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Improving Type 2 Diabetes Therapy Compliance and Persistence in the Kingdom of Saudi Arabia

How to Address Avoidable Economic and Societal Burden

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. Saudi Arabia reflects this trend, with T2D prevalence currently approximately 25% and growing,[1] and the number of individuals suffering from the condition forecasted to more than double by 2035. Despite improved diagnosis and advances in treatment options for individuals with T2D, sub-optimal therapy compliance 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 Saudi-specific burden of T2D and its complications, national initiatives in place to address this issue, and opportunities in relation to therapy compliance and persistence improvement strategies. A range of validated, Saudi-specific recommendations to address sub-optimal T2D therapy compliance and persistence are put forth for action by government stakeholders, payers, healthcare providers and healthcare administrators and focus on three broad phases of a patient journey toward optimal compliance and persistence, (i) identify and profile, (ii) activate and, (iii) sustain. These are all designed to improve T2D therapy compliance and persistence in the Saudi 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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Contents

Burden of T2D

Overview of T2D and its complications

Type 2 Diabetes (T2D) is a chronic disease 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 damage (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

T2D prevalence rates in Saudi Arabia range between 23.1% and 25.4%.[3, 4] Out of 18 million Saudi residents between the age of 20 to 79 years (of which approximately 70% are Saudi nationals[5]), about 3.6 million have diabetes, of which about 90% have T2D.[6, 7] In Saudi Arabia, among PwD over the age of 30, an estimated 40.3% are unaware of their condition.[8] Furthermore, with 25.5% of Saudi population above the age of 30 displaying signs of pre-diabetes and 28.7% of the Saudi population categorized as obese and hence at risk of T2D, the number of people with T2D is expected to rise significantly in the country.[8, 9, 10, 11] Indeed, by 2035, the number of PwD aged between 20 and 79 years old is estimated to reach 7.5 million.[12]

In 2014, the Saudi MoH spent an estimated SAR17 billion on direct management of type 1, type 2 and gestational diabetes for Saudi citizens alone, a figure that is expected to rise to SAR27 billion in the future.[13] The same study estimates the direct costs of type 1, type 2 and gestational diabetes management at SAR25 billion in the entire Saudi population, comprising both Saudi citizens and expatriates, a figure expected to rise to SAR39.8 billion in the future.[13] It is worth noting that these cost estimates do not account for indirect costs such as loss of productivity of the patient, caregivers and families. In addition, these costs do not reflect the impact of lower quality of life. As such, T2D places a significant strain on the healthcare system and society, which, in light of the epidemiology trends in the country, will rapidly escalate.

Challenges managing T2D in the Saudi healthcare system today

Recognizing the growing burden of T2D, the Saudi government announced a 10-year National Executive Plan (2010 to 2020) to control diabetes, which includes the establishment of 22 specialized diabetes centers, one in each health directorate.[14] Furthermore, the MoH has instituted a referral process for PwD, integrating care pathways across the 2,281 primary healthcare centers (PHCs), 22 specialized diabetes centers and 270 Diabetes Centers and Units Department of tertiary-care MoH hospitals.[15]

As it stands, PHC physicians receive limited training specific to T2D management,[16] despite the fact that diabetes is the third most frequent disease treated in PHCs.[15] This capability gap in T2D management at primary-care level has led to over-referral to specialty and tertiary-care levels, resulting in an imbalance in the integrated care referral system. While physicians in PHCs see 20 to 30 patients per day,[16] specialists in tertiary hospitals see between 60 and 70 PwD per day, allowing only 5 to 10 minutes per interaction, which is inadequate given the complexity of T2D management.[17] Furthermore, there is a deficit of fully trained and certified diabetes educators in Saudi Arabia as there currently are less than one hundred diabetes educators in the public sector, resulting in more than 40,000 PwD per diabetes educator.[16] To overcome this challenge, some hospitals provide training to nurses for patient education.[16] While PHCs do not have designated diabetes educators, tertiary hospitals and specialized diabetes clinics that do have female nurses as educators face restricted interactions with PwD notably due to cultural values and gender segregation.[18]

