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Improving Type 2 Diabetes Therapy Adherence and Persistence in Mexico

How to Address Avoidable Economic and Societal Burden

PATIENT
ACTIVATION

Introduction

As the prevalence of type 2 diabetes (T2D) increases globally, the condition and its associated complications are generating considerable—and growing—economic burden on healthcare systems and societies. Mexico reflects this trend, facing a rising prevalence of T2D,[1] with approximately two out of five people either having—or at high risk of developing—T2D, and 20.6 million people projected to live with the condition by 2040. Despite improved diagnosis and advances in treatment options for individuals with T2D, sub-optimal therapy adherence and persistence limit the benefits derived from these and contribute to avoidable economic and social burden.

This report is part of a publication series examining six countries and their differing stages of recognition of T2D as a public health priority. It examines the Mexico-specific burden of T2D and its complications, initiatives in place to address this issue, and opportunities in relation to therapy adherence and persistence improvement strategies. A range of validated, Mexico-specific recommendations to address sub-optimal T2D therapy adherence and persistence are put forth for action government stakeholders, payers and healthcare administrators, among other organizations and focus on three broad phases of a patient journey toward optimal adherence and persistence, (i) identify and profile, (ii) activate and, (iii) sustain. These are all designed to improve T2D therapy adherence and persistence in the Mexican population, and consequently decrease significant and avoidable economic and societal costs, and improve quality of life for people living with the condition.

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Burden of T2D

Overview of T2D and its complications

Type 2 Diabetes (T2D) is a chronic condition characterized by both insulin resistance and the progressive dysfunction of insulin-producing pancreatic beta-cells. Consequently, person(s) with T2D (henceforth referred to as PwD in this paper) suffer from elevated blood glucose and lipid levels as well as elevated blood pressure, which can result in long-term vascular complications.[2]

Undetected or poorly managed T2D with persistently elevated levels of blood glucose increases the risk of long-term debilitating and life-threatening complications due to macrovascular (e.g. stroke, myocardial infarction) and microvascular damage (e.g. nephropathy, foot ulcers leading to amputations, retinopathy leading to blindness), as well as short-term complications such as lethargy, poor wound healing and propensity for opportunistic infections. All of these complications can vastly decrease quality of life, productivity and life expectancy of PwD.

A major public health concern with significant economic and societal burden

In Mexico, there are at least 6.6 million people diagnosed with T2D, another 3.6 million people undiagnosed,[3, 4] and over 40 million people at high risk of T2D when considering the adult population classified as overweight and obese.[3] In other words, approximately two out of five people in the country either have or are at high risk of having T2D. Furthermore, prevalence is increasing with Mexico expected to have 20.6 million diagnosed PwD by 2040.[5] PwD are managed with a combination of lifestyle changes and pharmacotherapy, which includes a range of oral anti-diabetic and injectable drugs. However, despite a variety of effective medications,[6] this condition is not well controlled in many PwD.[7]

This high prevalence, combined with poor control, translates into diabetes being among the two leading causes of death in Mexico.[8] Approximately 20% of PwD develop diabetic foot ulcers[9] and, in 2013, 75,000 diabetes-related amputations were performed at Mexican hospitals.[10] Indeed, the leading causes of hospitalization are amputation; decompensation, which is linked to hypoglycemia; and infections.[11]

Economically, it was estimated that in 2013 approximately MXN179.5 billion were spent on diabetes care (direct costs).[1] It is worth noting that this cost estimate does not account for indirect costs such as loss of productivity of PwD, caregivers and families. In addition, aside these costs, there is also the impact on lower quality of life.[1] As such, T2D places a significant burden on the healthcare system and strain on society, which, in light of the epidemiological trends in the country, will rapidly escalate.

Challenges managing T2D in the Mexican healthcare system today

The Mexican health system is fragmented and there is neither a unified model of care nor a set of guidelines for diabetes implemented across the nation. PwD experience different levels of access to specialists, depending on the institution that provides health coverage in their location. Primary-care physicians also have different levels of preparation and approaches to treating PwD. Looking to provide holistic care, key public institutions in Mexico have implemented multidisciplinary programs of care for PwD, such as DiabetIMSS and MIDE (Integral Program in Stages for Diabetes Management). These programs however reach a limited number of PwD; indeed, DiabetIMSS cares for approximately 100,000 PwD on a monthly basis[12] while MIDE has over 40,000 people enrolled.[13] While there is a positive impact regarding prevention and treatments to reduce clinical and biochemical parameters, outcomes of specific improvement in glycemic or metabolic control are not consistently documented.[14]

Within this context, the National Strategy for the Prevention and Control of Overweight, Obesity and Diabetes established three strategic pillars (public health, medical attention and health regulation) to mitigate the impact of diabetes.[15] Each of the three pillars details areas of action to accomplish four main over-arching objectives:

1. Increase public and individual awareness on obesity and its relation to non-communicable conditions
2. Focus the National Health System on early diagnosis
3. Solve and control in the first contact
4. Decelerate the increase in prevalence of overweight, obesity and non-communicable conditions[15]

The National Strategy for the Prevention and Control of Overweight, Obesity and Diabetes, states that improving treatment adherence is one of two ways to improve PwD' quality of life and prevent further complications. However, the topic of adherence and persistence is not covered extensively and the underlying causes for failing to achieve optimal adherence and persistence and how to overcome them have not been fully addressed in Mexico. The work done so far to improve diabetes outcomes could be augmented by other, more targeted strategies that focus on current PwD to help them manage their condition and reduce the rate of diabetes-related complications.

Sub-optimal adherence and persistence is a cause of T2D-related complications

Adherence and persistence defined

The challenges in the T2D integrated care system outlined above contribute directly or indirectly to sub-optimal adherence and persistence to T2D therapy among PwD.

Defining therapy adherence and persistence

There is a lack of consensus in the literature on the exact definition of therapy adherence and persistence. In this paper, these terms are defined as:

Therapy adherence

"The extent to which a PwD acts in accordance with the prescribed interval, and dose of a dosing regimen"[16]

Therapy persistence

"The duration of time from initiation to [healthcare professional (HCP) recommended] discontinuation of therapy"[16]

Additionally, this paper focuses on the proportion of people who have low therapy adherence, rather than the level of therapy adherence itself.

Extent of sub-optimal T2D drug therapy adherence and persistence

Literature research and interviews have indicated that sub-optimal adherence and persistence is a significant issue for PwD, globally. A number of systematic reviews and meta-analyses on diabetes therapy adherence around the world have been conducted,[17, 18, 19] the most recent of which identified 27 studies and found that the proportion of PwD who are non-adherent to therapy ranges from 6.9% to 61.5%, with a mean value of 37.7%.[19] In Mexico specifically, a 2009 longitudinal, multi-thematic survey representative of the Mexican population at the national, regional, urban and rural level, identified that 45% of PwD were non-adherent while a further 14% completely abandoned treatment.[20]

Similarly, a comparative cross–sectional study conducted between 1997 and 1998 among 150 PwD in Chihuahua, Mexico, indicated that the proportion of non–adherent PwD was 45.8%.[21] This suggests that adherence and persistence is a significant unmet need for PwD in Mexico. This low level of general adherence may contribute to the high average HbA1c, indicating poor blood glucose control.[3, 20]

Despite these significant values, the actual rates of sub–optimal adherence and persistence to T2D therapy in Mexico may be even higher than the estimates stated above because many of these studies fail to grasp all aspects of adherence and persistence. For example, they are unlikely to include rates of primary non–adherence, defined as PwD who have been diagnosed but never initiated therapy. Additionally, many of these studies will not measure those who started but have since ceased taking their medications or, those who pick up their medication but do not take them at the recommended time or dose, i.e. poor concordance with dosing instructions.

Economic burden of sub-optimal adherence and persistence on governments and healthcare systems

Recognizing that sub–optimal T2D therapy adherence and persistence causes persistently elevated blood glucose levels,[22, 23] leading to increased risk of complications[24] and subsequently costs,[25,26] the extent of this contribution to complication–related costs was estimated. To do this, the CORE Diabetes Model (CDM), a validated health economic model, also used by payers to update diabetes guidelines in other countries,[26, 27, 28, 29] was customized to Mexico in order to provide guidance on potential healthcare system savings if the issue of sub–optimal T2D therapy adherence and persistence was addressed in Mexico.

