

# Exploring future models of primary care for Texas

Future models  
of primary  
care for Texas

Bit A. Kash

*NSF Center for Health Organization Transformation (CHOT) and  
Texas A&M University School of Public Health, College Station, Texas, USA*

Paul Ogden

*Texas A&M University College of Medicine, Bryan, Texas, USA*

Elizabeth Popp and Melissa Shaffer

*NSF Center for Health Organization Transformation (CHOT),  
Texas A&M University School of Public Health, College Station, Texas, USA, and*

Jane Bolin

*Southwest Rural Health Research Center,  
Texas A&M University School of Public Health, College Station, Texas, USA*

435

Received 19 January 2017  
Revised 20 January 2017  
20 March 2017  
Accepted 20 March 2017

## Abstract

**Purpose** – The purpose of this study is to identify best practices for innovative primary care models and to describe a potential future primary care (PC) model for Texas to address the burden of chronic disease in a population-based approach.

**Design/methodology/approach** – A systematic literature review was conducted and identified 1,880 published records through PubMed using 26 search terms. After abstract and full-text review, 70 articles remained as potential models.

**Findings** – Although there is already a severe shortage of physicians in Texas, emerging practice patterns and choices among physicians are likely to erode access to primary care services in the state. Health-care leaders are encouraged to consider models such as complex adaptive systems for team-based care, pharmacist hypertension care management program and combined nurse-led care management with group visit structure.

**Research limitations/implications** – As with any study, this research has its limitations; for example, models that might work in one state, or under a unique state-funded academic medical center, might not be “do-able” in another state within the nuances of a different funding mechanism.

**Practical implications** – Results of this research provide a model for implementing IPCM for the state of Texas first and will guide IPCM planning and implementation in other states.

**Originality/value** – This study is “land grant-centric” and focused on carrying out the mission of a major, top-tier research university with an emerging college of medicine at an academic medical center.

**Keywords** Primary care, Innovative, Academic medical training, Models of care, Physician shortage, Primary care access, Primary care workforce

**Paper type** Literature review

© Bit A. Kash, Paul Ogden, Elizabeth Popp, Melissa Shaffer and Jane Bolin. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>

National Science Foundation.



International Journal of Innovation  
Science  
Vol. 9 No. 4, 2017  
pp. 435-454  
Emerald Publishing Limited  
1757-2223  
DOI 10.1108/IJIS-01-2017-0005

## Introduction

The rural–urban divide in health care is well-documented and continues to persist decade after decade. The national survey rural health stakeholders – offices of rural health in each US state, rural health-care providers and community leaders – identified “access to quality health”, including cancer care, as one of the top priorities for our country once again for yet another decade. When comparing the two national reports, Rural Healthy People 2010 and Rural Healthy People 2020, one can clearly conclude that rural health priorities and problems have not changed much for the USA over the past decades. According to [Bolin \*et al.\* \(2015\)](#), access to quality health services, access to insurance and access to primary and specialty care are still top priorities in rural America. The common theme of the rural health disparity seems to be “access”, a problem that lends itself to be addressed through innovative social and information technologies as part of a grand challenge.

When surveying the current health-care landscape, one can detect a distinct skew in distribution of health-care providers and people. While 17 per cent of the US population lives in rural communities, only 9 per cent of physicians practice in these rural communities. Other health-care providers such as nurse practitioners, dentists, pharmacists face similar disproportionate geographic distributions. Additional concerns are lack of insurance, lower household income, higher health-care costs as percentage of household and higher emergency room (ER) spending for rural residents compared to urban residents. Beyond these challenges and resulting health disparities for populations in rural areas, travel and lodging expenses are an additional concerns and burden on rural community members when it comes to accessing appropriate specialty care in urban hubs ([Bolin \*et al.\*, 2015](#)). Thus, access to appropriate health-care services is highly dependent on geography. Geographic isolation is a key contributor to inadequate access to both early detection and appropriate treatment of a wide variety of health conditions, including cancer, which results in documented health disparities in America.

The purpose of this study is to identify best practices for innovative primary care models (IPCM) and to describe a potential future primary care (PC) model for Texas to address the burden of chronic disease in a population-based approach. The Texas A&M College of Medicine joined the National Science Foundation (NSF) Center for Health Organization Transformation (CHOT) as an academic/industry member in 2016, with the goal of establishing an innovative health care delivery institute that will incorporate health system reform, affordable care act (ACA) initiatives and delivery system innovation to address the primary care needs of Texas and improve the training of the next generation of health-care providers. CHOT researchers were tasked with providing the following:

- (1) An iterative scientifically and professionally guided literature review and environmental scan for purposes of creating a master plan for a new training center or program include the following:
  - current state-specific (Texas) focused environmental scan and population health status assessment;
  - evaluation of urban vs rural differences in health [medically underserved areas (MUAs) and health professional shortage areas (HPSA's)] across Texas;
  - evaluation of differences in practices, providers and populations;
  - evaluation of access to emergency department (ED) care across Texas; and
  - evaluation of access to specialty care across Texas.

- 
- (2) Based on the iterative literature review, identify key models considered to be best practices among academic PC training centers.
  - (3) Provide recommendations on how a leading college of medicine can design the future IPCM for the state of Texas.

Future models  
of primary  
care for Texas

PC is underfunded, understaffed, yet facing unprecedented demand for access. Addressing these issues requires a new inter-professional team of primary care change makers (PCP Network-Clinical Innovation Network).

437

---

## Background

The US health-care delivery system is evolving from a reactive delivery model to a more coordinated and proactive model of care. Today, practice guidelines, chronic disease prevention, diagnostic and treatment technologies and an increasingly engaged population present the health care delivery model with a unique opportunity to reinvent itself. PC is a key player in the future models of care and can be the anchor of an effective health-care delivery model. PC providers are now pursuing strategies to engage patients earlier and more often by using innovative technologies. Further, PC networks stand to benefit from improved integration with specialty care. Finally, PC networks are becoming increasingly proactive with their high acuity patients through the use of remote monitoring technologies with mobile health. In designing these new care models, it is important to make informed judgments on what is best suited for well-defined population segments within a state. The purpose of this study is to identify best practices for IPCM and to describe a potential future PC model for Texas to address the burden of chronic disease in a population-based approach. The IPCM is a product of a new environment of care concerned with improved access, effectiveness, timeliness, patient/parent engagement and efficiency of pediatric care. IPCM calls for evolving care teams and professional leadership in the reengineering of work processes around specific disease and patient population segments.

In identifying best practices and models of innovative primary care, it is important to consider important elements of innovation as it is related to health-care delivery. Innovation seems to be most successful when four crucial elements – collaboration, ideation, implementation and the assessment of value – are achieved through a rigorous process. The goal is not creativity for its own sake, but the systematic fostering of new ideas that deliver value and a measurable return on investment (Thomas and Wolf, 2009). In the end, the greatest value that innovation provides in the health-care industry is to help people live healthier lives. Therefore, it should be about people and meeting their needs in ways that enable them to maintain and enhance their health and well-being (Gupta and Armbruster, 2011). Innovation that helps people live better lives needs to also address the scope and impact of the potential programs and initiatives in a country as big and diverse as the USA. The US health industry is the largest and most complicated industry in the world. It is known for its runaway cost increases, abject inefficiencies, adversarial relationships between health plans and providers (hospitals and physicians) and stringent regulatory and accreditation obligations. The health-care industry consists of 340,650 separate establishments using 5,508,926 people with 2.2 million nurses and approximately 650,000 physicians (French and Weathersby, 2010).