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

Compliance and persistence defined

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

Defining therapy compliance and persistence

There is a lack of consensus in the literature on the exact definitions of therapy compliance (synonym: adherence, referred to as compliance in this paper) and persistence. In this paper, these terms are defined as:

Therapy compliance

"The extent to which a patient acts in accordance with the prescribed interval, and dose of a dosing regimen"[19]

Therapy persistence

"The duration of time from initiation to healthcare professional (HCP) recommended discontinuation of therapy"[19]

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

Extent of sub-optimal T2D drug therapy compliance and persistence

Extensive literature research and interviews have indicated that sub-optimal compliance and persistence is a significant issue for PwD globally. There are a limited number of published estimates of compliance and persistence rates in T2D therapy in Saudi Arabia:

- In a study of 535 PwD in the Al Hasa region conducted between June 2010 and June 2011, 57.5% (n=289) of PwD self-reported taking less than 80% of their prescribed medicines.[20]
- In a study of 290 PwD conducted at National Guard Health Affairs clinics in Riyadh between November 2012 and May 2013, 51% (n=148) of PwD self-reported low adherence as measured using the Morisky Medication Adherence Scale (MMAS-8).[21]

- In a study of 406 PwD in the Al Manhal and Al Kabel PHCs, between 19.2% (n=55, 40-60 years old) and 76.2% (n=16, less than 40 years old) of PwD reported not complying with their medication intake.[22]
- Separately, in a survey of Saudi public-sector physicians conducted for the purpose of this research, it was estimated that roughly 27.5% of Saudi PwD take less than 80% of the medication prescribed to them.

However, the actual rates of compliance and persistence to T2D therapy in the country may be even lower than many of the estimates stated above because many of these studies fail to grasp all aspects of compliance and persistence. For example, they are unlikely to include rates of primary non-compliance, defined as PwD who have been diagnosed but never initiated therapy. This is significant as rates of primary non-compliance have been shown to be as high as 15% in countries outside of Saudi Arabia.[23] Additionally, many of these studies will not measure those who started but have since ceased taking their medications or, those who do not take their medications at the recommended time or dose.

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

Recognizing that sub-optimal compliance and persistence to T2D therapy causes persistently elevated blood glucose levels leading to increased risk of short-term and long-term complications and hence rising economic costs of T2D management in Saudi Arabia, the CORE Diabetes Model, a validated health economics model, was customized to estimate the extent to which sub-optimal compliance and persistence to T2D therapy contributed to overall economic costs associated with avoidable T2D complications. This provides guidance on potential healthcare system savings if the issue of sub-optimal compliance and persistence was addressed.

Calculating the cost of sub-optimal T2D therapy compliance 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.[24,25] The model has been customized to Saudi Arabia to calculate the cost of avoidable T2D-related complications as a result of those PwD who struggle with therapy compliance and persistence.

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

1. The percentage of Saudi PwD with sub-optimal levels of therapy compliance and persistence
   - Estimated to be ~54% by taking the average from two compliance studies in the Al Hasa region and Riyadh, respectively[20,21]
2. The relationship between sub-optimal compliance and HbA1c as estimated by physicians in Saudi PHCs and diabetes clinics
   - Approximately 29% increase in HbA1c due to sub-optimal compliance[16]

What are HbA1c levels?

HbA1c levels are used to diagnose and monitor diabetes and refer to glycated hemoglobin (HbA1c), otherwise known as average plasma glucose concentration. HbA1c develops when hemoglobin, an oxygen-carrying red blood cell protein, combines with glucose in the blood, thus becoming glycated.[26]

