Type 2 Diabetes Care and Management:

A Comparison of German and American Approaches

By: Sarah Dinegar

Northwestern University, Department of German

Faculty Advisor: Dr. Franziska Lys

Spring 2019

DEDICATIONS

Without each of the unwavering support of each of the following individuals, this study would have not been possible. I would like to extend my deepest appreciation to:

Dr. Franziska Lys, Northwestern Department of German

For supporting me in this unconventional research endeavor from day one, for always patiently helping me think through each step of my planning, for reading and editing countless drafts, for believing in me and encouraging me even when I fell behind, & for pushing me to always realize my best work

Dr. Vinzenz Unger, Northwestern Department of Biological Sciences

For inspiring the origins of this project by teaching me the molecular cause of Type 2 Diabetes in biochemistry, for taking the time for long conversations to help me work through foundational ideas for this study, for editing each page with thoughtful detail, & for living by example his advice to be authentic

Dr. Jan Behrs, Northwestern Department of German

For taking the time to read and edit every page of this long work in short notice, for sharing his German expertise in many helpful comments, & for his kindly commending support

Dr. Rolf Haeger, physician in Braunschweig, Germany

For his willingness to enable the execution of this study, for giving me German physician contacts, for editing my German scripts and surveys, for helping me over every hurdle I encountered while interviewing physicians in Germany, & for his undying, enthusiastic support of my project & faith in me

All the German & American Physicians who were interviewed or surveyed

For sharing their valuable time to contribute their expertise & insights to this study

Dr. Peter Civetta, Office of Undergraduate Research

For teaching me how to how to do my own research, for helping me to turn my passions into ideas and my ideas into reality, for editing my abstracts time and time again, & for sharing his enthusiasm for undergraduate research that is stronger than just about anyone else's enthusiasm about anything in life

Dr. Megan Novak Wood, Office of Undergraduate Research

For her steadfast support & answering of all my questions throughout the many months of this project

My parents, Christina and Leonard Dinegar

For always being my biggest cheerleaders, for giving me the most wonderful gift of a Northwestern education, for patiently listening to me gush over every update of this research process – from my original ideas to my interview findings to my conclusions – & most of all, for their unconditional love & support

I would also like to thank the following entities for their financial support of this study:

Northwestern Office of Undergraduate Research

Northwestern Buffett Institute for Global Affairs

TABLE OF CONTENTS

ABSTRACTS……6
1. English
2. German

BACKGROUND INFORMATION / LITERATURE REVIEW……...8
1. Why Type 2 Diabetes Needs to be Noticed
2. German & American Healthcare Systems Compared
    2.1. German Healthcare
        2.1.a. Insurance Policy
        2.1.b. Insurance Coverage Descriptions
    2.2. American Healthcare
        2.2.a. Uninsured Americans
        2.2.b. Changes under the ACA
        2.2.c. Exorbitant Costs
    2.3. System Comparison
3. Type 2 Diabetes Care Compared
    3.1. Type 2 Diabetes Care in the German Healthcare System
    3.2. Type 2 Diabetes Care in the American Healthcare System
4. Why Focus on Primary Care Physicians?
5. Purpose of Research Study Questions

RESEARCH METHODS & DESIGN……20
1. Overview

RESULTS……21
1. German Physician Interview Results
    1.1. T2D Diagnosis & Disease Management Protocol in German Healthcare
        1.1.a. Diagnosis Protocol
        1.1.b. Prediabetes Recommendations
        1.1.c. T2D Disease Management Program (DMP) Protocol
    1.2. Strengths of T2D DMP
        1.2.a. Structure & Regularity
        1.2.b. Sustainability of Lifestyle Changes
        1.2.c. Decreased Incidence of Secondary Complications
        1.2.d. Accountability
    1.3. Weaknesses of T2D DMP
        1.3.a. Bureaucracy & Documentation
        1.3.b. Lack of Customization
        1.3.c. Alternate Financial Motives
        1.3.d. Not Enough Added Value
    1.4. German Physicians' Opinions on the Overall Impact of Germany's T2D DMPs on Health Outcomes, Quality of Care, & Economic Burdens of T2D
2. American Physician Interview Results
    2.1. T2D Diagnosis and Care Protocol in American Healthcare
        2.1.a. Diagnosis Protocol
        2.1.b. Preventive Measures
        2.1.c. Pre-diabetes Recommendations

2.1.d. T2D Care Protocols
2.2. Strengths of American T2D Care Protocol
2.2.a. Increasing Utilization of Technological Tools
2.2.b. U.S. Programs to Reduce T2D
2.2.c. Motivational Interviewing
2.2.d. Team-based Care Evolution
2.2.e. Transitional Care
2.3 Weaknesses of American T2D Care Protocol
2.3.a. High Cost of Medications
2.3.b. Lack of Insurance-covered Diabetes Education
2.3.c. American Healthcare's Focus on Reactive rather than Proactive Care
2.3.d. Overcrowding of the Public Healthcare System
3. Survey Results: Comparison of American & German Physician Responses
3.1. Approximate Percentage of Pre-diabetic & T2D Patients by Physician
3.2. Breakdown of Physician Recommendations to Pre-diabetic & T2D Patients
3.3. Physician Perception of T2D Care Efficacy
3.4. Satisfaction with Care

ANALYSIS……...…41
1. Similarities Between German and American T2D Care
1.1. General T2D Protocol
1.2. Positive Aspects of Both Countries' T2D Care
1.3. Challenges for Both Countries
1.3.a. T2D – a Silent Disease
1.3.b. Variety of Patient Compliance
1.3.c. Difficulty of Changing Lifestyle
1.3.d. Control Possessed by Pharmaceutical Companies
1.3.e. Too much Time Spent on Bureaucratic Paperwork, Not enough Time Spent with Patient
1.3.f. Other Miscellaneous Shared Challenges
2. Differences Between German and American T2D Care
2.1. Challenges Unique to the U.S.
2.1.a. T2D's Disproportionate Detriment to Lower SES & Minority Populations
2.1.b. Expensive Pharmaceuticals
2.1.c. Conflicting Interests within American Healthcare
2.1.d. T2D Rates Rising in Children
2.2. Challenges Unique to Germany
2.2.a. Downsides of the DMP
2.2.b. Freedom of Choice of Physicians – Prevention gone too far?
2.3. Fortes Unique to the U.S.
2.4. Fortes Unique to Germany
3. Recommendations for Improvement of T2D Care
3.1. Meeting Patients Where They Are
3.1.a. Increasing Use of Motivational Interviewing
3.1.b. Addressing Social Determinants of Health
3.2. Resource Advancement
3.2.a. Increasing Use of Technological Tools
3.2.b. Providing Access to T2D Education
3.2.c. Better Utilizing Current Resources
3.3. Changes in Healthcare Policy
3.3.a. Greater Employment of Team-based Care
3.3.b. Increasing Use of Home Visits

3.3.c. Ascertaining Root Causes
3.3.d. Payment Incentive Structure

CONCLUSION.……..……..57

APPENDICES……...…...…58
1. Survey Result Graphs
2. German Interview Scripts
3. German Survey Scripts
4. American Interview Scripts
5. American Survey Scripts
6. Recruitment Emails for German Physicians
7. Recruitment Emails for American Physicians

REFERENCES……...……..……...74

ABSTRACTS

1. English

Type 2 diabetes (T2D) affects over 422 million people worldwide. In 2017, diabetes care for the 29 million T2D Americans cost $327 billion, an approximately 88% increase from the 2007 estimate of $174 billion. These exorbitant costs are primarily associated with the consequential secondary complications and hospitalizations of T2D, including cardiovascular disease, stroke, blindness, kidney failure, neuropathy, Alzheimer's, and lower limb amputation. Within their multi-payer healthcare system, Germany has used standardized, evidence-based interventions called Disease Management Programs ("DMP"s) to manage T2D since 2002. Studies have shown markedly improved health care delivery and health outcomes since DMP implementation, including reduced incidence of diabetic secondary complications, decreasing financial burdens of T2D in Germany. No such programs exist in fragmented U.S. healthcare. Clearly needed reform warrants examination of and comparison with German T2D DMPs' successful methods. This study employed interviews and surveys to investigate German and American primary care physicians' opinions of the efficacy of their nation's respective T2D management methods in improving health outcomes, healthcare costs, and quality of care. German physicians reported similar protocol and resource availability for T2D management, as they all enroll their T2D patients in DMPs. In contrast, American physicians' responses varied widely by their clinical network and their patients' insurers. This thesis will discuss strengths and weaknesses of both systems as well as outline several universal challenges encountered with management of T2D. It will also provide insight into primary care physicians' opinions and recommendations on best directions forward for chronic disease management, particularly addressing these universal challenges.

2. Deutsch

Typ 2 Diabetes (T2D) betrifft über 422 Millionen Menschen weltweit. Im Jahr 2017, kostete Diabetes-Pflege für die 29 Million Amerikaner mit T2D $327 Milliarden, eine Zunahme von ungefähr 88% seit der Schätzung von 2007 von $174 Milliarden geschätzt. Diese exorbitanten Kosten sind meisten mit den sekundären Komplikationen oder Folgekrankheiten von T2D verbunden, einschließlich Herz-Kreislauf-Erkrankungen, Schlaganfall, Blindheit, Nierenversagen, Neuropathie, Alzheimer, und Amputation der unteren Extremitäten. Innerhalb des Mehrzahler-Gesundheitssystems hat Deutschland seit 2002 standardisierte, evidenzbasierte Interventionen, sogenannte Disease-Management-Programme ("DMP"s), um T2D zu verwalten. Studien haben gezeigt, dass sich die Gesundheitsversorgung und die gesundheitlichen Ergebnisse seit Einführung des DMP deutlich verbessert haben, einschließlich einer

geringeren Inzidenz von diabetischen Folgekomplikationen und einer Verringerung der finanziellen Belastung durch T2D in Deutschland. Im fragmentierten, uneinheitlichen amerikanischen Gesundheitssystem existieren keine solchen Programme. Die offensichtliche Notwendigkeit von Reformen rechtfertigt die Untersuchung und den Vergleich mit den anscheinend erfolgreichen Methoden der deutschen T2D-DMP. Für diese Studie wurden Interviews und Umfragen durchgeführt, um die Meinungen deutscher und amerikanischer Hausärzte zur Wirksamkeit der jeweiligen T2D-Managementmethoden ihres Landes bei der Verbesserung der Gesundheitsergebnisse, der Gesundheitskosten, und der Versorgungsqualität zu untersuchen.

Deutsche Ärzte berichteten insgesamt von ähnlichen Protokoll- und Ressourcenverfügbarkeit in ihrem T2D-Management, da alle ihre T2D-Patienten an DMPs teilnehmen. Im Gegensatz dazu unterschiedet sich die Behandlungsmethode der amerikanischen Ärzte stark nach dem klinischen Netzwerk, in dem sie arbeiteten, und nach den Versicherern ihrer Patienten. Zu den Stärken der T2D-DMPs in Deutschland gehörten die fortgesetzte Regelmäßigkeit der Besuche und die Nachvollziehbarkeit, die beide in der Struktur der DMPs angelegt sind, sowie die Verfügbarkeit des Zugangs zu T2D-Managementressourcen ohne finanzielle Barrieren. Zu den Schwächen gehörten die mangelnde Möglichkeit zur persönlichen Anpassung und die übermäßige bürokratische Dokumentation für einen minimalen Mehrwert. Die Stärken der amerikanischen Methoden ist die Möglichkeit von Innovationen, die den zunehmenden Einsatz von technologischen Instrumenten und motivierenden Interviewtechniken sowie die Entwicklung hin zu teambasierten Versorgungsleistungen und wertorientierten Erstattungsmodellen vorangetrieben hat. Die Schwächen resultierten hauptsächlich aus der systematischen Ungleichheit des Zugangs zur Gesundheitsversorgung in den USA, einschließlich des Mangels an von der Versicherung gedeckter Diabetesaufklärung, den unangemessen hohen Medikamentenkosten und der unzureichenden Bereitstellung erschwinglicher Vorsorge. Während diese Stärken und Schwächen viele Unterschiede zwischen deutscher und amerikanischer T2D-Versorgung aufzeigen, stehen beide Nationen beim Management von T2D vor mehreren universellen Herausforderungen. Zu diesen gemeinsamen Herausforderungen gehören die mangelhafte Kooperation der Patienten und die Schwierigkeit, eine nachhaltige Veränderung des Lebensstils herbeizuführen, was auf Verbesserungsbedarf bei der T2D-Versorgung beider Länder hinweist. Die Studie gibt einen Einblick in die Meinungen und Empfehlungen von Hausärzten zu den besten künftigen Maßnahmen für das Management chronischer Krankheiten, insbesondere im Hinblick auf die Bewältigung dieser universellen Herausforderungen. Zu den Empfehlungen gehörten ein umfassender Versicherungsschutz für Kurse zur intensiven Diabetesaufklärung, für Ernährungsberater, und psychologische Berater, sowie der verstärkte Einsatz von teambasierter Gesundheitsversorgung, Telemedizin und Apps zur Verbesserung der Patientenverantwortung, und ein wertorientiertes Erstattungssystem.

BACKGROUND INFORMATION / LITERATURE REVIEW

1. Why Type 2 Diabetes Needs to be Noticed

Type 2 Diabetes is one of two types of Diabetes Mellitus, a pathology characterized by the body's inability to control the blood concentration of the small sugar called glucose that is central to nutrition and metabolism (American Diabetes Association). Type 1 Diabetes Mellitus usually manifests itself earlier in life and is defined by the body's inability to produce insulin, the hormone that controls blood glucose levels (ADA). Type 2 Diabetes Mellitus, however, typically develops later in life though and is defined by progressive increased resistance to insulin due to prolonged high blood glucose levels. This thesis deals with Type 2 Diabetes Mellitus exclusively, and it will be referred to as T2D for the remainder of the paper. T2D has steadily risen to be one of the most significant health concerns worldwide: the number of individuals affected has risen from 108 million in 1980 to 422 million in 2014 (Mathers & Loncar, 2006). According to the National Diabetes Statistics Report (2017), 8.9% of the U.S. population (29 million individuals) have T2D, and it was America's 7th leading cause of death in 2015. The number of adults diagnosed with diabetes has been estimated to have tripled in the last 20 years (Center for Disease Control and Prevention, 2017), which would suggest there to be fundamental environmental or behavior contributors to the spread of this non-communicable disease. There were approximately 5.8 million people with T2D in Germany as of 2010, according to Deutsches Ärzteblatt International, (Tamayo, Brinks, Hoyer, et al., 2016). From 2012 data, the nationwide German National Health Interview and Examination Survey for Adults found the overall prevalence of T2D to be 7.4% in the German population between 18 and 79 years of age (Tamayo et al., 2016).

Average healthcare expenditures for diabetics were 2.3 times higher than what expenditures in absence of diabetes would be (CDC, 2017). Furthermore, care for diagnosed diabetics accounts for 1 in 4 healthcare dollars in the U.S., more than half of that expenditure being directly attributable to diabetes, according to the American Diabetes Association (2018). These massive costs in both nations are not primarily associated with the molecular cause of diabetes – the body's inability to properly metabolize glucose – but instead largely associated with consequential long-term complications and hospitalizations due to prolonged high glucose levels, including cardiovascular disease (leading to heart attack and stroke), blindness, kidney failure, nerve damage (neuropathy), Alzheimer's, and lower limb amputation (Mathers & Loncar, 2006). In Germany, individuals with T2D had 1.81 times higher direct (€3352 vs €1849) and 2.07 times higher indirect (€4103 vs €1981) annual healthcare costs than those without diabetes (Ulrich, Holle, Wacker, et al., 2016). As expected, these increased costs were significantly associated with cardiovascular complications, long duration of diabetes, and treatment with insulin (Ulrich et al., 2016). Beyond the

intangible costs of pain, suffering, and decreased quality of life that type 2 diabetics experience with the accompanying health problems of T2D, these economic estimates highlight the substantial financial burden that diabetes imposes on society.

The estimated total economic cost due to diagnosed diabetes in the U.S. in 2012 was $245 billion, a 41% increase from the previous estimate of $174 billion in 2007 (ADA, 2013). This cost was estimated to be $327 billion in 2017, a further 26% from 2012 once adjusted for inflation (ADA, 2018). Of this total, $237 billion were due to direct medical costs while $90 billion can be attributed to reduced productivity, (CDC, 2017). These ever rising costs are due to both the growth in diabetes prevalence and the increased medical costs per diabetic, particularly among the population aged 65 years and older thus contributing heavily to the growing economic burden of the Medicare program (ADA, 2018). While these costs were not reported distinguishing between type 1 and 2 diabetes, 90 to 95% of diabetes cases in the U.S. are type 2, so the heavy majority of these costs can be assumed to be associated with T2D (CDC, 2017).

Diabetic progression is identified by a patient's glycated hemoglobin (HbA1c) value, a key diagnostic marker used as an index of mean glycemia (blood glucose levels) in diabetics. HbA1c levels correspondence to diabetic progression do vary slightly among individuals, but the general, universal parameters are as follows: <5.7% = normal, 5.7–6.5% = prediabetic, >6.5% = diabetic. More than one in three American adults fall into this category of prediabetes – approximately 33.9% of the U.S. adult population (CDC, 2017). Perhaps even more concerning is the fact that nearly 90% of those 84.1 million adults are unaware they are prediabetic (CDC, 2017). Prediabetes often leads to progression to T2D, and elevates risk of heart disease and stroke (CDC, 2017). The consequential health and economic detriment that these massive and still growing epidemics of prediabetes and T2D in both Germany and the U.S. calls for drastic action. This study will examine how such action ought best be taken.

2. German & American Healthcare Systems Compared

Many of the industrialized countries employ a universal mandate for healthcare coverage, of which there are three primary program types. Universal coverage is characterized by a health insurance mandate and alleviates the costly overreliance on emergency services that comes about from lack of preventive care for uninsured population. In the first type of universal coverage, a national health service, medical services are delivered through government-salaried physicians in publicly owned and operated hospitals and clinics, financed by the government through tax payments. Private physicians collect their fees from the government and have specific regulations on their practice. Examples of this system include the U.K., New Zealand, and Spain. In the second type, a national health insurance or single-payer system, a single government entity collects all healthcare fees and pays out all healthcare costs. Canada, Denmark, and Sweden all employ this method in which medical services are publicly financed but not publicly provided.

In the third type, a multi-payer health insurance, or all-payer system, universal health insurance is provided via not-for-profit health insurance funds, or "sickness funds," that collect premiums from employees and employers and that are used to eliminate the administrative costs for billing by paying physicians and hospitals at uniform rates. Japan, France, and Germany all utilize this system. In contrast, the U.S. healthcare system is unique and un-uniform, with no universal health care coverage mandate (Department of Professional Employees, 2016). Instead of operating a national health service, a single-payer national health insurance system, or a multi-payer universal health insurance fund, the U.S. healthcare system can be best described as a hybrid system that will be discussed in further detail below.

2.1. German Healthcare

By measures of quality and cost, Germany has one of the world's most successful health care systems. According to the Institute for Quality and Efficiency in Health Care (IQWiG), approximately 90% of Germany's population is covered by statutory health insurance (2015). The remaining 10% of people living in Germany are insured privately, as residents of Germany whose gross income exceeds a designated threshold termed the '*Versicherungspflichtgrenze*' [Compulsory Insurance Limit] may choose to purchase private insurance. This private insurance has premiums based on age, general health, and requested health care services rather than on income. The 90% of the population not insured privately are still free to choose between any of the competing, nongovernmental health insurance funds within Germany's non-centralized universal care model (IQWiG, 2015). This delivery of healthcare is similar to the American system in the sense that both have coverage provided through many independent plans. The German healthcare system can be summarized as a publicly funded system with universal coverage that has also avoided long ques and extensive government intrusion (Ridic, Gleason, & Ridic, 2012).

2.1.a. Insurance Policy

Statutory insurers all have the same premium around 15.5%, of which 8.2% is paid by an employee's income and the remaining 7.3% is matched by their employer (Mossialos, Wenzl, Osborn, & Anderson, 2015). Premiums are thus not affected by one's marital status, family size, or health, and Germans have very low co-pays and no deductibles (DPE, 2016). Without deductibles, patients have no fear of spending hundreds of euros before their insurance starts to cover costs (Khazan, 2014). This premium percentage only goes up to a certain income level, the '*Beitragsbemessungsgrenze*' [income threshold], at which anyone earning more will still pay the same maximum premium (IQWiG, 2015). Premiums for children are covered by government general revenues, supported by the belief that the next generation should be the nation's fiscal responsibility rather than just the parents' responsibility (Reinhardt, 2009).

2.1.b. Insurance Coverage Descriptions

All insurers offer essentially the same '*Regelleistungen*' [standard benefits/services], including regular checkups with primary care physicians and access to specialists, psychotherapists, hospital services, screening tests, necessary vaccinations, pregnancy medical care, dental check-ups and treatment, and orthodontic treatment. As long as medically necessary, prescription drugs, rehabilitation services, physical and speech therapy, and medical aids and devices are also all covered. Some insurers do offer '*Satzungsleistungen*' [additional benefits/services], such as travel vaccinations, exercise programs, or reimbursements for taking part in preventative programs (IQWiG, 2015). German healthcare has no network limitations; people may see any healthcare professionals they choose (Khazan, 2014). As private entrepreneurs, German physicians receive a payment from insurers for each visit and procedure they perform. They are tightly regulated by collective annual budgets though, which are decided upon by groups of office-based physicians and insurers by region. Physicians do not receive additional funding if they go over these budgets. This discourages unnecessarily expensive procedures and keeps healthcare spending from skyrocketing (Knox, 2008).

2.2. American Healthcare

As mentioned previously, the U.S. employs its own unique hybrid model characterized by a blend of public and private insurance coverage. The U.S. government funds health services for low-income citizens through Medicaid and citizens over 65 years of age through Medicare (DPE, 2016). However according to the U.S. Census Bureau, 28.5 million Americans (8.8% of the population) did not have health insurance at any point throughout 2017. Of the insured, 37.7% were privately covered while 67.2% were government covered. Of health insurance coverage subtypes, employer-based insurance is the most common, covering 56.0% of the population, followed by Medicaid (19.3%), Medicare (17.2%), direct-purchase coverage (16.0%), and military coverage (4.8%) Most healthcare in the U.S., even if publicly financed, is delivered privately (Behrick, Hood, & Barnett, 2018).

2.2.a. Uninsured Americans

Lack of access to healthcare in the U.S. is driven primarily by the prohibitively high cost of care for many individuals. Americans with below-average incomes, when compared with their counterparts in other countries, are much more likely to report not visiting a physician when sick, not getting a recommended test, treatment, or follow-up care, not filling a prescription, and not seeing a dentist (Davis, Stremikis, Squires, & Schoen, 2012). Such avoidance of preventive care measures has resulted in patients developing much more severe conditions and thus needing much more costly medical attention downstream in hospitals. The Center for American Progress estimated that the lack of health insurance in the U.S. cost

American society between $124 and $248 billion annually (the low end representing just the cost of shorter lifespans of the uninsured and the high end representing both that cost and the loss of productivity due to the reduced health quality of the uninsured) (Harbage & Furnas, 2009).