Notwithstanding rigorous federal and state efforts over the past two decades to address the burden of improving access to care, rising rates of chronic diseases underscores the importance of preventive health care particularly among African-Americans and Hispanics. Appropriate patient management presents significant challenges, as persons with chronic

diseases are significantly more likely to have multiple comorbidities than other segments of the US population (NCHS, 2005). Achieving lifestyle changes may be more difficult in populations that are medically underserved because of the relative scarcity of health-care providers, reduced access to medical care, opportunities for engaging in healthy lifestyles and lack of culturally appropriate diabetes education for low-income and low-literacy groups.

One of the greatest challenges faced by health-care providers in low-income and medically underserved settings has been effectively dedicating time and resources to manage and teach patients in a manner that will be understandable and culturally acceptable to both low-income and low-literacy populations. This is a serious health concern, because low literacy has long been recognized as a predisposing factor for poor outcomes in chronic disease self-management (Braveman *et al.*, 2010).

This research is heavily driven by both theory and practice toward a clear definition of IPCMs including their variants across the USA. Results of this research will provide a model IPCM for the state of Texas first and will guide IPCM planning and implementation in other states. The over-arching goal is to focus on mechanisms to train, place and retain care-givers in rural communities that thus improve the ability of underserved populations who are at risk to better address the needs of their own populations.

### **The current state of health care in Texas**

As the second largest state in the USA, the Texas health care delivery system currently serves over 26 million people (Texas Department of State Health Services [TDSHS], 2014). When examining the overall state of health care in Texas, three main perspectives need to be considered:

- the overall health of the population;
- ease and availability of access to health care; and
- providing quality health care in a more efficient and less costly manner.

While there are many ways to gauge the overall health of a population, including mortality, morbidity, physical environments, social determinants and health-care service availability, this paper examines morbidity and mortality of preventable diseases, health rankings and overall access to services in regions across Texas.

The paper begins with a discussion of the leading causes of morbidity and mortality in Texas. In particular, the focus is on primary or ambulatory care sensitive conditions. Currently, chronic diseases make up the majority of the top ten causes of morbidity and death in the state of Texas. The most prominent chronic diseases include heart disease and stroke, cancer, diabetes and respiratory disease (TDSHS, 2014a). The other important factor, ease and availability of access, looks toward the current physician supply and distribution across Texas.

#### *Access to primary care, physician shortages, MUAs and HPSAs*

The state of Texas is currently in a state of serious physician shortage. There are approximately 63,000 licensed physicians in Texas, but only 46,953 are in active patient care so this is considered the net physician workforce for the state. The physician workforce is currently serving a population of approximately 26,448,193 Texas residents. Texas consistently ranks very low in comparison to other states based on the physician workforce. Texas ranks 41st in the nation for active patient care physicians per 100,000 population and 47th in active primary care physicians (PCPs) per 100,000 population. Just to be at the same level as the national average, Texas would require 12,819 additional physicians per 100,000

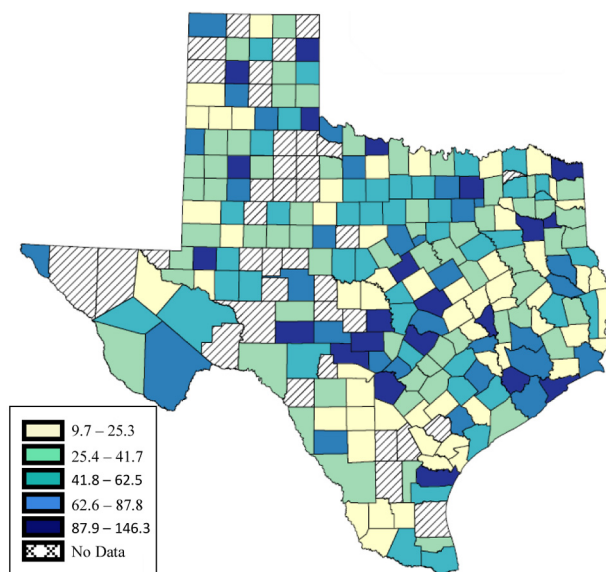
population. There are 35 counties in Texas with no physician of any kind and 80 counties with five or fewer physicians. The physician workforce in Texas is disproportionately located in the five most populous counties in the state (Harris, Dallas, Tarrant, Bexar, Travis) – 26,620 physicians (57 per cent) practice in these counties even though only 44 per cent of the state's population resides in these counties (NTREC, 2015) (Figure 1).

According to Richard A. Cooper, MD, a nationally recognized physician supply and utilization expert, the following are the suggested ratios per 100,000 population based on what can be economically supported:

Number of physicians that can be supported per 100,000 population:

Family medicine 31.0  
Internal medicine 26.9  
Pediatrics 16.1  
Cardiology 7.1  
General surgery 10.7  
Obstetrics/gynecology 13.0  
Orthopedic surgery 7.9  
Psychiatry 14.7

Although there is already a severe shortage of physicians in Texas, emerging practice patterns and choices among Texas physicians are likely to erode access to physician services in the state because 45 per cent of Texas physicians plan to accelerate their retirement plans, 19 per cent plan to cut back on hours, 9 per cent plan to switch to concierge practice and 6.4 per cent plan to work part-time. Currently, over 78 per cent of Texas physicians state they are already at full capacity or overworked/overextended, which translates to only 22 per cent of physicians having any capacity to take on more work or see



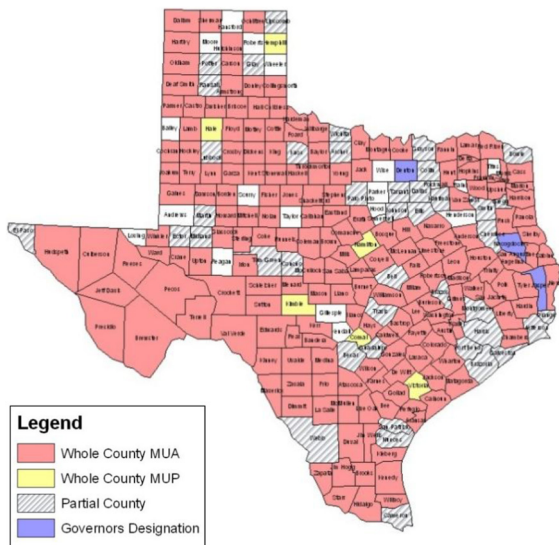
Source: NTREC (2015)

**Figure 1.**  
Primary care  
providers per 100,000  
in 2013

extra patients (NTREC, 2015). As shown in Figure 2, the vast majority of Texas counties are designated as “medically underserved areas” (MUAs).

Clearly Texas does not have enough physicians to keep up with the growing demand and to compound the problem there has been a lack of growth in the physician workforce. This lack of growth in the physician workforce is because of a combination of several key factors. First, there was a grossly inaccurate prediction that there would be an oversupply of physicians by 2000. Back in the 1950’s and 1960’s, there were serious physician shortages that led to an expansion of US medical schools, an increase in government funding for medical education and the creation of policies and programs that encouraged immigration of foreign-trained physicians. These efforts became so successful, that it led to a 1980’s prediction of an oversupply of physicians. Second, there has been a major reduction of federal graduate medical education (GME) support. One of the most notable funding cuts was Medicare’s freezing their funding of GME at 1996 levels. The third cause was state funding cuts of medical schools and graduate medical education. There was an estimated loss of \$127m in Medicaid GME support and \$8m in other GME funds. Texas is now one of only three states that do not pay for GME through the state Medicaid program. Finally, shrinking operating margins at teaching hospitals have jeopardized the future of existing residency programs and prevent further growth (Texas Medical Association [TMA], 2006).