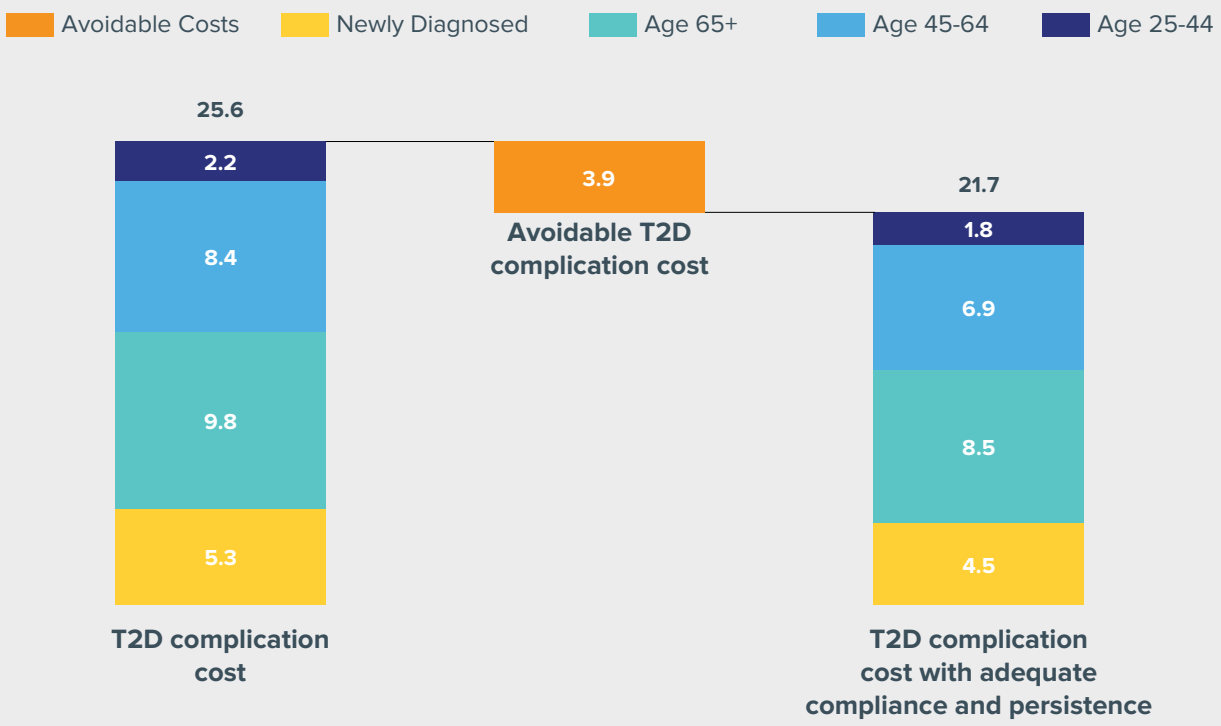
Measurement of HbA1c reflects average plasma glucose levels over a period of 8-12 weeks. It can be performed at any time of the day and does not require any special preparation such as fasting.[27] These properties have made it the preferred test for both diagnosing diabetes and assessing glycemic control in PwD. The higher the HbA1c level, the higher the increase in risk of diabetes-related complications. Normal, pre-diabetic and diabetic HbA1c ranges are provided below:[28]

HbA1c Level	Indication
<5.7%	Normal range
5.7% – 6.4%	Pre-diabetes
≥ 6.5%	Diabetes

Using the CORE Diabetes Model, it has been estimated that T2D-related complications will cost SAR25.6 billion per year to the Saudi healthcare system (mean of next 10 years, see Exhibit 1). By customizing the CORE Diabetes Model to take into account T2D therapy compliance and persistence levels in Saudi Arabia, it has been estimated that as much as 15.4% of this healthcare system cost, or approximately SAR3.9 billion per year, will be driven by complications suffered by those PwD who are currently struggling to achieve optimal T2D therapy compliance and persistence (see Exhibit 1).

To provide a sense of proportion, SAR3.9 billion annual cost is equal to ~3.5% of total healthcare spend in Saudi Arabia in 2015,[30, 31] likely to be ~10% of total spend on diabetes management in the future[13] and, is more than double the total annual spend on diabetes medications in Saudi Arabia today.[32] In summary, the economic cost burden of T2D complications of Saudi PwD who are struggling to achieve optimal T2D therapy compliance and persistence is significant and, most importantly, avoidable.

