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## International Diabetes Federation



### Review

# Call-to-action: Timely and appropriate treatment for people with type 2 diabetes in Latin America



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#### ABSTRACT

Latin America faces a unique set of challenges in the treatment of type 2 diabetes mellitus (T2DM). This report identifies these challenges and provides a framework for implementation of the strategies, policies and education programs which are needed to optimize the management of this condition. In order to improve future diabetes care, it will be necessary to address existing problems such as limitation of resources, inadequate management of hyperglycemia, and inappropriate education of healthcare team members and people with diabetes. Achieving these goals will require collaborative efforts by many individuals, groups and organizations. These include policymakers, international organizations, healthcare providers, those responsible for setting medical school curricula, patients and society as a whole. It is anticipated that improved/continuing education of healthcare professionals, diabetes self-management education and development of a team approach for T2DM care will lead to optimization of patient-centered care. Implementation of multi-centric demonstration studies and rational use of antidiabetic treatments will be necessary to demonstrate the long-term favorable impact of these strategies upon quality of care, prevention of chronic complications, mortality, healthcare costs and patient quality of life.

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## 1. Introduction

### 1.1. Diabetes in Latin America: The growing epidemic

Type 2 diabetes mellitus (T2DM) and other chronic non-communicable diseases are currently the leading health problems in Latin America [1]. It has been estimated that 26 million people in this region have diabetes [2], and this number is expected to rise to almost 40 million (60% increase) by 2030 [3].

In terms of T2DM population size, Brazil and Mexico rank among the top ten countries in the world, and it is estimated that 12 million people (approximately 45%) in the Latin American Region remain undiagnosed [2]. Globally, the prevalence of diabetes has shown a steady increase over several decades and it is anticipated that it will continue to rise as a result of changes in urbanization, economic growth and lifestyle [3].

Diabetes is important not only because of its rising prevalence, but also because it is frequently associated with the development of serious and disabling chronic complications. For example, diabetes is itself a major independent risk factor for cardiovascular disease [4] and is also frequently associated with the presence of other cardiovascular risk factors (CVRFs) [5,6]. According to several Latin American studies, most people with T2DM have at least one CVRF, with overweight/obesity and hypertension being the most common [5,6]. These conditions, which are associated with the provision of poor quality healthcare, result in the development of disabling chronic complications that increase the cost of care and decrease patients' quality of life [1,5,7–10]. It is therefore evident that, if we want to improve the prognosis of Latin American patients with diabetes, we must identify and address the underlying causes of poor care quality—and increased economic investment is not necessarily the most effective way to achieve this aim.

The costs associated with diabetes treatment are already high. In the year 2000, the total annual cost of diabetes in Latin America and the Caribbean was US\$ 65 billion [1]. This included US\$ 15 billion in Mexico, US\$ 2.6 billion in Central America and US\$ 44.4 billion in South America [1]. Costs are undoubtedly higher now as a result of the continuous increase in diabetes prevalence [2].

While the treatment of diabetes itself represents a considerable economic burden, it is now recognized that the chronicity of the condition and the development and

progression of complications that result from poor management are major predictors of resource use [6,11]. Studies have shown that intensive control of blood glucose and management of the associated CVRF in patients with T2DM is cost effective because this approach reduces development and progression of the chronic complications that markedly increase the cost of care [6,7,11–17].

Owing to the high prevalence of T2DM in Latin America, a growing number of patients are treated by primary care physicians (PCPs) who are often inadequately trained to manage this condition [1,18,19]. Access to specialist care is typically granted only at later stages of the disease, when patients have already developed preventable complications, and PCPs are therefore increasingly responsible for the provision of adequate metabolic control and for the timely initiation and titration of insulin therapy [18].

Unfortunately, the situation in Latin America is unlikely to improve in the near future because the limited number of specialists in this region will be unable to care for the growing population of people with diabetes. One possible strategy could be the widespread implementation of easily accessible educational programs for PCPs that focus on, among other important issues, patient care and the prescription and management of the early prescription of insulin. In addition, Latin America must reorganize its diabetes healthcare services to focus on behavioral changes, long-term treatment adherence, and the concept of “treatment to target” [1].

This manuscript summarizes the consensus of a multi-professional expert panel of diabetes specialists and community diabetes care leaders who convened to identify, discuss and suggest potential call-to-action points for the current management of T2DM in Latin America. This call-to-action provides a framework for implementation of strategies, policies and education programs in the Region. It aims to improve management of the disease, providing timely and effective treatment (including initiation of insulin therapy), which helps patients to achieve their glycemic targets.

### 1.2. The importance of glycemic control

Achieving target glycemic control is the cornerstone of effective diabetes management. This has been demonstrated by a number of studies, most notably the UK Prospective Diabetes Study (UKPDS), which showed that intensive glucose-lowering therapy significantly reduced microvascular and neuropathic complications in patients with T2DM [15,20]. Follow-up of this

patient cohort established that such control also prevented macrovascular complications during the 10 years after the trial, even though between-group differences in glycemic control were lost in the first year of post-trial monitoring [21]. The importance of glycemic control is emphasized in the recent Asociación Latino Americana de Diabetes (Latin American Diabetes Association, ALAD) guidelines which recommend target values for HbA1c of <6.5–7.0% (<48–53 mmol/mol) in the majority of people with T2DM [1]. Certain patients may require these goals to be customized based on their clinical parameters and particular circumstances [1].

Glycemic control is known to deteriorate with longer disease duration, and this is associated with a concomitant rise in disease-related comorbidities [6,15,20]. Based on these data, the ALAD consensus statement recommends the early use of combined oral therapy and the timely addition of insulin to the regimen of patients with T2DM who do not achieve adequate glucose control (Fig. 1) [1].