The serious GME shortage in Texas exacerbates the problem of physician shortage. A GME shortage indicates that some medical students will have to leave the state upon graduation to find a GME residency program elsewhere. Taking that into account with the strong correlation between location of GME training and entrance into practice, it is reasonable and likely that those students leaving Texas because of the lack of in-state



**Figure 2.**  
Health professional  
shortage areas in  
Texas

**Source:** Map created by Texas Primary Care Office (2011),  
15 July; Health Resources and Services Administration,  
Shortage Designation Branch, 19 July 2011

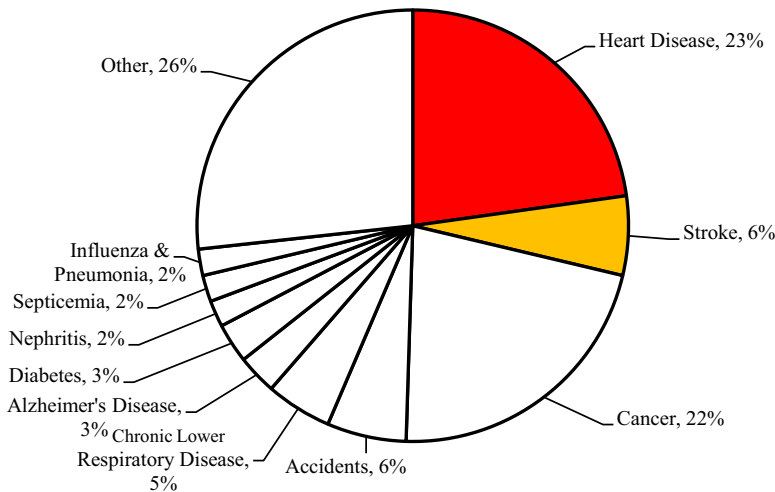


opportunities will not return to practice in Texas. Recent surveys by the Texas Medical Association and medical schools indicate that 38 per cent of students leaving the state for residency programs would have preferred to stay in Texas for GME. This represents a combined loss of \$27.4 million to the state from the investment in their medical education. Finally, as Texas lacks the resources to train an adequate number of physicians for the state population, the state is placed in a position of reliance on other states and countries to produce and provide the physicians Texas needs ([Texas Medical Association \[TMA\], 2006](#)).

*Heart disease & stroke*

Currently, heart disease is the leading cause of death in both the USA and Texas, with stroke not far behind as the fourth leading cause of death. Nearly 787,000 people in the USA died from heart disease, stroke and other cardiovascular diseases in 2011, which is about one of every three deaths in America. Cardiovascular diseases also claim more lives than all forms of cancer combined ([American Heart Association and American Stroke Association, 2015](#)). In 2010, the state expenditure for cardiovascular disease, which includes both heart disease and stroke, was approximately \$19.9bn, accounting for nearly one fourth (23.3 per cent) of the total hospital charges in Texas ([TDSHS, 2012](#)) ([Figure 3](#)).

In 2010, approximately 1.5 million Texans were living with cardiovascular disease, of which an estimated 38,987 died as a direct result of heart disease and an estimated 9,180 died as a direct result of stroke ([TDSHS, 2012](#)). Major contributors to heart disease and stroke include smoking, hypertension and high cholesterol. First, concerning smoking, tobacco use is currently the leading cause of preventable disease, disability and death in Texas and the USA, contributing an estimated one in five deaths. The adult smoking rate in Texas was an estimated 18 per cent in 2012 ([TDSHS, 2014](#)). For the current state of hypertension, in 2009, about three in 10 adults (29.1 per cent) in Texas had high blood pressure ([TDSHS, 2012](#)). The prevalence of hypertension is expected to increase approximately 8 per cent between 2013 and 2030; as there were



**Source:** American Heart Association and American Stroke Association (2010)

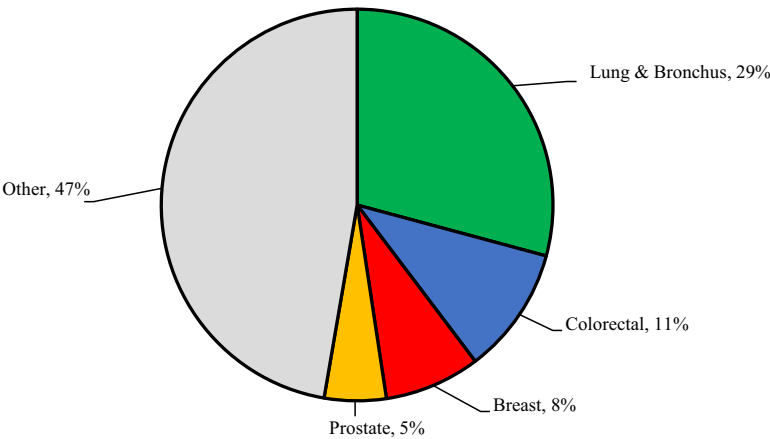
**Figure 3.**  
Leading causes of  
death in Texas

80 million Americans with high blood pressure in 2013, this expected jump in prevalence would result in about 86.4 million Americans with high blood pressure in 2030. Finally, for high cholesterol, in 2009, about four in 10 adults (40.9 per cent) in Texas had high cholesterol. Nearly one in every three Americans has high levels of LDL cholesterol – the main source of cholesterol buildup and blockage in arteries – and about 20 per cent of Americans have low levels of HDL cholesterol – which reduces cholesterol build up in arteries ([American Heart Association and American Stroke Association, 2015](#)).

*Cancer*

Cancer is currently the second most common death in both the USA and Texas, exceeded only by heart disease and accounts for nearly one of every four American deaths. Cancer is expected to overtake heart disease as the leading cause of death within the next decade. For Texan adults below the age of 75, cancer is already the leading cause of death. In 2016, it was estimated that there would be 116,690 new cases of cancer and 39,450 cancer deaths – more than 100 people per day – in the state of Texas ([American Cancer Society, 2016](#)). The most recent estimates have indicated that the total cost of cancer in Texas accounts for approximately \$31.3bn per year. Four cancer sites currently account for more than half of Texas’s cancer burden – lung and bronchus, colorectal, breast and prostate. Each year these four types of cancer account for more than 45,500 new cases of cancer and 17,000 cancer deaths in Texas ([ACS, 2008](#)) ([Figure 4](#)).

Lung cancer remains the leading cause of cancer death in Texas and the USA for both men and women (TDSHS, 2014). The total number of lung and bronchus cancer deaths each year exceeds deaths from breast, prostate and colorectal cancers combined ([ACS, 2008](#)). In 2015, 15,317 Texans had lung cancer ([American Lung Association, 2015](#)). Breast and prostate cancer are the most commonly diagnosed cancers in women and men, respectively, with more than 15,000 cases of breast cancer and nearly 13,000 cases of prostate cancer expected to be diagnosed in 2016. ([TDSHS, 2016](#)).