Exhibit 1: Mean Annual Economic Costs Associated With Sub-Optimal T2D Drug Therapy Compliance and Persistence in Saudi Arabia 2015-2025, SAR Bn



Source: IMS Core Diabetes Model

Notes: Adequate compliance was based on the definition of the `compliant' population used in the data sourced for the economic model.[20,21] 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.

Furthermore, this unnecessary spend and economic wastage is only one dimension of the overall cost of sub-optimal T2D therapy compliance 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. 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 comply 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 sub-optimal therapy compliance and persistence. Separately, due to the long-term nature of the disease and the ever-increasing prevalence, the costs linked to sub-optimal compliance and persistence in T2D therapy are only set to escalate in the short-to-medium term.

Burden of sub-optimal compliance and persistence on persons with T2D and society

The CORE Diabetes Model 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 compliant and persistent to their T2D therapy in Saudi Arabia (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).[33]

Exhibit 2: Increased Risk of Complications and Healthcare Costs over the Lifetime of a Non-Compliant PwD

Percent increased risk versus compliant PwD	Complication
286%	More likely to have end stage renal disease
24%	More likely to have a heart attack
26%	More likely to have a stroke
40%	More likely to have an amputation
111%	More likely to go blind (severe vision loss)
>SAR103,500	**Estimated extra cost to the healthcare system over their lifetime**

Source: IMS Core Diabetes Model

Table notes: Increased lifetime risk of various complications and healthcare costs calculated over the lifetime of a non-compliant PwD in comparison to a compliant PwD, based on the average 45-64 year old PwD.

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

Action is needed

By 2035, there could be 7.5 million individuals with T2D in Saudi Arabia.[12] In 2014, 15.7% of the MoH budget was spent on direct expenditure for type 1, type 2 and gestational diabetes,[13] of which we estimate around SAR3.9 billion is being driven by sub-optimal T2D therapy compliance and persistence.[29] Absence of action to tackle this problem now, when prevalence continues to rise and considerable challenges to optimal T2D management still exist in the public healthcare system, will result in a growing build-up of costs. A set of practical and action-oriented recommendations has been proposed in this paper to raise levels of compliance 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 and using digital technology to maintain effective disease self-management. These recommendations are presented to inspire collaborative discussion 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 compliance 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.[34] As such, PwD activation relates to the 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 compliance to therapy and a reduction in healthcare expenditure.[35, 36, 37] 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.[35]

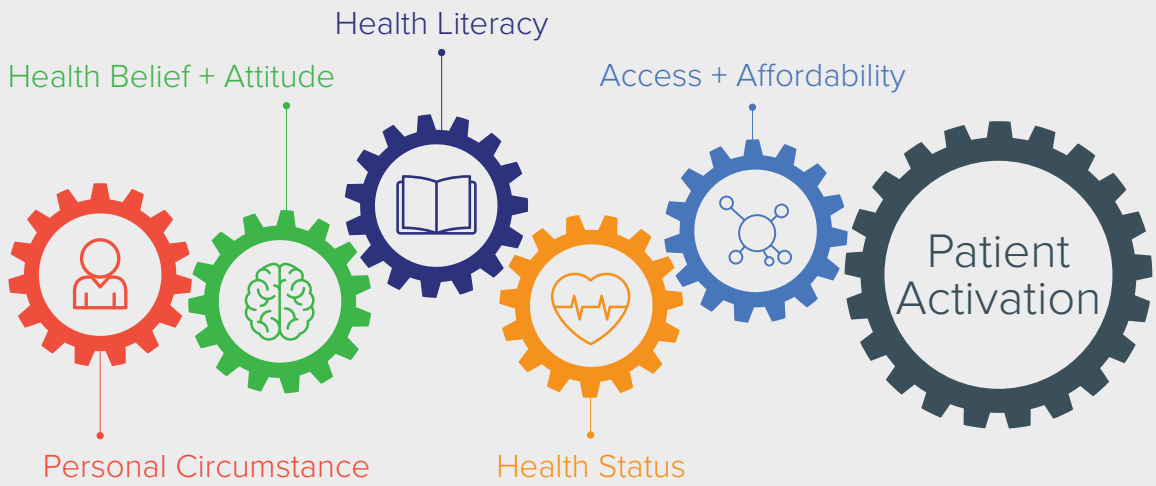
Consequently, T2D therapy compliance and persistence will remain sub-optimal as long as PwD activation remains inadequate. Effective PwD activation is difficult to achieve as it stems from the synergistic impact of multiple underlying drivers and stakeholders, hence a tailored, individualistic approach is needed to improve compliance.