The ALAD consensus statement divides patients into two groups based on HbA1c (<9% [<75 mmol/mol] and ≥9% [≥75 mmol/mol]). Those with HbA1c <9% (<75 mmol/mol) should make lifestyle changes (physical activity and healthy meals) in order to achieve weight reduction and good glycemic control. These patients should also take oral antidiabetic agents, with metformin as first-line therapy. Other classes of agents are recommended as initial therapy only in cases of metformin intolerance or contraindication [1]. Alternative agents include sulfonylureas, thiazolidinediones, incretin-based therapies (dipeptidyl peptidase-4 inhibitors [DPP-4i] and glucagon-like peptide-1 receptor [GLP-1R] agonists), meglitinides and acarbose

[1,22]. The ALAD consensus statement also recommends that insulin therapy should be initiated, with or without additional glucose-lowering agents, in patients with a baseline HbA1c <9% (<75 mmol/mol) whose glycemic goals are not met on oral combination therapy [1]. In patients with HbA1c ≥9% (≥75 mmol/mol), lifestyle change plus insulin therapy should be initiated immediately (i.e., without prior oral therapy), especially if the patient is clinically unstable or prone to ketoacidosis or weight loss [1].

## 2. Current challenges in diabetes management in Latin America

### 2.1. Current policy for diabetes management

Chronic non-communicable diseases such as cardiovascular disease, cancer, chronic respiratory disease and economic loss in low- and middle-income countries [23]. Despite strong evidence demonstrating the growing global burden posed by these conditions, their preventability, and the threat they pose to healthcare systems, their importance in developing countries has been largely neglected by policy makers; consequently, national and global actions have been insufficient or, in some cases, completely absent [24,25]. Of the chronic non-communicable diseases that currently prevail worldwide, diabetes is of particular importance due to the social, economic and health burden that it places on countries, health ministry budgets, individuals and their families [9,26,27]. Contributing to this

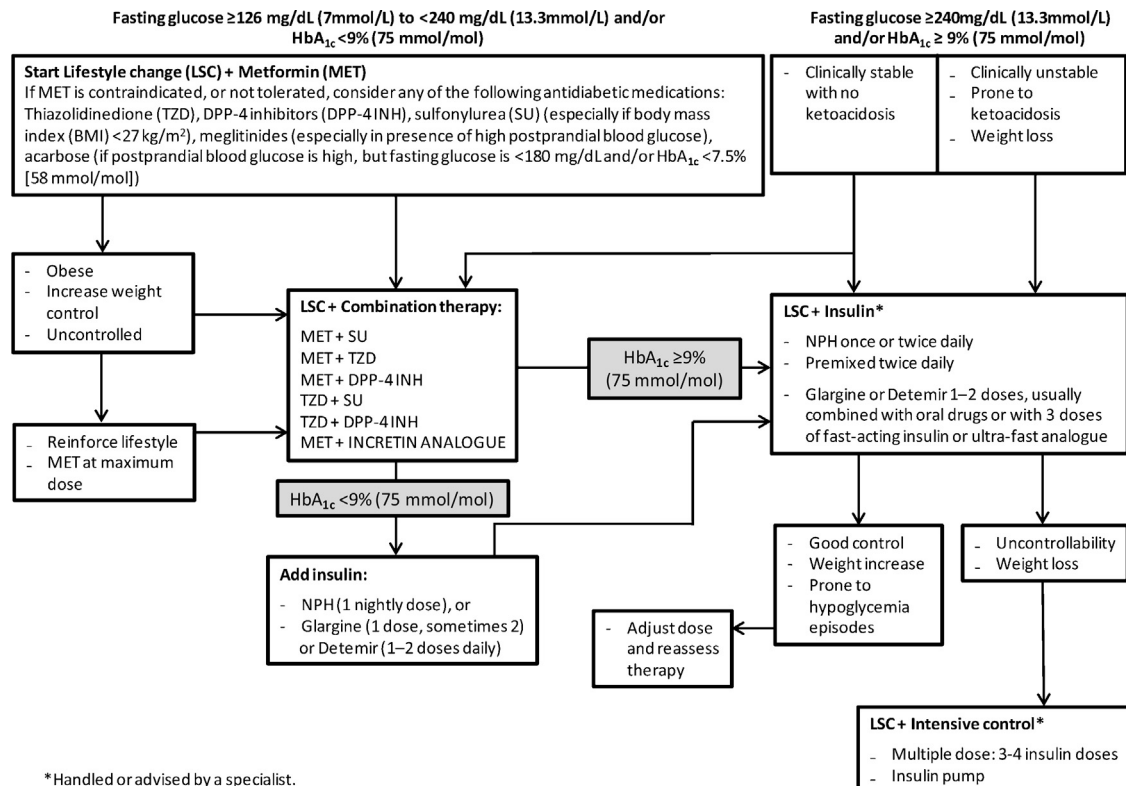


Fig. 1 – Latin American Diabetes Association recommendations for the management of hyperglycemia in patients with T2DM [1].

burden are both direct healthcare costs (e.g., drugs, hospitalizations, consultations, management of complications) and indirect costs caused by loss of productivity (e.g., disability, premature mortality) [7,28]. In an effort to resolve this, a recent United Nations resolution on diabetes (UNR) summarized different approaches to improve the prevention and control of T2DM [29].

Throughout middle-income countries such as those in Latin America, services for diabetes and other chronic diseases compete with demands from, and resources directed toward, infectious diseases [9]. In addition, the existing primary care structure is overstretched and under-resourced and, as a result, frequently fails to provide optimal care to patients with chronic diseases such as diabetes [7,9]. These problems are compounded by a lack of appropriate epidemiologic and quality of care data on diabetes, a deficiency which leaves policy makers unaware of the impact and burden of the disease and the negative economic impact of inadequate glycemic control [6,11].

In order to achieve glycemic target values and prevent the development and progression of chronic complications, people with T2DM must have access to skilled healthcare providers, antidiabetic therapies and supplies for self-monitoring blood glucose (SMBG), as well as appropriate education to actively participate in the control and treatment of their disease [30]. Limited resources and healthcare budgets are commonly considered to be the main barriers to achieving treatment goals in patients with diabetes [1,7,9]. However, lack of education also plays a key role [10,31,32]. Therefore, overcoming the burden of diabetes throughout Latin America will require an integrated public health approach that incorporates education of patients and healthcare team members, as well as allocation of appropriate resources for disease management [5,11,33–35].

