health problems, 94% were taking more than two medications and 55% were taking more than five medications.
 - **Better care:** Clinicians providing CMM identified and prevented or resolved 22 drug interactions in 20 patients using the Beers criteria (4.9%) and 210 interactions in 111 patients using the UK national guidelines (27%). Disease states most strongly associated with a drug interaction were diabetes, heart failure and central nervous system diseases.

Santos TOD, Nascimento MMGD, Nascimento YA, et al. Drug interactions among older adults followed up in a comprehensive medication management service at primary care. *Einstein (Sao Paulo)*. 2019 Aug 22;17(4):eAO4725. doi: 10.31744/einstein_journal/2019AO4725.

Patient Satisfaction with Clinical Pharmacy Diabetes Management in the Patient Centered Medical Home

- Using a Department of Veterans Affairs questionnaire, patient satisfaction of care received was evaluated in primary care clinics with a clinical pharmacist provider. The survey assessed patient satisfaction with pharmacist care as well as patient satisfaction within three domains: service, self-management and knowledge.

continued

continued

- **Improved outcomes:** The mean number of clinic visits during the study period was 7.9. A1c declined from a mean of 8.7 to 7.5 from before the initial visit with a clinical pharmacist to the last visit.
- **Improved patient satisfaction:** Mean overall patient satisfaction scores were 90.6% (SD = 10.0%). Mean scores within the service, knowledge and self-management domains of the DDSM-QM were 92.0% (SD = 10.8%), 89.7% (SD = 11.35) and 89.2% (SD = 12.0 %) respectively.

McFarland MS, Wallace J, Parra J, Baker J. Evaluation of patient satisfaction with diabetes management provided by clinical pharmacists in the patient-centered medical home. *Patient.* 2014;7:115–121. doi.10.1007/s40271-013-0039-7.

Assessment of the clinical utility of pharmacogenetic guidance in a comprehensive medication management service

- The evaluation of a collaborative pilot program aimed to demonstrate the benefit of incorporating pharmacogenetic information into CMM services. The pre- and post-interventional study evaluated 24 Hispanic patients who had a traditional CMM visit with a pharmacist prior to having pharmacogenetic testing. Genotyping was then performed to evaluate genetic variance in drug metabolizing enzymes. The pharmacist then incorporated the new pharmacogenetic information into the patient's management.
- **Improved outcomes:** 129 medication-related problems were identified on the first visit, with a median of five conditions per patient and three recommendations made for changes in the medication regimen per patient. Genotyping revealed variants with the potential to affect the safety and/or effectiveness of one or more current medications in 96% of patients, with a median of three variants per patient.
- **Better care:** Over 20% of the medications used in this patient cohort were affected by one or more of the variants. Using this information, the pharmacist was able to identify 22 additional medication-related problems, increasing the median number to six, and revised the medication action plans for all of the patients to incorporate the pharmacogenetic information.

Rodríguez-Escudero I, Cedeño JA, Rodríguez-Nazario I, et al. Assessment of the clinical utility of pharmacogenetic guidance in a comprehensive medication management service. *Journal of the American College of Clinical Pharmacy.* 2020;3:1028–1037. <https://doi.org/10.1002/jac5.1250>

Endnotes

- ¹ Watanabe JH, McInnis T, and Hirsch. Cost of Prescription Drug—Related Morbidity and Mortality. *Related Morbidity and Mortality. Annals of Pharmacotherapy.* 2018; 52(9): 829–837.
- ² Slone Epidemiology Center at Boston University. Patterns of Medication Use in the United States 2006: A Report from the SloneSuSurvey. <http://www.bu.edu/slone/files/2012/11/SloneSurveyReport2006.pdf>. Accessed June 2020.
- ³ Morabet N, Uitvlugt E, van den Bemt B, et al. Prevalence and Preventability of Drug-Related Hospital Readmissions: A Systematic Review. *J Am Geriatr Soc.* 2018 Mar;66(3):602–608. doi: 10.1111/jgs.15244. Epub 2018 Feb 22.
- ⁴ Patient-Centered Primary Care Collaborative (PCPCC). The patient-centered medical home: integrating comprehensive medication management to optimize patient outcomes resource guide, 2nd Ed. Washington, DC: PCPCC, 2012. www.pcpcc.org/sites/default/files/media/med-management.pdf. Accessed June, 2020.
- ⁵ Bodenheimer T, Sinsky C. From Triple to Quadruple Aim. *Care of the Patient Requires Care of the Provider.* *Ann Fam Med.* 2014 Nov; 12(6): 573–576.
- ⁶ Livet M, Blanchard C, Frail C, Sorensen T and McClurg M. Ensuring effective implementation: A fidelity assessment system for comprehensive medication management. *J Am Coll Clin Pharm.* 2020;3:57–67.