Calculating the cost of sub-optimal T2D therapy adherence and persistence with the CORE Diabetes Model

The CORE Diabetes Model is a validated, peer-reviewed model, which simulates clinical outcomes and costs for cohorts of patients with either type 1 or type 2 diabetes.[26, 27] The model has been customized to calculate the cost of avoidable T2D-related complications as a result of those PwD who struggle with therapy adherence and persistence.

This has been achieved by applying two key Mexico specific data points:

1. The percentage of PwD with sub-optimal levels of therapy adherence and persistence

   • Up to 59% as reported in ENNVIH 2009 survey (National Living Standards of Households Survey)[20]

2. The relationship between sub-optimal adherence and HbA1c as estimated by a weighted average among ENSANUT[3] and ENNVIH 2009 surveys results[20]

   • 33.4% increase in HbA1c due to sub-optimal adherence (significantly higher than results from a widely-cited scientific study on US PwD[23])
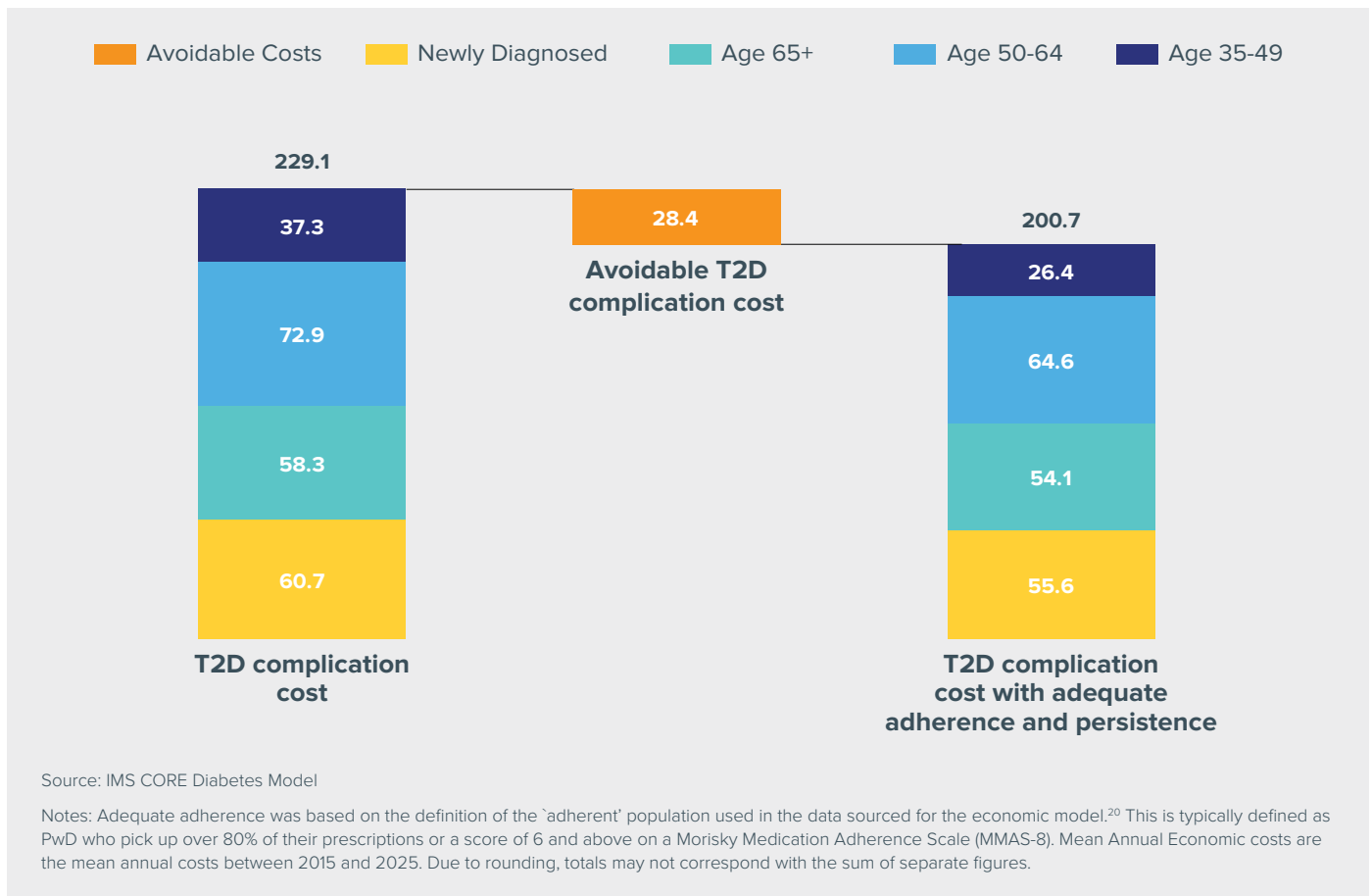
What are HbA1c levels?

HbA1c levels are used to diagnose and monitor diabetes and refer to glycated hemoglobin (HbA1c), reflective of average plasma glucose concentration. HbA1c develops when hemoglobin, an oxygen-carrying red blood cell protein, combines with glucose in the blood, thus becoming glycated.[30]

Measurement of HbA1c reflects average plasma glucose levels over a period of 8-12 weeks. It can be performed at any time of the day and does not require any special preparation such as fasting.[31] These properties have made it the preferred test for both diagnosing diabetes and assessing glycemic control in PwD.[31] The higher the HbA1c level, the higher the increase in risk of diabetes-related complications. Normal, high risk and diabetic HbA1c ranges are provided below:[32]

HbA1c Level	Indication
<5.7%	Normal range
5.7%-6.4%	High risk range
>6.5%	Diabetes

Using the CDM, it has been estimated that the cost of T2D–related complications to the Mexican healthcare system will be MXN229.1 billion per year (mean annual economic costs between 2015 and 2025, see Exhibit 1). By customizing the CDM to take into account therapy adherence and persistence levels in Mexico, it has been estimated that as much as 12.4% of this, or approximately MXN28.4 billion per year, will be driven by complications suffered by those PwD who are currently struggling to achieve optimal T2D therapy adherence and persistence (see Exhibit 1).

Exhibit 1: Mean Annual Economic Costs Associated With Sub-Optimal T2D Drug Therapy Adherence and Persistence in Mexico 2015-2025, MXN Bn

Legend: Avoidable Costs · Newly Diagnosed · Age 65+ · Age 50-64 · Age 35-49

T2D complication cost: 229.1
- Age 35-49: 37.3
- Age 50-64: 72.9
- Age 65+: 58.3
- Newly Diagnosed: 60.7

Avoidable T2D complication cost: 28.4

T2D complication cost with adequate adherence and persistence: 200.7
- Age 35-49: 26.4
- Age 50-64: 64.6
- Age 65+: 54.1
- Newly Diagnosed: 55.6

Source: IMS CORE Diabetes Model

Notes: Adequate adherence was based on the definition of the `adherent' population used in the data sourced for the economic model.[20] This is typically defined as PwD who pick up over 80% of their prescriptions or a score of 6 and above on a Morisky Medication Adherence Scale (MMAS-8). Mean Annual Economic costs are the mean annual costs between 2015 and 2025. Due to rounding, totals may not correspond with the sum of separate figures.

To provide a sense of proportion, MXN28.4 billion average annual cost is equal to ~3.7% of total healthcare spend in Mexico in 2015.[34] In summary, the economic cost burden of T2D complications of Mexico PwD who are struggling to achieve optimal T2D therapy adherence and persistence is significant and, most importantly, avoidable.

Furthermore, this unnecessary spend and economic wastage is only one dimension of the overall cost of sub-optimal T2D therapy adherence and persistence as it only pertains to the costs associated with avoidable complications of T2D and does not include indirect costs related to lost work days for working-age PwD and their family members. Additionally, spending and investment related to HCP training, T2D screening, diagnosis and PwD education, regular GP or hospital appointments, medication dispensing and medicine costs are all sub-optimized if PwD are unable to adhere and persist with their therapy or make the necessary changes to their lifestyle.

Moreover, these costs are expected to be underestimates due to the difficulty in accurately measuring the full extent of suboptimal therapy adherence and persistence. Separately, due to the long-term nature of the disease and the increasing prevalence, the costs linked to suboptimal adherence and persistence in T2D therapy are only set to escalate in the short-to-medium term.