## 2.2. *Inadequate use of oral blood glucose-lowering medication and timely insulin prescription and intensification*

The recent ALAD consensus statement recommends targets for HbA1c and fasting blood glucose (FBG) of <7% (<53 mmol/mol) and 70–120 mg/dL, respectively [1]. However, despite the availability of many antidiabetic therapies, HbA1c and blood glucose levels are far above target values in the majority of people with T2DM throughout Latin America [6,33]. This suggests that adherence to current treatment guidelines in this region is poor. The ALAD consensus statement recommends metformin and lifestyle change as first-line therapy in all diabetes patients with mean FBG <240 mg/dL and/or HbA1c <9% (<75 mmol/mol) [1]. In Latin America, this regimen most commonly comprises metformin and/or a sulfonylurea [6,33]. However, the poor levels of glycemic control among patients with diabetes in Latin America [6,33] demonstrate the inadequacy of the antihyperglycemic regimen instituted by many physicians. Fear of inducing side effects may, in part, explain the reluctance of physicians to titrate oral antihyperglycemic agents, the risk of hypoglycemia being particularly high in patients receiving sulfonylureas [1,36]. Although the recent introduction of GLP-1R agonists and DPP-4i offers great promise for the treatment of T2DM [37], issues of cost [38] and availability may negatively impact the use of these agents in Latin America. In those patients treated with incretins, their

use is associated with weight loss or weight neutrality and a low incidence of hypoglycemia [37]. These agents have also been associated with significant improvements in  $\beta$ -cell function, a characteristic that slows disease progression and delays the need for insulin treatment [39,40]. However, T2DM is a progressive disease and glycemic control typically deteriorates as disease duration increases [6,18]. As a result, treatment with multiple antidiabetic agents frequently becomes necessary and many patients eventually require insulin administration to achieve treatment target values [1,2,36,41–44].

The role of insulin in achieving glycemic control early in the course of T2DM and its value in the prevention of chronic diabetes complications is well established [15,41,44,45]. In addition, timely transition to insulin and more rapid intensification of treatment may delay the onset of diabetes-related complications [46,47]. Early institution of insulin therapy may also reduce the overall financial burden: Gagliardino et al. have shown that the cost of treating a single episode of an acute or chronic diabetes complication such as ketoacidosis, acute myocardial infarction or amputation is greater than either the total or partial annual cost of the appropriate control and treatment of several uncomplicated patients with diabetes [30]. Therefore, financing prevention programs that reduce the incidence of complications is likely to be cost-effective, as well as producing a better quality of life for people with diabetes [34,35,48].

Despite the proven benefits of insulin therapy, evidence suggests that initiation of insulin therapy is considerably delayed in clinical practice worldwide [31,32,49]. For example, a recent multinational, prospective, open-label study involving more than 66,000 patients with T2DM observed that, at the time of insulin initiation, mean HbA1c levels were 9.3–9.8% (78–84 mmol/mol), with at least 80% of the study population in each participating country already having long-term diabetes complications [49]. Inadequate intensification of therapy was also reported in the International Diabetes Mellitus Practice Study (IDMPS) registry, a 5-year survey that documented changes in diabetes treatment practice in 17 developing countries including Argentina, Ecuador, Venezuela and Colombia [32]. Reluctance of both patients and healthcare providers (HCPs) to initiate insulin therapy is a widespread and well documented phenomenon [50,51] that may, in part, underlie the poor glycemic control that is highly prevalent among people with diabetes in Latin America [5]. Certainly, it is known that delayed prescription and inappropriate insulin usage are key drivers of poor metabolic control [5,10,52,53]. It is important to note that, in addition to timely initiation, adequate insulin dose titration is crucial in order to attain the full benefits of this treatment [54].

With reference to the last point, in daily practice—and particularly at the primary care level—achieving glycemic target values in people treated with insulin remains a challenge. Insulin initiation, daily adjustment of its dose and the need for frequent assessments of blood glucose levels are often complicated for both patients and physicians due to a lack of adequate training together with misconceptions and concerns regarding the effect of therapy [43,51,55–58]. Results from the 2005 Diabetes Attitudes, Wishes and Needs (DAWN) study demonstrated that common barriers for patients include the belief that the requirement for insulin represents a personal failure, and that its use is not fully effective [51]. Additionally,



patient fears about insulin dose adjustments and daily self-monitoring of their blood glucose may compromise treatment adherence. Currently, adjustment of insulin doses in patients with T2DM is largely controlled by the HCP rather than by the patient, a strategy which can be both time-consuming and costly in terms of healthcare resource utilization [59,60]. This strategy also plays against patients' autonomy. Moreover – and crucially – evidence suggests that patient self-adjusted insulin titration is as effective in achieving glycemic control as physician-driven titration [61,62].

Although the evidence suggests that patient self-adjusted of insulin titration is as effective in achieving glycemic control as that driven by the physician [61,62], such adjustment is largely controlled by the HCP. This strategy plays against patients' autonomy and results in both time-consuming and costly in terms of healthcare resource utilization [59,60].

The aforementioned barriers to effective treatment have led to a situation in which inappropriate metabolic control is maintained for long periods, with the consequent development and progression of diabetes complications that increase the cost of care and decrease patients' quality of life [6]. Currently, a preventative approach is rarely taken, and HCPs tend to focus on the treatment of diabetes complications when they have developed rather than on early glycemic control to prevent or delay the onset of these complications [14,30].