Based on literature and extensive 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).[38, 39, 40, 41, 42] While these five distinct drivers work in concert to influence overall degree of PwD activation, they also are 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, caregivers, family, and PwD themselves. All of these stakeholders influence PwD activation and can promote T2D therapy compliance 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 compliance and persistence in T2D therapy and reduce the avoidable T2D complication cost of approximately SAR3.9 billion associated with this (see Exhibit 1).

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



Personal circumstances constitute the social factors, including age, gender, social network, socioeconomic factors that have an impact on the individual's health.[38,43,44]

Health beliefs and attitude relate to whether PwD accept their condition and believe in the benefits of their overall therapy.[39,45,46]

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."[40,47,48,49]

Health status relates to a variety of factors such as diet, exercise, and number of co-morbidities.[41,50,51]

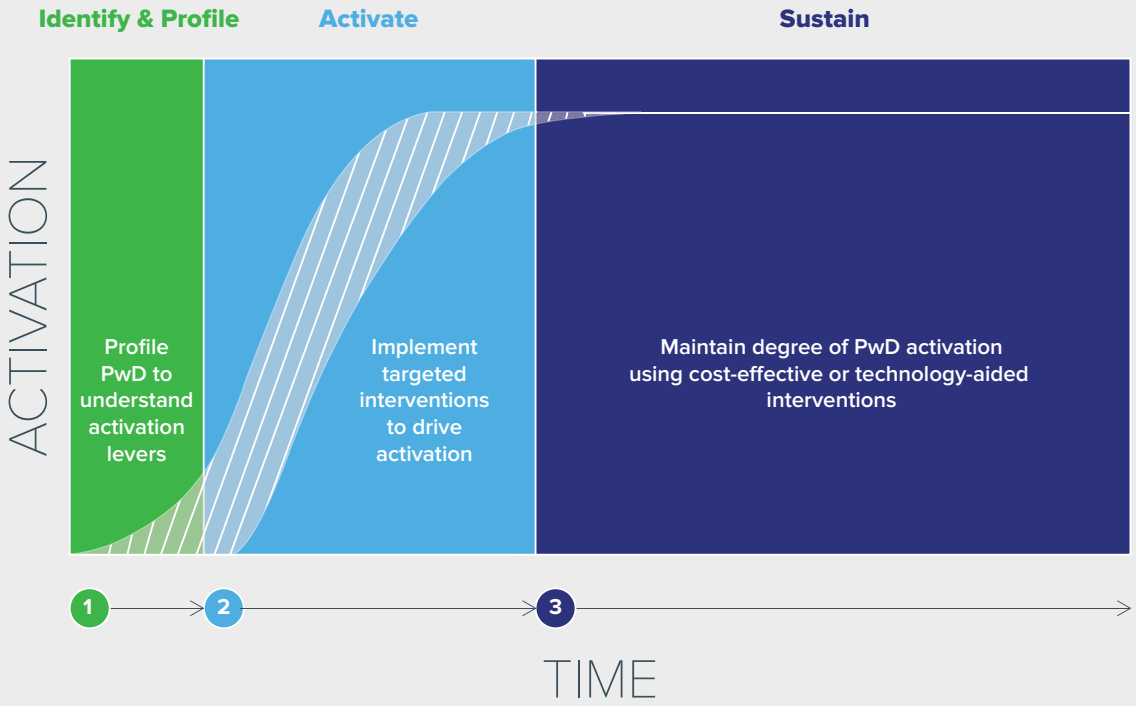
Access and affordability concerns access to and affordability of healthcare, healthy food, and exercise facilities.[42,52,53]

Source: IMS Consulting Group research and analysis

The path to optimal compliance and persistence

PwD activation relates to an individual's willingness and ability to take action to manage their own health and care and is paramount to improving therapy compliance and persistence and, in turn, health outcomes.[55] Through literature research and qualitative interviews with expert stakeholders, it has been determined that effective PwD activation and therefore a PwD' journey to optimal compliance 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 Compliance and Persistence



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, logistical and financial 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 compliance 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 proficient self-management behaviors in therapy compliance 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 Saudi PwD on the path to optimal compliance 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 compliance and persistence in Saudi Arabia, estimated to be SAR3.9 billion per year (see Exhibit 1).