Burden of sub-optimal adherence and persistence on individuals and society

The CDM has also estimated the extent of increased risk for debilitating and life–threatening complications such as coronary artery disease and myocardial infarction, cerebrovascular disease and stroke, renal failure, diabetic retinopathy and blindness, diabetic peripheral neuropathy and diabetic ulcers and lower limb amputations in PwD that are sub–optimally adherent and persistent to their T2D therapy in Mexico (see Exhibit 2). It must be noted that the particularly large increase in risk of end–stage renal disease is, at least in part, due to elevated HbA1c levels having a greater impact on microvascular complications in comparison to macrovascular complications with diabetes being the single most common cause of end–stage renal disease in the developed world. Therefore, poor diabetes control will create a much stronger impact on increasing the risk of these diabetes specific microvascular complications when compared to those with multiple other risk factors (i.e. stroke and heart attack).[35]

Exhibit 2: Increased Risk of Complications and Healthcare Costs Over the Lifetime of a Non–Adherent PwD

Percent increased risk versus adherent PwD	Complication
510%	More likely to have end stage renal disease
15%	More likely to have a heart attack
15%	More likely to have a stroke
19%	More likely to have an amputation
27%	More likely to go blind (severe vision loss)
>MXN458,522	**Estimated extra cost to the healthcare system over their lifetime**

Source: IMS CORE Diabetes Model

Notes: Increased lifetime risk of various complications and healthcare costs calculated over the lifetime of a non-adherent PwD in comparison to an adherent PwD, based on a 50-64 year old PwD

The path to optimal adherence and persistence relies on effective patient activation

Action is needed

By 2040, Mexico is set to have 20.6 million people diagnosed with T2D.[5] Currently, it is estimated that the direct cost of diabetes complications in Mexico is approximately MXN229.1 billion.[36] Of this, 12.4% is being driven by sub-optimal T2D therapy adherence and persistence.[36] Absence of action to tackle this problem now, when prevalence continues to rise, will result in an unsustainable build-up of costs.

A set of practical and action-oriented recommendations has been proposed in this paper to raise levels of adherence and persistence in T2D therapy, including diet, exercise and glucose-lowering medicines, by:

- Identifying and profiling PwD in need of help
- Improving access to and customizing T2D education
- Optimizing the physician capacity/capability balance in the public sector
- Using digital technology to maintain effective disease self-management

These recommendations are presented to inspire collaborative conversation and health outcome-oriented pilots that, if found successful, should be expanded to improve treatment outcomes and help reduce the significant cost burden of sub-optimal T2D therapy adherence and persistence.

Effective patient activation

What is patient activation?

Activation is defined as how well a person understands his or her role in the care process, and whether that person has the knowledge, skills, capacity and confidence to follow through with this role.[37] As such, PwD activation relates to an individual's willingness and ability to take independent actions to manage his or her health and care.

Research shows that increased degrees of activation are positively correlated with an increase in adherence to therapy and a reduction in healthcare expenditure.[38, 39, 40] For example, one study, which considers T2D among other conditions, found that patients with lowest activation levels were predicted to cost 21% more than highly activated patients.[38]
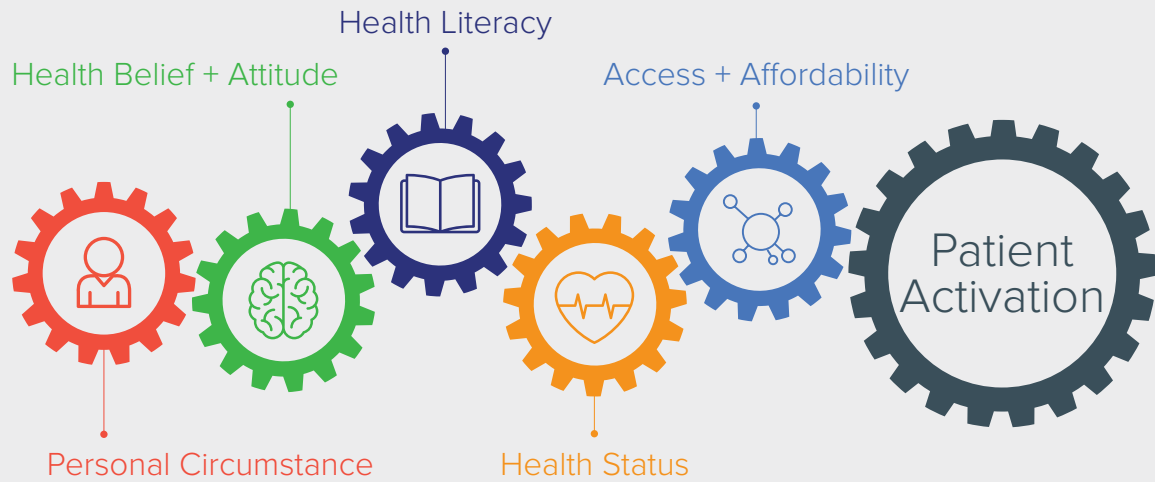
Consequently, T2D therapy adherence and persistence will remain suboptimal as long as PwD activation remains inadequate. Effective PwD activation is difficult to achieve as it stems from the synergistic impact of multiple underlying drivers and stakeholders. Hence, a tailored, individualistic approach is needed to improve adherence.

Based on literature and qualitative expert interviews, 'health beliefs and attitude', 'personal circumstances', 'health status', 'health literacy' and 'access and affordability' have been identified as the five key drivers of PwD activation (see Exhibit 3).[41, 42, 43, 44, 45] While these five distinct drivers work in concert to influence overall degree of PwD activation, they are also intertwined such that changes in one driver impact others (see Exhibit 3). For example, improving health literacy may positively impact health beliefs and attitude, thus enabling PwD to identify opportunities for overcoming burdens associated with barriers to access and affordability.

Effective PwD activation also requires multi-stakeholder involvement, including policy makers, payers, healthcare providers, the private sector, caregivers, family, and PwD themselves. All of these stakeholders influence PwD activation and can promote T2D therapy adherence and persistence. Policy makers, for instance, play key roles in improving access, health literacy, health beliefs and attitude by addressing barriers in integration and provision of care.

PwD activation is therefore the sum of personal circumstances, attitudes, behaviors, and motivations, which are themselves influenced by a variety of stakeholders. The combination of these factors results in a spectrum of PwD activation degrees that stem from different root causes. As a result, it is critical to not only quantify PwD activation but also identify its associated underlying causes. This will enable HCPs to address an individual's specific support and information needs and develop a customized, PwD-centric approach that positively impacts adherence and persistence in T2D therapy and reduce the avoidable T2D complication cost of approximately MXN28.4 billion per year associated with this (see Exhibit 1).

Exhibit 3: The Five Drivers of Patient Activation and Their Definition

Health Literacy

Health Belief + Attitude

Access + Affordability

Patient Activation

Personal Circumstance

Health Status

Personal circumstances constitute the social factors, including age, gender, social network, socio economic factors, that have an impact on the individual's health.[41,46,47]

Health beliefs and attitude relate to whether PwD accept their condition and believe in the benefits of their overall therapy. [42,48,49]

Health literacy relates to the extent "to which individuals have the capacity to obtain, process, and understand basic information and services needed to make appropriate decisions regarding their health."[43,50,51,52]