### 2.3. Lack of provider and patient self-management diabetes education

Several factors contribute to the suboptimal care of people with diabetes [5,63,64]: (a) inadequate knowledge and experience of HCPs [64–66]; (b) primary care providers' poor adherence to current guidelines [67]; (c) high patient volume per primary care provider of around 15–20 consultations per morning [67]; (d) limited patient access to care [7]; (e) poor patient compliance with self-care and treatment [6]; and (f) lack of patient education and poor attention to the psychological impact of the disease [6,63,68].

In most cases, the underlying causes of poor management have a common feature: inappropriate education at every level. In general, healthcare systems in Latin America do not utilize a comprehensive multidisciplinary team approach for the treatment of people with diabetes [1]. As a result, PCPs are usually responsible for the treatment of a large proportion of people with diabetes, despite the fact that many of them have insufficient training in the provision of adequate care [1,6,65]. In a recent study conducted in Brazil, PCPs reported that they did not feel prepared to implement educational practices for people with diabetes due to gaps in their disease knowledge [65]. The inherent complexity of diabetes treatment combined with the continuous introduction of new therapies and treatment strategies is often overwhelming for PCPs who must remain informed about a range of disease states and treatment modalities [19]. These factors make it difficult for these clinicians to implement effective diabetes treatment strategies and educate patients. As a result, patient education is frequently a low priority among practitioners, payers, public health opinion leaders and decision-makers [33].

This situation is both undesirable and detrimental to patient health, since a number of studies have demonstrated that

patient education can contribute to behavior change and improve metabolic control [33]. Through education, motivation and the involvement of patients as partners in the care process, treatment adherence and adequate disease control may be achieved [69,70]. To provide effective patient education, health professionals require training, updated knowledge of the disease and effective educational and communication skills, as well as an understanding of the patient's situation [65,71]. Education of PCPs to improve care outcomes will also have a major impact on healthcare costs by improving compliance with treatment and the metabolic control of T2DM patients at the primary healthcare level [10,35,70].

Currently, only a minority of patients within Latin America receive adequate diabetes education [6,33]. It is therefore necessary to implement a wide and efficient structured education program that is directed at both healthcare team members and people with diabetes, in order to improve the quality of care and encourage the timely prescription and appropriate use of insulin. Such a program would also promote patients' self-management behavior and patient-driven insulin titration algorithms to ensure optimal care and insulin treatment adherence, safety and tolerability [61,72–74].

## 3. A call-to-action

The expert panel calls on policymakers and HCPs throughout Latin America to help patients with T2DM achieve treatment targets and effectively manage their disease by focusing on the following four key areas.

### 3.1. Education of healthcare professionals

Overcoming the continuous increase in the prevalence of diabetes, the heavy burden that it imposes on both the healthcare system and society, the complexity of diabetes management, and the poor quality of care provided to people with the disease requires considerable expertise to match medication to the requirements of the individual patient, to manage complex drug regimens and to achieve long-term adherence to therapy [1,51]. It is therefore important that HCPs have adequate training in the pathophysiological basis of T2DM, the efficacy and tolerability of antidiabetic medications (including insulin titration and intensification), identification of individual patients' needs and the provision of strong support for patient education [1,51].

Such HCP educational programs should focus on the importance of early attainment of treatment targets through the appropriate early use of combined oral therapy and the timely addition of insulin in patients who do not achieve target glucose levels on intensive oral therapy [1]. Aggressive intervention with medication should also be pursued earlier if lifestyle intervention fails to achieve treatment targets [19]. In this regard, promotion of the ALAD consensus statement throughout Latin America would help guide PCPs through a simple decision-making process for diabetes management [1]. Additionally, HCPs should be trained to educate patients and promote their attendance at educational courses as an important part of their diabetes treatment. These programs should be mandatory for all undergraduate and postgraduate

level health students who may be involved in future diabetes care.

The organization and wide implementation of ‘insulinization units’ (specialist care groups that focus on insulin education in existing diabetes care centers), would also help to ensure timely and appropriate insulin prescription, titration and intensification. When possible, all patients initiated on insulin therapy should be referred to such an insulinization unit.

Owing to the shortage of human resources for healthcare throughout Latin America, more efficient use of healthcare personnel is urgently required. It has been demonstrated that nurses are capable of delivering many aspects of diabetes care if detailed management protocols are available or if they receive training, resulting in improved glycemic control and fewer complications [75]. Therefore, training nurses and community health workers is recommended to address the shortage of HCPs in diabetes care. When nurses are not available, appropriately trained peers could play such a role [76].

Key recommendations

Modification of the School of Medicine curricula	University modules which provide the skills for successful provision of diabetes care and efficient motivation to achieve long-term adherence to therapy should be mandatory for all undergraduate and postgraduate health students who may be involved in diabetes care
PCP training and support	Healthcare associations and institutes and established diabetes specialists should provide additional training, continuing education and support to PCPs involved in diabetes care. Primary care physicians should be trained to treat patients with insulin
Promotion of the ALAD consensus statement	The ALAD consensus statement [1] should be promoted throughout Latin America to help guide PCPs through a simple decision-making process for diabetes management
Increasing human resources for T2DM care	Non-medical members of the healthcare team such as nurses, pharmacists, community health workers and motivated patients should be trained in the skills and knowledge necessary for diabetes care, including patient self-management
Optimal utilization of diabetes expertise	A network of specialist care ‘insulinization units’ should be created within existing diabetes care centers. All patients initiated on insulin therapy should, when possible, be referred to such units

3.2. Patient-centered care and diabetes self-management education

Diabetes education programs are needed for both patients and the general public in order to create awareness about the disease and its consequences, to achieve sustained changes in lifestyle and to promote adherence to antidiabetic therapy [1,60]. It is well established that education of people with T2DM is critical in order to achieve their active and effective participation in the control and treatment of their disease [1,19,77].