Enabling optimal compliance

Prior to implementing any interventions, acting on some key enablers in both the public and private sectors would increase the chance of success for all interventions. These include, but are not limited to,

- **Rapidly improve screening programs:** Implementation of preventive screening programs could ensure diagnosis of PwD at an early (asymptomatic) stage. Post diagnosis, appropriate treatment would delay the onset of complications and reduce costs to the country.
- **Optimize PwD treatment pathway/referral:** In the Saudi public sector, PwD currently avoid revisiting the community PHCs once referred to a hospital, thus creating an overload of patients in hospitals. A clearer PwD pathway/referral system would allow well controlled PwD to move back to community PHCs, thus both reducing costs and creating capacity in hospitals for sub-optimally controlled PwD.
- **Develop robust national diabetes registry:** Data on epidemiology and parameters like compliance would help make evidence-based decisions at the level of policy makers and physicians. The Saudi National Diabetes Registry could be a suitable platform to build on.
- **Comprehensive integrated hospital information system (HIS):** The MoH's PHC Information System Strategy, part of the National e-Health Strategy, remains a work in progress since the majority of PHCs still operate manually.[56] An integrated and robust HIS could be used for technology-based interventions such as mobile-based communications, appointments and referrals. In the long run, it could also help promote Electronic Medical Records (EMR) that, in turn, aid in evidence-based treatment decisions.

Tracking information on activation, compliance, 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 compliance and persistence in Saudi Arabia

Identify and profile

Recommendation 1

Use predictive analytics to identify PwD at risk of low compliance and persistence

As health data gathering accelerates in Saudi Arabia, the bank of information (e.g., EMR) could be leveraged to quickly and accurately identify which PwD have or are at risk for low compliance 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 used in some other countries such as the U.S. Though this approach would be new to Saudi Arabia, it could have substantial impact and this impact could have broader benefit than just in the diabetes care space.

There is a growing number of predictive analytic service providers. Saudi health and government 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 patient care) of predictive analytics.

Recommendation 2

Use validated psychometric assessment models to evaluate identified PwD activation as related to their diabetes care

Once PwD have been identified as having or at risk for low therapy compliance 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. Such criteria could include an age range, such as all newly diagnosed PwD between the age of 25–44.

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 compliance and persistence. Such tools have been shown to increase compliance to therapy, reduce healthcare expenditure[35] and predict costs and outcomes for PwD.[36, 37] 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 compliance to medicine and a 2% decrease in hospital admissions and readmissions.[57]

Such assessment tools are yet to be used in Saudi Arabia. The adaptation or development of a PwD-specific activation measurement tool could align with the government's National Executive Plan on Diabetes Control and implemented as a public–private partnership. Pilot programs can be initiated in partnership with private insurance companies such as Bupa Arabia, Tawuniya and private hospitals such as Saudi Aramco and Dallah.

Activate

Recommendation 3

Offer educational courses to PwD (and if applicable caregivers) tailored to PwD degree of activation

Once PwD activation has been evaluated, there is still a considerable challenge to engage them. In the 'activate' phase, interventions could be tailored to the degree of PwD activation so that goals and action steps are realistic and build towards greater activation. For these PwD dependent on caregivers, it becomes important to also adequately educate the caregivers.