**Figure 4.**  
Leading cancer  
deaths by location

**Source:** ACS (2008)



## Diabetes

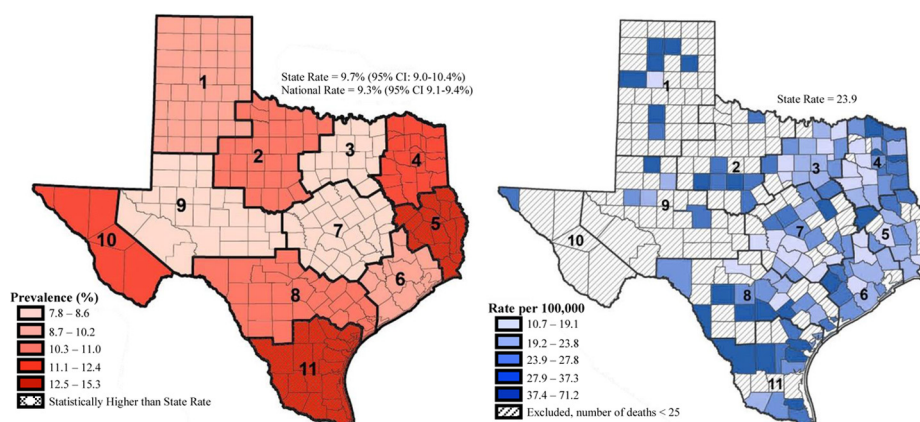
The prevalence of diabetes (T2DM) increased by 56.6 per cent between 2000 and 2010 with approximately 1.8 million adults (9.7 per cent) in Texas living with diabetes in 2010. (TDSHS, 2012). Rates of T2DM are even higher in South Texas and counties adjacent, such as the Gulf Bend Region of Texas which is 80 per cent Hispanic/Latino. Total hospital expenditures for the state of Texas in 2013 were \$29.05bn. About 596,200 hospital inpatient stays occurred among patients where the primary reason for hospitalization was diabetes, which is about 20 per cent of the 2.9 million total hospital stays in Texas in 2010 (TDSHS, 2013) (Figure 5).

The prevalence of diabetes for adults worldwide was approximately 6.4 per cent in 2010 and is projected to be 7.7 per cent in 2030; this would be a rise from about 285 million to 439 million people with diabetes in 2030 worldwide. In the USA, more than 21 million Americans have been diagnosed with diabetes, which is about 9 per cent of the adult population. Diabetes rates are increasing rapidly and about 35 per cent of Americans have prediabetes. In 2013, 1,159,365 adults in Texas had been diagnosed with prediabetes, which is about 7.7 per cent of the Texas population. In 2010, about 4,738 individuals died because of diabetes as the primary cause of death in Texas (TDSHS, 2013).

## Respiratory diseases

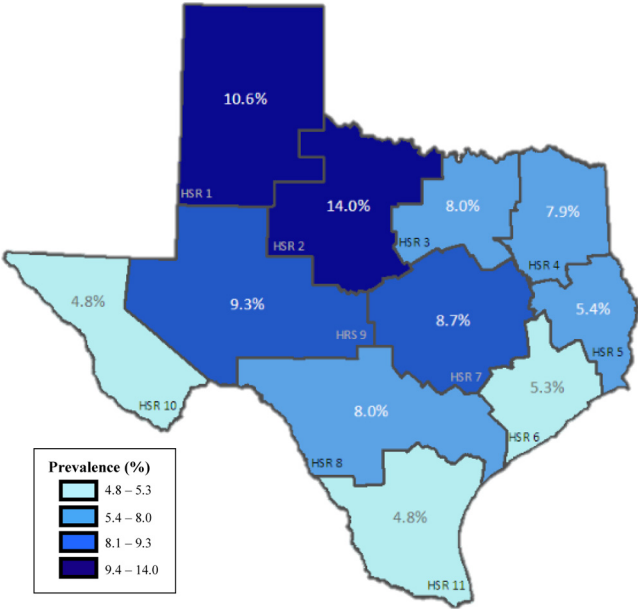
Chronic obstructive pulmonary disease (COPD) is the third leading cause of death in the USA behind cancer and heart disease. COPD includes a large group of lung diseases in which obstructed air flow interferes with normal breathing. It is currently estimated that about 12.7 million US adults have been diagnosed with COPD, but research has indicated that COPD is underdiagnosed and up to 24 million Americans have evidence of impaired lung function (ALA, 2013). In Texas in 2015, there were 1,048,566 adults diagnosed with COPD (ALA, 2015). According to the National Heart Lung and Blood Institute, the national project annual cost for COPD in 2010 was \$49.9bn (Figure 6).

Asthma is another major respiratory disease that affects a large amount of the USA and Texas populations. Deaths as a result of asthma are rare but they do occur; from 2003 to 2012, there were 2,160 reported deaths in Texas because of asthma (TDSHS, 2014). In 2015, there were 1,312,233 cases of adult asthma (7.3 per cent) and 501,054 cases of pediatric



**Figure 5.**  
Prevalence of  
diabetes by region  
and diabetes age-  
adjusted mortality  
rate by county

Source: TDSHS (2013)



**Figure 6.**  
Adult asthma  
prevalence by region  
2013

**Source:** Texas Department of State Health Services (TDSHS)  
(2014)

asthma (9.1 per cent) in Texas (ALA, 2015). In 2011, an estimated 13.2 million Americans (including 4.1 million children) had an asthma attack, which represents 51 per cent of the 25.9 million people who have asthma.

**Methodology**

*Data sources & study selection*

The project team completed a search of the PubMed database for English-written, peer-reviewed, original study articles published from January 1995 to June 2016 pertaining to primary care models. The search identified 1,880 published records in PubMed using 26 search terms. The search terms and search categories are shown in Table I. Search categories included “models of primary care”, “specialty care integration”, “technology”, “rural vs urban” and “physician burnout”. After removal of 96 duplicates, 1,784 records remained for further review.

*Data abstraction*

Abstracts were then reviewed and it was determined that 1,577 records did not address the search categories or priorities and were excluded. Full-text article reviews were done on the remaining 207 articles, of which 137 were subsequently excluded as not instructive. A total of 70 articles and/or records were included in the systematic review described in this report. The searching strategy and review process were conducted according to the guidelines of preferred reporting items for systematic reviews and meta-analyses (PRISMA) (Moher *et al.*, 2009). The PRISMA flowchart is represented in Figure 7.

PubMed search results (6/9/2016)			Future models of primary care for Texas
Search category	Search terms used	No. of results	
Models of primary care	"primary care model"	79	445
	"open access model" and "primary care"	2	
	"advanced access appointment system" and "primary care"	1	
	"care by design" and "primary care"	0	
	"patient-centered medical home" and "primary care"	376	
	"healthy connections program" and "primary care"	1	
	"family centered care" and "primary care"	30	
	"enhanced primary care model"	3	
	"team composition" and "primary care"	7	
	"team model" and "primary care"	14	
Specialty care integration	"specialty care integration" and "primary care"	0	445
	"specialty care" and "integration" and "primary care"	17	
	"gatekeeper" and "primary care"	109	
	"coordinator of care" and "primary care"	7	
Technology	"behavioral health" and "primary care"	465	
	"remote monitoring" and "primary care"	15	
	"mobile health" and "primary care"	91	
	"technology integration" and "primary care"	1	
Rural vs urban	"video doctor" and "primary care"	1	
	"rural primary care"	278	
	"rural care" and "primary care"	8	
	"urban primary care"	272	
	"urban care" and "primary care"	3	
	"rural and urban comparison" and "primary care"	9	
Physician burnout	"differences in rural and urban primary care"	0	Table I. Search terms and search categories
	"physician burnout" and "primary care"	17	
Total	"provider satisfaction" and "primary care"	74	
		1880	