For most patients who require insulin therapy, dose titration is carried out by physicians; however, evidence suggests that

patient-driven insulin titration algorithms are effective in managing blood glucose levels without compromising safety and tolerability [61,72–74]. Self-management diabetes programs underpinned by self-management education (including insulin self-titration training) are therefore an effective strategy for addressing the current shortage of HCP personnel. It is thus critical that self-management diabetes programs include adequate self-titration handling (including SMBG) delivered by competent diabetes educators who can provide ongoing self-management support to ensure optimum glycemic control [62,78]. Training volunteers and using ‘expert’ patients/peer educators is another effective way of addressing the human resource crisis [79,80]. Using patients in the provision of care empowers them and increases patient-centeredness; for example, in recent studies, peer education significantly improved HbA<sub>1c</sub> compared with standard diabetes care [76,81].

Key recommendations

Lifestyle interventions for the prevention and treatment of T2DM	Patients and their families should receive adequate education to empower them to make appropriate choices concerning healthy lifestyle; this includes appropriate levels of physical activity, good nutrition and avoidance of alcohol/smoking
Patient self-management education, including insulin self-titration	Diabetes education programs delivered by trained diabetes educators should be made available to patients with T2DM, family members and the general public. These programs should include insulin self-titration training
Peer-led diabetes education programs	Well-trained peer educators should be utilized to promote and lead diabetes self-management education programs

3.3. Implementation of pilot demonstration studies

The provision of objective evidence at every decision-making level (public health, social security and prepaid system) is of the utmost importance if the benefits of early diabetes treatment, including appropriate initiation and intensification of insulin, are to be demonstrated. For that purpose, multicentric demonstration studies with objective outcomes evaluations should be implemented across the Latin American Region.

These multinational cooperative pilot studies, designed and monitored by an *ad hoc* committee of experts from participating countries, would include a detailed evaluation of the impact of early diabetes treatment and appropriate insulinization on clinical, metabolic, therapeutic and psychological outcomes, and on patient treatment satisfaction. These studies would also provide baseline quality of life data for use in future cost-effectiveness analyses, further demonstrating the external validity and applicability of such programs in different care settings.

Key recommendations

Implementation of clinical and socioeconomic research	Multinational pilot studies analyzing the impact of early diabetes treatment and appropriate insulinization on clinical, metabolic, therapeutic and psychological outcomes should be implemented across the Latin American Region
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### 3.4. Changing policy for resource optimization

Treatment for T2DM (including oral glucose-lowering drugs [OGLD], injectable glucose-lowering drugs, and insulin), supplies for SMBG and continuous education of HCPs is expensive relative to the total current healthcare budget, and has to compete with other demands, in particular those for communicable diseases [38]. Optimization of resource usage and equity of resource distribution are therefore of paramount importance [7]. In this regard, we contend that implementation of the aforementioned strategies allows optimal use of available resources [14,30,33,35,76].

We do however recognize that, due to the large number of people with diabetes, it is not economically feasible to provide the entire T2DM population with the more expensive insulin analogues or pen injectors [38]. Similarly, the newer incretin-based therapies are extremely expensive and there is currently a lack of evidence for long-term outcome benefit [38]. For these reasons these therapies should be prescribed selectively.

We have established that provision of diabetes education, SMBG and HCPs are all extremely important in the care of people with T2DM. We therefore recommend that sufficient economic support be provided to ensure that every patient with diabetes has appropriate access to all these elements, as well as appropriate access to care and therapy. This could be achieved through more economical provision of insulin and OGLD [38].

#### Key recommendations

Rational use of insulin and other antidiabetic treatments	Metformin and sulfonylureas should be the main oral drug treatment in T2DM. Human insulin should be made available to all patients who are unable to achieve adequate glycemic control with OGLD. Analogue insulin and GLP-1 and DPP-4 treatments should be reserved for special patient groups (i.e., those who do not achieve treatment targets with OGLD and/or who suffer frequent hypoglycemia). These treatments may also be used if the economic situation of the patient or institution permits
Use of generic antidiabetic drugs	Antidiabetic drugs should be accessible to every patient with diabetes
Increase access to medicines	Strategic alliances should be created among all organizations involved in diabetes care. These organizations should call for public health policies that support appropriate coverage of diabetes treatment (education, drugs, SMBG). Decreases in medication cost should be promoted so that products can be offered at sustainable prices that are affordable for low income populations

## 4. Conclusion

The prevalence of T2DM in Latin America is currently high and is expected to increase over the next decade. Healthcare providers and public health organizations will be challenged

to find effective ways to control diabetes and reduce the socioeconomic burden associated with the development and progression of chronic complications. Studies have clearly shown that tight control of hyperglycemia and associated CVRFs can effectively reduce the development and severity of the complications of diabetes, thus reducing care costs and improving the quality of life of people with this condition.

This call-to-action aims to provide feasible strategies to improve diabetes management in Latin America, taking into account the unique challenges faced by people with diabetes and physicians in this region. These include provision of educational programs at every level (involving all HCPs dealing with diabetes care, healthcare team members, people with T2DM and their families), as well as timely and appropriate nationwide intensive hyperglycemia treatment using all the available therapeutic resources including insulinization programs. These initiatives would be associated with re-evaluation of the primary healthcare infrastructure and resource policy to ensure efficient use of every diabetes treatment resource, with the aim of effectively preventing the development and progression of chronic complications. Implementation of these strategies will optimize the use of human and economic resources. However, above all, it will improve the quality of life of people with diabetes and reduce the mortality associated with the disease.

### Conflict of interest statement

Miguel Escalante: Academic activities with Novo Nordisk, Bristol Myers Squibb, Boehringer Ingelheim, Sanofi, Astra Zeneca, Eli Lilly and Abbott.

Juan José Gagliardino: Lecturer for Bristol Myers Squibb, Eli Lilly, Merck Sharp and Dohme, NovoNordisk, Roche, Sanofi-Aventis and Servier. Member of Advisory Board for Bristol Myers Squibb, Eli Lilly, Merck Sharp and Dohme and NovoNordisk. Recipient of unrestricted research grants from Beta, Bristol Myers Squibb, Eli Lilly, Merck Sharp and Dohme, NovoNordisk, Roche and Sanofi-Aventis.