2.2.b. Changes under the ACA

This profound impact that lack of coverage has on the U.S. economy warranted the 2010 Patient Protection and Affordable Care Act (ACA). According to the U.S. Department of Health and Human Services report, this legislation made efforts to expand access to healthcare coverage, emphasize prevention and wellness, increase consumer protections, and promote evidence-based treatment and administrative efficiency in attempt to curb rising healthcare costs. The ACA's 2013 individual mandate decreased number of uninsured adults from 44 million in 2013 to under 27 million in 2016 (Kaiser Family Foundation, 2018). However, after the mandate was repealed in 2017, the number of uninsured increased by nearly 700,000 people, the first increase since ACA implementation (KFF, 2018). The nonpartisan Congressional Budget Office reported that now an estimated 13 million fewer Americans would be insured in 2027 compared to if the individual mandate had stayed in effect (CBO, 2017).

In another effort to improve American health and reduce financial burdens incurred through lack of preventive care, the ACA instated the option for Medicaid expansion. Prior to the ACA, the median state Medicaid income eligibility cutoff for working parents was 61% of the Federal Poverty Level (FPL), which means a family of four had to earn less than $15,000 annually to qualify (Paradise, 2015). With such low limits on income and lack of coverage for childless non-disabled adults, pre-ACA Medicaid left an estimated 47 million Americans uninsured in the "coverage gap," as they were ineligible for Medicaid yet could not afford any private health insurance (UCSF/UC Hastings Consortium on Law, Science and Health Policy, 2017). Under the ACA policy change, states have the option to expand Medicaid using federal government funding to all adults with income up to 138% of FLB, thus providing access to preventive care for individuals who had previously fallen within the coverage gap (U.S. Department of Health and Human Services). While this expansion granted coverage to millions nationwide, the 19 states that chose to not expand still have an estimated three million low income adults in the challenging coverage gap (Majerol, Kewkirk, Garfield, 2015).

2.2.c. Exorbitant Costs

Americans spend over $3 trillion a year on health care but have shorter life expectancies and higher rates of infant mortality and diabetes than global peers (Frist & Rivlin, 2015). Even Americans with access to health insurance encounter the barrier of extraordinarily high costs of care, as premiums and deductibles have been rapidly rising. From 1999 to 2015, premiums increased by 203%, outpacing both workers'

earnings and inflation (Long, Rae, Claxton, Jankiewicz, & Rousseau, 2016). And deductibles increased by 67% in the five years from 2010 and 2015 alone (Long et. al, 2016). According to the Organization for Economic Co-operation and Development (OECD), an international forum comprised of 34 countries with advanced or emerging economies, the U.S. spends more than double the $3,453 average of all OECD countries on a per capita basis (2015). One primary reason for this exceedingly greater cost is the U.S.'s many uninsured individuals who require expensive later-stage care due to their lack of initial preventive care as discussed above.

Further significant contributing factors to the skyrocketing U.S. healthcare costs include the vast expense of new technologies and prescription drugs, high administrative costs, and the rise of chronic disease (namely obesity, cardiovascular disease, and T2D), and (Beamesderfer & Ranji, 2012). Expensive new technologies and drugs fuel healthcare spending for development costs, even when they are not necessarily cost effective or appreciably value-adding. The U.S. spent $1,026 per capita on pharmaceuticals and other nondurable medical care in 2013, which was more than double the OECD average of $515 per capita on such care (OECD, 2015). Additionally, the U.S. leads all other industrialized nations in its share of national healthcare expenditures devoted to insurance administration (DPE, 2016). A nationwide estimate by the Center for American Progress suggested as much as half of the $361 billion spent annually on administrative costs to be wasteful (Winkler, Basch, & Cutler 2012). Aims to improve efficiency have been implemented through the ACA, but the U.S. still struggles in this category.

Regarding chronic disease care's massive burden, another hefty contributor to costs, the Dartmouth Atlas of Health Care reported that patients with chronic illness in their last two years of life account for 32% of total Medicare spending, primarily due to physician and hospital fees associated with repeated hospitalizations (2013). In 2014, 60% of Americans had at least one chronic condition, and 40% had more than one (Buttroff, Ruder, & Bauman, 2017). According to the National Academy of Sciences, the U.S. was found to have a higher rate of chronic illness and a lower overall life expectancy than other high-income nations (2013). Subsequently 90% of the nation's $3.3 trillion annual healthcare expenditures go towards care for chronic disease patients (CDC, 2019). This paper will primarily discuss and compare the ways in which the U.S. and Germany each are making efforts to mitigate the challenge of burdens, both health and financial, incurred by chronic disease (T2D in particular) in today's healthcare space.

2.3. System Comparison

In a Commonwealth Fund Commission healthcare comparison with Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the U.K., the U.S. ranked last overall in many categories (Davis, Stremikis, Squires, & Schoen, 2014). This demands attention, especially with the American healthcare system being by far the world's most expensive per capita as previously noted. U.S.

healthcare specialists are among the best in the world, but American medical treatment is often overspecialized, extremely inequitable, and problematically neglectful of primary and preventive care (DPE, 2016). While the U.S. ranked fifth for quality of care, it came in last in efficiency, healthiness of citizens' lives, and efficiency among those 11 countries. Germany fell in the middle of pack among the 11 countries regarding healthcare spending per capita at $4,495, while the U.S. ranked highest at $8,508. However, Germans were the most likely of the 11 nationalities to hear back from a doctor quickly if they had a question, the most likely to be able to get a same-day or next-day appointment, the most likely to be able to access doctors after-hours without problem, and found to rarely use emergency rooms; the U.S. was at low end for each scenario (Mossialos et al., 2015). Additionally, according to an analysis in the *American Journal of Public Health*, for each $100 Germany spends on healthcare, it extends life by about 16 weeks. Meanwhile in America, each $100 spent on healthcare resulted in only two to three weeks more of longevity (Khazan, 2014).

The U.S. and Germany both desperately are trying to make healthcare less expensive, but each nation's unique spirit gets in its way. Germany's more orderly system is often too rigid for needed experimentation, while America's fragmented system, where many individuals do not have health insurance, and hospitals and doctors each charge different amounts, is great for competitive innovation but too chaotic to make payment reforms stick or provide care to all those in need of it (Khazan, 2014). The ways in which these cultural norms have manifested themselves will become evident in the upcoming discussion of each nation's T2D management methods.

3. Type 2 Diabetes Care Compared

3.1. Type 2 Diabetes Care in the German Healthcare System

The nearly 6 million type 2 diabetics in Germany is shown to be a 38% increase from 1998 (Diabetes in Zahlen). Individuals with T2D in Germany were found to incur approximately twice as high both direct and indirect healthcare costs annually than those without it (Ulrich, Holle, Wacker 2016). T2D complications, which include foot amputation, retinopathy, blindness, nephropathy, end-stage renal disease, stroke, myocardial infarction/cardiac arrest, ischemic heart disease, chronic heart failure, and angina pectoris, have been shown to have a significant impact on total health care costs in Germany not only at the time of an event, but also in subsequent years (Kähm, 2018). Direct medical costs of diabetes in Germany averaged 21 billion euros, and the prevalence of the disease in Germany is projected to continue increasing in upcoming years (Köster, Schubert, & Huppertz, 2009).

Prevention is a priority in German health care (Khazan, 2014), so Germany logically has tried to combat their diabetes epidemic with a preventive outlook. Disease Management Programs (termed "DMPs") are programs geared towards specific groups of patients suffering from a chronic illness, such as T2D, who

receive a standardized, coordinated, set of evidence-based interventions. The goals are to enhance the patients' long-term health outcomes, lower healthcare spending by reducing the need for hospitalization and other costly treatments, and improve quality of medical care (Brandt, Hartmann, & Hehner, 2010). Though many of America's pioneering DMPs in the 1990s did not show short-term positive impacts, other nations including Germany have since tried to follow suit with their own nuanced approaches (Brandt et al., 2010). German statutory health insurance funds started offering DMPs nation-wide in cooperation with primary care physicians in 2002 (Bundesversicherungsamt, 2016). As of 2006, 75% of primary care physicians in Germany were registered with DMPs (Nagel, Baehring, & Scherbaum, 2006), and nearly four million patients had been enrolled in T2D DMPs by 2014 (Fuchs, Henschke, Blümel, & Reinhard, 2014). In German DMPs, the primary care physician sees DMP-enrolled patients approximately every three months, keeps close tabs on their adherence to program protocol, and coordinates specialist referrals. The DMP protocol includes diabetes education, nutrition consultation and guidelines, enrollment in fitness classes and gym membership, regular foot, eye, and kidney exams, medications (varies by disease progression), and strict, routine blood sugar checks.

The effectiveness of DMPs were evaluated in a study based on presence of guideline care (received medical advice over the last 12 months on at least two of the three lifestyle topics of diet, exercise, and smoking cessation, and had reported intake their recommended medication in the past 7 days), quality adjusted survival (survival and patients' questionnaire assessed quality of life), and patient self-management (reporting of regular physical activity, regular self-monitoring of blood glucose, blood pressure, and body weight, participation in diabetes education class, and adherence to medications) (Laxy, Stark, Meisinger, et al. 2015). At the 2006 baseline investigation, the likelihood of receiving guideline care was more than doubled for patients enrolled in a T2D DMP (Laxy, Stark, Meisinger, et al. 2015). Although the prevalence of receiving guideline care in the group of DMP enrollees stayed relatively constant from 2006 to when it was measured again in 2011, the prevalence of receiving guideline care in the non-DMP group went up substantially from 2006 to 2011 (Laxy, Stark, Meisinger, et al. 2015). This is interesting to note, since it could suggest that the implementation of DMPs and corresponding physician education requirements resulted in physicians starting to apply the adopted DMP standards to treat all patients. Though this study found that general DMP enrollment in high risk patients was weakly associated with quality-adjusted survival, it found that guideline of care was found to be a strong predictor of survival / mortality. Thus perhaps the DMPs themselves have not yet shown to have significant improvements on their enrolled population (in part due to a number of outside circumstances discussed in detail in this article). Yet the spill-over effect that the DMP model has had on improving guideline of care administered to those not enrolled in DMPs has had a significant effect in decreasing mortality in T2D patients since implementation of the DMPs in the early 2000s (Laxy, Stark, Meisinger, et al. 2015).

Recent studies, however, show markedly improved health care delivery and decreases in enrolled patients' HbA1c values (Kostev, Rockel, Jacob, 2017). Furthermore, Germany's DMPs had significantly reduced incidence of several diabetic medical complications and had lowered overall cost of care by 13 percent as of 2010 (Brandt et al., 2010). These successful results mixed with some of the past more mixed results warrant further investigation into these programs' efficacy, as there are many variable factors. This study approached evaluating the efficacy of T2D DMPs via inquiry of valuable opinions of Germany primary care physicians. As they have been administering T2D care through these programs to their patients for many years, they have important firsthand insights into the strong and weak points of the DMPs. Due to the lack of centralization of information from the nature of the U.S. healthcare system, comparable statistics for the U.S. disease management are largely inaccessible and progress is thus harder to discern. However, the nationwide success of German T2D DMPs apparent from these certain studies warrants a point of comparison with the differing American approach.

3.2. Type 2 Diabetes Care in the American Healthcare System

With the rising burden of chronic disease, America's aging population, and a tight financial healthcare climate, delivering better care in a more cost–effective and health outcomes–focused way is a necessity. As discussed in the German healthcare section, disease management programs emphasize educating the patient on how to better self-manage their conditions using the evidence based guidelines. Fragments of U.S. healthcare have also been making efforts to utilize models of integrated care with some characteristics similar to the German DMPs. Integrated care is also known as coordinated care, patient-centered collaborative care, or disease management, and has the clear purpose of providing individuals with chronic diseases with coordinated care that empowers the patient and as a result reduces demand for hospital admissions and improves health outcomes. Critical elements of any integrated-care program include (but are not limited to) patient education and engagement, proactive care coordination and case management, and personalized care planning with healthcare professionals (McKinsey, 2015). Prevention can reduce risk factors that lead to chronic diseases, slow their progression, improve overall health, reduce health care spending. As previously mentioned, T2D progression is measured by the biomarker HbA1c, wherein stricter care protocol typically begins when a patient's HbA1c reaches 6.5% (T2D diagnosis benchmark). Results of 112 individual trials that measured reduction in HbA1c achieved for integrated-care interventions compared with usual car demonstrated that, on average, integrated care delivers a 0.5-percentage-point reduction in HbA1c. While this reduction may appear small, it is clinically significant, given the gradient of the relationship between HbA1c and outcomes, with each 0.5 percent reduction in HbA1c associated with a 10.5 percent reduction in diabetes-related complications and mortality (McKinsey, 2015). With such

clear promise, these integrated care models emphasizing proactive prevention over reactive curing will be a critical strategy for U.S. healthcare to more heavily pursue in upcoming years.

One particular initiative in the U.S. towards better disease management is seen in the rise of accountable care organizations (ACOs), which have been piloted in recent years by private insurers, states, and the Centers for Medicare and Medicaid Services (Diabetes Management Programs: Improving Health). ACOs stand to improve clinical integration and coordination and build a sharper focus on prevention, disease, management, and self-care (McClellan, Kent, Beales et al. 2013). The Pioneer ACO Model, enabled by the Affordable Care Act, encouraged providers and caregivers to deliver more coordinated care to Medicare beneficiaries and lasted from 2012 to 2016. Both higher quality care and lower Medicare expenditures were found by the Centers for Medicare & Medicaid Services from the first year of the Pioneer Accountable Care Organization Model; the $87.6 million gross savings of the program were driven majorly by reductions that the Pioneer ACOs generated in hospital admissions and readmissions (Center for Medicare and Medicaid Services, 2013). Beyond just financial savings, Pioneer ACOs demonstrated better patient outcomes through examples including that the median blood pressure control among diabetic beneficiaries was 68% compared to it being 55% for the adult diabetic population in 10 managed care plans across 7 states, that the median low density lipoprotein (LDL) control among diabetic beneficiaries was 57% compared to it being 48% for the adult diabetic population in 10 managed care plans across 7 states, and that 25 of 32 Pioneer ACOs generated lower risk-adjusted readmission rates for their beneficiaries than the benchmark rate for all Medicare beneficiaries (CMMS, 2013). Pioneer ACOs have also improved the quality of care for patients; for example, one ACO dispatches hospital-trained nurses to patients' homes to do whatever the patient needs – manage prescription drugs, take blood-sugar readings, teach healthy eating habits or even arrange delivery of a motorized wheelchair, while another offers Care Coordination, a service for beneficiaries who need assistance with coordinating the medications, and many care visits associated with having multiple diagnoses. Pioneer ACOs were rated higher by ACO beneficiaries on all four patient experience measures relative to the 2011 non-ACO Medicare results (CMMS, 2013). A few of the American physicians interviewed work in practices that are part of an ACO, so further insight into the effectiveness and benefit of ACO existence in the context of T2D care will be discussed later in the results and analysis sections.

Another example of American disease management can be seen with the American Diabetes Association's Standards of Medical Care for Diabetes. Their guidelines include recommendations for glucose monitoring, nephropathy screening, glycemic control, blood pressure control, lipid management, immunizations, detailed guidelines for lifestyle management regarding nutrition, weight management, physical activity, tobacco use, alcohol consumption, and effective strategies for coping with stress (ADA, 2017).These guidelines inform Diabetes Self-Management Education and Support programs (DSME and

DSMS), which facilitate the knowledge, skills, and abilities necessary for optimal diabetes self-care. Studies have found that these programs improve diabetes knowledge and self-care behaviors, lower A1C, lower self-reported weight, improved quality of life, healthy coping, and reduced health care costs (ADA, 2017). However, reports indicate that only 5-7% of individuals eligible for DSME through Medicare or a private insurance plan actually receive it (ADA, 2017). This could be due to lack of referral, lack of perceived benefit, or logistical barriers, thus alternative and innovative models of DSME delivery need to be explored and evaluated (Bloom, Graf, & Anderer, 2010). Providing guideline-based care is challenging for primary care physicians largely due to the insufficient amount of time primary care physicians have to spend with each patient; studies found that only on average 54.9% of necessary recommendations were found to have been provided to adult patients by their primary care physicians (McGlynn, Asch, Adams, et al., 2003). U.S. healthcare's current fee-for-service reimbursement system, which is characterized by physicians being paid per person per visit rather than being paid on a basis of patient health outcome metrics, generally does not offer specific compensation to health care providers for emphasizing preventative guidelines to help patients make changes to improve their health. Clearly, prevention is not deemed to be at the forefront of importance in American health care (Frist & Rivlin, 2015). But for T2D, research clearly shows that high-risk individuals can avoid developing T2D – or those already diagnosed can improve/reverse the condition – by implementing preventive lifestyle improvements including losing weight through dietary intervention and regular physical activity (Mathers & Loncar, 2006). Given both the health outcome and financial motivations, there is an enormous need to more robustly incentivize both patients and providers to focus heavily on successfully fulfilling preventative protocol particularly in the case of T2D.

4. Why Focus on Primary Care Physicians?

The opinions and voices of primary care physicians ought be well considered, as they themselves administer this preventive care to the patients and can ascertain most effective methods to improve T2D conditions. They have potential to play the single most critical role in the outcomes of chronic disease patients. An adult primary care physician who has, for instance, approximately 2,000 patients (each of whom annually accounts for $5,000 in healthcare spending) can be seen as a CEO in charge of approximately $10 million of annual revenue (Koch et al., 2011). Despite only accounting for about 5% of that spending, primary care possesses huge economic weight as its upstream interventions (or lack thereof) have strong influence over need for (or prevention of) downstream the medical care pipeline such as subspecialty referrals, imaging and medical testing, dialysis, invasive procedures, and hospitalizations (Mostashari, Sanghavi, & McClellan, 2014). The roles of primary care physicians is particularly crucial in the context of chronic disease, such as prevention of T2D. While one would imagine that primary care physicians would thus feel they have great power in influencing their patients' economic burdens and health outcomes, they instead

expressed when surveyed that they do not feel they should be expected to play a central role in controlling costs (Tilburt, Wynia, Sheeler et al., 2013). Yet they also reported that the best ways to control health care costs are through promoting continuity of care, using cost-effective treatments, chronic disease care coordination, and prevention and adhering to clinical guidelines – all of which are primarily within their control (Tilburt, Wynia, Sheeler et al. 2013). This disconnect indicates that primary care physicians are being illogically underutilized in their potential to further health care reform. As no experiential research of primary care physicians with disease management programs exists, this study provides new insight into what methods of chronic care management providers of primary care themselves believe most effectively improve health outcomes, healthcare costs, and quality of care for patients – from the approaches used in the doctor's office with the patient to the insurance and policy level.

5. Purpose of Research Study Questions

This study will address the following questions:

A. In the opinion of German primary care physicians, what are T2D DMPs' biggest
    1. Strengths?
    2. Weaknesses?
    3. Areas of possible improvement?
B. In the opinion of American primary care physicians, what are their T2D care's greatest:
    1. Strengths?
    2. Weaknesses?
    3. Areas of possible improvement?
C. In the opinion of German primary care physicians, how effective are German T2D DMPs in:
    1. Improving health outcomes of T2D patients?
    2. Reducing costs associated with secondary complications of T2D?
    3. Improving quality of care delivered to T2D patients?
D. Considering the opinions of all of the physicians questioned, what are the current most effective management and treatment practices for T2D?
E. Looking forward, what changes in physicians' practicing or healthcare policy would be most effective at improving the health outcomes, cost burdens, and quality of care of T2D patients?

RESEARCH METHODS & DESIGNS

1. Overview

In Germany, I interviewed 8 primary care physicians, emailed them a link to an online survey, and requested they forward the link to primary care physician colleagues to fill out the survey as well. The length of time they have practiced medicine was asked in the survey, but otherwise, no other personal or demographic information was recorded. Data from all 8 interviews were used in results, and a total of 7 survey responses were correctly filled out and recorded. All recruitment of and communication with German physicians (including emails, the interviews, and the surveys) was conducted in German. In the U.S. (Colorado), I interviewed 9 primary care physicians, emailed them a link to an online survey, and requested they forward the link to primary care physician colleagues to fill out the survey as well. I also interviewed a care coordinator in one of the primary physician's office for supplemental, contextual data. I also conducted an informative interview with an employee of the YMCA who runs Denver's branch of the Diabetes Prevention Program (DPP). The YMCA runs their DPP in a partnership with the CDC's National Diabetes Prevention Program. This DPP program is a version of a nationwide, year-long lifestyle intervention program for individuals at risk of developing T2D that was started by the National Institute of Diabetes and Digestive and Kidney Diseases. Data from all 11 interviews was used in interview results, and a total of 24 survey responses (surveys administered to primary care physicians only) were correctly filled out and recorded. The interviews were all initially recorded, and I listened back to each recording following the interviews to take detailed notes then consequently deleted the recordings. The data from the results were compiled into qualitative results, analysis, and conclusions. The survey data were analyzed and explained in the results sections. Interview and survey scripts for used both for German and American physicians can be found in the Appendices.

RESULTS

1. German Physician Interview Results

1.1. T2D Diagnosis & Disease Management Program Protocol in German Healthcare

1.1.a. Diagnosis Protocol

Every 2 years (after age 35), patients have a check-up that is covered by health insurance, though not everyone goes in reality, physicians reported. There is a screening for T2D at this check-up in the measurement of HbA1c, and it was stressed that many patients do not realize they have T2D. Though the exact designations of HbA1c levels vary by age and race, general parameters in Germany were same as U.S. (under 5.7% is normal, 5.7–6.5% is pre-diabetic, and over 6.5% is diabetic).

1.1.b. Prediabetes Recommendations

If they have a prediabetic HbA1c, physicians typically do not yet recommend DMP enrollment but rather recommend lifestyle change advice including nutritional instruction and increasing physical activity. They also request the patient come in for more frequent appointments.

1.1.c. T2D Disease Management Program (DMP) Protocol

When a patient is diagnosed with a diabetic HbA1c, they are enrolled in a T2D DMP. To enroll their patients in a DMP, German physicians must take an education course; most all primary care doctors participate in DMPs. DMPs are largely covered by '*Krankenkassen'* [health insurance]. Approximately 75-90% of the program components are fully covered by insurance, and patients are generally very willing to pay the remaining small amount out of pocket, reported physicians. The health insurance pay for most any medicines that the doctor deems necessary to use. The T2D DMP protocol includes enrollment in diabetes education course, enrollment in fitness programs, and consultation with dietician (to supplement nutrition recommendations from doctor). The DMP protocol also includes regular check-ups with an ophthalmologist (eye doctor), podiatrist (foot doctor), nephrologist (kidney specialist), and in extremely progressed cases, an endocrinologist. The primary care physician receives feedback from each specialist; they oversee and direct all aspects of care for the patient. A DMP participant must come to regular three-monthly appointments, and they receive a phone call from the health insurance company if they miss one in which the health insurance tells them that they will be dismissed from the program if they miss two appointments in a row. One doctor explained how the requirement of seeing all of his DMP patients every 3 months is not a challenge, thanks to the appointment scheduling format that changed with the implementation of DMPs: the blocks from 9-11am and 4-5:30pm every day are only for the already planned appointments like

these DMP appointments, which are each very brief. This then leaves sufficient time throughout the day for appointments regarding more proximate or urgent illnesses, explained this physician.