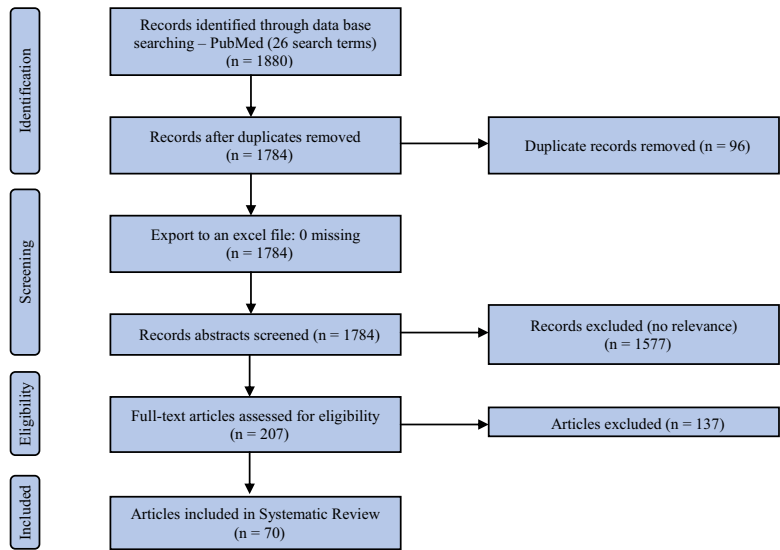
### Data analysis

The 70 articles included in the systematic literature review were coded and described according to categories in a Microsoft Excel spreadsheet. The main categories (and subcategories) of the literature review included patient segment (diabetes, heart, lung, other), location (city, state, country), setting (rural, urban), model description, team composition, patient communication, outcome descriptions (measures, clinical, cost, access, significance) and remote patient monitoring. After completion of coding, the articles were filtered for relevance to the major health problems in Texas and the significance of the study outcomes. The articles highlighted in the results are the articles pertaining to chronic diseases and health care access problems in Texas and exhibit the most significant outcomes.

### Results: potential models of primary care

Based on our findings, implications for building IPCMs in a large state such as Texas will require a population segmentation approach to be successful. Prior studies of evidence-based primary care models demonstrate the importance of segmenting and planning for patient populations by disease category and severity (Kash *et al.*, 2016). Therefore, we will present implications for practice organized by most relevant disease categories to be targeted by the IPCM.

**Figure 7.**  
PRISMA Flowchart  
for systematic review



### *Heart disease & stroke*

#### *Achieving cardiovascular excellence in Colorado home blood pressure monitoring program.*

The achieving cardiovascular excellence in Colorado (A CARE) program is a quality improvement initiative to help primary care practices use home blood pressure measurement (HBPM) to improve blood pressure control. This initiative was designed in particular for rural and urban underserved populations. Overall, this program aimed to provide patients with self-management tools to support HBPM and a reporting system that could be easily integrated into routine practice so patients could share home blood pressure information with their providers, who could, in turn, make clinical and lifestyle management decisions to improve blood pressure control between regular office visits. Twenty-six practices that were members of the Shared Colorado Practices and Partnerships implemented A CARE and participated in this study, which totaled 3,578 patients. Before implementation of the program, the average initial home blood pressure (systolic/diastolic) of the participants was 137.6/83.0 mmHg and decreased to 131.2/78.7 mmHg by the end of the program. This represents an average decrease of 6.5/4.4 mmHg ( $p < 0.001$ ). The percentage of patients achieving target blood pressures before implementation was initially 34.5 per cent and increased to 53.3 per cent by the end ( $p < 0.001$ ). These results represent a major positive impact on the target population's risk for cardiovascular events; a population-wide 5-mmHg decrease in systolic pressure would be expected to decrease stroke mortality by 14 per cent, coronary heart disease by 9 per cent and overall mortality by 7 per cent (DeAlleaume *et al.*, 2015).

*Complex adaptive systems for team-based care.* In this study, complex adaptive team system principles were used to implement team-based care in a private, five-clinic primary care practice. Rather than providing the clinics with an operational structure to implement, this study took the approach of allowing the practices to use or modify existing patient management care processes or develop new ones as necessary. The implementation that was required across the board was the use of the study resources to improve their Minnesota healthscores vascular disease quality scores and hire a registered nurse (RN) care manager

to coordinate the team-care program. The clinics used the concepts of the patient-centered medical home and the chronic care model to develop (or modify) their patient care systems. The RN care manager rotated to a different clinic every month, but care coordinators and providers from all five clinics could contact her by phone and e-mail during the trial. The purpose of this study was to test if these new patient management systems, developed using complex adaptive team principles, would increase the proportion of patients who met goals for controlling their risk factors of diabetes. Medical records from a random sample of patients were reviewed at 12 months before implementation, 12 months during implementation and 6 months after implementation. In addition to reviewing medical records for improved health, the study also tested patient and provider satisfaction by mailing satisfaction surveys. After completing the study, the mean LDL cholesterol level was nearly 7 mg/dL lower in post-intervention than it was pre-intervention. The proportion of providers who indicated that they were satisfied or very satisfied increased from 59.5 per cent before implementation and 74.3 per cent after implementation ( $p = 0.0017$ ) (Kottke *et al.*, 2016).

*Pharmacist hypertension care management program.* The pharmacist hypertension care management model establishes a group of practitioners, including physicians, nurses, pharmacists, social workers and additional specialties, to partner with patients for a holistic and effective primary care. This interdisciplinary model unites the health-care team and improves outcomes by focusing on patient-centered care. The goal of this study was to evaluate the effectiveness of pharmacists as part of the patient-aligned care team for veterans with hypertension. Conducted at an urban midwest VA medical center, the program was provided by six clinical pharmacists within four primary care clinics over a 1-year period. Patients who were referred to the care management program met with a pharmacist in addition to their normal primary care physician. As part of the pharmacists' scope of practice, medication dosages were maximized before additional medications were added to the regimen and blood pressure goals were established. Patients were discharged from the program once blood pressure goals were attained at a pharmacist or primary care physician visit, but these patients were reenrolled if their blood pressure goals became uncontrolled at any subsequent primary care visit. The primary outcomes were the differences in systolic and diastolic blood pressure levels at 6- and 12-month follow-ups in the cases compared with the controls. Before the program, baseline blood pressure was higher (139.9/80.0 mmHg vs. 136.7/78.2 mmHg,  $p \leq 0.0002$ ), while baseline blood pressure control was lower (35 per cent vs. 49 per cent,  $p < 0.0001$ ) in the cases compared to the controls. Among the cases, systolic blood pressure decreased from baseline by  $-4.0$  and  $-7.1$  mmHg at 6 and 12 months, respectively; controls had a systolic blood pressure decrease of  $-1.6$  and  $-2.6$  mmHg at 6 and 12 months. For patients in the program, diastolic blood pressure decreased from baseline by  $-2.5$  and  $-3.2$  mmHg at 6 and 12 months, respectively, whereas controls had a diastolic blood pressure decrease from baseline by  $-1.1$  and  $-1.2$  mmHg at 6 and 12 months. Ultimately, patients who were referred to the pharmacist hypertension care management program had a significant improvement in blood pressure and indicated that this may be an effective method of improving blood pressure control among veterans in the patient-centered medical home model (Zillich *et al.*, 2015).