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## REFERENCES

- [1] Guzman JR, Lyra R, Aguilar-Salinas CA, Cavalcanti S, Escano F, Tambasia M, et al. Treatment of type 2 diabetes in Latin America: a consensus statement by the medical associations of 17 Latin American countries. *Latin American Diabetes Association. Rev Panam Salud Publica* 2010;28(6):463–71.
- [2] International Diabetes Federation. *IDF diabetes atlas*. 5th ed. Brussels, Belgium: International Diabetes Federation; 2012, Available from: URL: (<http://www.idf.org/diabetesatlas/5e/Update2012>).
- [3] Whiting DR, Guariguata L, Weil C, Shaw J. *IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030*. *Diabetes Res Clin Pract* 2011;94(3):311–21.
- [4] Primary Prevention of Cardiovascular Diseases in People With Diabetes Mellitus: A Scientific Statement From the American Heart Association and the American Diabetes Association. *Circulation*. 2007;115:114–26.
- [5] Gagliardino JJ, de la Hera M, Siri F. Evaluation of the quality of care for diabetic patients in Latin America. *Rev Panam Salud Publica* 2001;10(5):309–17.
- [6] Lopez SG, Tambascia M, Rosas GJ, Etchegoyen F, Ortega CJ, Artemenko S. Control of type 2 diabetes mellitus among general practitioners in private practice in nine countries of Latin America. *Rev Panam Salud Publica* 2007;22(1):12–20.
- [7] Barcelo A, Aedo C, Rajpathak S, Robles S. The cost of diabetes in Latin America and the Caribbean. *Bull World Health Organ* 2003;81(1):19–27.
- [8] Bahia LR, Araujo DV, Schaan BD, Dib SA, Negrato CA, Leao MP, et al. The costs of type 2 diabetes mellitus outpatient care in the Brazilian public health system. *Value Health* 2011;14(5 Suppl 1):S137–40.
- [9] Arredondo A, Zuniga A. Economic consequences of epidemiological changes in diabetes in middle-income countries: the Mexican case. *Diabetes Care* 2004;27(1):104–9.
- [10] Gagliardino JJ, Kleinebreil L, Colagiuri S, Flack J, Caporale JE, Siri F, et al. Comparison of clinical-metabolic monitoring and outcomes and coronary risk status in people with type 2 diabetes from Australia, France and Latin America. *Diabetes Res Clin Pract* 2010;88(1):7–13.
- [11] Ringborg A, Cropet C, Jonsson B, Gagliardino JJ, Ramachandran A, Lindgren P. Resource use associated with type 2 diabetes in Asia, Latin America, the Middle East and Africa: results from the International Diabetes Management Practices Study (IDMPS). *Int J Clin Pract* 2009;63(7):997–1007.
- [12] Gaede P, Vedel P, Larsen N, Jensen GV, Parving HH, Pedersen O. Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. *N Engl J Med* 2003;348(5):383–93.
- [13] Patel A, MacMahon S, Chalmers J, Neal B, Billot L, Woodward M, et al. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. *N Engl J Med* 2008;358(24):2560–72.
- [14] Caporale JE, Elgart J, Pfirter G, Martinez P, Vines G, Insua JT, et al. Hospitalization costs for heart failure in people with type 2 diabetes: cost-effectiveness of its prevention measured by a simulated preventive treatment. *Value Health* 2011;14(5 Suppl 1):S20–3.
- [15] UKPDS. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *UK Prospective Diabetes Study (UKPDS) Group. Lancet* 1998;352(9131):837–53.
- [16] Duckworth W, Abraira C, Moritz T, Reda D, Emanuele N, Reaven PD, et al. Glucose control and vascular complications in veterans with type 2 diabetes. *N Engl J Med* 2009;360(2):129–39.
- [17] Gerstein HC, Miller ME, Byington RP, Goff Jr DC, Bigger JT, Buse JB, et al. Effects of intensive glucose lowering in type 2 diabetes. *N Engl J Med* 2008;358(24):2545–59.
- [18] Brunton S, Gough S, Hicks D, Weng J, Moghissi E, Peyrot M, et al. A look into the future: improving diabetes care by 2015. *Curr Med Res Opin* 2011;27(Suppl 3):65–72.
- [19] Chacra AR, Davidson JA, Diaz J, Escalante-Pulido M, Litwak LE, Mestman JH, et al. An algorithm for the treatment of type 2 diabetes in Latin America. *Diabetes Obes Metab* 2005;7(2):148–60.
- [20] UKPDS. Effect of intensive blood-glucose control with metformin on complications in overweight patients with type 2 diabetes (UKPDS 34). *UK Prospective Diabetes Study (UKPDS) Group. Lancet* 1998;352(9131):854–65.
- [21] Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA. 10-year follow-up of intensive glucose control in type 2 diabetes. *N Engl J Med* 2008;359(15):1577–89.
- [22] Inzucchi SE, Bergenstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, et al. Management of hyperglycaemia in type 2 diabetes: a patient-centered approach. Position statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetologia* 2012;55(6):1577–96.
- [23] Unwin N, Alberti KG. Chronic non-communicable diseases. *Ann Trop Med Parasitol* 2006;100(5–6):455–64.
- [24] Booth FW, Gordon SE, Carlson CJ, Hamilton MT. Waging war on modern chronic diseases: primary prevention through exercise biology. *J Appl Physiol* 2000;88(2):774–87.
- [25] Beaglehole R, Yach D. Globalisation and the prevention and control of non-communicable disease: the neglected chronic diseases of adults. *Lancet* 2003;362(9387):903–8.