In Saudi Arabia, newly diagnosed PwD are not formally educated on T2D, especially if diagnosed in a PHC.[16, 58] Instructor-based patient education programs can help promote behavioral changes in PwD, thus positively influencing PwD activation and engagement, notably in terms of positive lifestyle changes, compliance to medication, physician visits and regular HbA1c tests, especially in the first few years post diagnosis.[59, 60] Such education programs would fit well within the initiatives of National Directorate for Control of Chronic Diseases "Non Communicable Disease (NCD)" and could be driven in cooperation with health education management in National Guard Health Affairs (NGHA) in the public sector. Initiation of such programs in the private sector could be facilitated by the HIS and EMRs, which are already in place in this sector.

For optimal delivery of educational courses tailored to PwD activation degrees, the personnel in charge of delivering such courses could receive extra training on this. In Saudi Arabia, this starts with balancing capacity and capability within the various tiers of the healthcare system. Actions to do so include:

- Introducing trained and certified diabetes educators in PHCs.
- Increasing the capability of physicians in PHCs to provide T2D education tailored to PwD activation degrees.
- Engaging pharmacists in PHCs and MoH hospitals in PwD management and activation.

Recommendation 4

Introduce trained and certified diabetes educators in PHCs

Presently, most PHCs in Saudi Arabia do not have dedicated general health educators. Instead, health educators visit PHCs one or two days a week; however, they cannot spend sufficient time on diabetes as they need to cover a broad spectrum of diseases.[16] In the Saudi public sector, there are fewer than a hundred diabetic educators and these are primarily employed by the diabetes clinics, general public hospitals and tertiary public hospitals.[16] Consequently, there is a need to introduce T2D-educated nurses in PHCs.

A combination of options can be considered to educate nurses such as a certification course in diabetes education (DEC) and/or a Diabetic Diet course (DDC) from reputable colleges or a centrally organized training course followed by on-site training. Multiple options, such as an online certification course, can be offered to ensure convenience and safety. The course materials should include clinical and non-clinical aspects of treating and managing T2D to help PwD stay engaged. This includes training on PwD engagement based upon activation degrees.

A program such as Project HOPE, endorsed by the International Diabetes Federation (IDF), was launched in India in 2007, where approximately 3,500 Diabetes educators went through an E-Learning Program (IDEEL), which was followed by a 15-day clinical internship under the guidance of an endocrinologist and a diabetes educator.[61] An IDEEL-like program could be rolled out in Saudi Arabia with the support of leading local universities for certifications and online offerings for time and cost efficiency.

Recommendation 5

Improve the capability of physicians in PHCs to provide T2D education tailored to PwD degree of activation

There are still further improvements that could be made to advance treatment and management of PwD in Saudi Arabia. This is because some physicians are not specifically trained to manage PwD and, in some instances, non-Saudi physicians follow their native country's treatment guidelines.[16]

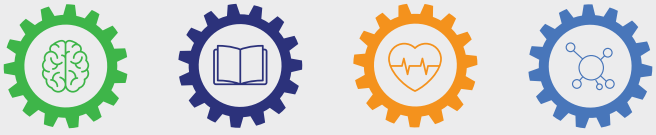
An annual refresher course for PHC physicians could address the capability gaps identified above and could be included within the National Executive Plan of Diabetes Control (2010–2020). Such a course should include:

- T2D treatment and management, including information on global and local best practices.
- Behavioral change management (notably to tailor engagement programs to PwD activation degrees).
- Impact of T2D complications on PwD quality of life and T2D-related costs to the country.[16]

Currently, physicians attend nonspecific Continuous Medical Education (CME) and conferences to gain credits. The MoH should administer CME or conference attendance according to the specialty and encourage cost-effective, accredited, online CME courses specific to T2D.

Recommendation 6

Engage pharmacists in PHCs and MoH hospitals in PwD management and activation



Pharmacists regularly interact with PwD as prescriptions are filled and refilled in PHC or MoH hospital pharmacies. Most pharmacists speak Arabic and could be leveraged to provide education on therapy and compliance, including appropriate dosing, to these PwD with low activation degrees.

Training materials for pharmacists in PHCs and MoH hospitals could be developed and distributed as part of a public-private partnership. Additionally, chain pharmacies could also play important roles in such an initiative in the retail sector.