1.2. Strengths of T2D DMP

Most of the doctors reflected that they remembering having been quite annoyed with DMPs when they were first implemented. They thought, "Why do I need to do this? This is pointless; I already administer good enough care myself. For whom should we do this? For the health insurance companies?" But now, approximately 16 years after DMP implementation, almost every physician interviewed admitted that they think the DMPs do add value for a variety of reasons discussed below.

1.2.a. Structure & Regularity

As recounted by one physician: in the past, a T2D patient would come in, and he would give this patient all the necessary recommendations. He would say he wants to see them again soon, in approximately three months, but then the patient would not come back for a year or two. Then finally when the patient did return, the doctor asked, *"Was ist mit Ihrem Zucker? Er ist nicht kontrolliert!*" ["What is with your sugar? It is not controlled!"] To which the patient simply replied, *"Ja, das habe ich vergessen*" ["Yeah I forgot."] This doctor explained how the automatically computer-scheduled, three-monthly appointments for T2D patients accompanied by the phone call reminders from the health insurance company for missed appointments are the biggest benefit of the DMPs in his eyes. With such regular appointments, physicians can much more tightly monitor their T2D patients' HbA1c levels. Strong patient-doctor relationship also develop from these regular visits, enabling the doctor to be able to better understand the patient's lifestyle. Doctors can notice how small, seasonal lifestyle changes affect the patient's blood sugar levels with such understanding and such frequent observation over the progression of diabetes. For instance, one physicians recounted how a patient might throughout the summer start drinking cold drinks including soda or juice more often, which very negatively affects their diabetes progression. If the doctor is meeting with the patient on this regular basis through the DMP protocol, the doctor is able to ask the patient what lifestyle changes they have made lately (the addition of more cold drinks, in this case), and talk through how that has impeded their pace of improvement and detrimentally affected their disease state. This regularity of meeting also gives the physician the opportunity to check for other ailments such as heart or kidney disease earlier on, which if caught, can prevent future development of these costly and fatal diseases. One physician stated that such successful controlling of diabetes and other diseases "*würde nicht existieren ohne ein regelmäßiges Recordsystem, was auch überwacht wird"* ["would not exist without the regular, monitored record system (the DMP)."]

1.2.b. Sustainability of Lifestyle Changes

The majority of enrolled patients stay in the program once they start. The patients who benefit the most are individuals who by nature are inclined to follow strict, regimented structure. Physicians reported that the lifestyle changes that patients make through the DMP guidance are generally very sustainable changes, because they see patients on such a regular and continued basis. This enables implementation and monitoring of very small, realistic, slow, and steady lifestyle changes. Doctors reported that even the patients whose diabetes worsens usually at least worsens at a slower rate when participating in a DMP. One physician said he believes that T2D DMPs "*eine nachhaltige Besserung des Gesundheitszustands der Mehrheit der Diabetiker gebracht hat"* ["have brought lasting, sustainable improvements in the states of health of the majority of Type 2 Diabetics."]

1.2.c. Decreased Incidence of Secondary Complications

Most physicians agreed that it is very rare to see secondary complications in any of their T2D patients as of recent, thanks to the regular specialist appointments. This decrease in secondary complications means significant decrease in costs and increase in quality of life for T2D patients. Several doctors emphasized that one of the biggest strength of the DMPs came about in particular from '*die Fußkontrolle*' [the regular podiatrist check-ups]. This has led to a decreased amputation rate, which has been one of the most significant improvements both in terms of health outcomes and reducing health care costs since the implementation of DMPs. Even a doctor who was otherwise extremely skeptical about the benefit of DMPs agreed that, though he was not sure if the decrease of amputation rates actually ends up saving money due to the costs of the DMP itself, there has definitely been a decrease in the amputation rates both in his patients and nationwide as a result of the DMPs,.

1.2.d. Accountability

The accountability measure inherently provided by the structure of DMPs was recognized as notably beneficial by many physicians interviewed. Several doctors emphasized how sad it is when patients do not make efforts to manage and reverse their T2D, because there are so many diseases that one cannot control and cure ourselves, but for T2D, one can. One physician explained that the biggest improvement in patients that she sees as a result of the DMPs is how patients are constantly reminded of what they should be doing. This increased awareness and self-responsibility drives many patients to take their diabetes into their own hands. The continuity and regularity of appointments provides an opportunity for the patient to constantly receive feedback, which acts both as a positive motivator and an accountability measure. How health insurance calls the patient if they miss an appointment and then dismisses the patient from the program if they miss two appointments also contributes to holding the patient accountable. Though there is no actual

punishment for a patient if they are dismissed from the program due to lack of adherence to protocol, one physician stated how "*Es ist eine psychologische Bestrafung, du bist aus dem Programm rausgeschmissen worden"* ["It's a psychological punishment, to be dismissed from the program."] German doctors nearly unanimously reported many of their patients to be much more attentive and mindful of the DMP protocol as compared to how attentive they had been to their doctor's recommendations before the DMP.

1.3 Weaknesses of T2D DMP

1.3.a. Bureaucracy & Documentation

The bureaucratic paperwork of the DMPs was the biggest weakness about which most German physicians complained. Many of the doctors interviewed felt that the hassle of all of the paperwork for DMP participation and documenting all the statistics is "*für die Arztpraxis eine große Belastung"* ["an enormous burden for the doctor's office."] However, they largely admitted to the absolute necessity of obtaining the statistics of patients' outcomes to be able to assess the efficacy of DMPs. But nevertheless a significant amount of time and financial resources must be invested by employees of medical practices and of the overall health insurance system to facilitate these DMPs. One doctor complained of how his secretary and nurses spend so much time putting all of DMP participant's health information into computers, as well as notifying patients for the frequent DMP appointments. These time and financial resources could naturally be utilized in many other contexts within healthcare, and some German physicians were critical as to whether investment in DMP operations was the most effective use of these valuable resources.

1.3.b. Lack of Customization

Another important weakness about which some physicians complained was that the DMP protocol was too rigid and did not allow for enough for individuality. They emphasized how it sometimes was not suitable for patients older than 80 years, as elderly patients with T2D do not need to meet the same standards for HbA1c levels as younger patients. Thus the DMP protocol's HbA1c recommendation is too ambitious for elderly patients, and even could result in negatively impacting their health if achieved. This lack of customization to the patient that is inherent to a standardized protocol can prove to be a pitfall of the DMP's success.

1.3.c. Alternate Financial Motives

Another concern of some physicians was the existence of "*finanzielle Vorteile für die Krankenkassen,"* ["financial benefits for the health insurance companies,"] as health insurance companies receive payment for each patient's enrollment in a DMP. Additionally, doctors get paid a small annual bonus for each of their patients enrolled in a DMP to incentivize patient participation. One physician stated that he thought

DMPs weren't at all beneficial, but he did them anyways just for this financial bonus (though it was quite small, he noted). The majority of patients stay in program forever, which brings up controversy about the ethical motives of both the insurance companies and the doctors themselves, given that they benefit financially (though trivially) from patients staying sick forever rather than reversing and being cured of their chronic illness. Though the cases of fully reversing T2D and thus leaving the DMP are few and far between due to the challenge of such drastic lifestyle change, it can be absolutely possible with strong patient commitment, physician dedication, and adequate education and programming.

1.3.d. Not Enough Added Value

One physician bluntly remarked, "*Ob sie die Versorgung wirklich verbessert oder verändert hat, ob die Diabetiker besser eingestellt sind, das bezweifle ich"* ["whether the care has really changed and T2D patients are really better controlled, I'm doubtful."] Though the majority of physicians felt that there was enough beneficial value obtained from the DMPs to outweigh the pitfalls, this physician's opinion definitely must be taken into consideration. This same physician also asserted the belief, "*Wir brauchen gar keine Programme; für die Statistik ist ein Program gut, aber für die Versorgung ist jeder Hausarzt selbstverantwortlich"* ["We do not need any programs; for statistics, a program is good, but for the care, each primary care physician is individually responsible."] Naturally this idea that primary care physicians should be already administering the best possible care to their T2D patients without any program is another valid viewpoint taken by some. Finally, it must be considered, as mentioned by almost all of the doctors interviewed, that DMPs do not fully solve the problem of patient compliance and discipline to make necessary lifestyle changes. While the structure and accountability of DMPs are helpful, there are still the exception patients that do not improve lifestyle and their T2D continues to worsen, despite the DMPs. One doctor explained how in her opinion, the same patients who were motivated and followed the doctor's instructions without the program are those who follow the program protocol when in the DMP.

1.4. German Physicians' Opinions on T2D DMP's Overall Impact on Health Outcomes, Quality of Care, and Economic Burdens of T2D

Though there was some variation between physicians, the overall consensus was that an average of around 25% of T2D patients enrolled in a DMP really improved their diabetes to the extent of no longer needing to be enrolled in the DMP, around 50% stabilized at a static point with just Metformin and continuation of DMP care, and about 25% continued to worsen. Though some of this can be attributed to the DMP's strict structure, some of it must also be attributed to the nature of different patients – some are much more compliant with doctor's orders, motivated to make lifestyle changes, and willing to take control of their health while others are much more apathetic and interested in taking the medications rather than making

lifestyle changes. Physicians said that some patients are quite unenthusiastic about the DMP and ask why they have to do this program, while the strict structure is very beneficial for and appreciated by other patients. One doctor stated that "*der Patient und der Einfluss des Arztes"* ["the patient and the influence of the doctor"] are the most important determinants in the success of a T2D patient's health outcomes. She said that she found the most successful tactic to be "*Mitarbeit mit Patienten, Hilfe anbieten, und aktive Kooperation; keine Angst machen, nicht zu streng"* ["collaboration with the patient, providing help and resources to them, and engaging in active cooperation; not inciting fear or being too strict."]

Physicians largely agreed that it is hard to say whether or not the DMPs save money, because they believed they would do all of the specialist appointments that end up playing the largest role in T2D cost burden with or without the existence of DMPs. However most doctors did think DMPs have improved quality of care for patients due to the financial incentive and accountability that comes with the DMPs for doctors. Most physicians, often with citation of recent research, also agreed that, health outcomes for the majority of his their T2D patients have improved since DMP implementation. When speaking on whether DMPs had improved health outcome, quality of care, and economic burden, one German physician well-summarized many of the physicians' opinions: *"Ja, leicht – es ist schon ein Gewinn wenn nur einige dabei sind die bessere auf ihre Gesundheiten zu achten. Ob es einen großes Unterschied macht, weiß ich nicht*" ["yes, slightly - even if only a few patients are better paying attention to their health, it's already a win. But if it makes a big difference, I don't know."]

2. American Physician Interview Results

2.1. T2D Diagnosis and Care Protocol in American Healthcare

2.1.a. Diagnosis Protocol

U.S. physicians typically start checking for T2D around age 40, though younger if the patient is obese or there is family history of T2D. T2D used to be called "adult onset" diabetes, but now it's called Type 2 instead, because in recent years there have been more and more children diagnosed. Thus screening of overweight individuals for T2D is starting much younger more often. Most physicians interviewed said they are able to catch T2D patients fairly early and on the preventive side, if the patients are coming for their regular annual or biannual checkups. While older patients tend to meet those standards, younger adults generally are not as consistent. A physician noted that amidst their busy lives, adults often do not want to make the time to go to the doctor for these preventive visits, and are further disincentivized when their insurance doesn't cover it. Although regular preventive visits are covered in Medicaid and some private insurers, they are unfortunately not covered by all insurers. Some physicians interviewed have encountered this problem in practice, and these physicians said they thus pick up T2D incidentally more typically than through preventive care. One physician explained that, in addition to the financial and time reasons, "A lot

of people don't want to have a chronic disease, so they ignore it for a while." The high blood sugars characteristic of T2D do not cause debilitating symptoms until they are present for a prolonged period of time. A physician said that in her patient population in her smaller practice, some patients will not come in until their glucose level is so high that it can't even be read on the glucometer (over 600). Often the reason they visited the doctor's office is because of a yeast infection or bacterial infection in the skin, which occur as a result of these prolonged high blood sugars. At this point, patients have presumably had high glucose levels for a long time and thus often have the severe secondary complications of long-term organ damage such as kidney failure, gangrene, neuropathy, and retinopathy. Manifestations of secondary complications are very hard to predict and widely vary from patient to patient. An inadvertently helpful area of incidental T2D detection is in pregnant women, as they are all screened for it at their first prenatal visit. One physician remarked that many patients who do not come in regularly often go ten years with T2D before being diagnosed; she inquired, "Is that the fault of health system? Of the patients for not coming in? Of the doctors? Hard to say."

However, networks such as Kaiser Permanente, America's largest integrated managed care consortium, and HealthOne Colorado Care Partners, a clinically integrated network and accountable care organization, focus more heavily on prevention. Thus the physicians within these networks reported that they diagnose pre-diabetes much more often from preventive screening than incidentally, as their patients tend to come more regularly for their insurance-covered, preventive visits. A HealthOne physician stated that he rarely sees secondary complications in his patients as compared to 30 years ago, because they "catch [T2D] earlier, treat it harder, and have more drugs." Though the U.S. Preventative Services Task Force has recommended HbA1c as the best test for screening for T2D, a HbA1c test is currently covered by most insurances only if an abnormal glucose level has been diagnosed first for many practices. At Kaiser Permanente though, they run preventative labs including HbA1c on regular basis, and for anyone with BMI of over 25 (considered overweight), HbA1c screening is always included. HbA1c testing will probably be more widely covered (without needing the glucose test first) in upcoming years though, one physician explained.

2.1.b. Preventive Measures

Physicians want to try to prevent patients from developing T2D early on, or at least prolong the time until it manifests itself. At Kaiser Permanente, this preventive instruction includes many phone appointments, which patients love, one doctor noted, because there is no charge and it is easier than coming into the office. This is possible since Kaiser doctors are salaried, rather than fee-for-service. Within a fee-for-service payment model, far fewer physicians do such phone calls as they are not being reimbursed for that time. A physician in a smaller, less resource-laden practice emphasized how she tries to educate children and parents at their physicals about healthy food to buy, the importance of physical activity, how to keep a food diary,

the need to cut out sugary drinks, etc. in effort to prevent T2D. She explains though, how while she makes a point to capitalize on healthy lifestyle habits, fitness, and maintaining a healthy weight in both adult and child physicals, many doctors don't emphasize this in pediatric physicals, especially when children just go to a Walgreens clinic or somewhere similar for an inexpensive physical, which can be quite problematic. When speaking about preventive recommendations, the key here is to meet patients where they are, was the repeated advice of several physicians. One explained, "If you try to tell them no sugary drinks at all though, they usually just tune us out. So we try saying one glass of juice a day, but watered down please." Lifestyle improvements they suggest can be simple as standing up a few times throughout day to reduce sedentariness, for example.

2.1.c. Prediabetes Recommendations

One physician recounted, "If a patient has prediabetes, then I tell them about this amazing study. In it, prediabetic patients were broken into two groups: 1) given metformin, in which 25% fewer patients progressed to diabetes 2) recommended diet and exercise, in which 50% fewer patients progressed to diabetes. I think that is incredibly empowering. That means you have more control over your condition than anything I can do for you." The quality and magnitude of resources offered to prediabetic patients was found to vary widely by provider and insurance. At Denver Health, the family care physician said she sets up appointments with RNs for prediabetic patients to learn about dietary guidelines for all Medicaid patients. At Kaiser, the physician said he starts conversation on diet and exercise, and recommends inexpensive pre-diabetes classes through Kaiser. He explained that this group class is beneficial, because "it's good for patients to understand that it's a common diagnosis, when they see other people in the class." Kaiser physicians try to get the patients involved in improving their condition right away by recommending they study a breadth of information on their website and offering dietician appointments, and they check in with them again in the following year.

At New West Physicians, a fairly large network of 135 providers, a physician said he recommends prediabetic patients to attend a three hour education session given by their on-staff nurse diabetes educator. The session includes everything from how to count carbs to eat better at restaurants. It does cost money for patients though; he thought one of the biggest improvements to care would be making this free. At HealthOne Colorado Care Partners, physicians recommend exercise (30min 5x / week), weight loss (with a focus on setting reasonable, attainable goals), and participation in the nationwide, year-long Diabetes Prevention Program offered to prediabetics through the YMCA. This program will be discussed in greater detail in the American strengths section below. This physician noted how he can only do so much with his few minutes in the office with the patient, thus the DPP's one year length is extraordinarily helpful in building sustainable change in patients' lifestyles. Some of the physicians interviewed in smaller practices

were unaware of the DPP as a resource, but were excited by the idea and wanted to refer their future patients there. Often in smaller practices, the physicians lamented the lack of educational resources they could offer their prediabetic patients.

2.1.d. T2D Care Protocols

Once a patient has been diagnosed with T2D, physicians said they try to see their patient every three months until the diabetes is controlled, then every six months. It is less often than that for doctors in certain practices though, depending on the patient population and insurers involved. The frequency is critical for the physician to check the patients' HbA1c, weight, and ask about lifestyle habits. One physician noted that less compliant patients' appointment attendance sometimes depends on their prescription length. In an effort to improve their attendance and accordingly their health, she thus often gives only three months of prescriptions to encourage a higher chance of them returning regularly for their check-up appointments.

Accountability is crucial to T2D care. "If you make them accountable, keeping a food diary, keeping track of how much they exercise, then it makes them a partner in their health instead of having the mentality of 'I have a problem, fix it' that so many patients come in to the doctor with," stated one physician. At Kaiser Permanente, physicians can see in their computer system's database who of their diabetics is over their target HbA1c level and how long they have been above this target. They can thus reach out to these patients more often to offer resources, check in with them, and try to get them more involved. A physician stated that treatment, with lifestyle change playing a leading role, should be intensified every 3 months until the HbA1c goal is reached. But it often takes years before intensification is achieved due to patients' "clinical inertia." The norm for T2D patients, most physicians agreed, is to be stabilized on diet improvement and two oral hypoglycemic drugs (metformin and sulfonylurea, which will be discussed in further detail below), though further medications are sometimes used as needed. One physician noted that sometimes "threatening" patients with having to take insulin, a more potent medication than the two aforementioned, makes them really get on top of their diabetes, because insulin causes them to gain weight. Another physician stated that from his experience, the people who achieve reversal through diet, exercise, and lifestyle have more long-lasting changes improving their condition than people who just use medications.

After discussing weight loss, diet, exercise, lifestyle changes, food diary, most physicians put T2D patients on the fairly inexpensive, generic medication Metformin. Metformin works by lowering glucose production in the liver and improving the body's insulin sensitivity, and the majority of T2D patients stay on Metformin for life. At Denver Health, the physician said she puts almost all T2D patients on, in addition to Metformin, a low-dose ACE-inhibitor (this lowers blood pressure and maximizes blood flow to the kidneys) and a statin (this lowers cholesterol). After these "first line of defense" options come sulfonylureas

(these help the body secrete more insulin) followed by newer, more expensive medications including GLP-1 receptor agonists and SGLT-2 inhibitors (these lower blood sugar, help enable weight loss, and lower risk of heart disease and cardiovascular events), or, at last resort, insulin. GLP-1 receptor agonists respond quickly to rises in a patient's blood sugar but also do not cause hypoglycemia. This new medication is thus extremely beneficial for elderly T2D patients, as hypoglycemia is a common problem that arises with insulin use and can be particularly dangerous for seniors. Physicians noted that many patients have trouble with insurance coverage of these newer, more effective medications and thus, unfortunately, cannot afford them. Retrospective research showed that German physicians utilize fairly similar medication guidelines; the medication details were discussed in this American section though because this information was learned from the American physicians as the language barrier had inhibited discussion of specific medications beyond Metformin and Insulin with German physicians.

In regards to the specialist visits that are sometimes part of T2D care, the majority of physicians said that they only send their very progressed cases of T2D to endocrinologists and nephrologists, though many T2D patients do end up needing nephrologist attention at some point in their care. Most physicians said they give foot exams at every appointment and administer an annual microalbumin check (for kidney function). Also, an annual eye doctor visit is required for all T2D patients to check for retinopathy. Patients are referred to specialists under supervision of the primary care physician when needed. One physician noted that if a specialist recommends an expensive medication, Medicare or Medicaid is more likely to cover it than if a primary care doctor recommends it, so that is sometimes the reason for specialist referral. However, it is often difficult to make an appointment with a specialist, particularly for Medicare/Medicaid patients, as many providers do not get much if any reimbursement for seeing these government insured patients.

2.2. Strengths of American T2D Care Protocol

The majority of strengths of T2D care in the U.S. revolve around the opportunity for innovation that is possible to some degree within the American healthcare system. This flexibility enables the potential for rapid evolution of improvement of care. While this potential has certainly not yet been realized throughout the entire healthcare system, there are strong examples of promise that were elucidated in several of the American physician interviews, which are recounted below.

2.2.a. Increasing Utilization of Technological Tools

When speaking about T2D diagnosis screening, a HealthOne physician explained, "I use my phone than my stethoscope in the exam room nowadays." He identified the Agency for Healthcare Research and Quality Electronic Preventive Services Selector (AHRQ ePSS), an application designed to help primary

care clinicians identify clinical preventive services most appropriate for their patients, as the most helpful tool for screening people for T2D. Based on current, evidence-based recommendations of the U.S. Preventive Services Task Force, ePSS gives him all the recommended guidelines and tests for each patient based on their health characteristics and risk factors, says what is covered by which insurance and what is not, and thus helps him deliver better, individualized care. Furthermore, he explained the increasing use of telemedicine video calls to overcome barriers for patients of travel to the office. This is particularly helpful to provide care for individuals without access to reliable transportation or in rural communities. Colorado is a telehealth state, along with 28 other states to date. These states require both private insurers and Medicaid to cover telemedicine services to the same extent as face-to-face consultations, incentivizing physicians to take advantage of this useful resource. While of course real life appointments are still critical to good care, telemedicine is extremely beneficial for follow-up appointments to more regularly monitor blood sugars and lifestyle change progress. Another useful resource on which several physicians commented is a patient-doctor online portal, through which they can easily communicate with their patients to answer questions, give reminders, and check in during the time in between appointments. Use of portal communication can be helpful to more regularly monitor T2D patients' conditions and increase patient accountability.

2.2.b. U.S. Programs to Help Reduce T2D

While there is no nationwide, insurance-covered disease management program in the U.S. parallel to Germany's DMPs, programs do exist that resemble aspects of a DMP. A few nationwide programs of such nature that interviewed physicians mentioned they utilize in their T2D care are described below.