### Cancer

Rural disparities in cancer incidence and mortality are well-documented in the USA, with some regions experiencing significantly higher rates of cancers and higher mortality

because of later stage of detection and poorer access to screening, care and clinical trials (Ojinnaka *et al.*, 2015).

Cancer care continues to call for a multidisciplinary approach, involving different specialty experts. To facilitate this approach, tumor boards were created to have the different specialties when designing treatment plans. Tumor boards have been involved in cancer care for decades and they continue to assist the flow of treatment planning for cancer patients. Physicians come together to discuss options and treatment plans for cancer patients and make decisions on cancer care management. With different specialties involved, different ideas are brought to the table. The importance of tumor boards can be seen through the requirement by the American College of Surgeon's Commission for a cancer program to be accredited (Keating *et al.*, 2013). Tumor boards involve multiple disciplines to develop the best treatment plan and, ideally, improve patient outcomes (Stevenson *et al.*, 2013).

Virtual tumor boards exist so that the multidisciplinary approach can be continued throughout different hospitals and health systems to deliver the standard of care and improve patient outcomes and satisfaction. Not every facility or system has a virtual tumor board; currently, only those in a large metropolitan area with academic medical centers use these boards. To overcome the limiting aspect of tumor boards relying on a diverse and specialized local oncology department, the use of videoconference to create virtual tumor boards was developed. By including multiple health systems into developing a treatment plan, the limitation of regions no longer results in substandard cancer care. As videoconference technology is increasing, the reach of virtual tumor boards is expanding. Virtual tumor boards have been successfully implemented with widespread success and are the future of cancer care because they improve access while being feasible and highly accepted (Marshall *et al.*, 2014).

The virtual tumor board provides community providers access to university-based facilities without the travel or referrals. It allows providers with various sub-specialties to communicate more often, which results in developing an effective treatment plan.

### *Diabetes*

*Combined nurse-led care management with group visit structure.* This study examines how combined nurse-led care management and group visits affect patient outcomes in rural communities. This study took place in two rural primary care practices in North Carolina; one of which served as the intervention and the other as the control. In the intervention practice, the care of diabetic patients was redesigned in an effort to optimize patient outcomes and to provide patients with access to a full range of diabetes management services. This redesign included nurse-led planned care visits using evidence-based clinical management, patient education and support for self-management through a group visit structure, making decision support tools available for providers and providing a new clinical information system in the form of a patient registry. For the nurse-led care management, a certified nurse specialist (CNS) evaluated each patient who identified diabetes-relevant problems and developed specific action plans. Each action plan included scheduling the patient to attend the group visit process. Patients were assigned to a group of 3-12 patients who met a series of four 2-h group sessions over approximately 6 months. At each session, intervention patients were checked in on by an office staff member, were evaluated initially by the CNS, completed one of the 4 educational sessions and were evaluated by the physician provider (Bray *et al.*, 2005).



In total, 160 ( $n = 160$ ) diabetic patients were enrolled in the study (112 intervention patients and 48 control patients). The median  $Hb_{A1c}$  was not significantly different at baseline in the intervention and control groups, but it was significantly different when compared at the end of the study period. In the intervention group, median  $Hb_{A1c}$  at baseline was  $8.2 \pm 2.6$  per cent and median  $Hb_{A1c}$  at an average follow-up of  $11.3 \pm 5.7$  months was  $7.1 \pm 2.3$  per cent ( $p < 0.0001$ ). In the control group, median  $Hb_{A1c}$  increased from  $8.3 \pm 2.0$  per cent to  $8.6 \pm 2.4$  per cent ( $p < 0.05$ ) over the same time period. In the intervention group, 61 per cent of patients had a reduction in  $Hb_{A1c}$ , whereas only 37 per cent of control patients had a reduction ( $p < 0.01$ ). The percentage of patients who had an  $Hb_{A1c}$  of less than 7 per cent increased significantly in the intervention group from baseline to follow-up (32 to 45 per cent,  $p < 0.01$ ) but not in the control group (23 vs 29 per cent). Ultimately, these findings suggest that a revised care management system that includes nurse-led visits and a group visit structure can be successfully incorporated into a rural primary care practice and appears to produce improved clinical outcomes compared to usual care. (Bray *et al.*, 2005)

*Risk stratification and interventions in managed care organization.* The purpose of this study was to evaluate the impact of a comprehensive diabetes management program that includes risk stratification and social marketing on clinical outcomes and patient satisfaction within a managed care organization (MCO). The program was implemented in the following phases: enrollment, initial encounter, risk stratification and action planning, intervention, patient education, interim visits and follow-up visits. The program personnel included a team care coordinator (responsible for administrative tasks, maintaining contact with patients, data management and scheduling), team care leader (registered nurse who implemented the orders and assumed responsibilities for care as directed by the patients' primary care providers), diabetes educators, nutritionists, advanced practice nurses and physician assistants. At the end of the 12-month period, the data showed a significant improvement in glycemic control as measured by  $Hb_{A1c}$ . The number of patients in the low-risk category ( $Hb_{A1c} < 7$  per cent) increased by 51.1 per cent from 47 members at baseline to 71 members after 12 months. The number of patients in the moderate category (7 to  $< 8$  per cent) increased 2.5 per cent and the number of patients in the high risk category ( $\geq 8$  per cent) decreased by 58.3 per cent from 76 to 48 participants. Reduction in hypertension was also seen at 12 months. The percentage of patients with blood pressure readings  $< 140/90$  mmHg increased from 38.9 per cent at baseline to 66.8 per cent at 12 months. Patients expressed a significant increase in satisfaction with the program and staff performance. Providers also indicated that 100 per cent were "very satisfied" with the program and 100 per cent believed that their patients' diabetes was better controlled as a result of the management program.

### *Respiratory diseases*

*Practical, robust implementation and sustainability model to improve asthma care.* The practical, robust implementation and sustainability model (PRISM) incorporates concepts from the literature about the diffusion of innovations, the chronic care model, model for improvement and reach, effectiveness, adoption, implementation and maintenance (RE-AIM). PRISM takes into account the characteristics of the external environment, the implementation and sustainability infrastructure, the recipients of the intervention and how these factors influence the adoption, implementation and maintenance of the intervention/program. This study used a pre-post, quasi-experimental design. The goal of the program was to provide quality asthma care to all patients in the region that included interactive, multidisciplinary workshops, asthma champion workshops for local clinic site leaders, in-

clinic coaching visits, clinician support tools, patient asthma education materials and teaching aids, resource website and provider practice feedback reports. After completion of the study, all participants had reported improved confidence in their ability to provide quality asthma care. Respondents increasingly reported providing elements of quality asthma care to at least 60 per cent of their asthma patients (Cicutto *et al.*, 2014).