Health status relates to a variety of factors such as diet, exercise, and number of co-morbidities.[44,53,54]
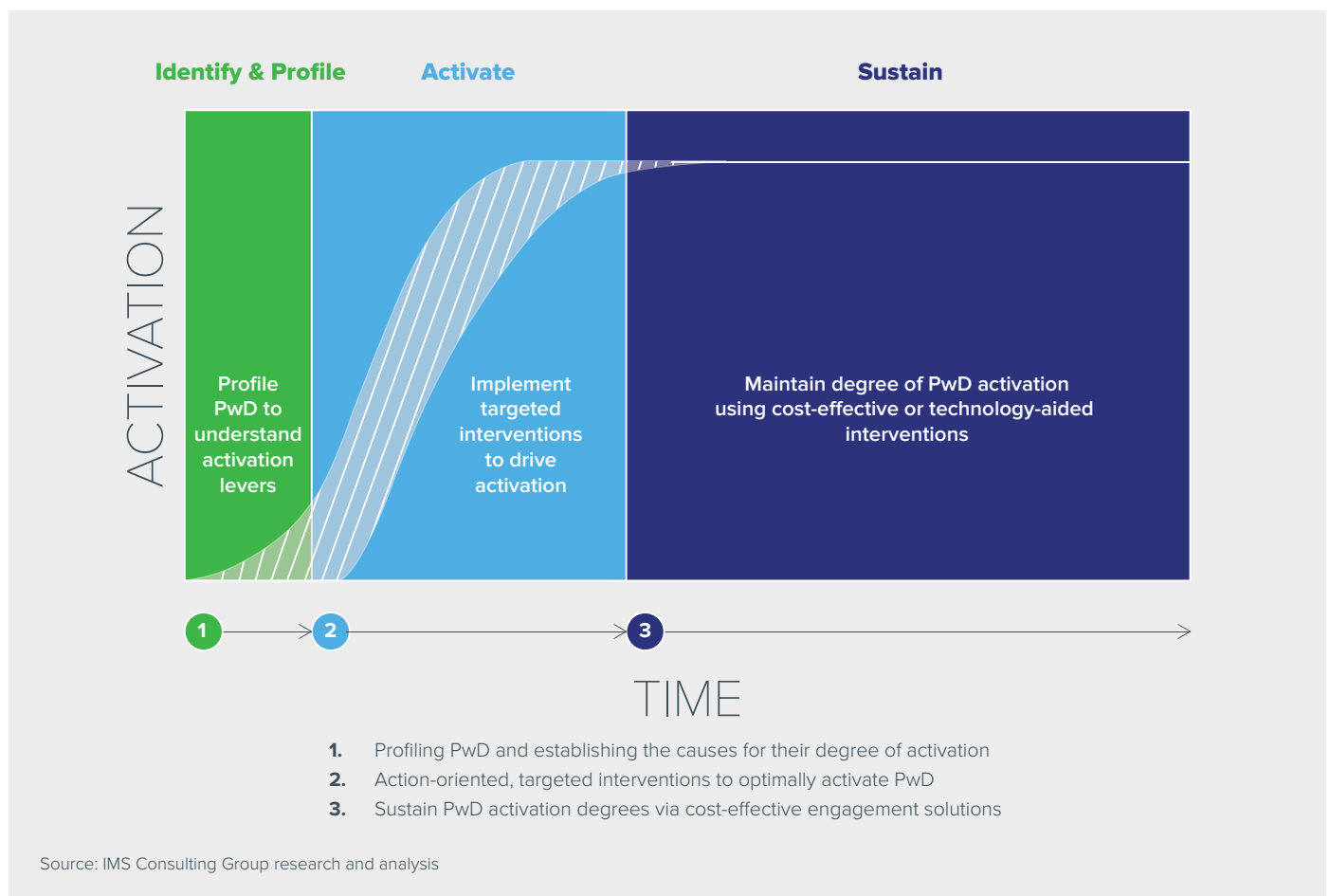
Access and affordability concerns access to and affordability of healthcare, healthy food, and exercise facilities.[45,55,56]

Source: IMS Consulting Group research and analysis

The path to optimal adherence and persistence

PwD activation relates to an individual's willingness and ability to take action to manage their own health and care. It is therefore paramount to improving therapy adherence and persistence and, in turn, clinical outcomes.[58] Through literature research and qualitative interviews with expert stakeholders, it has been determined that effective PwD activation and therefore a PwD' journey to optimal adherence and persistence requires progression through three key phases identified as 'identify and profile', 'activate', and 'sustain' (see Exhibit 4).

Exhibit 4: A PwD Path to Optimal Adherence and Persistence

Identify & Profile   **Activate**   **Sustain**

ACTIVATION

Profile PwD to understand activation levers

Implement targeted interventions to drive activation

Maintain degree of PwD activation using cost-effective or technology-aided interventions

1 → 2 → 3

TIME

1. Profiling PwD and establishing the causes for their degree of activation
2. Action-oriented, targeted interventions to optimally activate PwD
3. Sustain PwD activation degrees via cost-effective engagement solutions

Source: IMS Consulting Group research and analysis

In the 'identify and profile' phase, PwD need to be assessed by HCPs to determine their degree of activation as well as the health-related attributes (including attitudes, motivations, behaviors and logistical challenges) that lead to this degree of activation. In the 'activate' phase, to effectively improve activation and successfully set PwD on the path to optimal adherence and persistence, interventions, goals and action steps need to be customized based on the individual's degree of activation. Finally, in the 'sustain' phase, PwD who have reached high degrees of activation and therefore display proficient self-management behaviors in adherence and persistence can be transitioned to cost-effective T2D management solutions.

Customized interventions within each of these phases have been designed to overcome the varied challenges related to activation and support Mexican PwD on the path to optimal adherence and persistence in T2D therapy. To effectively promote and sustain these at a country level, it is essential that any interventions are assessed, validated, consolidated and embedded appropriately in the healthcare system or governing body. This will require alignment between public stakeholders within the healthcare system and involvement from private stakeholders as well as legislative changes. With this view, it has been suggested that a number of assessment metrics and outcomes could be used to validate each intervention proposed in the paper (see Appendix, Exhibit A). By implementing these interventions, it will be possible to reduce the avoidable complication costs resulting from sub-optimal T2D therapy adherence and persistence in Mexico, estimated to be MNX28.4 billion per year (see Exhibit 1).

Enabling optimal adherence

Acting on some key enablers in both the public and private sectors would increase the chance of success for all interventions.

In summary, these enablers could include, but are not limited to,

- **Significantly increase testing of Hb1Ac levels in all institutions:** PwD could be tested for HbA1c levels up to 4 times a year.[59] HbA1c testing is the first recommendation from the Organisation for Economic Co-operation and Development (OECD) as a key indicator for measuring success of process and outcomes in diabetes care. In 2012, only 7.7% of Mexican PwD were tested for HbA1c levels.

- **Increase diagnosis rate:** Many PwD are first diagnosed when the condition is already presenting severe symptoms and radical intervention is required. More aggressive action is needed to diagnose diabetes earlier.

- **Increase the reach and depth of electronic medical record (EMR) implementation:** EMRs will improve PwD follow up and assist in having accurate PwD information for condition management and in measuring outcomes.

- **Shift physician incentives:** There is a predominant approach that relies, at least partially, on PwD consultation quotas. A more individualistic framework should be considered, much more oriented towards personalized medicine, and one that would further support activation-aimed programs.

Tracking information on activation, adherence, interventions and health outcomes would act as a data resource to analyze what interventions are working and where, thus presenting further opportunities to optimize and allocate resources for the most cost-effective results.

Recommended interventions to improve T2D therapy adherence and persistence in Mexico

Identify and profile

Recommendation 1

Use predictive analytics to identify PwD at risk for low adherence and persistence

EMRs have been implemented in some IMSS[60] and ISSSTE[61] hospitals as well as in some Ministry of Health (MoH) hospitals. EMRs could initially be implemented in reference centers and hospitals where diabetes is commonly treated. From then on, implementation could be expanded to hospitals with lesser volume of PwD.

As Mexican health data gathering accelerates, the bank of information (e.g., EMRs) could be leveraged to quickly and accurately identify which PwD have or are at risk of low adherence and persistence. For example, data could be used to perform "predictive analytics", a process whereby software algorithms mine compiled data based on set criteria. This would make identification quick and accurate thus narrowing down the pool of PwD for further profiling and intervention. Predictive analytic capabilities are already being used in some other countries, such as the US and the UK.[62, 63] Though this approach would be new to Mexico, it could have substantial impact and this impact could have broader benefit than just in the diabetes care space.

There are a growing number of predictive analytics service providers. The Mexican government and healthcare system leadership could explore early discussion and possibilities with such organizations to start a process that allows for the full leverage of the benefits (cost reduction and improved PwD care) of predictive analytics.

Recommendation 2

Develop a diabetes-specific tool for validating PwD activation degree

Once PwD have been identified as having or at risk of low therapy adherence and persistence, they can then be profiled using psychometric assessment tools to determine their actual degree of activation and the underlying drivers of this. However, understanding that full leverage of predictive analytics will take some time, simple criteria could be used in the interim to rapidly implement psychometric assessment models now. For instance, acknowledging that adherence to T2D therapy can be low in newly diagnosed PwD[64] or in PwD with complex dosing regimen,[18] these subgroups could be preferentially given a psychometric assessment.