Diabetes Prevention Program

As aforementioned, the DPP is a year-long program offered at YMCAs nationwide to reduce progression from prediabetes to T2D. The Center for Medicare and Medicaid Innovation (CMMI) proved covering the DPP to be beneficial through cost-benefit analysis research. This resulted in Medicare starting to cover the DPP for all of their pre-diabetic patients, and the CMMI is now pushing for coverage by Medicaid as well. The program was designed by the National Institute for Health and financially supported by CDC. The pilot program proved that lifestyle intervention can clearly reduce T2D progression and be simultaneously cost-effective if administered in a group program. Cost-effectiveness aside, participants, particularly seniors, were found to be even more successful in this group program than in individually-administered intervention sessions due to the sense of comradery, community, and accountability associated with the group nature of the program. The program consists of 25 one-hour sessions delivered over the course of a year: weekly for sessions 1-16, biweekly for sessions 17-19, and monthly for sessions 20-25. Guiding participants through

every part of the year is key to its success; it was found to be crucial to help show participants how to still enjoy holiday traditions and vacations but manage them without weight gain and falling back into the old detrimental behaviors that progress their pre-diabetes.

The DPP director at a Denver YMCA explained, "We tell them 'the laws of physiology': no one is special, we will all lose weight if we eat less and exercise more. Having conversation about how weight is what is causing your health problems is the first step." The program's method to achieve the ultimate goal of reducing T2D risk is as follows: 1) track weight 2) track their physical activity 3) track everything they eat daily. The subgoals include reducing weight by 5% (have them work towards 7% though) and increasing physical activity to 150 min / week. Participants track their food intake in a booklet in which they document calories and fat grams, a process that forces them to be cognizant of the importance of label reading when choosing foods. The DPP director explains, "We have people who have McDonald's for breakfast, McDonald's for lunch, and Arby's for dinner. So we don't ever say 'Don't eat chips. Don't go to McDonald's', but rather talk about how to eat healthier at breakfast and dinner if you're going to McDonald's for lunch, for instance… We talk about managing health improvements and ask them how they can balance day to day life with a healthier lifestyle. Everyone has different ideas and different suggestions for lifestyle changes; we help them negotiate with themselves and figure out what will work for them." Lifestyle coaches guide patients through their journey to establishing their new behaviors by utilizing motivational interviewing throughout the process. They start weight tracking around the second session and discuss how to increase physical activity and overcome barriers, and they start the actual physical activity tracking in the following sessions. These conversations are very individualized, for example: for a swim class, does the participant have a swim suit for the class? A towel? How will this fit in their daily schedule? Additionally, if participants are not attending sessions, they will be called by phone as reminder throughout the year. Research has proved that the DPP reduces the progression from prediabetes to T2D by as much as 58% overall and by 71% among adults aged 60 years or older. "At the end of the day, it's mostly about the psychological piece of how much control you believe you have over your health – all about how you monitor and change your behavior," states the DPP director. The DPP is an incredible program with exciting, enduring success in reducing pre-diabetic patients' progression to T2D, and it ought be more widely known, recommended, and utilized.

Silver Sneakers Fitness Program

Another forte in the U.S. healthcare system that one physician mentioned is Medicare's Silver Sneakers Fitness program, a value added no-cost program offered to AARP Medicare Supplement insurance members. The program provides a basic health club membership to over 9,000 participating health centers across the nation to promote healthy lifestyle in seniors. In addition to access to the gyms, there are Silver

Sneakers classes that teach seniors how to manage diabetes, quit smoking and lose weight, and have been proved to be quite successful. As an aside from this program but on the same token of Medicare services that help with T2D care, Medicare pays for 20 minutes of chronic care management every month for patients with two or more chronic conditions, thus a nurse or care coordinator can do outreach to T2D patients in the time in between their appointments. Unfortunately, though, not all providers are aware of or fully utilize this valuable resource.

2.2.c. Motivational Interviewing

As clear by this point in this study, education and lifestyle changes serve as vital methods of T2D condition improvement. To enact such changes, physicians at Kaiser Permanente and HealthOne Colorado Care Partners described their approach of motivational interviewing. They will ask questions such as "Is it stress? Are you a stress eater? Is it finance? Can you not afford these foods?" These physicians try to sincerely engage their patients through such conversations to reach individualized conclusions of how to best improve each patient's disease. This root cause searching is critical to figuring out how to attain sustainable lifestyle improvements needed to reverse T2D progression. A HealthOne physician noted how his approach to care has changed; he used to be more paternalistic, but now focuses on trying to engage the patient through motivational interviewing and being more on their level. For instance, through such interviewing he has learned how many T2D patients have trouble meeting their goal due to the unhealthy lifestyles of their family members. Family habits can be the hardest aspect of lifestyle change to overcome, thus the physicians often need to focus on getting the whole family on board to enact changes needed for their diabetic patient's condition to improve. Another HealthOne physician explained how he thinks motivational interviewing works much better than just saying, "I'm the almighty doctor, take this drug or you're going to die," which has not succeeded well in the past. For example, when trying to encourage a patient to quit smoking (as smoking is a risk factor for T2D), this physician explained he tries to find out, "What's motivating them to continue to smoke? I ask them 'What is the need that cigarettes fill? What could motivate you to find something different to fill that need?' Some patients want to live to see their grandkids, some don't want to end up like their father with an oxygen-tube around their neck. You have to find out what lies at the motivation of each patient." Getting enough sleep is also critical for T2D patients to improve, thus this physician said he will ask patients, " 'Did you have a good night's sleep? Why didn't you have a good night's sleep? Is it stress? Where is this stress coming from?" And if he doesn't have enough time to discuss how a patient can alleviate their stressors and get more sleep during their visit, he will refer them to mental health counselor or life coach for another appointment. On this topic of motivational interviewing, another physician commented, "It ain't perfect, but it's better. But at the end of the day, the patient still has to do the work."

At Kaiser Permanente, their Diabetes Care Team (which includes registered nurses and medical assistants) reaches out every month or two to those patients who are not at their HbA1c goal. They really try to get to know and engage the patients and figure out *why* they aren't reaching their goal, a Kaiser physician noted, in explanation of his gratitude for the team's work. Several physicians interviewed noted that mental health (depression, anxiety) are a big root problem for many patients. Patients will not have success improving their lifestyle with this huge roadblock, and people with chronic diseases are three times less likely to be compliant to taking medications if they have depression, one doctor noted. Thus access to counseling was concluded to be a much-needed resource for T2D patients, though unfortunately of the interviewees, only HealthOne Colorado Care Partners and Kaiser Permanente physicians reported having an in-office mental health counselor to whom they could refer their patients. Additionally, several doctors noted that while they make an effort to engage in motivational interviewing with their patients, the limited time they are allotted to each patient severely restricts their efficacy with this method.

2.2.d. Evolution towards Team-based Care

At Kaiser Permanente, the diabetes care coordinators help physicians immensely with the T2D care management. A Kaiser physician reported, "As a doctor, you need a team to work with these folks. And that's the biggest strength that we have at Kaiser with our Diabetic Care Teams." On that same token, a Denver Health physician said, "I love having access to good RNs who will spend 30 minutes to an hour on patients explaining comprehensive nutrition, how to check their blood sugars, how to use a glucometer, etc." As this physician compared her work at Denver Health to her previous work in a small, private practice, she explained, "I feel that I am able to give better care to my diabetics in my current situation. Not having the educated help (RN, nutritionist, social worker) in the office was hard – as a small practice we couldn't afford it. Now I have such a large network of resources to refer patients." Several of the physicians interviewed commented on this evolution towards more team-based care. At HealthOne Colorado Care Partners, there is a registered dietician, a life coach / physical therapist, and a licensed counselor in each office. At an annual physical, physicians can thus refer patients to any of those resources for a follow-up appointment.

HealthOne's teams for chronic disease care also include care coordinators, most of whom are medical assistants. In addition to coordinating communication between a patient's various healthcare professionals, coordinators manage transitional care, medicine reconciliation, disease education, and diet education. They also reinforce doctors' instructions, figure out what challenges are present in the home lifestyle, and help try to mitigate social determinants of health. For example, the HealthOne care coordinator interviewed explained, "We can talk to them about what they need to change in their home life, and how we can make

it work for them. If food is an issue, we can figure out how to get them meal delivery; if food, water, and shelter aren't met, no one can think of anything beyond that."

2.2.d. Transitional Care

Transitional care, or the process of shifting a patient's care from being provided in once setting (typically a hospital) to another (typically the patient's home under supervision of primary care healthcare professionals), is critical for patients with chronic disease like T2D. Good transitional care typically includes a face-to-face visit with the patient to explain to them to expect regular phone check-ins, including a crucial phone call 48 hours after discharge. In this phone call, details about final diagnosis, medication reconciliation, guidelines upon discharge, planning of follow-up appointment with the primary care provider, and need for supplemental resources are all asked. An appointment with the primary care provider in 7–14 days is thus planned. The HealthOne care coordinator interviewed said there are myriad evidence-based studies that prove that good transitional care significantly decreases the patient's chance of being readmitted to the hospital, thus both improving their health outcomes and reducing financial burdens of their chronic illness. As T2D patients can often be hospitalized for kidney failure or limb amputation, good transitional care to prevent expensive rehospitalizations plays a crucial role in T2D patient outcomes and cost savings. A Health Affairs policy brief found that the lack of well-coordinated transitional care was responsible for somewhere between $25 to $45 billion in wasteful spending in 2011 through avoidable complications and unnecessary hospital readmissions (Burton, 2012). While some healthcare providers provide excellent, insurance-covered transitional care to their patients, many others ought invest more heavily in this area for the sake of improving health outcomes and quality of care for their chronic disease patients, as well as for financial health.

2.3. Weaknesses of American T2D Care

The hallmark of the American healthcare system is its lack of uniformity across payers and providers. While this gives rise to some of the benefits of innovation discussed above, it also poses many challenges revolving around unequal access to adequate care and resources for both patients and providers. The majority of the weaknesses enumerated in this upcoming section stem from these disparities within U.S. healthcare. As quoted by one of the physicians interviewed, "Access is everything. If it wasn't disincentivizing to come see me, patients would come in more often and be able to get questions answered. If the healthcare system was free, socialized, single-payer, whatever you want to call it." As elucidated in the weaknesses of Germany's T2D Care previously discussed though, universal coverage alone does not solve every problem. But such universal healthcare access would at least give T2D patients access to the medications and effective intervention programs they need without financial barrier.

2.3.a. Lack of Insurance-covered Diabetes Education

One substantial weakness in the American T2D care protocol is the lack of insurance coverage of diabetic education, nutritionists, exercise programs, and mental health counselors for many patients. “The cost of pushing any behavior modification is so huge – of a nutritionist, of joining a gym, of education,” protested one physician. These financial barriers pose challenging for patients especially in lower SES or with certain insurance providers who do not cover such resources. One physician ruminated, “What could be improved? Education… it’s huge. It’s a huge void. It would be such a low cost for such a huge benefit,” and yet another remarked, “the problem is, we don’t have any education classes. So insurance companies will pay thousands of dollars for insulin or dialysis, but won’t pay for something really, really simple like diabetes education.” Diabetes education programs exist, for instance some hospitals have diabetic teaching classes through the hospital nutritionist, but such programs are almost never covered by health insurance. Several physicians expressed their distress at how nutritionists and other dietary education used to be covered but no longer is. Many physicians noted that they think group nutrition sessions would be the best option, for cost-effectiveness, to keep people accountable of their health through alliance with other peers, and to share tips with one another.

One physician explained how she often does a lot of nutrition advice to her T2D patients over the phone, but she doesn’t get reimbursed for that which is challenging. Within some provider networks and through certain payer contracts though, nutritionists and diabetes education are covered. For example, at Ponderosa Family Physicians, a group of eight family physicians and one endocrinologist, they have a nurse on staff who is a diabetic educator. Through local funding, they have recently been able to offer an intense eight month intervention led by a nutrition nurse through their practice. Such quality covered access to education resources, however, is few and far between for most patients and providers. Another physician said she tries to fill in this gap of educational resources by advising her T2D patients with “3 new dietary tips” at each three-monthly appointment. Her practice had no such course as a resource, though she said she personally had offered a diabetes education session at her clinic for free once a month for a time.

2.3.b. High Cost of New Medications

All physicians identified the exorbitant prices of the newer medications and lack of insurance coverage for these medications for many patients as one of the most pressing problems in T2D care in the U.S. As quoted from one doctor, “The good thing is we have so much more information and so many more medications to control it. The bad thing is we have so many more *expensive* medications to control it.” Medications such as the GLP-1 receptor are extremely beneficial particularly for elderly T2D patients, yet are prohibitively expensive. Thus while this product of the latest research that has such potential to help so many patients, it

instead proves to be a challenging financial barrier for much of the population in need, depending on the insurer.

2.3.c. America's Focus on Reactive rather than Proactive Care

The American cultural norm of relying much more heavily on reacting to problems than preventing problems lies at the heart of the nation's healthcare problems. This costly paradigm manifests itself both at the policy and provider level as well as at the patient level. One physician stated in exasperation, "They're not paying for the diabetes education at the front end, but then dialysis is a fortune!" while another pointed out, "One month of insulin? You could do a lot of classes for that." An interviewee also complained though how even Medicaid patients, for whom their preventive visits are paid, often don't come in to see the doctor until they have a debilitating problem, remarking, "People just aren't trained to come in preventatively." Yet another doctor exclaimed, "In America, we have the highest GDP yet the highest number of people without healthcare coverage… a big part of the reason that we spend twice as much on healthcare as any other nation but have worse health outcomes is that there are so many uninsured people that aren't getting any healthcare until they get to the ER." However, as noted earlier, more progressive networks with broader resources like Kaiser Permanente and HealthOne Colorado Care Partners have shifted focus towards proactive, rather than reactive, treatment plans. It would be beneficial more U.S. providers move in that direction, as the health outcome and financial efficacy of such methods become clearer and clearer. "We've gotten good at prolonging life in America but now need to work on improving quality of life," commented one physician.

2.3.d. Overcrowding of the Public Healthcare System

A final weakness that a Denver Health physician noted was overcrowding in the public health system in which she works. She explained that Obamacare gave substantial growth of funding towards Medicaid, which was great in giving a lot more people healthcare coverage. But it also has led to an overcrowding of the system. Because there were tens of thousands more Medicaid patients in Denver essentially overnight, it now takes an extremely long time for patients to get their needed doctor's appointment. There are not enough resources for all of these Medicaid patients, as physicians for the most part are heavily financially disincentivized to accept government funded patients. The nature of the American Healthcare system being divided into public and private sectors gives rise to such a problem.

3. Survey Results: Comparison between German and American Physicians' Responses

Each of these following statistics are based on 7 German primary care physicians (n=7) and 24 American primary care physicians (n=24) who completed the survey. Due to the small number of German physicians

who completed the survey, however, the results are not sufficient to draw robust conclusions. Thus while this section will present several of the survey findings of interest, the survey findings will not be discussed in detail due to the lack of statistical strength. Rather the focus of the subsequent analysis section will be the interview results, as the nature of those qualitative findings in the context of a small sample size provide more generalizable conclusions.

3.1. Approximate Percentage of Pre-diabetic and T2D Patients by Physician

When American physicians were asked what percentage of their patients are pre-diabetic, 33% reported 0–15% of patients, 46% reported 15–30% of patients, 17% reported 30–45% of patients, and 4% reported more than 45% of patients. In comparison, 57% of German physicians reported 0–15% of patients as pre-diabetic and 43% reported 15–30% of patients. When American physicians were asked what percentage of their patients have T2D, 42% reported 0–15% of patients, 25% reported 15–30% of patients, 29% reported 30–45% of patients, and 4% reported more than 45% of patients. In comparison, 71% of German physicians reported 0–15% of patients to have T2D and 29% reported 15–30% of patients. These results match the research cited in the introduction that reported a higher percentage of Americans have pre-diabetes or T2D in comparison to Germans.

3.2. Physician Recommendations to Pre-diabetic and T2D Patients

71% of German physicians surveyed reported they enroll their pre-diabetic patients in a DMP, while the remaining recommend healthier lifestyle guidelines but not strictly within the DMP protocol. When asked to mark what recommendations they make to their pre-diabetic patients, similarly high proportions of American and German physicians stated they give recommendations including nutritional advice and recommending diabetes education. Other recommendations, however, varied starkly. For example, 43% of German physicians reported referring their pre-diabetics to specialists in comparison to 8% of American physicians, and 100% of German physicians reported that they see a patient more frequently once they have pre-diabetes in comparison to 38% of American physicians who reported this. When asked to mark what specific recommendations they make to their T2D patients, American and German physicians reported in similar proportions to those same recommendations of nutrition, diabetic education, and exercise guidelines as discussed for their pre-diabetic recommendations. 100% of the German physicians responded that they enroll their T2D patients in a DMP; therefore, their T2D recommendations essentially all fall within the DMP protocol. Thus German physicians referred patients to exercise programs or personal trainers more than American physicians (who were more likely to rather just recommend increasing exercise than referral to a structured program). German physicians also reported referral to a specialist and increased frequency of seeing patient at higher percentages than American physicians for T2D patients, though the differences

were not quite as large as those with the pre-diabetic patients. These similarities in recommendations show the universality of diabetic recommendations, and these differences suggest the more preventive nature of German healthcare to be at work in pre-diabetic and T2D care as expected. See Appendix 1, Figures 1–4 for further detail on physicians' recommendation responses.

3.3. Physician Perception of T2D Care Efficacy

When asked if they believed T2D DMPs on average improved the health outcomes of their enrolled T2D patients, German physicians reported the following results: 57% agreed, 29% were neutral, and 14% disagreed. When asked if they believed T2D DMPs on average improved the quality of care their enrolled T2D patients received, German physicians responded in the same proportions: 57% agreed, 29% were neutral, and 14% disagreed. When asked whether or not they believed T2D DMPs significantly reduces cost burdens incurred by diabetes (by preventing secondary complications), 67% of German physicians agreed while 33% disagreed. In answer to this paper's research questions about DMP efficacies, these results suggest that German physicians largely do believe DMPs to improve health outcomes, quality of care, and reduction of costs, with the last factor being the strongest opinion. This lines up with the research that was discussed in the literature review section about proving T2D DMP's beneficial impact on cost reductions. While the lack of a structured protocol made it meaningless to ask American physicians these same questions about improvement of health outcomes or of quality of care, American physicians were asked whether or not they believed the preventative management protocol that they administer to their T2D patients significantly reduces cost burdens incurred by diabetes (by preventing secondary complications). They responded with 45% agreeing, 42% being neutral, and 13% disagreeing. Thus this suggests that German physicians seem to have slightly stronger opinion that their T2D DMP care alleviate costs in comparison to American physicians' opinions of their care's efficacy in cost reduction. Yet in addition to being not certainly generalizable due to the aforementioned small sample size (especially for the German physicians), these opinions are also not entirely uniform. This suggests that while Germany's DMPs are viewed by some to offer significant improvements, the strict structure of DMPs does not necessarily provide a full or perfect solution to T2D care.

3.4. Satisfaction with Care

When asked about the level of satisfaction with the quality of resources and care that they are able to provide to their Type 2 Diabetic patients, 21% of American physicians were satisfied, 42% neutral, and 37% dissatisfied. In comparison, 33% of German physicians were satisfied, 17% neutral, 50% dissatisfied. These results were quite interesting and somewhat surprising, as German physicians seemed to be relatively satisfied with the care they are able to provide to their patients when questioned about it in the interviews.

German physicians did not critique the DMP T2D protocol or give near as many suggestions for improvement of the resources, in comparison to the American physicians' myriad critiques and recommendations for change in the interviews. A result that aligned more closely with the interview findings though was that when asked how satisfied they were generally with the DMP-Model Protocol, German physicians reported: 67% neutral, 33% dissatisfied. Reasons for dissatisfaction noted in survey responses included: too much bureaucracy, the program not allowing enough for individuality and being too rigid, a lack of reward principle, and not exact enough guidelines or too much left to the whim of the doctor (see German weaknesses section from earlier for further discussion of these reasons). These results all generally suggest though that neither German nor American physicians are as a whole satisfied with the quality of resources they can offer their patients through their respective T2D protocols. Thus both call for improvement.

When American physicians were asked how satisfied they believe their T2D patients are with the quality of resources and care that they receive, physicians perceived 8% of their patients to be satisfied, 54% neutral, 38% dissatisfied. In comparison, German physicians perceived 33% of their patients to be satisfied and 67% neutral. This difference provides interesting insight, as these American responses mirror the American physician dissatisfaction trend, while the German physicians' perceptions of little dissatisfaction among their patients are somewhat contradictory with the German physicians' own dissatisfaction with resources they can offer. Perhaps this could stem from how many American patients have trouble getting access to the care they need within the American healthcare system as compared to German patients, who know they always have access to the healthcare they need. While interesting, these results of patients' perceived satisfaction though definitely do not override the German physicians' dissatisfaction and need for improvement of T2D care resources.

ANALYSIS

1. Similarities Between German and American T2D Care

1.1. General T2D Protocol

Despite the wide variance of resources available to T2D patients across Germany and the U.S., the two nations do share much of the basic protocol when diagnosing and administering care for this disease. To start, both German and American physicians stated that the target HbA1c (and thus recommendations surrounding it) varies from patient to patient, especially in respect to age. Essentially older patients do not need to keep it as low as middle aged or younger patients, because older patients will die before most of the consequences of T2D would affect them, and because a low blood sugar is of greater danger for elderly people. Next, both countries generally want to see their T2D patients every three months until they have their condition controlled, at which point six monthly appointments become the norm (though this frequency is typically not achieved across all patient populations in reality). Both American and German physicians also agreed that diabetic education is a factor critical to success for their T2D patients, and that the intensity of this education need be improved, delivered more frequently and for a longer total period of time, and (in the U.S.) made more widely available at no cost to all T2D patients.

Other shared characteristics of the T2D protocol included that primary care physicians usually oversee most all of diabetic care. Also doctors universally try to personalize care to each patient and recommend small, realistic lifestyle changes with which they follow up at the following three month appointment. Examples of such recommendations from both German and American physicians included to only drink water (cut out sugary drinks), eat five handfuls of veggies per day, or lose ten pounds (rather than 50 pounds). Both nations' physicians also said that they send their T2D patients who have progressed so far as to need insulin to the endocrinologist approximately every three months in addition to the three-monthly primary care visit. Finally, some German physicians explained that the success of DMPs in preventing secondary complications does not usually come from completely curing the patients and graduating them from the program. It rather comes from the typically lifelong enrollment in the DMP where patient achieves a state of controlled T2D, in which they have an HbA1C between 7-8% and are stabilized with just Metformin. In the same light, American physicians heavily agreed that while T2D is reversible, most patients do not enact drastic enough sustainable lifestyle change to achieve such reversal but rather are stabilized or controlled with Metformin and some small lifestyle improvements.