*Easy breathing program for asthma management.* Easy breathing program is an asthma management program for primary care clinicians with the goals of improving the diagnosis, determination of disease severity and treatment of asthma for disadvantaged, urban, primarily minority children. The program consists of a validated survey that is completed by the parents of all children (from 6 months to 18 years of age) who present for care, for any reason, at any of the six primary care clinics in Hartford, CT. Before implementation of the program, clinicians at each site participated in 4 h of training which included both how to use the easy breathing forms and time for discussion about asthma demographics, pathophysiology and medications and rationale for the recommendations for asthma management. All the physicians and mid-level practitioners completed a 50-question pretest before training and posttest about 2 to 4 weeks after training and a 30-question follow-up test 12 to 18 months after completion of training. A provider satisfaction survey was also distributed to clinicians 12 to 18 months after program implementation. The mean correct score for all physicians on the pretest was 61 per cent (95 per cent CI, 57-65 per cent) and increased on the posttest to 77 per cent (95 per cent CI, 74-81 per cent) ( $p < 0.001$ ). The mean correct percentage score for all mid-level practitioners on the pretest was 54 per cent (95 per cent CI, 50-59 per cent) and increased on the posttest to 69 per cent (95 per cent CI, 63-75 per cent) ( $p < 0.001$ ). All clinicians felt that the easy breathing training program had increased their knowledge of asthma (Cloutier *et al.*, 2002).

### **Practical implications: future of primary care for Texans**

There are several opportunities for further investigation, including focused and stakeholder interviews. One model structure that might prove feasible is the alignment of a college of medicine primary care (family medicine) residency using the patient-centered medical home, incorporating the concepts of an accountable care organization, interdisciplinary teams, being funded through the Texas 1115 Medicaid Waiver. The Healthy South Texas program has resulted in program expansion or initiation at several sites, including Victoria, Corpus Christi, Alice, Kleburg, Cuero, McAllen and elsewhere. The infrastructure is in place for chronic disease management in diabetes, asthma, cardiovascular disease and strong maternal-child health emphases and prevention of infectious diseases.

By incorporating and leveraging the infrastructure that has been built in the past 5 years not only in the Coastal Bend and South Texas but also in the 17 county Brazos Valley region, an excellent primary care residency program could be established focusing on the needs of underserved and rural Texans. Some excellent rural health systems exist in many of these areas, including South East Texas Health System (SETHS) and several hospitals and clinics in the south-central coastal region of Texas, as well as FQHCs such as the lone star circle of care in Round Rock, Texas. Finally, Houston Methodist Hospital system has several outlying clinics and suburban hospitals that would be excellent training sites for rural-focused primary care physicians in Texas. Multi-level partnership as suggested above will be able to facilitate a larger societal impact of the family medicine training initiatives at the college of medicine.

## Limitations

As with any study, this research has its limitations. This research is heavily driven by both theory and practice toward a clear definition of IPCMs including their variants across the USA. However, models of education and practice vary significantly across the USA because of state-by-state variation in funding, differences in regulation, and, most recently differences across those states that expanded Medicaid under the ACA. Models that might work in one state, or under a unique state-funded academic medical center, might not be “doable” in another state within the nuances of a difference funding mechanism.

## Conclusions

This research is heavily driven by both theory and practice toward a clear definition of IPCMs including their variants across the USA. Results of this research will provide a model IPCM for the state of Texas first and will guide IPCM planning and implementation in other states. The over-arching goal is to focus on mechanisms to train, place and retain care-givers in rural communities that thus improve the ability of underserved populations who are at risk to better address the needs of their own populations. This study is original in both its theory and approach within the constraints of fashioning an educational model that is “land grant-centric” and focused on carrying out the mission of a major, top-tier research university with an emerging college of medicine at an academic medical center and its key partners.

Health-care leaders, academic programs and practitioners are encouraged to consider models such as the following:

- complex adaptive systems for team-based care, which show an increase in the proportion of patients who met goals for controlling their risk factors of diabetes;
- pharmacist hypertension care management program, which shows a significant improvement in blood pressure;
- virtual tumor boards, which provide greater access to cancer care and allow the multidisciplinary approach to be continued throughout hospitals and health systems regardless of location;
- combined nurse-led care management with group visit structure, which can be successfully implemented in rural primary care practice and produce improved clinical outcomes; and
- PRISM model to improve asthma care, which increases health-care providers’ knowledge and confidence in their ability to provide quality asthma care.

## References

- American Cancer Society (2008), *Texas Cancer Facts & Figures*, American Cancer Society, Atlanta, GA.
- American Cancer Society (2016), *Cancer Facts & Figures 2016*, American Cancer Society, Atlanta, GA.
- American Lung Association (2013), *Trends in COPD (Chronic Bronchitis and Emphysema): Morbidity and Mortality*, American Lung Association, Washington, D.C.
- American Lung Association (ALA) (2015), *Estimated Prevalence and Incidence of Lung Disease*, American Lung Association, Washington, D.C.
- American Heart Association and American Stroke Association (2010), *Texas State Fact Sheet, American Heart Association and American Stroke Association*, American Heart Association and American Stroke Association, Dallas, TX.

- American Heart Association and American Stroke Association (2015), *Heart Disease and Stroke Statistics – at-a-Glance*, American Heart Association and American Stroke Association, Dallas, TX.
- Bolin, J.N., Bellamy, G.R., Ferdinand, A.O., Vuong, A.M., Kash, B.A., Schulze, A. and Helduser, J.W. (2015), “Rural healthy people 2020: new decade, same challenges”, *The Journal of Rural Health: Official Journal of the American Rural Health Association and the National Rural Health Care Association*, Vol. 31 No. 3, pp. 326-333.
- Braveman, P.A., Cubbin, C., Egerter, S., Williams, D.R. and Pamuk, E. (2010), “Socioeconomic disparities in health in the United States: what the patterns tell us”, *American Journal of Public Health*, Vol. 100 No. 1, pp. 186-196.
- Bray, P., Thompson, D., Wynn, J.D., Cummings, D.M. and Whetstone, L. (2005), “Confronting disparities in diabetes care: the clinical effectiveness of redesigning care management for minority patients in rural primary care practices”, *The Journal of Rural Health*, Vol. 21 No. 4, pp. 317-321.
- Cicutto, L., Dingae, M.B. and Langmack, E.L. (2014), “Improving asthma care in rural primary care practices: a performance improvement project”, *Journal of Continuing Education in the Health Professions*, Vol. 34 No. 4, pp. 205-214.
- Cloutier, M.M., Wakefield, D.B., Carlisle, P.S., Bailit, H.L. and Hall, C.B. (2002), “The effect of easy breathing on asthma management and knowledge”, *Archives of Pediatrics & Adolescent Medicine*, Vol. 156 No. 10, pp. 1045-1051.
- DeAlleaume, L., Parnes, B., Zittleman, L., Sutter, C., Chavez, R., Bernstein, J., LeBlanc, W., Dickinson, M. and Westfall, J.M. (2015), “Success in the achieving cardiovascular excellence in colorado (a care) home blood pressure monitoring program: a report from the shared networks of colorado ambulatory practices and partners (SNOCAP)”, *Journal of the American Board of Family Medicine*, Vol. 28 No. 5, pp. 548-555.
- Defense Advanced Research Projects Agency (DARPA) (2016), *Battlefield Medicine*, available at: [www.darpa.mil/program/battlefield-medicine](http://www.darpa.mil/program/battlefield-medicine) (accessed 15 November 2016).
- French, J. and Weathersby, R. (2010), “Applying science to medicine”, *International Journal of Innovation Science*, Vol. 2 No. 1, pp. 1-11.
- Gupta, P. and Armbruster, R. (2011), “Innovations in healthcare: a reality”, *International Journal of Innovation Science*, Vol. 3 No. 2, pp. 101-104.
- Kash, B.A., Tan, D., Tomaszewski, L. and Tittle, K.O. (2016), “The pediatric medical home: what do evidence-based models look like?”, *American Journal of Accountable Care*, Vol. 4, pp. 34-40.
- Keating, N., Landrum, M., Lamont, E., Bozeman, S., Shulman, L. and McNeil, B. (2013), “Tumor boards and the quality of cancer care”, *Journal of the National Cancer Institute*, Vol. 105 No. 2, pp. 113-121.
- Kottke, T., Huebsch, J., McGinnis, P., Nichols, J., Parker, E., Tillema, J. and Maciosek, M. (2016), “Using principles of complex adaptive systems to implement secondary prevention of coronary heart disease in primary care”, *The Permanente Journal*, Vol. 20 No. 2, pp. 17-24.
- Marshall, C., Peterson, N., Naik, A., Velde, N., Artinyan, A., Albo, D., Berger, D. and Aanya, D. (2014), “Implementation of a regional virtual tumor board: a prospective study evaluating feasibility and provider acceptance”, *Telemedicine and e-Health*, Vol. 20 No. 8, pp. 705-711.
- Moher, D., Liberati, A., Tetzlaff, J. and Altman, D.G. (2009), “Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement”, *PLoS Medicine*, Vol. 6 No. 7, pp. 1-6.
- National Center for Health Statistics (NCHS) (2005), *Health, United States, 2005 with Chartbook on Trends in the Health of Americans*, US Department of Health and Human Services, Hyattsville, MD.
- North Texas Regional Extension Center (NTREC) (2015), *The Physician Workforce in Texas*, North Texas Regional Extension Center, Merrit Hawkins, available at: [www.merrithawkins.com/UploadedFiles/](http://www.merrithawkins.com/UploadedFiles/)