Information then garnered from a psychometric assessment tool will reveal the PwD' ability and willingness to take independent action to manage their own health and care. This evaluation step is a prerequisite to setting realistic goals and actions and set PwD onto the path of optimal adherence and persistence. Such tools have been shown to increase adherence to therapy, reduce healthcare expenditure[40] and predict costs and outcomes for PwD. The Patient Activation Measure (PAM) Survey, an example of such a tool, assesses beliefs, knowledge, and confidence in managing one's condition and assigns individuals to one of four activation levels, ranging from disengaged and overwhelmed (level 1) to maintaining behaviors and pushing further (level 4). On a 100 point scale, each point increase in PAM score translates into a 2% increase in adherence to medicine and a 2% decrease in hospital admissions and readmissions.[65]

While such patient activation measurement tools need to be adapted to the Mexican context, probably including a measure of patient educational or socioeconomic level, it would be useful for tailoring frequency of consultation, type of education required, support needed, along with many other initiatives aimed at improving PwD engagement. Results from this assessment could very well be integrated to EMR, where available.

Activate

Recommendation 3

Strengthen primary-care physician communication and advisory capabilities

Patient adherence and persistence greatly depends on appropriate communication and there are opportunities in Mexico to strengthen physician capabilities in this area.[66] PwD adherence and persistence greatly depends on appropriate communication.[67] In Mexico, treatment-naïve PwD tend to get diagnosed in advanced stages of the condition.[68] Therefore, these individuals do not have the opportunity to make progressive changes to their lifestyle. Typically, they need to be treated pharmacologically and also make, at times, radical lifestyle changes. Within this context, physicians need to be prepared to deliver basic elements of education aimed at improving PwD activation in a language and form suitable to the socioeconomic and health knowledge level of PwD. Primary-care physicians do not have the time to impart education; as such their involvement may be best limited to referring PwD to the appropriate course and building the bridge to other stakeholders (nurse, social worker, nutrition specialists, diabetes educator) who will likely be responsible for more in-depth and tailored education.

In order to improve physician capability, continued medical education could be provided where primary-care physicians gain certification in delivering basic PwD education and in empowering PwD in making better decisions regarding the management of their condition. This can be done via a combination of onsite and online training aimed at providing physicians with powerful phrases to communicate to PwD. There are instances where this type of approach has provided positive results in improving and honing existing HCP capabilities.[69] This initiative can be implemented in key reference centers of urban areas where capacity issues should not be so challenging. Finally, success measurement can be as simple as checking for knowledge retention on a periodical basis.

Recommendation 4

Expand number of HCPs for engaging PwD on importance of adherence and persistence

Regardless of their activation degree, consultations for PwD tend to range between 10 and 20 minutes.[70] While improvements in consultation length may be a more effective measure, this would probably not be enough for the physician to communicate all aspects related to T2D and its self-management. This is especially true at the time of PwD diagnosis or treatment change. Leveraging existing resources such as nurses, diabetes educators, and social workers in imparting education could potentially increase the quality of care and length of HCP-PwD interactions thereby improving likelihood of adherence and persistence. Social workers and nurses also face high workloads making the role of the diabetes educator crucial for improving adherence and persistence. These HCPs could become partners to physicians in improving PwD health literacy and health status as well as influencing attitude and lifestyle changes.

A program can be designed to expand, develop and train nurses, social workers and diabetes educators, notably in empowering PwD to take control of their condition. One way that this could be rapidly implemented is to embed being a diabetes educator within the social service that college students need to undertake before graduation. This would allow tapping into a qualified pool of resources that is also going to replenish itself. Furthermore, such an initiative would not be costly to the healthcare system.

Recommendation 5

Tailor educational programs to PwD activation degrees

Educational content for PwD does not seem to be making a meaningful impact in reducing obesity, incidence of diabetes or that of typical diabetes co-morbidities.[71] An assessment of current educational tools for connectivity to individual PwD needs, ease of use for PwD and HCP, implementation efficiency, cost, and impact might be warranted. Such an assessment would bring gaps to light relative to their effectiveness in improving activation and, thereby, adherence and persistence, and health outcomes. Once a data-based assessment has been completed, existing educational programs should be progressively reinforced to promote a better understanding of diabetes and its complications and tailor education to PwD activation degrees. PwD with low activation degree present a higher health risk and potentially greater burden to the system. Focusing on these PwD, a program in certain healthcare centers such as those with DiabetIMSS or MIDE, programs that have proven success.[14]

Replicating this initiative on a nationwide scale may prove challenging. However, there are certain PwD activation initiatives that can be replicated on a minor scale. A PwD selection based on age, test values, risk factors, among others, may be made to make sure key individuals at high risk are targeted; this process could effectively and quickly be carried out using predictive analytics. Depending on the PwD, there will probably be some interventions that are more needed than others; therefore, making this initiative more PwD-specific, resulting in optimized use of resources and greater scalability.

Recommendation 6

Develop a community and household-based support network

In Mexico, PwD health literacy is generally low and socioeconomic factors are an important barrier to meaningfully address the issue. The population lacks sufficient understanding of the condition and its complications, which prevents adequate activation, and thus, adherence and persistence in T2D therapy. It is important to address these barriers within the first 90 days of treatment initiation as a large segment of PwD abandons their treatment in this time window.[72] Getting low activation degree PwD off to a good start on the many changes that diabetes causes should positively impact the long–term health burden. For that purpose, while improving PwD health literacy should continue to be a priority, developing and training a proper support network could also be fostered.

Family members should constitute the first option for providing support and increasing PwD activation degrees, especially through promoting and sustaining behavioral changes. However, they can be supported by the community in the form of PwD advocacy groups or community leaders, including religious leaders. There are over 2,800 DIF (National System for Integral Family Development) facilities in Mexico that could be leveraged as location for meetings and activities.[73] These stakeholders, while independently managed, could provide forums for discussions, workshops on how to better diet, and general information on managing their condition, also impacting PwD activation degrees positively. Furthermore, these activities should also aid in relieving stress for these PwD. Even PwD with higher activation degrees could benefit from such initiatives as they would provide additional resources to sustain results. According to a study conducted in Mexico City involving PwD attending a first level public hospital, inclusion within social support groups can positively impact an individual's level of metabolic control.[74]

In the literature review, these groups are attended primarily by the unemployed population and over 50 years of age as their time availability enables them to dedicate time to this. In order to expand its reach to other PwD cohorts there are modifications to be made in order to better engage PwD and positively impact their activation degrees. Location and timing could be among the improvements to be made. Given commuting distances in most cities, these groups should meet in a location within a walking distance of the PwD' home. Moreover, sessions should also be conducted outside of regular work offices, which may include weekends, so that it provides opportunity to those who are employed. The support network is not meant to be a perfect solution, but an assisting method of educating PwD.

Sustain

The preceding recommendations are designed to activate PwD so that they are empowered to effectively self-manage their condition and adhere to their therapy, thus prolonging life and reducing the risk of complications. However, these interventions all require a high degree of human involvement, which is costly and no longer necessary to the same extent once a PwD exhibits a high degree of activation. Therefore, in order to maintain activation, a sustainable approach must be adopted to reduce unnecessary human involvement and associated costs. Technology and digital offerings can be phased in throughout the PwD path to optimal adherence and persistence where, at the point of maximal activation, they will be sufficient to keep PwD engaged at a minimum cost to the healthcare system.

Recommendation 7

Monitor high PwD activation and repeat or adapt activation strategy for PwD with dropping activation or diabetes control

Even once fully activated, a PwD' degree of activation will vary over time, notably as a result of natural disease progression or a change in the person's external environment that impacts on their ability to independently self-manage their condition. Consequently, it is critical to periodically reassess PwD activation and take appropriate actions with these PwD that are experiencing a temporary decrease in their degree of activation. Similarly, those that are self-managing their condition well by sustaining their degree of activation need positive reinforcement that what they are doing is having a beneficial impact on their health.