1.2. Positive Aspects of Both Countries' T2D Care

German and American physicians noted with appreciation the immense wealth of medical knowledge available in both countries, in terms of both information about T2D and medications. The physicians agreed

that the widespread access to inexpensive basic medications such as Metformin and the cutting-edge research that is always evolving to create better T2D pharmaceuticals are expedient features of T2D care in both countries. The physicians interviewed also generally concurred that while a T2D patient's health will rarely be rapidly reversed, success comes through working together as patient and doctor, month after month, year after year, to implement and sustain small lifestyle changes that all add up to a healthier patient.

1.3. Challenges for Both Countries

1.3.a. T2D – a Silent Disease

In Germany and the U.S., many people are unaware that they are diabetic. An American physician explained, "Diabetes is sort of a silent disease. They feel fine, so they don't think it's doing anything to their bodies. Part of my job is to educate them, or even scare them, so they take it a little more seriously." One physician remarked how, when he tells a pre-diabetic patient that they have a high blood sugar, he has to really work to convince the patient of the importance of lifestyle changes and encourage and motivate them, because high sugar levels alone do not have immediate detrimental effects. He said that patients usually don't follow pre-diabetic recommendations strictly, which often gives rise to spiraling into T2D; he tries to see prediabetic patients as often as possible to encourage lifestyle changes, keep a closer eye on sugar levels, and prevent progression. On the same token, a German physician described how T2D patients must implement hard lifestyle changes *"ohne überhaupt ein Benefit zu spüren"* ["without feeling / sensing any benefit at all."] Essentially T2D presents looming threats, but there are no directly visible benefits to achieving the challenging lifestyle changes. This challenge to motivate patients on the grounds of future, not-yet-present problems is universal.

1.3.b. Variety of Patient Compliance Level

A similarly internationally-shared hardship is the variance of patient compliance. "Some people are really motivated, but some people just say 'Just give me the meds. I'm not going do that, just give me the meds,'" recounted one American physician. Doctors from both countries explained how while many of their elderly patients come in very regularly, their middle-aged patients don't come in near as frequently because their lives are extremely busy between work, family, etc. One physician also noted that her older patients do very well in DMPs, because they listen to the doctor very well, eat very regularly without snacking in between, and exercise a good amount; it is the younger and middle aged people who have irregular lives laden with bad lifestyle habits (especially when they have hectic work lives). Another German physician ruminated, "Some patients just straight up don't care… they live very well and happily and don't feel bad and are busy with life so just don't want to bother themselves with it. You can tell them that they'll get heart attacks, kidney failure, blindness, but they don't care." Several physicians conceded that most patients know what

they need to do, but a lot of them just don't do it, and rather depend on medicine. Physicians encounter this challenge of how to engage each patient individually and try to truly incentivize them to comply worldwide. An American physician explained,"That's the art of medicine, not the science of medicine. Some people are very data driven and will change when they hear the numbers, other people require lots of encouragement and need a pat on the back to change their habits."

1.3.c. Difficulty of Changing Lifestyle

A German physician with predominantly elderly patients perfectly illuminated one of the biggest challenges healthcare professionals encounter with the T2D patient population at large: adults get very set in their ways and are not willing to make lifestyle changes. This physician said, *"Es gibt so die Gedanken bei typischen älteren deutschen Patienten dass, morgens iß Brötschen, eine Hälfte mit Honig, die andere mit Marmelade. Mittags gibt's Mittagessen, und spätnachmittags Stücken von Kuchen. Dann abends gibt's zwei Stücke Brot, eines mit Käse, eines mit Wurst. Und das ist das Leben der Älteren*" ["There is a notion in older, typical German patients, that in the morning, one eats bread, half with honey, the other half with marmalade. There's lunch at lunchtime, and later in the afternoon, pieces of cake. In the evening, there are two pieces of bread, one with cheese, one with sausage. And that is the life of the elderly people."] And a physician has no luck with such patients when suggesting to replace the bread with a salad, or forgoing the honey or the cake. Nearly all T2D patients, besides the minority of patients who are children, have been cementing their unhealthy lifestyle habits year after year for a lifetime. One physician put it painfully truthfully: "The reality is, the reason someone has become a type 2 diabetic is the reason that they probably won't achieve these lifestyle changes; lifestyle change is hard." And yet another doctor remarked, "The problem with people, even very smart people, is successfully realizing behavior change; it's so hard to incentivize." Behavior change is the root problem that needs to be solved. Though challenging to solve, solutions have been successfully implemented; such solution hopefuls will be discussed in the upcoming recommendations and future directions section.

1.3.d. Control Possessed by Pharmaceutical Companies

In both Germany and the U.S., all physicians lamented the overbearing control the pharmaceutical companies exercise throughout the healthcare field and society as a whole. These companies spend billions annually schmoozing physicians to influence them into writing more prescriptions for their products. Several physicians recounted how they usually hear about the newest medications through the pharmaceutical sales representatives. Each interviewee said they wished it wasn't this way though, as such attempt at persuasion is, for the sake of the health of their patients, so unethical. Also, pharmaceutical

companies keep prices of new medications prohibitively high in the U.S., a problem that Germany has to some degree overcome, which will be further discussed in the ensuing differences section.

1.3.e. Too much Time Spent on Bureaucratic Paperwork, Not enough Time Spent with Patient

While spending sufficient time with each patient is not currently a pressing problem in Germany, one German physician said that he thinks there will soon not be enough time for all the DMP appointments and paperwork. As discussed in the German weaknesses section, one of physicians' greatest complaints about German DMPs was the amount of documentation they require. As the U.S. moves towards value-based reimbursement systems, which requires documentation of metrics of patient outcomes, a similar problem is arising. For example, one physician whose practice gets reimbursements for successful T2D management explained how, to meet the criteria for showing her T2D patient had their eye exam, she must obtain the results of the exam from the ophthalmologist, with whom she would not typically communicate. She said meeting such criteria ends up resulting in so much bureaucratic work for herself and her staff, taking away valuable time to spend with the patients. However, the benefit to her patients' health outcomes that comes with such accountability for good T2D management must be considered as well. Another U.S. physician noted with concern that "Time has become a much bigger issue." A balance must be struck in preventive healthcare between the amount of paperwork required and the recording of critical metrics contributing to health outcomes, as to not let the time spent on bureaucratic obligations outweigh the time needed to be spent with the patients.

1.3.f. Other Miscellaneous Shared Challenges

German and American physicians both encountered several other challenges inherent to today's modern world. "People blame genetic factors, but forget about environmental factors," remarked one physician. For instance, the Americanization of many nations, spreading fast food and sugary drinks worldwide, has driven the attractive social norm to a fatally unhealthy state. One physician emphasized the importance of parents teaching their children healthy habits by example and education, explaining, "Parents don't understand that how the kids are is due to their own habits and the food they buy at home**.** As the parents buy the food, it's what their kids eat. They're setting up their kids for type 2 diabetes." Children must be taught the life-changing importance of healthy eating in both Germany and the U.S. amidst this global society that worships many epitomes of unhealthiness. The marketing of sugary, "pretty looking" foods are addictive to children, instilling habits that pave their life path of obesity and T2D amongst other health problems. "It's amazing how many people drink sugary drinks, and have no idea how bad that is," reflected an American physician woefully. Beyond the modern world's praise of all foods packaged and sugar-filled, the sedentary lifestyle brought by office jobs and hours of TV and Netflix drive more and more citizens of

both Germany and the U.S. towards T2D and accompanying health complications each year. Physicians of both nations commented about the explosion of growth in prevalence of T2D cases in recent decades. Another challenge both German and American physicians strive to solve is the best way to reaching rural patients. A primary care physician interviewed who works in a small, rural German town explained how, in rural areas, primary care physicians must try to do all treatments for their patients since specialists are so few and far between. One hopeful solution to this issue of reaching rural populations is increased use of telemedicine, which will be discussed in the upcoming recommendations and future directions section.

2. Differences Between German and American T2D Care

2.1. Challenges Unique to the U.S.

2.1.a. T2D's Disproportionate Detriment to Lower SES and Minority Populations

Several American physicians recounted personally that the T2D rates for their patients from Latino and Native American communities are particularly high. Accordingly, the CDC reported that the rates of diagnosed diabetes to be 7.4% in non-Hispanic whites, 8.0% in Asian Americans, 12.1% in Hispanics, 12.7% in African Americans, and 15.1% in American Indians / Alaskan Natives (2018). Studies have shown that when all other variables are controlled, it is in fact the lower socioeconomic status that drives increase in prevalence of T2D more so than race or ethnicity inherently (Link & McKinlay, 2013). Thus, these minorities are disproportionately affected by the T2D epidemic likely due heavily to their socioeconomic status. American physicians emphasized how challenging it is for lower SES individuals to afford healthy food, and how this contributes to higher levels of obesity and consequently T2D in many of their lower SES patients. "Bulk carbs and fast food are cheap," stated one physician, while yet another lamented the popularity of sugary drinks among her lower SES patients. This physician described how one of her T2D patients who worked as a construction worker drank 6 Gatorades daily, and how she often saw patients of hers that were mothers giving their babies bottles full of Coke – starting the detrimental health habits so early on in childhood. She talked at length about how she would have to work through lifestyle changes with these patients, but finding solutions was often very challenging with healthier foods being generally more expensive especially in the food deserts in which many of her patients live.

In addition, regular doctor's visits are often challenging: lower SES patients also often times do not have reliable transportation to/from the doctor's office. Furthermore, they often must work long hours because of multiple jobs or irregular shifts, which can prohibit the ability to come to the doctor's office during regular hours, explained another physician. Between these logistical obstacles and the financial barrier imposed by lack of good insurance coverage, patients of lower SES receive minimal preventive care. They instead often end up in the emergency room when conditions have progressed to a severe state. One physician said that having primary care offices stay open later in the evening to accommodate for patients

with long work hours would be a helpful improvement, though of course this option in tradeoff imposes on the healthcare professionals' lives. Another physician summarized the situation well: "It's often hard for people to take time off work to go to the nutritionist or even to attend regular T2D appointments. We have to think about how we can meet people where they are."

2.1.b. Expensive Pharmaceuticals

As discussed in the American weaknesses section, the prices of T2D medications continue to rise to prohibitively high heights in the U.S. Germany had encountered this problem of skyrocketing pharmaceutical costs as well, but combatted it by reforming its coverage for prescription medications in 2010. Pharmaceutical companies had been setting the prices for new drugs and were not required to prove that the drug was an improvement over previously available prescription drugs prior to these reforms. The reforms required that, while the manufacturer could set the price of a new drug for its first 12 months on the market, it would be undergoing a process of benefit assessment throughout that year. Through comparative effective research, the pharmaceutical companies must now prove that the new medication has an "added benefit to the patient, compared to the previously existing standard treatment." Drugs without added benefits are reimbursed according to a government pricing list, and the patients have to pay the price difference if they want the new drug despite a lack of provable added benefit. A price is negotiated between the manufacturer and health insurers for new drugs with added benefit. German policymakers placed immense importance on the effort to maintain open market access for new drugs when implementing this reform, as they wanted to ensure patient choice, access to the most effective medications, and encouragement of the drive for clinical innovation. They do not control prescription drugs through government bureaucracy, but rather through benefit assessment by non-governmental bodies and private-sector negotiations. All of these characteristics are attractive to, and could certainly be beneficial to, the American pharmaceutical market. Germany has experienced immense financial savings through this reform as the rapid increasing of their drug prices have been curbed (Bahr & Huelskoetter, 2014). While price negotiation is the norm in the private sector in U.S. healthcare, federal law forbids Medicare Part D from negotiating prescription drug prices with manufacturers. This results in price negotiations in the U.S. being more fragmented, which gives manufacturers much greater leverage and power to push prices up. Keeping the exorbitant costs of prescription drugs at bay could help millions of American T2D patients receive the care they need.

2.1.c. Conflicting Interests within American Healthcare

In the U.S., "You have the insurance soapbox, you have the pharmaceutical soapbox, you have the patient soapbox, you have our soapbox as providers," asserted one physician interviewed. This variety of financial

interests in American healthcare often leads to conflict. Contrary to government insurance coverage, like in Germany, or under Medicare or Medicaid, private insurers often don't invest in proactive care or medications as much for their customers because customers move from insurer to insurer as they change employers, another interviewee explained. Thus insurers think 'Is it really worth it spending that much money on them if they're just going to leave soon anyways?' Denver Health family physician said, "I would vote for a single-payer system. Because then, everybody's got the same plan and you're not pushing the costs down the hill." While the German universal, multi-payer system definitely isn't perfect, at least it does set insurers, providers, and patients against one another financially; it thus does not give rise to such conflict of interest when it comes to providing adequate preventive care.

2.1.d. T2D Rates Rising in Children

As mentioned earlier, T2D used to be known as "adult onset diabetes" because it was unheard of in people under the age of 30. Yet in recent decades, the number of children and adolescents developing T2D (usually associated with obesity), has skyrocketed and is still climbing, most prominently in the U.S. (Rosenbloom, Joe, Young, et al., 1999). The CDC predicted that one in three children born in the U.S. in 2000 will likely develop T2D in their lifetime with the current state of unhealthy lifestyle plaguing society (2014). This emerging T2D epidemic in the pediatric population, especially among minorities whose proportion in the U.S. population is increasing, poses a serious public health crisis (Rosenbloom et al., 1999). The full impact of this epidemic, both in decline of health and financial burden, will be felt as these children age and develop the long-term complications of T2D. While there is probably also some pediatric development of T2D in Germany, it is a very rare occurrence (Neu, Feldhahn, Ehehalt, et al., 2009), and none of the physicians interviewed said they had seen any pediatric cases of T2D in their time practicing medicine.

2.2. Challenges Unique to Germany

2.2.a. Downsides of the DMP

As discussed in the German weaknesses section, the German DMP imposes strict regimen on German physicians' T2D care. While this has many positive effects as discussed in the strengths section, this extreme regimen results in a lack of patient by patient customization. Despite America's many problems in its T2D care, inherent to its lack of standardization comes the benefit of flexibility for patient by patient customization. Additionally, the bureaucracy and paperwork of DMP were a challenge for the German physicians, as they felt sometimes the time spent on this aspect of the program did not outweigh the value added by the program. However, the paperwork healthcare professionals in DMPs must complete is necessary to both to document their adherence to protocol and to provide research data to measure the efficacy of the program, but the time it takes does nevertheless pose a challenge. As long as the bureaucratic

measures are outweighed by health outcome and financial benefit of such recording and value-based reimbursement methods though, this issue will only grow, so must be mitigated through methods such as heavier reliance on team-based care.

2.2.b. Freedom of Choice of Physicians – Prevention gone too far?

An interesting feature of the German healthcare system is that not only do patients have the freedom to choose the physicians they see, but they may see as many as different physicians as they desire. While the principle of freedom of choice in healthcare is definitely a positive, it also brings problems. Several of the physicians interviewed complained that patients will go to multiple different primary care physicians and see specialists excessively and unnecessarily, incurring high unwarranted costs. One physician recounted that on average, a German goes to the doctor (including any specialists) 17 times per year. This mindset of extreme utilization of preventive care is great to a certain extent in keeping patients healthy and preventing conditions from progressing to severe states as so often happens in the U.S. However, 'too much prevention' ends up negatively impacting the system when it causes individuals who actually need to see specialists, for instance T2D patients, to be unable to secure an appointment in a timely manner. Thus a balance must be struck between the American way of waiting until a condition warrants going to the ER and the German way of proactively going to the doctor so often that others in more dire need are unable to receive adequate care in a timely manner.

2.3. Fortes Unique to the U.S.

The main positive aspect of American T2D care, as discussed in the U.S. strengths section, is the greater prevalence of new, creative methods to try to drive behavior change and lifestyle improvement of T2D patients. The German physicians embraced much the mindset that this DMP is a set protocol; regardless of whether it was succeeding at improving health outcomes and reducing costs incurred, they would follow it and not challenge it to be improved. Some German physicians stated they wouldn't change anything about the DMP when asked in interviews – they thought it to be a very good and well-structured program. They believed the lack of a 100% success rate for it was due to the patients' discipline and was thus outside of their responsibility. While this physician satisfaction on one hand illustrates potential effectiveness of DMPs, it also illustrates the cultural mindset of Germany that prevents the spur for flexible innovation to improve patient discipline that exists in the U.S.

In the U.S., particularly some of the more progressive primary care practices put heavy emphasis on the constant effort to innovate new and better ways to improve their T2D patients' health outcomes and reduce their cost burdens. While not all American providers are of this mindset, it definitely was more predominant in the U.S. as compared to Germany. And though Germany's T2D DMPs are doing a better

job in improving T2D than American healthcare on average, the novel T2D care in some of the more progressive primary care practices in the U.S. most certainly trumped the results of the DMPs in terms of both economic savings and improving patient outcomes through innovative methods of driving lifestyle change. Many of the recommendations for future directions in the upcoming section come from these American primary care practices, as the German physicians offered far fewer ideas of change and means of improvement as compared to the U.S. physicians.

2.4. Fortes Unique to Germany

Several of the German physicians did recount very positive results of success from their T2D DMP patients, as discussed in the previous German survey results section. One physician talked about how he does observe significant lifestyle improvements in his patients, though he is not positive if it is a result of the DMPs. He thought that cultural and generational improvement could be contributing factors ("70 is the new 60," he said). He explained that people exercise a lot more as of recent; many of his T2D patients enroll in sport programs that are insurance covered as part of their T2D '*Kassenleistung'* [services covered by health insurance]. Most of the German physicians recounted that on average, their T2D patients' health has improved since DMP implementation. This opinion paired with the studies showing DMP efficacy suggest that DMPs have in fact been an advantageous addition to German chronic care management.

3. Recommendations for Improvement of T2D Care

3.1. Meeting Patients Where They Are

3.1.a. Increasing Use of Motivational Interviewing

One of currently most pressing areas in need of improvement emphasized by both German and American physicians was better engaging T2D patients to drive day to day to lifestyle changes. Several American physicians said they're trying to focus on motivational interviewing as was discussed in the American strengths section as well as shared decision making to make lifestyle changes in small, sustainable steps, worded by one physician as "progressive and relentless incrementalism." Physicians of both nations stated how a successful patient engagement has a much better chance of being achieved through working together with the patient, as a doctor–patient team trying to improve this individual's health, rather than as a superior doctor telling the patient how to change their life.

3.1.b. Addressing Social determinants of health

American physicians also stressed how understanding social determinants of health is critical to the ability to engage with patients and meet them where they are at; for example, access to healthy foods affect chronic disease more than anything. A Denver Health physician remarked, "The more money you have, the more

you're educated about health, and the healthier food you can buy." She also explained though how Denver Health has realized that they end up saving a lot more money by controlling T2D than having to care for it reactively, and thus they provide fairly good (and affordable) preventive diabetic care to the population of Medicaid recipients as well as undocumented immigrants that they serve on the basis of this cost-benefit analysis. At the end of the day, providing access to preventive care and encouraging adherence to these regular primary care visits for lower income populations is a critical path to both decreasing cost burdens associated with chronic diseases like T2D as well as improving health outcomes of these patients. Possible solutions proposed by physicians to address some of the problems that currently inhibit low SES patient populations from getting preventive care included having some primary care practices offer extended hours, increasing home visits, and of course improving insurance coverage for these patients. It must be noted though that the former two would most likely require increased reimbursements for physicians. Providing financial resources to low income patients also has potential to provide immense benefit to both health outcomes and downstream cost burdens -- HealthOne Colorado Care Partners care coordinator explained, "If I can find them the resource to pay that Excel bill, then they can have the money to go buy healthy food. So that's what we're really trying to do. Find the resources for people so that they're able to then focus on better managing their chronic disease management."

3.2. Resource Advancement

3.2.a. Increasing Use of Technological Tools

Utilization of recent technology is a critical step forward that preventive care must further develop to improve their patient accountability and communication. Physicians can engage their patients in this high tech age by moving beyond phone calls and reaching out to people via applications and patient portals; they can follow up after appointments more efficiently, offer to answer any questions at any time, reach out to patients regularly to find out what's going on in their life, remind them to keep up with lifestyle changes, get back on necessary medications, come back into the office as needed, etc. As mentioned in the American strengths section, American physicians are more widely using applications including AHRQ ePSS (recommendations used to identify most appropriate clinical preventive services by patient characteristics and risk factors) and patient–physician portal communications. While such applications were not mentioned by physicians in Germany, increased utilization of technological tools for patient screening, recommendations, and accountability would definitely be extremely beneficial to improving health outcomes, quality of care, and cost burdens of T2D patients in both nations. Additionally, both American and German physicians agreed that effort to further increase use of telemedicine video calls is a critical future direction, as this can effectively provide preventive or regular T2D care for individuals without access to reliable transportation or in rural communities.

3.2.b. Providing Access to T2D Education

American physicians interviewed unanimously agreed that, for the sake of improving health outcomes and reducing cost burdens, the U.S. needs to make T2D education insurance covered for all pre-diabetic and T2D patient. In Germany, physicians emphasized that the key to effective diabetic education is offering well-structured programs weekly or monthly for extended period of time to really change habits; they called it '*Nachschulung*' [corrective training], for nutrition, exercise, and smoking. An American physician explained how the most effective place to start health education is in elementary schools as curriculum, as this can instill good habits earlier on and often starts dialogue with the parents at home. She referenced that this was how the anti-smoking campaign found success. This physician goes to high schools regularly to give nutrition education talks including teaching kids how to read labels; she advocates that such education will be critical to trying to combat the growing diabetes epidemic in this next generation.

3.2.c. Better Utilizing Current Resources

While increasing access of diabetic education is definitely needed, full utilization of current resources available is also a crucial step that physicians must take. News about the YMCA's Diabetes Prevention Program being free for all Medicare patients must be spread and further taken advantage of. In Germany, a physician stated they thought that the currently available fitness programs should be promoted more strongly by the health insurances. Another great resource that American physicians should be sure to be using is Medicare's compensation for 20 minutes of chronic care management every month for patients with two or more chronic conditions. A nurse or care coordinator can do outreach in that time (between appointments); this is very helpful to the patient, and it adds revenue to the practice.

3.3. Changes in Healthcare Policy

3.3.a. Greater Employment of Team-based Care

German and American physicians both agreed that the best way to hold patients accountable and increase their compliance to their T2D care protocol is by reminding them regularly through communication and seeing them often. As these more frequent check-ins simply cannot all be performed by the primary care physician alone, team-based care is needed. HealthOne care coordinator explained, "We're really trying to make the primary care doc the quarterback, directing the care. But it's a whole team collaborating – communicating to make sure services aren't duplicated and working together to best help the patient manage their chronic condition. One physician just can't do all the work. That's why they need our team-based care." Some practices within larger networks have care coordinators, while many, especially smaller practices, cannot afford to have one. Wider utilization of team-based care in upcoming years is a crucial

future direction, as it has been shown to improve the quality of care immensely as well as reduces financial burdens by improving health outcomes of patients with chronic diseases such as T2D (ANA, 2012).