- [26] Lam DW, LeRoith D. The worldwide diabetes epidemic. *Curr Opin Endocrinol Diabetes Obes* 2012;19(2):93–6.
- [27] Arredondo A, De IE. The cost of diabetes in Latin America: evidence from Mexico. *Value Health* 2011;14(5 Suppl 1):S85–8.
- [28] Olivera EM, Duhalde EP, Gagliardino JJ. Costs of temporary and permanent disability induced by diabetes. *Diabetes Care* 1991;14(7):593–6.
- [29] Siegel K, Narayan KM. The Unite for Diabetes campaign: overcoming constraints to find a global policy solution. *Global Health* 2008;4:3.
- [30] Gagliardino JJ, Olivera EM, Barragan H, Puppo RA. A simple economic evaluation model for selecting diabetes health care strategies. *Diabetic Med* 1993;10(4):351–4.
- [31] Khunti K, Damci T, Meneghini L, Pan CY, Yale JF. Study of Once Daily Levemir (SOLVE): insights into the timing of insulin initiation in people with poorly controlled type 2 diabetes in routine clinical practice. *Diabetes Obes Metab* 2012;14(7):654–61.
- [32] Chan JC, Gagliardino JJ, Baik SH, Chantelot JM, Ferreira SR, Hancu N, et al. Multifaceted determinants for achieving glycemic control: the International Diabetes Management Practice Study (IDMPS). *Diabetes Care* 2009;32(2):227–33.
- [33] Gagliardino JJ, Etchegoyen G. A model educational program for people with type 2 diabetes: a cooperative Latin American implementation study (PEDNID-LA). *Diabetes Care* 2001;24(6):1001–7.
- [34] Gagliardino JJ, Aschner P, Baik SH, Chan J, Chantelot JM, Ilkova H, et al. Patients' education, and its impact on care outcomes, resource consumption and working conditions: data from the International Diabetes Management Practices Study (IDMPS). *Diabetes Metab* 2012;38(2):128–34.
- [35] Gagliardino JJ, Olivera E, Etchegoyen GS, Guidi ML, Caporale JE, Martella A, et al. PROPAT: a study to improve the quality and reduce the cost of diabetes care. *Diabetes Res Clin Pract* 2006;72(3):284–91.
- [36] Rodbard HW, Jellinger PS, Davidson JA, Einhorn D, Garber AJ, Grunberger G, et al. Statement by an American Association of Clinical Endocrinologists/American College of Endocrinology consensus panel on type 2 diabetes mellitus: an algorithm for glycemic control. *Endocr Pract* 2009;15(6):540–59.
- [37] Garber AJ. Incretin therapy—present and future. *Rev Diabetic Stud* 2011;8(3):307–22.
- [38] Gill GV, Yudkin JS, Keen H, Beran D. The insulin dilemma in resource-limited countries a way forward? *Diabetologia* 2011;54(1):19–24.
- [39] Garber AJ. Incretin effects on beta-cell function, replication, and mass: the human perspective. *Diabetes Care* 2011;34(Suppl 2):S258–63.
- [40] Nicolucci A, Rossi MC. Incretin-based therapies: a new potential treatment approach to overcome clinical inertia in type 2 diabetes. *Acta Biomed* 2008;79(3):184–91.
- [41] Ranjit UI, Anjana RM, Mohan V. Importance of controlling diabetes early—the concept of metabolic memory, legacy effect and the case for early insulinisation. *J Assoc Physicians India* 2011;59(Suppl):8–12.
- [42] Kendall DM, Cuddihy RM, Bergenstal RM. Clinical application of incretin-based therapy: therapeutic potential, patient selection and clinical use. *Eur J Intern Med* 2009;20(Suppl 2):S329–39.
- [43] Pearson J, Powers MA. Systematically initiating insulin: the staged diabetes management approach. *Diabetes Educ* 2006;32(1 Suppl):19S–28S.
- [44] Wright A, Burden AC, Paisey RB, Cull CA, Holman RR. Sulfonylurea inadequacy: efficacy of addition of insulin over 6 years in patients with type 2 diabetes in the U.K. Prospective Diabetes Study (UKPDS 57). *Diabetes Care* 2002;25(2):330–6.
- [45] Marre M. Before oral agents fail: the case for starting insulin early. *Int J Obes Relat Metab Disord* 2002;26(Suppl 3):S25–30.
- [46] Ohkubo Y, Kishikawa H, Araki E, Miyata T, Isami S, Motoyoshi S, et al. Intensive insulin therapy prevents the progression of diabetic microvascular complications in Japanese patients with non-insulin-dependent diabetes mellitus: a randomized prospective 6-year study. *Diabetes Res Clin Pract* 1995;28(2):103–17.
- [47] Bretzel RG. Intensive insulin regimens: evidence for benefit. *Int J Obes Relat Metab Disord* 2004;28(Suppl 2):S8–13.
- [48] Solli O, Stavem K, Kristiansen IS. Health-related quality of life in diabetes: the associations of complications with EQ-5D scores. *Health Qual Life Outcomes* 2010;8:18.
- [49] Zilov AV, Wenyng Y, Gonzalez-Galvez G, Home P, Jianwen C, Hasan M. Prevalence of complications of diabetes in people with type 2 diabetes: data from Asia, Europe and Latin America from the A1chieve study. *Diabetes* 2011;60(Suppl 1).
- [50] Nichols GA, Koo YH, Shah SN. Delay of insulin addition to oral combination therapy despite inadequate glycemic control: delay of insulin therapy. *J Gen Intern Med* 2007;22(4):453–8.
- [51] Peyrot M, Rubin RR, Lauritzen T, Skovlund SE, Snoek FJ, Matthews DR, et al. Resistance to insulin therapy among patients and providers: results of the cross-national Diabetes Attitudes, Wishes, and Needs (DAWN) study. *Diabetes Care* 2005;28(11):2673–9.
- [52] Clark M. Psychological insulin resistance: a guide for practice nurses. *J Diabetes Nurs* 2007;11:53–6.
- [53] Cobble ME. Initiating and intensifying insulin therapy for type 2 diabetes: why, when, and how. *Am J Ther* 2009;16(1):56–64.
- [54] Swinnen SG, Hoekstra JB, DeVries JH. Insulin therapy for type 2 diabetes. *Diabetes Care* 2009;32(Suppl 2):S253–9.
- [55] O'Connor PJ. Commentary—improving diabetes care by combating clinical inertia. *Health Serv Res* 2005;40(6 Pt 1):1854–61.
- [56] Polonsky WH, Fisher L, Guzman S, Villa-Caballero L, Edelman SV. Psychological insulin resistance in patients with type 2 diabetes: the scope of the problem. *Diabetes Care* 2005;28(10):2543–5.
- [57] Polinski JM, Smith BF, Curtis BH, Seeger JD, Choudhry NK, Connolly JG, et al. Barriers to insulin progression among patients with type 2 diabetes: a systematic review. *Diabetes Educ* 2013;39(1):53–65.
- [58] Benroubi M. Fear, guilt feelings and misconceptions: barriers to effective insulin treatment in type 2 diabetes. *Diabetes Res Clin Pract* 2011;93(Suppl 1):S97–9.
- [59] Oyer DS, Shepherd MD, Coulter FC, Bhargava A, Brett J, Chu PL, et al. A(1c) control in a primary care setting: self-titrating an insulin analog pre-mix (INITIATEplus trial). *Am J Med* 2009;122(11):1043–9.
- [60] Strange P. Treat-to-target insulin titration algorithms when initiating long or intermediate acting insulin in type 2 diabetes. *J Diabetes Sci Technol* 2007;1(4):540–8.
- [61] Meneghini L, Koenen C, Weng W, Selam JL. The usage of a simplified self-titration dosing guideline (303 Algorithm) for insulin detemir in patients with type 2 diabetes—results of the randomized, controlled PREDICTIVE 303 study. *Diabetes Obes Metab* 2007;9(6):902–13.
- [62] Barag SH. Insulin therapy for management of type 2 diabetes mellitus: strategies for initiation and long-term patient adherence. *J Am Osteopath Assoc* 2011;111(7 Suppl 5):S13–9.
- [63] Beckles GL, Engelgau MM, Narayan KM, Herman WH, Aubert RE, Williamson DF. Population-based assessment of the level of care among adults with diabetes in the U.S. *Diabetes Care* 1998;21(9):1432–8.