Clinical outcomes could be used to cost-effectively identify PwD experiencing a temporary setback in activation. For instance, highly activated PwD who move outside the normal range for HbA1c levels, number of hypoglycemic events, number of hospitalizations and/or infection rates should be offered to retake a psychometric assessment to re-quantify their degree of activation and identify its associated root causes. Review of clinical outcomes would ideally occur every 90 to 120 days in order to rapidly take action with those PwD who need further support while continuing with the existing strategy and giving continual HCP-led feedback on progress on clinical outcomes for those PwD whose condition remains satisfactorily controlled.

Recommendation 8

Leverage technology and digital offerings to maintain PwD activation

In Mexico, the effective use of technology to increase adherence and persistence has not been optimized. However, certain PwD may find that technology aids them to better monitor their condition by being a user-friendly and non-invasive option to deal with some of the unavoidable tasks, e.g., purchasing or adhering to their medical treatment.[75]

Specifically, there could be a system based on SMS, as mobile telephones now have 71.5% penetration in Mexico.[76] Content should be limited and frequency needs to be evaluated. Based on PwD activation degrees, there could be simple reminders of when to take medication for those with high activation degrees. For those with lower, activation degrees, content may extend to nutritional advice as well as consultation reminders.

There have been previous programs showing that technology could successfully support patient engagement in Mexico. For instance, The NGO Carlos Slim Foundation established the innovative and comprehensive CASALUD model, which fosters technology to engage patients, manage NCDs (Non-communicable diseases) and train health professionals within Seguro Popular.[77] Moreover, in a study, conducted in Mexico for one year to assess two different reinforcement strategies for diabetes self-care management, psychological distress and glycemic control, PwD were contacted on a monthly basis to promote self-management attitudes and addressing problems as they arose. Analyzed PwD groups displayed improved treatment adherence and had better adherence to the recommended meal plan and pharmacological treatment.[78] As such, calls from a call center can also be leveraged and may be an effective manner to reach PwD located in both urban and rural areas.

Recommendation 9

Leverage mass media to promote importance of adherence and persistence

Traditional mass media can also be leveraged in order to quickly reach out to PwD. It may be advisable to combine media in order to reach a greater number of PwD with different activation degrees.

Radio, which has high penetration in the country and greater reach than newspapers and magazines,[79] could be a useful method to promote messages regarding timing of medication and dieting tips. Another potential medium is to have short commercials with adherence and persistence oriented content in certain high rated telenovelas. Given their high rating and reach across the nation, where 8 out of 10 most watched programs in 2010 were telenovelas,[80] they may present an opportunity to impact a large proportion of PwD.

In Mexico, there have not been large implementations of educational programs using different media mix. There was an initiative where 70 individuals were subject to training on nutritional aspects through radio programs. Participants showed improved knowledge after the experiment.[81] Content could be designed based on short tips targeting importance of taking medication, self-management and lifestyle changes.

Conclusion

The economic and societal burden of low T2D therapy adherence and persistence in Mexico is high and rising. T2D-related complications are thought to make up 80% of T2D costs to the healthcare system[1] and it is predicted that approximately 12.4% of these complication-related costs, estimated to be MXN28,4 billion per year (see Exhibit 1), are due to sub-optimal therapy adherence and persistence. With 6.64 million PwD today and the possibility of over 10 million diagnosed by the end of the decade,[3,82] it is imperative that structured action is taken to improve T2D therapy adherence and persistence.

In light of this, a comprehensive and coordinated set of suggested actions has been laid out in this paper to identify and profile PwD struggling to engage with their condition, activate them, and then sustain that degree of activation. By making steps to pilot these recommendations and measure their outcomes, the MoH could make informed decisions on how and what interventions to scale up for successful reduction of significant and avoidable costs of sub-optimal T2D therapy adherence and persistence, as well as improve health of millions of PwD.

Additional Information:

For further details on methodology, sources, calculations, and generation of recommendations, please refer to the separate Appendix document.

References

1. Barraza M, Guajardo V, Picó J, García R, Hernández C, Mora F, Athié J, Crable E, Urtiz A. Carga Económica de la Diabetes Mellitus en México, 2013. 1st ed. Mexico:Funsalud, 2015

2. Cade W. Diabetes-Related Microvascular and Macrovascular Diseases in the Physical Therapy Setting. Physical Therapy. 2008;88(11):1322-1335

3. IMS calculation based on database: Secretaría de Salud. Encuesta Nacional de Salud y Nutrición 2012 y 2006. Available at http://ensanut.insp.mx/basesdoctos.php. Last accessed on 18 May 2015

4. IMS calculation based on database: Consejo Nacional de Población (CONAPO). Población mexicana por edad. Available at http://www.conapo.gob.mx/mwg-internal/de5fs23hu73ds/progress?id=YujnPKGUSSICU__5vGch18lFVv__d4f4naUaA00wMeg3w. Last accessed on 18 May 2016

5. IDF. Atlas de diabetes 2015.Available at http://www.idf.org/mwg-internal/de5fs23hu73ds/progress?id=klxrNJi6JqnV7Cmc-qXiSuXykV7z1pPa4BI6Uw1EMIU. Last accessed on 18 May 2016

6. Diabetes.co.uk. Diabetes drugs. Available at http://www.diabetes.co.uk/Diabetes-drugs.html#atoz. Last accessed on 29 April 2016

7. Secretaría de Salud. Encuesta Nacional de Salud y Nutrición 2012. Available at http://ensanut.insp.mx/informes/ENSANUT2012ResultadosNacionales.pdf. Last accessed on 18 May 2016

8. The Update team. Mexican diabetes devastation. It is essential to tax soda. World Nutrition. 2015;6(3):137-139

9. Tapia J, Ruiz H, Ochoa J, Hernandez B. Proporción de incidencia de amputaciones en pacientes con lesiones de pie del diabético. Revista Mexicana de Angiología. 2015;43(1):9-13

10. Gutiérrez A. Amputación de extremidades. ¿Van a la alza?. Revista mexicana de Angiología. 2014;42(3):112-114

11. Dirección general de epidemiologia. Boletín epidemiológico diabetes mellitus tipo 2 primer trimestre-2013. Available at http://www.epidemiologia.salud.gob.mx/doctos/infoepid/bol__diabetes/dm2_bol1_2013.pdf. Last accessed on 18 May 2016

12. IMSS. Informe de Labores del IMSS 2014-2015. Available at http://www.imss.gob.mx/mwg-internal/de5fs23hu73ds/progress?id=C1WDY711u5yvswuhIW4P3fP3fWW-PrWy0w24rR9Urmo,. Last accessed on 18 May 2016

13. Cámara de Diputados. Evaluación de la Política Pública del Tercer Nivel de Atención en Salud. Available at http://informe.asf.gob.mx/Documentos/Auditorias/2014_1650_a.pdf. Last accessed on 18 May 2016

14. Mendoza M, Velasco J, Nieva R, Andrade H, Rodríguez C, Palou E. Impacto de un programa institucional educativo en el control del paciente diabético. Revista Médica del Instituto Mexicano del Seguro Social. 2013;51(3):254-259

15. Secretaría de Salud. Estrategia Nacional para la Prevención y Control de la Obesidad y la diabetes. 70 Años a Favor de la Salud, 1943-2013. Available at http://www.paho.org/mwg-internal/de5fs23hu73ds/progress?id=qmLvmUg8xM4aBv0pyr3X-__CBi78RVND3aZajWN1cOtQ,. Last accessed on 18 May 2016

16. Cramer J, Roy A, Burrell A, Fairchild C, Fuldeore M, Ollendorf D, Wong P. Medication Compliance and Persistence: Terminology and Definitions. Value in Health. 2008;11(1):44-47

17. Cramer J. A systematic review of adherence with medications for diabetes. Diabetes Care. 2004;27(5):1218–1224

18. García L, Álvarez M, Dilla T, Gil V, Orozco D. Adherence to Therapies in Patients with Type 2 Diabetes. Diabetes Therapy. 2013;4:175-194

19. Krass I, Schieback P, Dhippayom, T. Adherence to diabetes medication: a systematic review. Diabetic Medicine. 2015;32(6):725-737

20. IMS calculation based on database: Teruel G, Rubalcava L, Thomas D, Frankenberg E, Crimmins E, McDade T, Rivera J, Seeman T, Villalpando S, Arenas E, Farfán G, Flores K, Morales R, Velázquez A. Mexican Family Life Survey. Available at http://www.ennvih-mxfls.org/english/ennhiv-3.html. Last accessed on 18 May 2016