3.3.b. Increasing Use of Home Visits

Both German and American physicians accoladed the effectiveness of home visits at figuring out what factors are truly affecting a T2D patient's health and inhibiting needed lifestyle changes from progressing. While it is expensive to reimburse American healthcare professionals for the extra time spent carrying out home visits, nearly all of the physicians interviewed said they find home visits to be nevertheless cost effective due to the money saved by avoiding future expensive health complications through this method of prevention. They are able to reach patients who may not otherwise be able to come in to the office right where they are. German physicians also mentioned the benefit they have felt in home visits to their T2D patients. They also mentioned that these home visits are becoming harder to fit in time wise, though, with the growing number of T2D patients in need of such visits. In the U.S., Medicare Advantage plans – "bundled" plans that include Medicare as well as additional benefits and function as an alternative way to receive Medicare coverage through private insurance companies rather than through the federal government – provide more extensive home health services coverage, proving to be a beneficial pioneer in fostering growth of home visit use. The HealthOne care coordinator recounted the value of a Medicare Advantage enabled home visit as it "allowed for a nurse to visit the home of an elderly woman with T2D who kept having hypoglycemia but they didn't know why… we found out she was living with all of her grandchildren and giving them all of her food since they were on a very tight budget, hence her hypoglycemia from the T2D medications… now we have been able to provide her with some resources to get adequate food."

3.3.c. Ascertaining Root Causes

While addressing root causes of diabetes at the societal level was not heavily emphasized among German physicians, several of the American physicians had strong opinions on and recommendations about this topic. One interviewee remarked, "I would tax the living daylights out of high fructose corn syrup, simple carbohydrates, I would make them almost prohibitively expensive. And then take all that money and funnel it back into healthcare… It's basically poison. I mean why would you sell poison to the citizens of the country? I mean let's be clear. Just plot the average weight of the average American over the past 50 years. It's just hideous. It's ungodly dangerous. We're going to ruin the United States of America just based on our food supply. And then we're going to pretend that we can't afford to take care of those people. Almost 2/3 of all chronic disease in the U.S. is self-inflicted." Another American physician stated, "Health companies haven't started taking responsibility because they don't have to…. They have so much lobbying money, and it's cheaper to make unhealthy food, and then that's what lower SES people buy, then it ends

up being way more expensive in the long run though to treat their health conditions due to their unhealthy lifestyle." This physician proposed solutions including further increase of taxes on sodas and other unhealthy, sugary foods, and then use of that exact taxpayer revenue for diabetes education (since so much of taxpayers money is going into dialysis anyways).

Another interviewee pointed out, "Food company manufacturers need to get involved with the education. Cigarette companies had to put the dangers on the label…. We need to follow suit." One doctor told a story using a metaphor for how American healthcare operates: "There's this little town on a river, and the people of the town have realized that there's been an increase of their citizens drowning in the river. So they develop a new rapid response team to help rescue drowning people. And that helps some, but some people are still dying. So in addition to that, they build a little clinic that specializes in the care of near-drowning people. And that still helps a little bit, but there are still people drowning in the river. So then they develop an huge research center to research about how people are drowning in the river. In the meantime, a little boy is taking a walk a bit up the river, and notices there is a big hole in a bridge. He puts a few planks over the hole, and the drowning stops. So in the U.S., what is our response to any health problem? Oh let's do some more research, let's build a new research institution, let's build better helicopters, let's build better trauma units! Really? Really? Could we just turn off the high fructose corn syrup? Just for a decade? And see what happens? It's really not that hard!" Another physician summarized all of these exasperated viewpoints well in explaining, "It all comes down to root cause analysis. Sometimes I think when I retire, I'm just going to specialize in protests against bad root causes." To ameliorate the T2D epidemic, acknowledgement of and action taken to improve the root causes of the disease's proliferation are obligatory.

3.3.d. Payment Incentive Structure

Several German physicians stated that the problem with the T2D DMPs was a lack of a rewards principle; they believed there would be greater success in improving patient health if both the patient and the physician were rewarded monetarily for achieving progress. They explained how they thought that such monetary incentives which would end up saving money at the end of the day. However, it unfortunately is not highly probable that T2D patients will be paid by health insurance companies for adhering to program protocol and achieving health improvements any time in the near future in either German or American healthcare. Change that is more probable though, is change surrounding physician payment.

Several physicians interviewed brought up the recently catalyzed shift in American healthcare from fee-for-service (FFS) to value-based reimbursement. The FSS payment model that has dominated U.S. healthcare for decades is characterized by physicians being paid per person per visit as mentioned in the introduction. Since physicians are not incentivized to make efforts to provide preventive care to patients

and American culture does not emphasize prevention, many patients wait until they are in dire need before coming in to the doctor's office, thus compromising prevention efforts. And physicians are not reimbursed based on quality of care or on their patients' health outcomes, thus there is little differentiation between effective and ineffective patient-physician interactions. This payment model based on patient volume also disincentivizes doctors to take the time to explain the necessary lifestyle change advice to patients; prescription writing is faster thus allows for seeing more patients. A societal shift from the exorbitantly expensive reactive care to the much more cost effective and quality-of-life-improving proactive care described throughout this paper can likely only be driven by economic means.

In answer to this need comes the value-based primary care reimbursement model, which incorporates clinical outcomes into provider payment and provide differential reimbursements based on measures of medical costs incurred and clinical quality (NIDDKD). These reimbursements can be negotiated through "shared risk" contracts, in which the cost of a patient's illness is shared between the payer and the provider or (NIDDKD). The most heavily pursued value-based strategies include accountable care organizations, clinically integrated networks, bundled payment programs, patient-centered medical homes, and Shared Savings payment strategy (Feeley & Mohta, 2018). An accountable care organization (ACO) is a government-funded network of doctors and hospitals that shares medical and financial responsibility for providing coordinated care to their Medicare patients with the goal of focusing on primary care and limiting unnecessary spending (Feeley & Mohta, 2018). A clinically integrated network is comprised of otherwise independent physicians who negotiate collectively for commercial payer contracts that are characterized by performance-based payment incentives to motivate physicians' achievement of clinical metrics (Care Transformation Center, 2014). A bundled payment program provides single payments for multiple services addressing a single condition (e.g. T2D), as is used in Medicare Advantage plans as described above. A patient-centered medical home is a redesigned care delivery model emphasizing patient-centered, individualized, and team-based primary care (CTC, 2014). Finally, Shared Savings as described by payment reform expert Michael Bailit "is a type of payment reform strategy that offers incentives for providers to reduce healthcare spending for a defined patient population, by offering those providers a percentage of net savings realized as a result of their efforts" (North Texas Clinically Integrated Network).

HealthOne Colorado Care Partners, where two of the physicians interviewed work, is an ACO and CIN that gets much of its reimbursements through value-based contracts with both commercial payers as well as Medicare Advantage. Over recent years, they have seen significant advantages both in health outcomes and financial savings in their increased negotiation of value-based contracts, explained the physicians interviewed. In 2017, in one of their value-based contracts, the rest of the Colorado market's costs went up 4.7% while theirs only went up 2.5%. "We almost bent the cost curve in half," stated this physician. He continued, "All of the other doctors in Colorado spent approximately $1.7 million more than

us. If you imagine the amount of overutilization, unattended consequences, waste that goes on, you could save millions if everyone was in value-based contracts. And that's the goal." Since HealthOne Colorado Care Partners saved that insurance company $1.7 million in money out the door to doctors and hospitals and were in a one-sided risk contract with this insurer, their practice received half of the savings back (~$800,000). Currently they have all one-sided risk contracts, but they want to eventually transition to two-sided risk to incentivize insurance companies to give them much more money up front and to earn back more later. If this would have been two-sided risk, they would have received the entire $1.7 million back. This enormous reimbursement gives them the financial capacity to reinvest into preventive care management resources such as in-house behavioral psychologist and nutritionist at their practices, all very beneficial for T2D patients as discussed previously. The HealthOne physician explained that value-based contracts "encourage physicians to use the money to build high-performing, transformative primary care practices."

To draw from a greater sample size, a July 2018 survey of the New England Journal of Medicine Catalyst Insights Council (comprised of clinical leaders, clinicians, and executives at U.S.-based healthcare organizations) showed 42% of respondents to say they think value-based reimbursement models will soon be the primary revenue model for U.S. healthcare (Feeley & Mohta, 2018). This transition is indeed well underway, as nearly a quarter of reimbursement among U.S. healthcare organizations has turned value-based in recent years, after a fee-for-service dominated system that had been stagnant for decades. Insights Council members agreed that the metrics important to value-based care include health outcomes, costs, safety indicators, patient experience indicators, and process measures. 46% of survey respondents believed value-based contracts significantly improve the quality of care, another 42% say value-based contracts significantly lower the cost of care. While this suggests noteworthy support for value-based reimbursement, still a significant number (36%) of respondents said they are uncertain that this will become U.S. healthcare's primary revenue model. 37% of respondents said they neither agreed nor disagreed that value-based contracts significantly improve the quality of care, and 41% neither agreed nor disagreed that value-based contracts significantly lower the cost of care (Feeley & Mohta, 2018). This uncertainty was matched by some of those physicians I interviewed who were unfamiliar with value-based care and/or did not participate in value-based contracting. To succeed, the value-based revolution will have to overcome barriers including changes in infrastructure requirements, regulation/policy, information technology, and administrative details. But value-based contracting does hold promising potential for chronic care management, because, as stated by a HealthOne physician, "To succeed in value-based contracting, you've got to focus on prevention."

Value-based reimbursement was not identified to be a potentially influential method to improve T2D management until about halfway through the interviews with the American physicians, which put

limitations on this study. If I had learned about it sooner, I would have liked to have asked the previous American physicians about it as well as the German physicians what they think about its potential clout, and if any such initiatives exist in Germany (I could not find of any such initiatives to exist). Among the Americans physicians I did ask about it though, it seemed that the ones who were part of value-based contracts were in favor of its ability to improve T2D health outcomes, quality of care, and cost burdens, while those unfamiliar with it were more skeptical and unsure. Some physicians may simply prefer the fee-for-service system, others may just be unfamiliar with what value-based reimbursement actually represents, while yet others might want to see more evidence that value-based reimbursement actually improves outcomes and reduces costs before shifting (Feeley & Mohta, 2018). Recommendations for best methods forward in T2D care from both German and American physicians included widespread insurance coverage of intensive diabetes education courses, more adeptly addressing of social determinants of health, and increased utilization of home visits, team-based care delivery, motivational interviewing, and telemedicine & apps to improve patient accountability. Payment structure evolving from fee-for-service to value-based care was viewed by several interviewees to be the necessary way forward to incentivize the increased use of all these recommendations. Yet clearly further education of providers about value-based reimbursement, evidence of success of currently value-based contracts, and patience will be needed to fully pilot America's novel value-based approach to healthcare. Only the upcoming years will tell to what extent value-based care improves the health outcomes of, quality of care for, and cost burdens incurred by T2D (and other chronic care) patients. If it is successful, perhaps Germans will be investigating American value-based T2D management programs in the future instead of us Americans investigating the German T2D DMPs as has been done in this thesis.

CONCLUSION

This paper has laid out findings of similarities, differences, strengths, and weaknesses of T2D management methods in Germany and the U.S., as well as best directions forward. Germany champions the strength of providing fairly good DMP-administered T2D care to all who it through their universal health insurance coverage, while the quality of T2D care and resources available varies widely in the U.S. depending on provider and insurer. With the high number of Americans with uncomprehensive insurance or with none at all, many who need care to control their T2D end up suffering expensive hospitalizations due to secondary complications that occur with the lack of preventive care, which is detrimental to all parties.

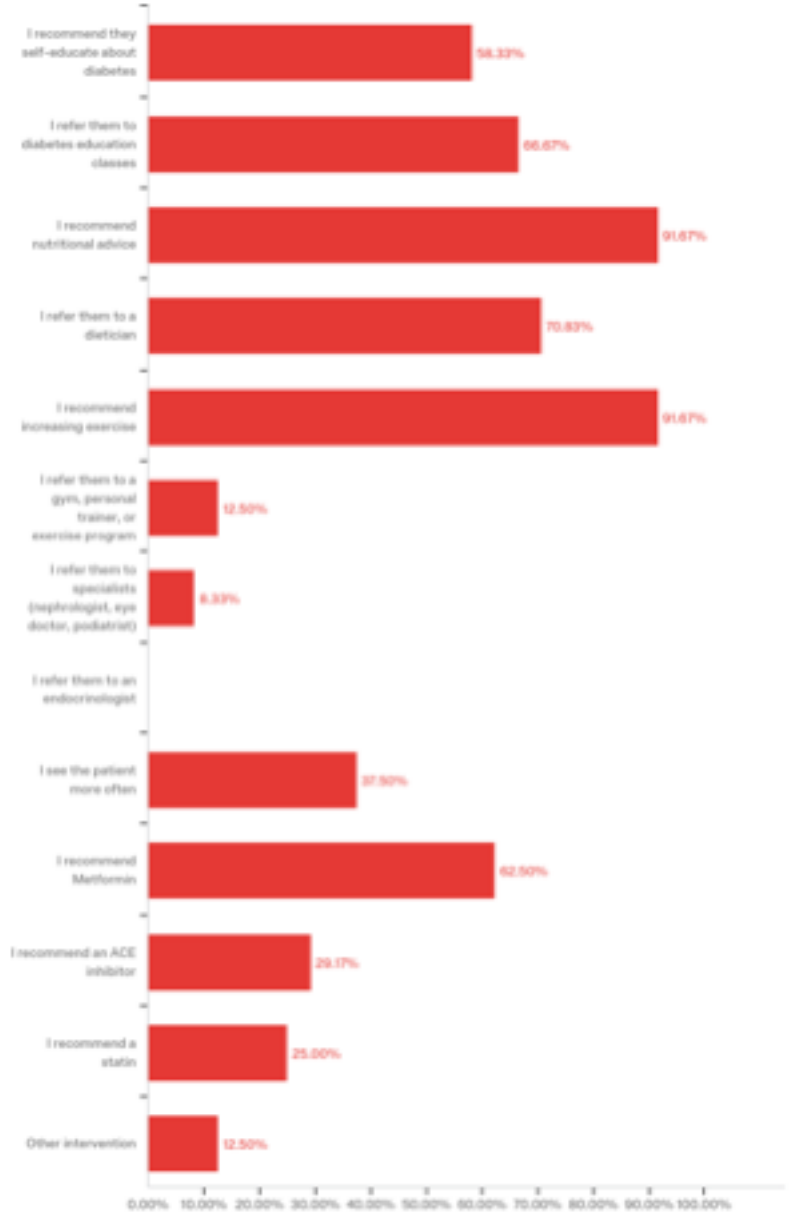
Noteworthy strengths of Germany's T2D DMPs included better blood sugar level monitoring (from frequency of visits), improved patient accountability (from health insurance companies calling patients if they miss an appointment), more regular specialist visits (reducing occurrence of secondary complications), and availability of access to T2D management resources without financial barrier. German DMP key weaknesses included lack of customization and excessive bureaucratic documentation for minimal added value. Strengths of American methods revolved around a greater prevalence of innovation, exemplified by increasing utilization of technological tools and motivational interviewing techniques, as well as an evolution towards team-based care delivery and value-based reimbursement models. Weaknesses stemmed from systematic inequality of access in U.S. healthcare, including lack of insurance-covered diabetes education, prohibitively high costs of medication, and insufficient provision of affordable preventive care.

Despite these differences between German and American T2D care, both nations do encounter several universal challenges in T2D management. Such shared challenges include imperfect patient compliance and difficulty of achieving sustainable lifestyle changes, indicating need for improvement in both nations' T2D care. With the strict structure of German DMPs, less impetus of creative methods to overcome this barrier and drive patients' lifestyle improvements existed among German providers as compared to select U.S. providers. Yet nearly all physicians agreed on needing to address these universal challenges. Primary recommendations included restructuring of payment incentive system based in rewarding improved health outcomes, as well as increased utilization of home visits, dieticians, mental health counselors, technological tools for patient communication and accountability, team-based care, and rigorous diabetes education. Evidently, a future of improving T2D care and management hinges on an intensification of preventive measures, which must be directed by primary care providers, incentivized by insurers, and achieved by patient–physician cooperation. This heightened prevention is the only way forward – not only for the sake of financial reduction it is sure to bring, but first and foremost, for the health outcomes of millions of present and future T2D patients that it will indisputably improve.

APPENDICES

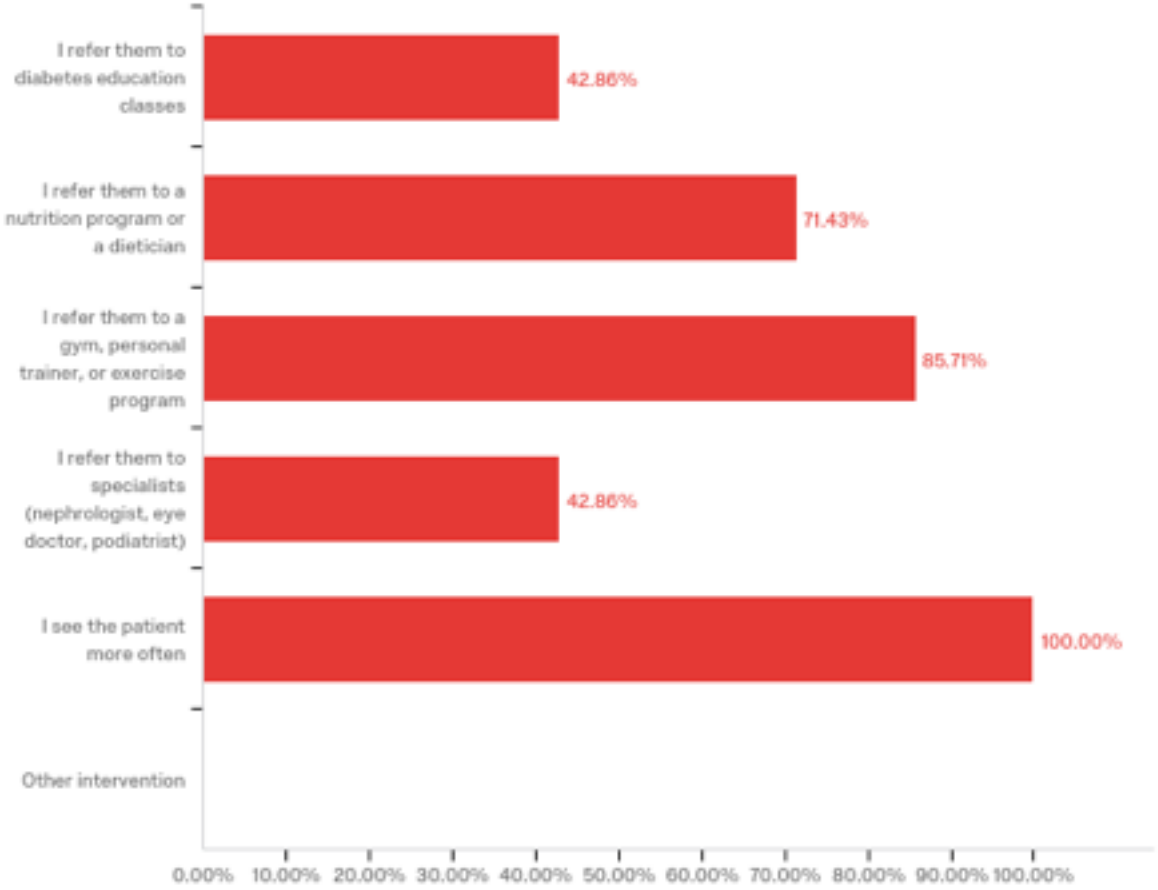
Appendix 1. Survey Result Data
*It should be noted that that the recommendation lists (used in these first four figures) were made for each country based on the recommendations that had been mentioned during any of the interviews of physicians of that country. Thus the reason that there are more recommendation options for the American than German physicians was because at the time the German surveys were given, those were the only recommendations that had been mentioned by German physicians (the German half of the study was performed before the American half).

Figure 1. American physicians' recommendations to pre-diabetic patients



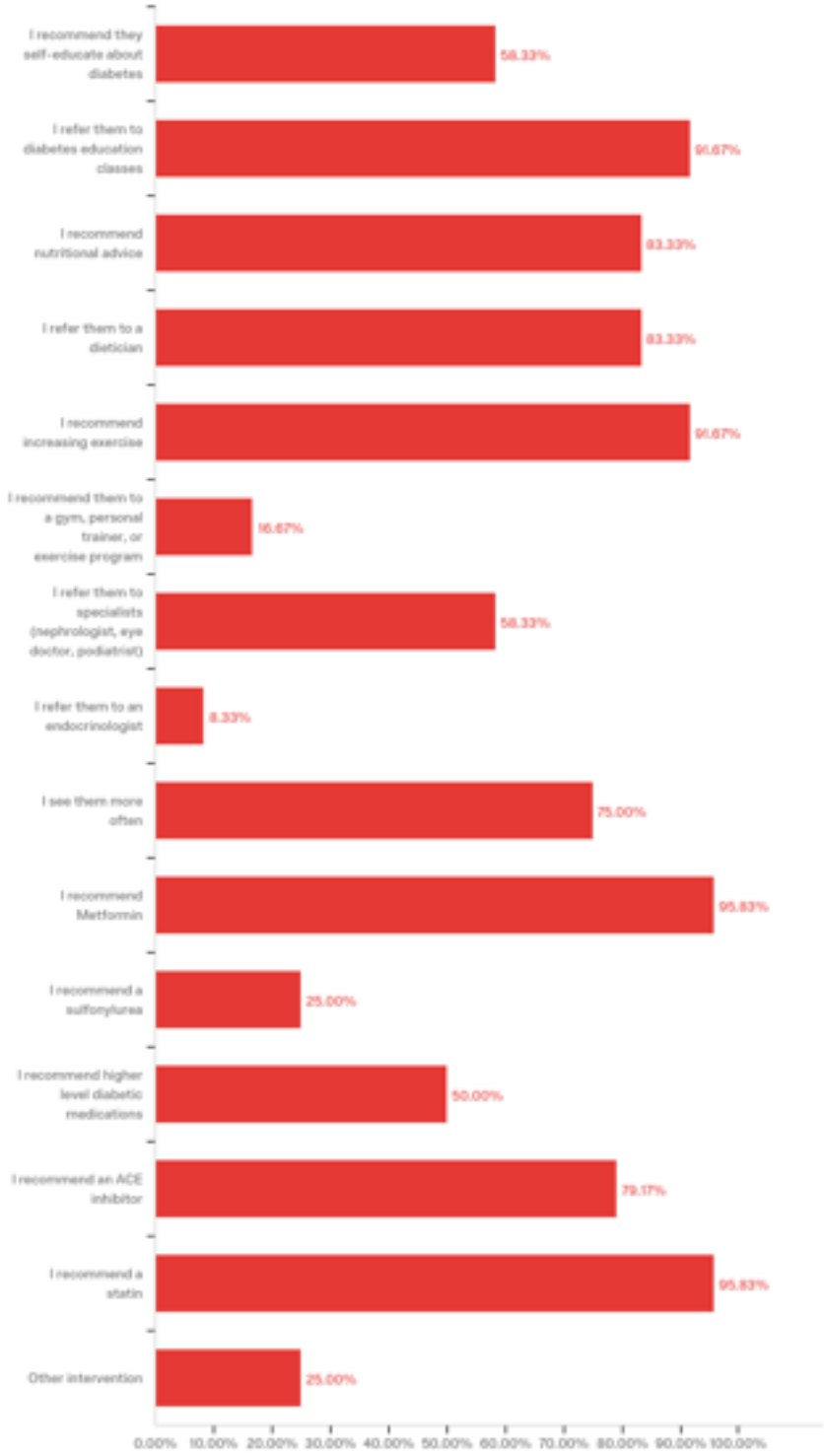
*Interventions mentioned in “Other” included: general weight loss recommendations, food diaries, exercise apps, support groups, and retesting of HbA1c at appointments three months, six months, and one year after the initial pre-diabetic diagnosis.