Recommendation 7

Run T2D management awareness campaigns before and during Ramadan

Compliance to T2D therapy decreases during Ramadan.[16] In Saudi Arabia, programs exist to address compliance during Ramadan, e.g. Healthy Interactions, in collaboration with IDF and supported by Lilly Diabetes, created conversation maps on managing diabetes during this period. This program aims to educate PwD on the risks associated with fasting and on making informed decisions related to self-management during Ramadan. Interactive sessions between educators and PwD were followed by extensive consultation with HCPs.[62, 63]

Besides existing programs, a public awareness campaign on medicine dosing and T2D management could be coupled with training and awareness programs in PHCs. These could feature educational materials specific to T2D management during Ramadan for PwD, educators, pharmacists and general physicians treating PwD. Efforts to create awareness could begin two to three months before Ramadan and continue until the end of the fasting period.

Additionally, the Saudi government could evaluate partnering with private "chain pharmacies" to implement awareness campaigns. For example, Nahdi Medical Company launched the "I Challenge Diabetes" social media campaign to raise awareness, provide guidance and sponsor offers at fitness clubs.[16, 64]

Sustain

The preceding recommendations are designed to activate PwD so that they are empowered to effectively self-manage their condition and comply with their therapy, thus prolonging life and reducing the risk of complications. However, these interventions all involve a high degree of human interaction, 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 can be adopted to reduce human involvement and associated costs.

Recommendation 8

Monitor 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 would help to periodically reassess PwD activation and take appropriate actions with these PwD that are experiencing a temporary decrease in their degree of activation.

Clinical outcomes could be used to cost-effectively identify PwD experiencing a temporary setback in activation. For instance, highly activated PwD who suddenly 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 could 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 for those PwD whose condition remains satisfactorily controlled.

Recommendation 9

Leverage technology and digital offerings to maintain PwD activation

A multi-pronged, structured approach could be used to help HCPs gradually encourage PwD to start adopting technology and help them independently manage their condition. Such an approach could leverage:

- A structured instructor-based refresher program.
- Educative videos and handouts with reference to online educational materials.[65]
- Mobile technology: In Saudi Arabia, high mobile phone penetration (~65%)[66] could support the use of SMS, social media and apps for PwD education. SMS can be effectively used to remind PwD about blood glucose checkups, medication intake, physician visits and to provide educational, self-awareness materials.[67, 68] Studies in Saudi Arabia have shown better glycemic control in PwD who were sent SMS reminders in Arabic in relation to medication intake, awareness and educational information.[67]
- Mobile apps: Saudi Arabia-specific apps like 'Step counter', 'NAHDI Mobile App' could help Saudi PwD independently manage their diet and physical activity.
- Social media based educational messaging to build awareness and a sense of community, which becomes a source of encouragement for PwD; e.g., Diabetes UK runs a twitter feed that is followed by an audience of 138,000.

All the above recommendations could be initiated as pilot projects, which would allow assessment of outcomes and capture of the learnings. Involvement from relevant stakeholders such as leading university hospitals, corporations like Saudi Aramco, Bupa Arabia, Tawuniya, Dallah Health and select PHCs will be crucial for the success of such initiatives. Successful pilots could then be scaled up to cover all PHCs as well as other public and private institutions in the entire Kingdom.

Conclusion

The economic and societal burden of low T2D therapy compliance and persistence in Saudi Arabia is high and rising. T2D-related complications are thought to make up 64% of total type 1, type 2 and gestational diabetes management costs to the healthcare system[13] and it is predicted that around 15% of these complication related costs, estimated to be SAR3.9 billion per year (see Exhibit 1), are due to sub-optimal T2D therapy compliance and persistence.[29] With around ~3.5 million PwD in Saudi Arabia today, estimated to grow to ~7.5 million by 2035,[6, 12] it is imperative that structured action is taken to improve T2D therapy compliance and persistence on a war footing.

In light of this, a comprehensive and coordinated set of 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 benefits, Saudi healthcare system leaders 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 compliance and persistence, as well as improve health of millions of PwD. This could allow Saudi Arabia to become a regional, if not global, Center of Excellence in diabetes care.

Additional Information:

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

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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.

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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.

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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.

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