21. Durán B, Rivera B, Franco E. Apego al tratamiento farmacológico en pacientes con diagnóstico de diabetes mellitus tipo 2. Salud Pública México. 2001;43(3):233-236

22. Doggrell S, Warot S. The association between the measurement of adherence to anti-diabetes medicine and the HbA1c. International Journal of Clinical Pharmacy. 2014;36:488-497

23. Krapek K, King K, Warren S, George K, Caputo D, Mihelich K, Holst E, Nichol M, Shi S, Livengood K, Walden S, Lubowski T. Medication adherence and associated hemoglobin A1c in type 2 diabetes. Annals of Pharmacotherapy. 2004;38(9):1357-1362

24. Stolar M. Glycemic Control and Complications in Type 2 Diabetes Mellitus. The American Journal of Medicine. 2010;123(3):S3–S11

25. Barquera S, Campos I, Aguilar C, Lopez R, Arredondo A, Rivera J. Diabetes in Mexico: cost and management of diabetes and its complications and challenges for health policy. Global Health. 2013;9(3):1-9

26. McEwan P, Foos V, Palmer JL, Lamotte M, Lloyd A, Grant D. Validation of the IMS CORE Diabetes Model. Value in Health. 2014;17(6):714-724

27. Palmer A, Roze S, Valentine W, Minshall M, Foos V, Lurati F, Lammert M, Spinas G. The CORE Diabetes Model: Projecting Long-term Clinical Outcomes, Costs and Cost-effectiveness of Interventions in Diabetes Mellitus (Types 1 and 2) to Support Clinical and Reimbursement Decision-making. Current Medical Research and opinion. 2004;1:S5–S26

28. Dawoud D, Fenu E, Wonderling D, O'Mahony R, Pursey N, Cobb J, Amiel SA, Higgins B. Basal insulin regimens: systematic review, network meta-analysis, and cost-utility analysis for the National Institute for Health and Care Excellence (NICE) Clinical Guideline on type 1 diabetes mellitus in adults. Value Health. 2015;18(7):339

29. Amiel S. Type 1 diabetes in adults: new recommendations support coordinated care. Available at https://www.guidelinesinpractice.co.uk/type1-diabetes-in-adults-new-recommendations-support-coordinated-care. Last accessed on 29 April 2016

30. Diabetes.co.uk. Guide to HbA1c. Available at http://www.diabetes.co.uk/what-is-hba1c.html. Last accessed on 29 April 2016

31. WHO. Use of Glycated Haemoglobin (HbA1c) in the Diagnosis of Diabetes Mellitus. 2011. Available at http://www.who.int/diabetes/publications/report-hba1c_2011.pdf?ua=1. Last accessed 29 March 2016

32. American Diabetes Association. Standards of medical care in diabetes 2011. Diabetes care. 2011;34(1):11–61

33. Extrapolated from the CORE Diabetes Model

34. OECD. Health Statistics. Available at http://www.oecd.org/centrodemexico/estadisticas/. Last accessed on 19 April 2016

35. Fowler M. Microvascular and Macrovascular Complications of Diabetes. Clinical Diabetes. 2008;26(2):77-82

36. IMS Core Diabetes Model for Mexico 2015

37. Nutting P, Miller W, Crabtree B, Jaen C, Stewart E, Strange K. Initial lessons from the first national demonstration project on practice transformation to a patient-centered medical home. The Annals of Family Medicine. 2009;7(3):254-260

38. Hibbard J, Greene J, Overton V. Patients with lower activation associated with higher costs; delivery systems should know their patients' 'scores'. Health Affairs. 2013;32(2):216-222

39. Begum N, Donald M, Ozolins I, Dower J. Hospital admissions, emergency department utilisation and patient activation for self-management among people with diabetes. Diabetes Research and Clinical Practice. 2011;93(2):260-267

40. Remmers C, Hibbard J, Mosen D, Wagenfield M, Hoye R, Jones C. Is patient activation associated with future health outcomes and healthcare utilization among patients with diabetes?. The Journal of Ambulatory Health Management. 2009;32(4):320-327

41. Griffith L, Field B, Lustman P. Life stress and social support in diabetes: association with glycemic control. The International Journal of Psychiatry in Medicine. 1990;20(4):365-372

42. Brownlee-Duffeck M, Peterson L, Simonds J, Goldstein D, Kilo C, Hoette S. The role of health beliefs in the regimen adherence and metabolic control of adolescents and adults with diabetes mellitus. Journal of Consulting and Clinical Psychology. 1987;55(2):139-144

43. Wallace A, Seligman H, Davis T, Schillinger D, Arnold C, Bryant B, Freburger J, DeWalt D. Literacy-appropriate educational materials and brief counseling improve diabetes self-management. Patient Education and Counseling. 2009;75(3):328-333

44. Bos-Touwen I, Schuurmans M, Monninkhof E, Korpershoek Y, Spruit L, Ertugrul I, de Wit N, Trappenburg J. Patient and disease characteristics associated with activation for self-management in patients with diabetes, chronic obstructive pulmonary disease, chronic heart failure and chronic renal disease: a cross-sectional survey study. PLoS One. 2015;10(5):e0126400. doi: 10.1371/journal.pone.0126400

45. Chernew M, Shah M, Wegh A, Rosenberg S, Juster I, Rosen A, Sokol M, Yu-Isenberg K, Fendrick A. Impact of decreasing copayments on medication adherence within a disease management environment. Health Affairs. 2008;27(1):103-112

46. Delamater A, Jacobson A, Anderson B, Cox D, Fisher L, Lustman P, Rubin R, Wysocki T. Psychosocial therapies in diabetes: report of the Psychosocial Therapies Working Group. Diabetes Care. 2001;24(7):1286-1292

47. Glasgow R, Toobert D. Social environment and regimen adherence among type II diabetic patients. Diabetes Care. 1988;11(5):377-386

48. Boston University School of Public Health. The Health Belief Model. Available at http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/SB721-Models/SB721-Models2.html. Last accessed on 22 March 2016

49. Farmer A, Kinmonth A, Sutton S. Measuring beliefs about taking hypoglycaemic medication among people with Type 2 diabetes. Diabetic Medicine. 2006;23(3):265-270

50. Institute of Medicine. Health Literacy: A Prescription to End Confusion, 2004. Available at http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/2004/Health-Literacy-A-Prescription-to-End-Confusion/healthliteracyfinal.pdf. Last accessed on 29 April 2016

51. Zeber J, Manias E, Williams A, Hutchins D, Udezi W, Roberts C, Peterson A. ISPOR Medication Adherence Good Research Practices Working Group. A systematic literature review of psychosocial and behavioral factors associated with initial medication adherence: a report of the ISPOR Medication Adherence & Persistence Special Interest Group. Value Health. 2013;16(5):891-900

52. Woodard L, Landrum C, Amspoker A, Ramsey D, Naik A. Interaction between functional health literacy, patient activation, and glycemic control. Journal of Patient Preference and Adherence. 2014;8:1019-1024

53. Aung E, Donald M, Williams GM, Coll JR, Doi SAR. Influence of patient-assessed quality of chronic illness care and patient activation on health-related quality of life. International Journal for Quality in Health Care. 2016; DOI: http://dx.doi.org/10.1093/intqhc/mzw023. [Epub ahead of print]

54. Kato A, Fujimaki Y, Fujimori S, Isogawa A, Onishi Y, Suzuki R, Yamauchi T, Ueki K, Kadowaki T, Hashimoto H. Association between self-stigma and self-care behaviors in patients with type 2 diabetes: a cross-sectional study. BMJ Open Diabetes Research and Care 2016;4(1):e000156

55. Gellad W, Grenard J, McGlynn E. A review of barriers to medication adherence: a framework for driving policy options. Rand Corporation. Available at http://www.rand.org/pubs/technical_reports/TR765.html. Last accessed on 18 May 2016

56. Goldman D, Joyce G, Zheng Y. Prescription drug cost sharing: associations with medication and medical utilization and spending and health. JAMA. 2007;298(1):61-69

57. IMS research and analysis

58. Hibbard JH, Gilburt H. Supporting people to manage their health, An introduction to patient activation. Available at: http://www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/supporting-people-manage-health-patient-activation-may14.pdf. Last accessed on 29 April 2016