Figure 2. German physicians’ recommendations to pre-diabetic patients



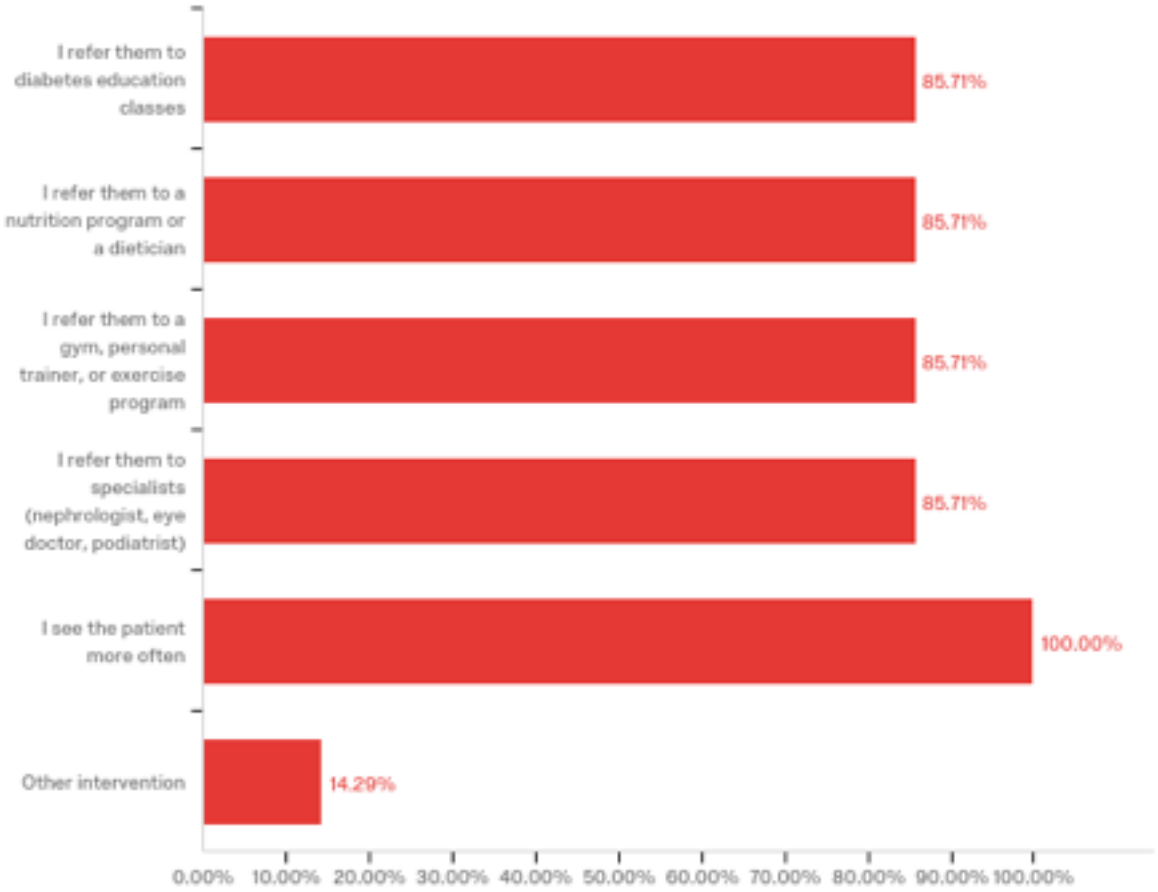
*No interventions were mentioned in “Other”

Figure 3. American physicians' recommendations to T2D patients



*Interventions mentioned in "Other" included: starting insulin if HbA1c > 10%, recommending 81mg Aspirin daily, and ordering diabetic shoes and diabetic foot care if neuropathy present at foot exam. It was also mentioned by several doctors that medications and referrals vary heavily based on HbA1c, patient situation, and risk factors such as high blood pressure or kidney health.

Figure 4. German physicians' recommendations to T2D patients



*No interventions were described from the selection of "Other"

Appendix 2. German Interview Scripts

2.1. Deutsch

Interview Fragen für deutsche Ärzte:

- Erzählen Sie mir von Ihrem regelmäßigen Verlauf der Betreuung, Behandlung und Behandlung Ihrer Typ-2-Diabetiker.
  - Zeitpunkt der Diagnose: Wann fangen Sie an, mit ihnen darüber zu sprechen, dass sie gefährdet sind - was ist der Marker für Prädiabetika, und sprechen Sie dann mit ihnen? Oder nicht, bis sie eigentlich Diabetiker sind? (Fragen Sie nach spezifischen Biomarkern und Protokoll)
- Erzählen Sie mir von Ihrer Erfahrung mit DMPs für Typ-2-Diabetiker als praktizierender Arzt.
  - Wie funktioniert das DMP-Modell in Deutschland?
  - Gibt es in Deutschland hauptsächlich nur einen Typ 2 Diabetiker DMP, oder werden mehrere Wettbewerber angeboten?
  - Bieten alle Ärzte die Teilnahme an DMPs an? Ist die Teilnahme sehr empfehlenswert? Ist sie vorgeschrieben?
  - Wie viele teilnehmen? Ich habe gelesen, dass ab 2010 etwa 75% der Hausärzte eingeschrieben sind - Was würdest du erraten, ist diese Zahl in den letzten Jahren gestiegen? Wäre diese Zahl aus deiner persönlichen Erfahrung zutreffend?"

- Empfiehlst du als Arzt nur das DMP-Protokoll für deine berechtigten Patienten oder bist du verpflichtet, es für sie zu beauftragen?
- Was ist im DMP enthalten? (Fragen Sie nach Einzelheiten zu allen unten aufgeführten Themen)
    - Wann schlagen Sie vor, dass Patienten mit Diabetes Typ-2-Risiko an einem DMP teilnehmen?
    - Wie oft treffen Sie Patienten, die an einem DMP teilnehmen?
    - Welche Rolle spielen Krankenschwestern oder Krankenschwesterpraktiker im Managementprozess und verfolgen den Fortschritt der Patienten?
    - Werden für Typ-2-Diabetes Lehrveranstaltungen angeboten?
    - Fachliche Empfehlungen?
    - An welchem Punkt schickst du Patienten an Spezialisten?
    - In welchem Maße versuchen Sie, sie vorher selbst zu behandeln?
    - Folgst du immer der Pflege und den Anweisungen, die ein Patient vom Spezialisten erhält?
    - Medikamente?
    - Inwieweit sind Medikamente ein Schwerpunkt bei Typ-2-Diabetes-DMPs? Inwieweit werden Lifestyle-Verbesserungen im Vergleich stärker betont?
    - Richtlinien zur Ernährung?
    - Richtlinien zum Sport?
    - Richtlinien für Schlaf, allgemeines Wohlbefinden, etc?
    - [Fragen Sie auch, welche Dinge durch die Krankenversicherung bezahlt werden / wenn die Patienten (vollständig oder teilweise) für jedes der Themen etwas bezahlen müssen]
- Was sind die größten Stärken der DMPs, bei denen Sie angemeldet sind?
- Was sind die größten Mängel des DMP, bei dem Sie angemeldet sind?
- Hast du geübt, bevor DMPs implementiert wurden? Wenn ja, vergleichen Sie / Kontrast vor und nach.
- Beschreibe die Evolution des Systems seit du geübt hast
    - Welche Verbesserungen wurden gemacht?
    - Welche Hindernisse sind aufgetreten - in Ihrer täglichen Praxis? Auch in dem größeren Umfang, den Sie kennen?

- Was sind allgemeine Ansichten von DMPs von Patienten? Wie zufrieden sind sie mit der Qualität und Art der Pflege, die sie erhalten, soweit Sie wissen?
- Was sind allgemeine Ansichten von DMPs von Ärzten einschließlich Ihnen selbst? Wie zufrieden sind sie (und Sie) mit der Qualität und Art der Versorgung, die sie ihren Patienten in diesem Modell bieten können, würden Sie sagen?
- Offensichtlich variiert dies von Patient zu Patient, aber aus Ihrer Erfahrung - was denken Sie im Durchschnitt über die tatsächlichen Auswirkungen der Teilnahme an einem DMP auf die 1) Gesundheitsergebnisse, 2) Qualität der Pflege und 3) wirtschaftliche Belastung Ihrer Typ-2-Diabetiker?
- Was sind die drastisch verbesserten Gesundheitsaspekte, die Sie aus Ihrer Erfahrung sehen - HbA1c-Spiegel? Gewicht? Andere Gesundheitsbedingungen?
- Wie nachhaltig sind Ihrer Erfahrung nach Verbesserungen, die durch eine DMP bei Patienten langfristig erzielt werden? Sehen Sie Rückfälle oder halten sich Menschen, die ihren Zustand verbessert haben, an das Protokoll?
- Wo sind die größten Geldsparer, die DMPs erleichtern, die Sie aus Ihrer Erfahrung sehen? Denken Sie, DMPs sparen Geld in der Patientenversorgung?

- Hat Deutschland mehr Erfolg bei der Senkung der Morbidität und Mortalität durch DMP durch 1), die auf eine größere Anzahl von Personen mit geringem Risiko abzielt, oder 2) weniger Personen mit hohem Risiko? Was wäre mit wirtschaftlichem Nutzen aus Option 1 oder 2?

2.2. English

Interview Questions for German Physicians:

- Tell me about your regular course of care, management, and treatment of your type 2 diabetic patients.
  - Time of diagnosis: When do you start talking to them about them being at risk – what is the marker of pre-diabetic, and do you talk to them then? Or not until they're actually basically diabetic? (Ask for specific biomarkers and protocol)
- Tell me about your experience with DMPs for type 2 diabetics as a practicing physician.
  - How does the DMP model work in Germany?
    - Is there primarily only one type 2 diabetic DMP nationwide, or are there multiple ones competing being offered?
    - Are all doctors offered participation in DMPs? Is participation highly recommended? Is it mandated?
    - How many take part? I have read that as of 2010, roughly 75% of primary care physicians are enrolled – What would you guess, has that number increased in recent years? Would that number seem to be accurate from your personal experience?
    - Do you as a physician just recommend the DMP protocol for your eligible patients, or are you obliged to almost mandate it for them?
  - What is included in the DMP? (Ask for specifics on all the topics listed below)
    - When do you suggest patients at risk of type 2 Diabetes to enroll in a DMP?
    - How often do you meet with patients enrolled in a DMP?
    - What role do nurses or nurse practitioners play in the process of management and following up with the patients' progress?
    - Are there educational classes offered on type 2 Diabetes?
    - Specialist Referrals?
      - At what point do you send patients to specialists?
      - To what extent do you try to treat them on your own before doing this?
      - Do you always follow up on the care and instructions a patient receives from the specialist?
    - Medications?
      - To what extent are medications an emphasized part of type 2 diabetes DMPs? In comparison, to what extent are lifestyle improvements more emphasized?
    - Guidelines on nutrition?
    - Guidelines on exercise?
    - Guidelines on sleep, general wellness, etc?
    - [Also ask which things are paid for through health insurance / if anything must be paid for by patients (fully or partially] for each of the topics]
  - What are the biggest strengths of the DMPs you're enrolled in?
  - What are the biggest shortcomings of the DMP you're enrolled in?
  - Did you practice before DMPs were implemented?
    - If so, compare/contrast before & after

        - Describe the evolution of the system since you've been practicing
            - What improvements have been made?
            - What obstacles have been encountered – in your daily practice? Also on the larger scale that you know of?
    - What are general views of DMPs from patients? How satisfied are they with the quality and type of care they are receiving as far as you know?
    - What are general views of DMPs from physicians including yourself? How satisfied are they (and you) with the quality and type of care they are able to provide their patients within this model would you say?
- Obviously this varies from patient to patient, but from your experience – what do you think on average is the actual impact that participating in a DMP has on the 1) health outcomes, 2) quality of care, and 3) economic burden of your type 2 diabetic patients?
    - What are the most drastically improved health aspects that you see from your experience – HbA1c levels? Weight? Other health conditions?
    - From your experience, how sustainable are improvements that came about thanks to a DMP in patients over the long term? Do you see relapses or do people who improved their condition stick with the protocol?
    - Where are the biggest money savers that DMPs facilitate that you see from your experience? Do you think DMPs save money in patient care?
- Has Germany found more success in decreasing morbidity and mortality through DMPs by 1) targeting larger number of persons at low risk or 2) smaller number of persons at high risk? What about economic benefits from option 1 or 2 would you guess?

Appendix 3. German Survey Scripts

3.1. Deutsch

Umfrage Fragen für deutsche Ärzte:
Abschnitt 1: Bitte wählen Sie die beste Antwort für jede Frage.

1) Was ist die Altersspanne Ihrer Patienten?
a. 0-20 Jahre b. 20-40 Jahre c. 40-60 Jahre d. älter als 60

2) Was ist der Standort der Praxis?
a. Ländlich b. Stadt c. Vorstädt d. Anderer Standort

3) Wie viele Jahre haben Sie Medizin praktiziert?
a. 0-10 Jahre b. 10-20 Jahre c. 20-30 Jahre d. 30+ Jahre

4) Wie oft sehen Sie Ihren durchschnittlichen gesunden Patienten (Patient ohne diagnostizierte Beschwerden?)
a. Sehr selten (seltener als einmal alle 3 Jahre)
b. Einmal alle 3 Jahre
c. Einmal alle 2 Jahre
d. Einmal im Jahr (oder öfter)

5) Wie oft unterscuchen Sie einen Patienten über 45 Jahren (der keine klinische Manifestation von Diabetes hat) für Prä-Diabetes / Typ-2-Diabetes?
a. Seltener als einmal alle 3 Jahre
b. Einmal alle 3 Jahre
c. Einmal alle 2 Jahre
d. Einmal im Jahr (oder öfter)

6) Wie oft untersuchen Sie einen übergewichtigen Patienten für Prä-Diabetes / Typ-2-Diabetes?
a. Seltener als einmal alle 3 Jahre
b. Einmal alle 3 Jahre
c. Einmal alle 2 Jahre
d. Einmal im Jahr (oder öfter)

7) Wie viel Prozent Ihrer Patienten, die Sie regelmäßig sehen, sind vordiabetisch?
a. 0-15% b. 15-30% c. 30-45% d. 45% +

8) Wie viele Prozent Ihrer Patienten, die Sie regelmäßig sehen, haben Typ-2-Diabetes?
a. 0-15% b. 15-30% c. 30-45% d. 45% +

9) Welche Art von Protokoll befolgen Sie für Ihre vordiabetischen Patienten?
a. DMP b. Andere, bitte erklären Sie (Textfeld zur Beschreibung)

10) Welche Art von Protokoll befolgen Sie für Ihre Typ-2-Diabetiker?
a. DMP b. Andere, bitte erklären Sie (Textfeld zur Beschreibung)

11) Welche Art von Intervention verschreiben Sie Ihren prädiabetischen Patienten? (Markieren Sie alle zutreffenden Antworten)
a. Ich empfehle dem Patienten Typ-2-Diabetes-Schulung / Information
b. Ich empfehle dem Patienten Diätassistent / Ernährungsprogramm
c. Ich empfehle dem Patienten ein Trainingsprogramm / Fitnessstudio / Fitnesstrainer
d. Ich empfehle dem Patienten einen Spezialisten (Podologe, Nephrologe, Augenarzt, usw.)
e. Ich sehe den Patienten öfters
f. Andere Interventionen, bitte erklären Sie (Textfeld zur Beschreibung)

12) Welche Art von Eingriff verschreiben Sie Ihren Typ-2-Diabetikern?
a. Ich empfehle dem Patienten Typ-2-Diabetes-Schulung / Information
b. Ich empfehle dem Patienten Diätassistent / Ernährungsprogramm
c Ich empfehle dem Patienten ein Trainingsprogramm / Fitnessstudio / Fitnesstrainer
d. Ich empfehle dem Patienten einen Spezialisten (Podologe, Nephrologe, Augenarzt,
e. Ich sehe den Patienten öfters
f. Andere Interventionen, bitte erklären Sie (Textfeld zum Beschreiben)

Wenn Sie an einem DMP teilnehmen, beantworten Sie bitte auch die Fragen 13-20

<u>Abschnitt 2:</u> Bitte lassen Sie mich wissen, ob Sie den folgenden Aussagen zustimmen:

13) Die Teilnahme an einem DMP verbessert die Gesundheitsergebnisse meiner Patienten (im Durchschnitt)

a) stimme nicht zu b) stimme zu c) stimme voll zu d) keine Meinung

14) Die Teilnahme an einem DMP verbessert die Qualität der Gesundheitsversorgung, die meine eingeschriebenen Patienten erhalten (im Durchschnitt)

a) stimme nicht zu b) stimme zu c) stimme voll zu d) keine Meinung

15) Die Teilnahme an einem DMP verringert die wirtschaftliche Belastung meiner Patienten (im Durchschnitt)

a) stimme nicht zu b) stimme zu c) stimme voll zu d) keine Meinung

16) Seit seiner Einführung im Jahr 2003 hat es das DMP-Modell für mich einfacher / weniger kompliziert gemacht, für meine Patienten zu sorgen

a) stimme nicht zu b) stimme zu c) stimme voll zu d) keine Meinung

Abschnitt 3: Bitte geben Sie an, wie zufrieden Sie mit der Pflege sind, die Sie Ihren Patienten durch Ihr DMP anbieten können:

17) Wie zufrieden sind Sie als Arzt mit dem aktuellen DMP-Modell?

a) überhaupt nicht zufrieden b) zufrieden c) stark zufrieden d) keine Meinung

18) Wie zufrieden sind Ihre Patienten im Durchschnitt mit der Pflege, die sie durch das DMP-Modell erhalten?

b) überhaupt nicht zufrieden b) zufrieden c) stark zufrieden d) keine Meinung

19) Wie zufrieden sind Sie mit der Autonomie / Verantwortung, die Sie als Arzt in einem DMP haben?

a) überhaupt nicht zufrieden b) zufrieden c) stark zufrieden d) keine Meinung

20) Wie zufrieden sind Sie mit der Qualität der Ressourcen, die Sie Ihren Patienten durch das DMP anbieten können?

a) überhaupt nicht zufrieden b) zufrieden c) stark zufrieden d) keine Meinung

3.2. English

Survey Questions for German Physicians:
Section 1: Please choose the best answer for each question.

1) What is the age range of your patients?
    a. 0–20 years b. 20–40 years c. 40–60 years d. 60+ years
2) What is the nature of the location of practice?
    a. Rural b. City c. Suburban d. Other
3) How many years have you been practicing medicine?
    a. 0–10 years b. 10–20 years c. 20–30 years d. 30+ years
4) How often do you see your average patient who has no previously diagnosed conditions?
    a. Very infrequently (less often than once every 3 years)
    b. Once every 3 years
    c. Once every 2 years
    d. Once a year (or more often)
5) How often do you screen a patient over 45 years (who has no clinical manifestation of diabetes) for pre-diabetes / type 2 diabetes?
    a. Less often than once every 3 years
    b. Once every 3 years

c. Once every 2 years
d. Once a year (or more often)

6) How often do you screen an overweight patient for pre-diabetes / type 2 diabetes?
   a. Less often than once every 3 years
   b. Once every 3 years
   c. Once every 2 years
   d. Once a year (or more often)
7) What percent of your patients that you see on a regular basis are pre-diabetic?
   a. 0–15% b. 15–30% c. 30–45% d. 45%+
8) What percent of your patients that you see on a regular basis have type 2 diabetes?
   a. 0–15% b. 15–30% c. 30–45% d. 45%+
9) What type of protocol do you follow for your pre-diabetic patients?
   a. DMP b. Other, please describe (have text box to describe)
10) What type of protocol do you follow for your type 2 diabetic patients?
   a. DMP b. Other, please describe (have text box to describe)
11) What type of intervention do you prescribe to your pre-diabetic patients? (Mark all answers that apply)
   a. Refer to type 2 diabetes education course/information
   b. Refer to dietitian / nutrition program
   c. Refer to exercise program / gym / physical trainer
   d. Refer to specialists (podiatrist, nephrologist, ophthalmologist)
   e. Increase how often you see them for appointments
   f. Other, please describe (have text box to describe)
12) What type of intervention do you prescribe to your type 2 diabetic patients?
   a. Refer to type 2 diabetes education course/information
   b. Refer to dietitian / nutrition program
   c. Refer to exercise program / gym / physical trainer
   d. Refer to specialists (podiatrist, nephrologist, ophthalmologist,
   e. Increase how often you see them for appointments
   f. Other (have text box to describe)

If you are enrolled in a DMP, please also answer questions 13–21

Section 2: Please let me know whether you agree with the following statements:

13) Participating in a DMP improves the health outcomes of my patients enrolled (on average)

   a) I don't agree b) I agree c) I strongly agree d) no opinion

14) Participating in a DMP improves the quality of health care my enrolled patients receive (on average)

   a) I don't agree b) I agree c) I strongly agree d) no opinion

15) Participating in a DMP lessens the economic burden of my patients enrolled (on average)

   a) I don't agree b) I agree c) I strongly agree d) no opinion

16) Since its implementation in 2003, the DMP model has made it easier/less complicated for me to care for my patients

a) I don't agree b) I agree c) I strongly agree d) no opinion

17) Since its implementation in 2003, the DMP model has made it more difficult/really complicated for me to care for my patients

a) I don't agree b) I agree c) I strongly agree d) no opinion

Section 3: Please indicate your level of satisfaction with the care you can provide your patients through your DMP:

18) How satisfied are you as a physician with the current DMP model?

a) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

19) How satisfied are your patients, on average, with the care they receive through the DMP model?

b) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

20) How satisfied are you with the amount of autonomy/responsibility you have as a physician enrolled in a DMP?

a) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

21) How satisfied are you with the quality of resources you are able to offer your patients through the DMP?

a) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

Appendix 4. American Interview Scripts

Interview Questions for American Physicians:

- Tell me about your regular course of care, management, and treatment of your type 2 diabetic patients.
- Disease Management in the U.S. – ask if they've heard of DMPs / explain
    - Are you / your patients participating in any similar program? If so, describe.
    - Is this the most common way of type 2 Diabetes care across primary care physicians? If not, what is the most common? [ask for their opinion of the general scope of types of type 2 diabetes care and management across the U.S.]
- What is included in your typical protocol for your type 2 Diabetic patients? (Ask for specifics on all the topics listed below)
    - At what point do you establish them as being type 2 Diabetic?
    - How often do you meet with patients?
    - Are there educational classes offered on type 2 Diabetes?
    - Specialist Referrals?
        - At what point do you send patients to specialists?
        - To what extent do you try to treat them on your own before doing this?
        - Do you always follow up on the care and instructions a patient receives from the specialist?
    - Medications?