- [MerrittHawkings/Surveys/Merritt\\_Hawkins\\_NTREC\\_Physician\\_Workforce\\_Survey.pdf](#) (accessed 15 November 2016).
- Ojinnaka, C., Bolin, J., Nash, P., Ory, M. and McClellan, D. (2015), "Cancer in rural America", in Bolin, J., Bellamy, G., Ferdinand, A., Bellamy, G., Vuong, A., Kash, B., Schulze, A., Helduser, J. (Eds), *Rural Healthy People 2020*, Vol. 2, pp. 1-14.
- Stevenson, M.M., Irwin, T., Lowry, T., Ahmed, M.Z., Walden, T.L., Watson, M. and Sutton, L. (2013), "Development of a virtual multidisciplinary lung cancer tumor board in a community setting", *Journal of Oncology Practice*, Vol. 9 No. 3, pp. 77-80.
- Texas Department of State Health Services, Center for Health Statistics (TDSHS) (2012), *Cardiovascular Disease in Texas*, Texas Department of State Health Services, Center for Health Statistics, Austin, TX.
- Texas Department of State Health Services, Center for Health Statistics (TDSHS) (2014), *The Health Status of Texas*, Texas Department of State Health Services, Center for Health Statistics, Austin, TX.
- Texas Department of State Health Services, Center for Health Statistics (TDSHS) (2016), *Cancer in Texas 2016*, Texas Department of State Health Services, Center for Health Statistics, Austin, TX.
- Texas Department of State Health Services, Office of Surveillance, Evaluation, and Research (TDSHS) (2013), *The Burden of Diabetes in Texas*, Texas Department of State Health Services, Office of Surveillance, Evaluation, and Research, Austin, TX.
- Texas Department of State Health Services, Office of Surveillance, Evaluation, and Research (TDSHS) (2014), *2014 Texas Asthma Burden Report*, Austin, TX.
- Texas Medical Association (2006), *Why Texas Needs More Physicians*, available at: [www.texmed.org/template.aspx?id=5427](http://www.texmed.org/template.aspx?id=5427) (accessed 15 November 2016).
- Texas Primary Care Office (2011), *Medically Underserved Areas*, available at: [www.dshs.texas.gov/uploadedImages/Content/Family\\_and\\_Community\\_Health/chpr/MUA%20July%20Map%202011.jpg](http://www.dshs.texas.gov/uploadedImages/Content/Family_and_Community_Health/chpr/MUA%20July%20Map%202011.jpg) (accessed 15 November 2016).
- Thomas, K. and Wolf, M. (2009), "Innovation strategies for addressing today's healthcare challenges", *International Journal of Innovation Science*, Vol. 1 No. 4, pp. 179-190.
- Zillich, A.J., Jaynes, H.A., Bex, S.D., Boldt, A.S., Walston, C.M., Ramsey, D.C., Sutherland, J.M. and Bravata, D.M. (2015), "Evaluation of pharmacist care for hypertension in the Veterans Affairs patient-centered medical home: a retrospective case-control study", *The American Journal of Medicine*, Vol. 128 No. 5, p. 539.

### Further reading

- Baylor College of Medicine (2016), *Baylor Family Medicine*, available at: [www.bcm.edu/healthcare/care-centers/family-medicine](http://www.bcm.edu/healthcare/care-centers/family-medicine), [www.bcm.edu/departments/family-and-community-medicine/education/family-medicine](http://www.bcm.edu/departments/family-and-community-medicine/education/family-medicine) (accessed 15 November 2016).
- Brown University Alpert Medical School (2016), *About Brown Family Medicine*, available at: [www.brown.edu/academics/medical/about/departments/family-medicine/about](http://www.brown.edu/academics/medical/about/departments/family-medicine/about) (accessed 15 November 2016).
- Clark, C.M., Snyder, J.W., Meek, R.L., Stutz, L.M. and Parkin, C.G. (2001), "A systematic approach to risk stratification and intervention within a managed care environment improves diabetes outcomes and patient satisfaction", *Diabetes Care Journal*, Vol. 24 No. 6, pp. 1079-1086.
- Concord Hospital(2016), "NH Dartmouth family medicine program", available at: [www.concordhospital.org/healthcare-professionals/nh-dartmouth-family-medicine-residency/](http://www.concordhospital.org/healthcare-professionals/nh-dartmouth-family-medicine-residency/) (accessed 15 November 2016).
- Doximity Residency Navigator(2016), *Best Residency Program*, available at: [https://residency.doximity.com/programs?residency\\_specialty\\_id=43&sort\\_by=reputation](https://residency.doximity.com/programs?residency_specialty_id=43&sort_by=reputation) (accessed 15 November 2016).
- Gregory, S.T. and Menser, T. (2015), "Burnout among primary care physicians: a test of the areas of worklife model", *Journal of Healthcare Management*, Vol. 60 No. 2, pp. 133-148.

- Morse, R. and Hines, K. (2016), "Best medical schools: primary care", *US News & World Report*, available at: <http://grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/top-medical-schools/primary-care-rankings?int=af3309&int=b3b50a&int=aac509> (accessed 15 November 2016).
- UC Davis Health System, Department of Internal Medicine (2016), Internal Medicine Residency Program, available at: [www.ucdmc.ucdavis.edu/internalmedicine/education\\_programs/primary\\_care.html](http://www.ucdmc.ucdavis.edu/internalmedicine/education_programs/primary_care.html) (accessed 15 November 2016).
- University of Pennsylvania Family Medicine Residency (2016), *Residency Program in Family Medicine and Community Health Program Highlights*, available at: [www.pennmedicine.org/departments-and-centers/family-medicine-and-community-health/medical-training/residency](http://www.pennmedicine.org/departments-and-centers/family-medicine-and-community-health/medical-training/residency) (accessed 15 November 2016).

**Corresponding author**

Bitu A. Kash can be contacted at: [bakash@sph.tamhsc.edu](mailto:bakash@sph.tamhsc.edu)