- [64] McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, et al. The quality of health care delivered to adults in the United States. *N Engl J Med* 2003;348(26):2635–45.
- [65] Torres HC, Rozemberg B, Amaral MA, Bodstein RC. Perceptions of primary healthcare professionals towards their role in type 2 diabetes mellitus patient education in Brazil. *BMC Public Health* 2010;10:583.
- [66] Assuncao MC, Santos IS, Costa JS. Process assessment of health care: adequacy of the diabetes mellitus treatment in Pelotas, Southern Brazil. *Cad Saude Publica* 2002;18(1):205–11.
- [67] Mudaliar U, Kim WC, Kirk K, Rouse C, Narayan KM, Ali M. Are recommended standards for diabetes care met in Central and South America? A systematic review. *Diabetes Res Clin Pract* 2013.
- [68] Larme AC, Pugh JA. Attitudes of primary care providers toward diabetes: barriers to guideline implementation. *Diabetes Care* 1998;21(9):1391–6.
- [69] Funnell MMARM. Empowerment and self-management of diabetes. *Clin Diabetes* 2004;22–127.
- [70] World Health Organization. Adherence to long-term therapies: evidence for action. World Health Organization; 2003, Available at: ([http://www.who.int/chp/knowledge/publications/adherence\\_full\\_report.pdf](http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf)).
- [71] Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002;346(6):393–403.
- [72] Blonde L, Merilainen M, Karwe V, Raskin P. Patient-directed titration for achieving glycaemic goals using a once-daily basal insulin analogue: an assessment of two different fasting plasma glucose targets—the TITRATE study. *Diabetes Obes Metab* 2009;11(6):623–31.
- [73] Davies M, Storms F, Shutler S, Bianchi-Biscay M, Gomis R. Improvement of glycemic control in subjects with poorly controlled type 2 diabetes: comparison of two treatment algorithms using insulin glargine. *Diabetes Care* 2005;28(6):1282–8.
- [74] Ligthelm RJ. Self-titration of biphasic insulin aspart 30/70 improves glycaemic control and allows easy intensification in a Dutch clinical practice. *Prim Care Diabetes* 2009;3(2):97–102.
- [75] Renders CM, Valk GD, Griffin SJ, Wagner EH, Eijk Van JT, Assendelft WJ. Interventions to improve the management of diabetes in primary care, outpatient, and community settings: a systematic review. *Diabetes Care* 2001;24(10):1821–33.
- [76] Gagliardino JJ, Arrechea V, Assad D, Gagliardino GG, Gonzalez L, Lucero S, et al. Non-inferiority of peer education of people with type 2 diabetes in a structured environment. *Diabetes Metab Res Rev* 2013;29(2):152–60.
- [77] Rubin RR. Adherence to pharmacologic therapy in patients with type 2 diabetes mellitus. *Am J Med* 2005;118(Suppl 5A):27S–34S.
- [78] Meetoo DD, McAllister G, West A. Assessing glycaemic control: self-monitoring of blood glucose. *Br J Nurs* 2011;20(15):919–25.
- [79] David L, Tetrack MD, Christopher G, Parkin MS. Integrating chronic care into family practice: blending the paradigms. *Clin Diabetes* 2013;31:10–3.
- [80] van dW. I, de Leeuw JR, Gorter KJ, Rutten GE. Effectiveness of peer-led self-management coaching for patients recently diagnosed with Type 2 diabetes mellitus in primary care: a randomized controlled trial. *Diabetic Med* 2012;29(10):e390–7.
- [81] Philis-Tsimikas A, Fortmann A, Lleva-Ocana L, Walker C, Gallo LC. Peer-led diabetes education programs in high-risk Mexican Americans improve glycemic control compared with standard approaches: a Project Dulce promotora randomized trial. *Diabetes Care* 2011;34(9):1926–31.