59. Driskell O, Holland D, Waldron J, Ford C, Scargill J, Heald A, Tran M, Hanna F, Jones P, Pemberton J, Fryer A. Reduced testing frequency for glycated Hemoglobin, HbA1c, Is Associated With Deteriorating Diabetes Control. Diabetes Care. 2014;37(10):2731-2737

60. Secretaria de Salud. Manual del Expediente Clínico Electrónico. Available at http://www.who.int/goe/policies/countries/mex_ehealth.pdf. Last accessed on 18 May 2016

61. ISSSTE. Expediente clínico (ISSSTEMED). Memoria documental. Dirección de tecnología y desarrollo institucional. Available at http://www.issste.gob.mx/mwg-internal/de5fs23hu73ds/progress?id=RkjV8g_rm2P41gOI_CAeb6aeADdmp0YqJFVWaBFTTfs,. Last accessed on 18 May 2016

62. Nuffield Trust. Uses of predictive risk adjustment in the NHS. Available at http://www.nuffieldtrust.org.uk/our-work/projects/risk-adjustment-nhs. Last accessed on 29 April 2016

63. Trinacty C, Adams A, Soumerai S, Zhang F, Meigs J, Piette J, Ross D. Racial differences in long-term adherence to oral antidiabetic drug therapy: a longitudinal cohort study. BMC Health Services Research. 2009;9:24

64. Insigna Health. Fact: The PAM® Survey is a predictive powerhouse. Available at http://www.insigniahealth.com/products/pam-survey. Last accessed on 7 March 2016

65. Hernández A, Elnecavé A, Huerta N, Reynoso N. Análisis de una encuesta poblacional para determinar los factores asociados al control de la diabetes mellitus en México. Salud Pública Mexico. 2011;53:34-39

66. Rodríguez J, Polo F. Los determinantes Sociales de la Salud en adherencia al tratamiento de pacientes con Diabetes Mellitus tipo 2. Diversidad, Cultura y Salud. Available at http://www.eumed.net/libros-gratis/2011f/1142/determinantes_sociales_de_salud_en_adherencia_tratamiento_pacientes_con_diabetes.html. Last accessed on 16 May 2016

67. Sabag E, Álvarez A, Celiz S, Gómes A. Complicaciones crónicas en la diabetes mellitus: Prevalencia en una unidad de medicina familiar. Revista Médica del Instituto Mexicano del Seguro Social. 2006;44(5):415-421

68. Rodríguez R, Magdaleno M, Munguía C, Hernández J, Casas E. Factores de los médicos familiares asociados al control glucémico de sus pacientes con diabetes mellitus. Gaceta Médica de México 2003;139(2):112-117

69. IMSS. Auditoría de Desempeño: 12-1-00GYR-07-0413. Instituto Mexicano del Seguro Social. Available at http://www.asf.gob.mx/Trans/Informes/IR2012i/Documentos/Auditorias/2012_0413_a.pdf. Last accessed on 18 May 2016

70. UAQ. Campos R, Suarez K. Evaluación del impacto del programa "Caminando a la Salud" en el estado nutricio y hábitos alimentarios de niños de primaria en el Estado de Querétaro. Available at http://ri.uaq.mx/bitstream/123456789/966/1/RI000518.pdf. Last accessed on 18 May 2016

REFERENCES

71. Yeaw J, Benner J, Walt J, Sian S, Smith D. Comparing adherence and persistence across 6 chronic medication classes. Journal of Managed Care Pharmacy. 2009;15(9):728–740

72. DIF. Directorio nacional de instituciones de asistencia social. Available at http://dnias.dif.gob.mx/. Last accessed on 18 May 2016

73. Arredondo A, Márquez E, Moreno F, Bazán M. Influencia del apoyo social en el control del paciente diabético tipo 2. Revista de Especialidades Médico-Quirúrgicas. 2006;11(3):43–48

74. Cabrera N, Castro P, Demeneghi V, Fernández L, Morales J, Sainz L, Ortiz M. mSalUV: un nuevo sistema de mensajería móvil para el control de la diabetes en México. Revista Panamericana de Salud Pública. 2014;35(5):371–377

75. INEGI. Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de Información en los Hogares 2015. Available at http://www.inegi.org.mx/est/contenidos/proyectos/encuestas/hogares/regulares/dutih/2015/default.aspx. Last accessed on 18 May 2016

76. McClellan M, Tapia R, Thoumi A, Maday M, Drobnick E, Morales P, Saucedo R, Gallardo H, Mújica R. Preventing chronic disease through innovative primary care models. CASALUD. Center for Health policy at Brookings. Mexico Global accountable care in action. 2015

77. Lerman I, López A, Villa A, Escobedo M, Caballero E, Velasco M, Gómez F, Rull J. Estudio piloto de dos diferentes estrategias para reforzar conductas de autocuidado y adherencia al tratamiento en pacientes de bajos recursos económicos con diabetes tipo 2. Gaceta Médica Méxicana. 2009;143(1):15–19

78. Ernst & Young. ¿La estrategia de medios de tu compañía tiene la dirección adecuada? Estudio de la publicidad en los medios de comunicación masiva en México: eficiencia, alcance, impacto y experiencia. Available at http://www.ey.com/mwg-internal/de5fs23hu73ds/progress?id=vylPQ796a-XrRlRKZLp5D4Tm0hpT1Pbw299i6eDJLdQ,. Last accessed on 18 May 2016

79. Nielsen IBOPE. Anuario 2009-2010: Audiencias y Medios en México. Available at https://www.nielsenibope.com.mx/uploads/09.pdf. Last accessed on 18 May 2016

80. Cabrera C. Evaluación de dos estrategias de educación nutricional vía radio en Guadalajara, México. Centro de Estudios en Salud, Población y Desarrollo, Centro Universitario en Ciencias de la Salud, Universidad de Guadalajara. 2002;18(5):1289–1294

81. IMS calculation based on database: Secretaría de gobernación. Consejo nacional de población. Estimaciones y proyecciones de la población en República Mexicana. Available at http://www.conapo.gob.mx/es/CONAPO/Proyecciones_Datos. Last accessed on 18 May 2016

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About the Institute

The IMS Institute for Healthcare Informatics leverages collaborative relationships in the public and private sectors to strengthen the vital role of information in advancing healthcare globally. Its mission is to provide key policy setters and decision makers in the global health sector with unique and transformational insights into healthcare dynamics derived from granular analysis of information.

Fulfilling an essential need within healthcare, the Institute delivers objective, relevant insights and research that accelerate understanding and innovation critical to sound decision making and improved patient care. With access to IMS Health's extensive global data assets and analytics, the Institute works in tandem with a broad set of healthcare stakeholders, including government agencies, academic institutions, the life sciences industry and payers, to drive a research agenda dedicated to addressing today's healthcare challenges.

By collaborating on research of common interest, it builds on a long-standing and extensive tradition of using IMS Health information and expertise to support the advancement of evidence-based healthcare around the world.

Research Agenda

The research agenda for the Institute centers on five areas considered vital to the advancement of healthcare globally:

The effective use of information by healthcare stakeholders globally to improve health outcomes, reduce costs and increase access to available treatments.

Optimizing the performance of medical care through better understanding of disease causes, treatment consequences and measures to improve quality and cost of healthcare delivered to patients.

Understanding the future global role for biopharmaceuticals, the dynamics that shape the market and implications for manufacturers, public and private payers, providers, patients, pharmacists and distributors.

Researching the role of innovation in health system products, processes and delivery systems, and the business and policy systems that drive innovation.

Informing and advancing the healthcare agendas in developing nations through information and analysis.

Guiding Principles

The Institute operates from a set of Guiding Principles:

The advancement of healthcare globally is a vital, continuous process.

Timely, high-quality and relevant information is critical to sound healthcare decision making.

Insights gained from information and analysis should be made widely available to healthcare stakeholders.

Effective use of information is often complex, requiring unique knowledge and expertise.

The ongoing innovation and reform in all aspects of healthcare require a dynamic approach to understanding the entire healthcare system.

Personal health information is confidential and patient privacy must be protected.

The private sector has a valuable role to play in collaborating with the public sector related to the use of healthcare data.

IMS INSTITUTE
FOR
HEALTHCARE INFORMATICS

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