        - To what extent are medications an emphasized part of your type 2 diabetes care? In comparison, to what extent are lifestyle improvements more emphasized?
        - Do you use GLP-1 receptor agonists or SGLT-2 inhibitors with your patients?
    - Guidelines on nutrition? exercise? sleep, general wellness, etc?
    - Do you address mental health problems as first part of chronic disease management?
    - Do you intensify therapy / recommendations / treatment of your patients every 3 months until they're to their goal a1c?
    - Do you focus on transition of care for your type 2 diabetic patients (like for post hospitalization from some secondary complication)?
    - Do you have a care coordinator or care navigator at your practice that does this?
    - [Also ask which things are paid for through health insurance / if anything must be paid for by patients (fully or partially) for each of the topics]
- What are the biggest strengths of the framework that you as a primary care physician in the U.S. can care for your type 2 diabetic patients?
- What are the biggest shortcomings of the framework that you as a primary care physician in the U.S. can care for your type 2 diabetic patients?
- Describe the evolution of the system since you've been practicing
    - What improvements have been made? Gotten worse?
- What are general views of your type 2 Diabetic patients? How satisfied are they with the quality and type of care they are receiving as far as you know?
    - Do they seek out extra treatment/management guidance from other sources that you know of? If so, please describe.
    - Have you heard of the Diabetes Prevention Program (YMCA)?
- What are general views of physicians including yourself regarding the type 2 Diabetic care they provide? How satisfied are they (and you) with the quality and type of care they are able to provide their patients within this model would you say? (If not very satisfied, what changes would you suggest?)
    - Obviously this varies from patient to patient, but from your experience – how does the type of type 2 diabetes care you provide improve 1) health outcomes and 2) economic burden of your type 2 diabetic patients? (elaborate!)
    - What are the most drastically improved health aspects that you see from your experience – HbA1c levels? Weight? Other health conditions?
    - From your experience, how sustainable are improvements that came about thanks to your care in patients over the long term? Do you see relapses or do people who improved their condition stick with the protocol?
- Do you think your type 2 Diabetes care saves significant healthcare dollars in patient care? Where are the biggest money savers that you see from your experience?
- Are you on value-based contract or fee for service? How do you see value-based care as impacting chronic disease management?
- What is your opinion of ACOs? Clinically integrated networks? How do you see either of these impacting quality of care, health outcomes, and economic burdens for type 2 diabetics?
- What do you think of one-sided risk vs. two-sided risk value based contracts?
- Do you utilize the 20 minutes of chronic care management / month for patients with 2+ chronic conditions that's paid for by Medicare? If yes, how?
- Do you think that having extended hours late at night would help low SES patients come to doctor more? If no, what ways would encourage them to come and compliancy?
- What do you think of RAF score system for payment and how do you see it impacting chronic disease management / care and outcomes for type 2 diabetics?

- What do you think of Physician Fee Schedule 2019 and how it will impact chronic disease care / management?
- What do you think of Medicare Advantage?
- What do you think of MIPS and how does it impact chronic disease care / management?

Appendix 5. American Survey Scripts
Survey Questions for American Physicians:
<u>Section 1: Please choose the best answer for each question.</u>

22) What is the age range of your patients?
    a. 0–20 years b. 20–40 years c. 40–60 years d.
23) What is the nature of the location of practice?
    a. Rural b. City c. Suburban d. Other
24) How many years have you been practicing medicine?
    a. 0–10 years b. 10–20 years c. 20–30 years d. 30+ years
25) How often do you see your average patient who has no previously diagnosed conditions?
    a. Very infrequently (less often than once every 3 years)
    b. Once every 3 years
    c. Once every 2 years
    d. Once a year (or more often)
26) How often do you screen a patient over 45 years (who has no clinical manifestation of diabetes) for pre-diabetes / type 2 diabetes?
    a. Less often than once every 3 years
    b. Once every 3 years
    c. Once every 2 years
    d. Once a year (or more often)
27) How often do you screen an overweight patient for pre-diabetes / type 2 diabetes?
    a. Less often than once every 3 years
    b. Once every 3 years
    c. Once every 2 years
    d. Once a year (or more often)
28) What percent of your patients that you see on a regular basis are pre-diabetic?
    a. 0–15% b. 15–30% c. 30–45% d. 45%+
29) What percent of your patients that you see on a regular basis have type 2 diabetes?
    a. 0–15% b. 15–30% c. 30–45% d. 45%+
30) What type of protocol do you follow for your pre-diabetic patients?
    a. DMP b. Other, please describe (have text box to describe)
31) What type of protocol do you follow for your type 2 diabetic patients?
    a. DMP b. Other, please describe (have text box to describe)
32) What type of intervention do you prescribe to your pre-diabetic patients? (Mark all answers that apply)
    a. Refer to type 2 diabetes education course/information
    b. Refer to dietitian / nutrition program
    c. Refer to exercise program / gym / physical trainer
    d. Refer to specialists (podiatrist, nephrologist, ophthalmologist,
    e. Increase how often you see them for appointments
    f. Other, please describe (have text box to describe)
33) What type of intervention do you prescribe to your type 2 diabetic patients?
    a. Refer to type 2 diabetes education course/information
    b. Refer to dietitian / nutrition program

c. Refer to exercise program / gym / physical trainer
d. Refer to specialists (podiatrist, nephrologist, ophthalmologist,
e. Increase how often you see them for appointments
f. Other (have text box to describe)

Section 2: Please indicate your level of satisfaction with the care you can provide your patients through your DMP:

34) How satisfied are you as a physician with the framework that you as a primary care physician in the U.S. can care for your type 2 diabetic patients?

c) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

35) How satisfied are your patients, on average, with the current type 2 Diabetes care they receive?

d) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

36) How satisfied are you with the amount of autonomy/responsibility you have as a physician providing care to your type 2 Diabetic patients?

b) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

37) How satisfied are you with the quality of resources you are able to offer your type 2 Diabetic patients?

b) Not satisfied at all b) satisfied c) I strongly satisfied d) no opinion

Appendix 6. Recruitment Emails for German Physicians
6.1. For Interview Inquiry

Sehr geehrter / geehrte _____,

Mein Name ist Sarah Dinegar, und ich bin die Nichte von Herrn Haeger. Ich studiere Pre-Medizin und Deutsch an der Northwestern Universität in Evanston, Illinois. Ich führe eine Forschungsstudie in der Abteilung für Deutsch bei meiner Professorin, Dr. Franziska Lys, an der Northwestern durch. Ich bitte um Ihre Teilnahme in einem Interview, da Sie aufgrund Ihrer Erfahrung als Arzt über meine Forschung verfügen. Der Zweck dieser Studie ist es, die differenzierten Unterschiede bei der Behandlung und Behandlung von Typ-2-Diabetes in Deutschland im Vergleich zu den USA zu verstehen. Ich möchte speziell über die Typ-2-Diabetes-Disease-Management-Programme (DMPs) in Deutschland lernen und versuchen, Parallelmodelle zu identifizieren verwendet von den US-Ärzten. Ich möchte spezifische Unterschiede zwischen den Methoden beider Länder aufzeigen, die dazu beitragen könnten, die wirksamsten Methoden zur Behandlung und Behandlung von Typ-2-Diabetes zu finden. Ihre Teilnahme würde mir dabei helfen, dies zu erreichen.

Ob Sie teilnahmen möchten, können wir dann ein Termin für das Interview finden. Das Interview sollte ungefähr 45-50 Minuten dauern, und natürlich könnte ich zu Ihrer Arztpraxis kommen, um das Interview zu führen. Ich werde auch Ihre Teilnahme in einer kurzer Online-Umfrage (nur 5-10 Minuten lang) bitten. Die Online-Umfrage ist völlig freiwillig.Ich bin in vom 21. bis 29. Juni in Deutschland — welche Tag (und um welche Uhrzeit) während dieser Zeit würde für Sie gehen?

Ich bedanke Sie schon im Voraus für die Zeit, die Sie mich nehmen. Ich weiß, wie wertvoll und begrenzt Ihre Zeit ist, und ich schätze Ihre Hilfe sehr. Ob Sie irgendeine Fragen über die Forschungsstudie oder die Befragungen, lassen Sie es mich wissen, und ich kann gerne mehr Einzelheiten zur Verfügung stellen.

Freundliche Grüße,

Sarah Dinegar
Northwestern Universität Klasse von 2019
Weinberg College of Arts & Sciences
Pre-medizin, Biochemie/Biophysik Konzentration l Deutsch

6.2. For Survey Inquiry (email requested to be passed on to colleagues of interviewed physicians)

Sehr geehrter / geehrte _____,

Vielen Dank für Ihre Zeit und Hilfe mit meiner Studie. Ihr Interview war sehr hilfreich, und ich bin ganz dankbar für Ihre Teilnahme. Hier ist der Link für die kurze Online-Umfrage, wovon ich Ihnen erzählt habe: https://weinberg.co1.qualtrics.com/jfe/form/SV_8wYpGskOvO13lEV
Wenn Sie Zeit haben, können Sie das bitte ausfüllen.

Wenn ich Sie noch um einen großen Gefallen bitten dürfte, wäre ich ihnen sehr dankbar, wenn Sie so nett wären, diese Online-Umfrage an verschiedene Kollegen weiterzuschicken. Mein Ziel ist natürlich so viele Antworten wie möglich zu erhalten, um eine bessere statistische Aussagekraft für meine Studie zu erzielen. Ich habe unten eine Email-Vorlage beigefügt, die Sie benutzen könnten, um Ihre Kollegen zur Teilnahme an der Studie zu bitten. Darüber würde ich mich sehr freuen. Aber wenn Sie möchten das nicht tun, das ist kein Problem und ich bin immer noch ganz dankbar für Ihre Teilnahme.

Herzliche Dank noch mal für Ihre Hilfe. Eine schöne Woche, und alles Gute!

Mit freundlichen Grüßen

Sarah Dinegar
Northwestern University Class of 2019
Weinberg College of Arts & Sciences
Biology, Biochemistry/Biophysics Concentration | German

Appendix 7. Recruitment Emails for American Physicians

7.1. For Interview Inquiry

Dear _____,

My name is Sarah Dinegar, and I am a friend of Dr. Ana Gardner and have received your contact information through her. Thank you very much for your interest in participating in my research. I am a rising senior studying Pre-medicine and German at Northwestern University in Evanston, Illinois. I am conducting this research study in Northwestern's department of German with my professor, Dr. Franziska Lys. The purpose of this study is to understand the differences in the treatment and management of type 2 diabetes in Germany as compared to the US. I have traveled to Germany and interviewed 8 physicians there, and learned a great deal specifically about the type 2 diabetes disease management programs (DMPs) they use there. I now want to interview physicians in the U.S. to compare the care administered to type 2 diabetic

patients here to the care administered through the DMPs as well as try to identify parallel models used by the US doctors. I thus am asking for your participation in an interview because of your experience as a physician. I would like to highlight specific differences between the methods of both countries that could help to find the most effective methods of treating and treating type 2 diabetes. Your participation helps me achieve this.

The interview should take about 45-50 minutes, and I can come to your doctor's office (or wherever else would be most convenient for you) to conduct the interview. I am in Colorado from now through early September, and am very flexible in the times and days that I can come interview. Let me know your availability in upcoming weeks or throughout August, and we can schedule a time. I will also ask you to participate in a quick online survey (only 5-10 minutes long) following the interview, so that I can obtain statistical results of answers to some questions in addition to the interview. The online survey is completely voluntary, though.

I thank you in advance for the your consideration – I know how valuable and limited your time is, and I appreciate your help immensely. If you have any questions about the research study or the interviews, please let me know and I can gladly provide more details.

Best Regards,

Sarah Dinegar
Northwestern University Class of 2019
Weinberg College of Arts & Sciences
Pre-Medical Track, Biochemistry/Biophysics Concentration | German

7.2. For Survey Inquiry (email requested to be passed on to colleagues of interviewed physicians)

To Whom it May Concern,

My name is Sarah Dinegar, and I am an aspiring medical student at Northwestern University in Evanston, Illinois. I am performing a research study under Dr. Franziska Lys in the Department of German to compare type 2 Diabetes treatment and management in Germany versus in the U.S. I ask for your participation in this brief online survey portion of my survey, as you possess expertise from your experience as a physician that pertains to my research. I want to learn specifically about the type 2 diabetes Disease Management Programs (DMPs) Germany uses, and try to identify any parallel models used by the U.S. physicians. I aim to pinpoint specific differences between the two nations' methods that could contribute to conclusions of the most effective ways to treat and manage type 2 diabetes, and your participation in my survey would help me immensely in achieving this.

Thank you very much for your time and consideration. I know how valuable and limited your time is, and I really appreciate your help.

Best Regards,

Sarah Dinegar
Northwestern University Class of 2019
Weinberg College of Arts & Sciences
Pre-Medical Track, Biochemistry/Biophysics Concentration | German

REFERENCES

American Diabetes Association. (2013). Economic costs of diabetes in the US in 2012. *Diabetes care*, *36*(4), 1033-1046.

American Diabetes Association. (2017). Standards of medical care in diabetes. *Diabetes Care*, 40(S1), S1–S131.

American Diabetes Association. (2018). Economic costs of diabetes in the US in 2017. *Diabetes care*, *41*(5), 917-928.

American Nurses Association (ANA). (2012). *The Value of Nursing Care Coordination*.

Bahr, D. & Huelskoetter, T. (2014). Comparing the Effectiveness of Prescription Drugs: The German Experience. *Center for American Progress.*

Beamesderfer, A. & Ranji, U. (2012). U.S. Health Care Costs, Background Brief. Kaiser Family Foundation.

Behrick, E., Hood, E., & Barnett, J. (2018). *Health Insurance Coverage in the United States: 2017.* United States Census Bureau.

Bloom, F. J., Graf, T., Anderer, T., & Stewart, W. F. (2010). Redesign of a diabetes system of care using an all-or-none diabetes bundle to build teamwork and improve intermediate outcomes. *Diabetes Spectrum*, *23*(3), 165-169.

Brandt, S., Hartmann, J., & Hehner, S. (2010). *How to design a successful disease-management program.* McKinsey & Company.

Bundesversicherungsamt (2016). *Zulassung der strukturierten Behandlungsprogramme (Disease Mangement Programme – DMP) durch das Bundesversicherungsamt (BVA).*

Burton, Rachel. (2012). *Improving Care Transitions.* Health Affairs Health Policy Brief.

Buttorff C., Ruder T., & Bauman M. (2017). *Multiple Chronic Conditions in the United States.* Rand Corporation.

Care Transformation Center Advisory Board. (2014). *The care transformation alphabet: What's the difference between CI, ACO, and PCMH?*

Centers for Disease Control and Prevention. (2014). *Now, two out of every five Americans is expected to get type 2 diabetes during their lifetimes*.

Centers for Disease Control and Prevention. (2017). *National diabetes statistics report, 2017.*

Centers for Disease Control and Prevention. (2018). *Diabetes Home, Type 2 Diabetes.*

Centers for Medicare and Medicaid Services. (2013). Press release, *Pioneer Accountable Care Organizations succeed in improving care, lowering costs*.

Congressional Budget Office. (2017). *The Bipartisan Health Care Stabilization Act of 2017 and the Individual Mandate.*

Davis, K., Stremikis, K., Squires, D., & Schoen, C. (2014). "Mirror, Mirror on the Wall: How the Performance of the U.S. Health Care System Compares Internationally, 2014 Update." *The Commonwealth Fund Commission on a High Performance Health System*.

Department of Professional Employees. (2016). *The U.S. Healthcare System: An International Perspective Factsheet.*

Diabetes in Zahlen. (n.d.) *Deutsche Diabetes Hilfe*.

End of Life Care. (2013). *The Dartmouth Atlas of Health Care*.

Evidence for Integrated Care. (2015). McKinsey & Company.

Feeley, T. W. & Mohta, N.S. (2018). New Marketplace Survey: Transitioning Payment Models: Fee-for-Service to Value-Based Care. *New England Journal of Medicine Catalyst*.

Frist B., & Rivlin A. (2015). *The Power of Prevention.* U.S. News and World Report.

Fuchs, S., Henschke, C., Blümel, B., & Reinhard, M. (2014). Disease Management Programs for Type 2 Diabetes in Germany. *Deutsches Ärzteblatt International*, 111(26), 453–63.

Harbage, P. & Furnas, B. (2009). The Cost of Doing Nothing on Health Care*. Center for American Progress.*

Health and Economic Costs of Chronic Disease. (2019). *Center for Disease Prevention: National Center for Chronic Disease Prevention and Health Promotion.*

Health Policy Institute, McCourt School of Public Policy. (2003). Georgetown University. *Diabetes Management Programs: Improving Health while Reducing Costs?*

Institute for Quality and Efficiency in Health Care (IQWiG). (2015). *Health insurance in Germany.*

Kähm, K., Laxy, M., Schneider, U., et al. (2018): Health Care Costs Associated With Incident Complications in Patients With Type 2 Diabetes in Germany. *Diabetes Care*, 41(5): 971–978

Key Facts about the Uninsured Population. (2018). Kaiser Family Foundation.

Key Features of the Affordable Care Act, By Year. (n.d.) U.S. Department of Health and Human Services.

Khazan O. (2014). What American Healthcare Can Learn from Germany*. The Atlantic*.

Knox, R. (2008). Keeping German Doctors On A Budget Lowers Costs. *National Public Radio*.

Koch, K., Miksch, A., Schürmann, C, et al. (2011). The German Health Care System in International

Comparison: The Primary Care Physicians' Perspective. *Deutsches Ärzteblatt International*, 108(15): 255–261.

Köster, I., Schubert, I., & Huppertz, E. (2012). Follow up of the CoDiM-study: cost of diabetes mellitus 2000–2009. *Deutsche Medizinische Wochenschrift,* 137:1013–16.

Kostev, K., Rockel, T., & Jacob, L. (2016). Impact of Disease Management Programs on HbA1c Values in Type 2 Diabetes Patients in Germany. *Journal of Diabetes Science and Technology,* 11(1), 117-122.

Laxy M, Stark R, Meisinger C, et al. (2015). The effectiveness of German disease management programs (DMPs) in patients with type 2 diabetes mellitus and coronary heart disease: results from an observational longitudinal study. *Diabetology and Metabolic Syndrome*, 7: 77.

Link, C. L., & McKinlay, J. B. (2009). Disparities in the prevalence of diabetes: is it race/ethnicity or socioeconomic status? Results from the Boston Area Community Health (BACH) survey. *Ethnicity & disease*, *19*(3), 288.

Long, M., Rae, M., Claxton, G., Jankiewicz, A., & Rousseau, D. (2016). Recent Trends in Employer-Sponsored Health Insurance Premiums. Jama, 315(1), 18-18.

Majerol, M., Kewkirk, V., & Garfield, R. (2015). *The Uninsured: A Primer – Key Facts about Health Insurance and The Uninsured in the Era of Health Reform.* Kaiser Family Foundation.

Mathers, C.D., & Loncar D. (2006). Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med*, 3(11), e442.

McClellan M, Kent J, Beales S, et al. (2013). *Accountable care: focusing accountability on the outcomes that matter: report of the Accountable Care Working Group*. World Innovation Summit for Health.

McGlynn, E. A., Asch, S. M., Adams, et al. (2003). The quality of health care delivered to adults in the United States. *New England Journal of Medicine*, 348(26), 2635-2645.

Medicaid: Changes under the Affordable Care Act. (2017). *Health Reform Tracker.* UCSF/UC Hastings Consortium on Law, Science and Health Policy.

Mossialos, E., Wenzl, M., Osborn, R., & Anderson, C. (2015). *International Profiles of Healthcare Systems, 2014.* The Commonwealth Fund.

Mostashari F, Sanghavi D, McClellan M. Health reform and physician-led accountable care: the paradox of primary care physician leadership. *JAMA*. 2014; *311*(18): 1855 – 6.

Nagel, H., Baehring, T, & Scherbaum, A. (2006). Implementing Disease Management Programs for Type 2 Diabetes in Germany. *German Diabetes Center, Leibniz Center for Diabetes Research at the Heinrich Heine University of Dusseldorf, Germany*, 50-53.

National Diabetes Statistics Report (2017). *Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.* 3-9

National Institute of Diabetes and Digestive and Kidney Diseases. (n.d.) *Changing Landscape: From Fee-for-Service to Value-Based Reimbursement.*

Neu, A., Feldhahn, L., Ehehalt, S., Hub, R., Ranke, M. B., & DIARY group Baden-Württemberg. (2009). Type 2 diabetes mellitus in children and adolescents is still a rare disease in Germany: a population-

based assessment of the prevalence of type 2 diabetes and MODY in patients aged 0–20 years. *Pediatric diabetes*, *10*(7), 468-473.

North Texas Clinically Integrated Network, Inc. (TXCIN). (2019). *Cracking the Shared Savings Code.*

Organisation for Economic Co-operation and Development. (2015). *Health at a Glance 2015: OECD Indicators.*

Paradise, J. (2015). *Medicaid Moving Forward*. Kaiser Family Foundation.

Reinhardt, U. (2009). Health Reform Without a Public Plan: The German Model. *The New York Times*.

Ridic, G., Gleason, S., & Ridic, O. (2012). Comparisons of health care systems in the United States, Germany and Canada. *Materia socio-medica*, *24*(2), 112–120.

Rosenbloom, A. L., Joe, J. R., Young, R. S., & Winter, W. E. (1999). Emerging epidemic of type 2 diabetes in youth. *Diabetes care*, *22*(2), 345-354.

Tamayo, T., Brinks, R., Hoyer, A., Kuß, O., & Rathmann, W. (2016). The prevalence and incidence of diabetes in Germany: an analysis of statutory health insurance data on 65 million individuals from the years 2009 and 2010. *Deutsches Ärzteblatt International*, *113*(11), 177.

Tilburt, J.C., Wynia, M.K., Sheeler, R.,D., et al. (2013). Views of US physicians about controlling health care costs. *JAMA*. 310(4):380-388.

Ulrich, S., Holle, R., Wacker, M., et al. (2016). Cost burden of type 2 diabetes in Germany: results from the population-based KORA studies. *BMJ open*, *6*(11), e012527.

U.S. Health in International Perspective: Shorter Lives, Poorer Health. (2013). *National Research Council.*

Winkler, E., Basch, P., & Cutler, D. (2012). Paper Cuts: Reducing Health Care Administrative Costs. *Center for American Progress*.