Building Blocks

IN DIABETES EDUCATION AND CONTROL:

A framework for comprehensive diabetes care

Pan American Health Organization

Regional Office of the World Health Organization

Building Blocks in Diabetes Education and Control:

A Framework for Comprehensive Diabetes Care

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Building Blocks in Diabetes Education and Control:

A Framework for Comprehensive Diabetes Care

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Contex

Introduction 11
Building Blocks in Diabetes Education and Control (BBDEC) 13
Building Blocks in Misiones, Paraguay 14
The structure of diabetes care 15
- The concept of comprehensive diabetes care 15
- Prevention in high-risk groups 17
- Diabetes detection 17
- Medical care 17
- Nutritional education and therapy 18
- Physical activity 18
- Diabetes education 18
- Psychological support 19
- Self-help groups or clubs for people with diabetes 19
- Treatment and prevention of complications 19

Characteristics and objectives of comprehensive diabetes care 20
Definition of the three working scenarios 21
Characteristics of the scenarios 23
- 1) Characteristics of Scenario 3 (High Level of Resources) 23
- 2) Characteristics of Scenario 2 (Medium Level of Resources) 24
- 3) Characteristics of Scenario 1 (Low Level of Resources) 25

Diabetes prevention according to levels of care 26
The Chronic Care Model 27
Adequate diabetes care 29
- Preparation of clinical protocols 29

Establishing goals for changing attitudes and skills of health care providers 31
Components of diabetes care 32
- Building blocks in diabetes education: 32
- Diabetes self-management education 32
- Elements of successful diabetes self-management education 33

Building blocks in nutrition 36
Nutritional therapy and type 1 diabetes 37
Nutritional therapy and type 2 diabetes 38
Proportions of nutrients 39
Food and nutrition education 43
Carbohydrate (CHO) counting 43
Scenarios 47
Application of algorithms by scenario 52
Algorithms for the prevention, diagnosis, treatment, and control of diabetes and its complications 53
Monitoring 65
Annex 1 66
Patient Monitoring Record 66
ANNEX 2 70
QUALIDIAB questionnaire and instructions 70
ANNEX 3 78
Participants in PPECD activities 78
Acronyms and terminology 81
References 82

Introduction

Diabetes and other chronic diseases have become the primary causes of morbidity and mortality in all countries. An estimated 171 million people around the world are living with diabetes and this number will climb to 300 million in 2030. In the Americas, the estimated number of people with diabetes was 13.3 million in 2000, with a projection of 32.9 million in 2030[1].

Diabetes is an expensive disease. In Latin America and the Caribbean the cost of diabetes was estimated at $65 billion in 20002. In that study, most of the estimated costs of diabetes was attributed to premature mortality and disability. The few studies that have been conducted in Latin America and the Caribbean have demonstrated that the quality of care for diabetes is suboptimal[3, 4, 5, 6, 7]. High-quality diabetes care can improve glycemic control, and this has been associated with a lower frequency of certain complications and hence a reduction in premature mortality[8, 9].

In September 2008 the Directing Council of the Pan American Health Organization adopted the resolution "Population and Individual Approaches to the Prevention and Management of Diabetes and Obesity," which calls on Member States to strengthen their efforts in the prevention and control of diabetes and obesity[10] (http://www.paho.org/English/GOV/CD/CD48.r9-e.pdf).

Building Blocks in Diabetes Education and Control (BBDEC)

Diabetes management is complex and requires training and resources. This document was prepared with input from a group of experts and people with diabetes from 25 countries of the Americas with the aim of providing a simple framework for diabetes care. This framework can be applied at different levels of care, according to technical capabilities and available resources.

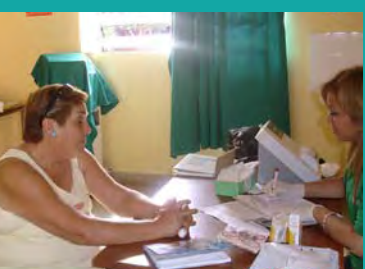
The preparation of this document was based on several international workshops coordinated by the Declaration of the Americas on Diabetes (DOTA), with representation from 25 countries. Annex 4 presents the complete list of participants in the BBDEC workshops.

The final review of the manuscript was carried out by Juan José Gagliardino (Argentina), Elena Carrasco (Chile), Elizabeth Duarte and Sandra Verduguez (Bolivia), Rosario García (Cuba), Felicia Cañete (Paraguay), Linda Siminerio (United States), Godfrey Xuereb (CFNI, /WHO, Geneva), and Anne Belton (Canada).

From 2004 to 2009 the Building Blocks program was implemented as a pilot in the municipality of Misiones in Paraguay, with excellent results. Box 1 presents a summary of the activities carried out in Misiones.

Based on the results obtained in Misiones, the document was reviewed and updated in 2009 by Alberto Barceló (PAHO), Elena Carrasco (Chile), Elizabeth Duarte (Bolivia), Felicia Cañete (Paraguay), and Juan José Gagliardino (Argentina), who together prepared the final version in Spanish which was then translated to English. The final English version was reviewed by Alberto Barceló from PAHO, Godfrey Xuereb from WHO, and Dalip Ragoobirsingh from the University of West Indies, Mona Campus, Jamaica.

The result is this guide, Building Blocks in Diabetes Education and Control (BBDEC)l, which organizes diabetes care according to different scenarios and levels of treatment. It identifies the characteristics of each scenario and proposes measures and standards to facilitate the establishment of a comprehensive care network for people living with diabetes.



Box 1

Building Blocks in Misiones, Paraguay

The first pilot program for Building Blocks in Diabetes Education and Control is being carried out in the Department of Misiones, Paraguay, which has a primarily rural population of 100,840. Health care in Misiones is provided through one regional hospital, eight centers, and 20 health posts that are participating in the project. Building Blocks is being carried out in the Eighth Health Region of Misiones, a predominantly rural area with difficult access to secondary and tertiary health care. The population that has benefited from this project includes approximately 48,000 people over 20 years of age.

Through the Building Blocks pilot, health professionals were trained in diabetes management, making it possible to optimize treatment in the health units. Teamwork improved, and community leaders were trained to act as liaisons that could connect members of the community to health services.

During the development of the Building Blocks project, the annual number of diabetes screenings increased from 465 at the beginning of the project in 2004 to 2,615 in 2007. The number of educational activities on diabetes increased from 180 to 3,000 in the same period. Clinical and laboratory results from 520 patients were analyzed at the beginning of the project and 12 months later. The results showed improvement in all indicators, especially those related to glycemic control.

The structure of diabetes care

The concept of comprehensive diabetes care

An approach that is unidimensional, exclusively biomedical, or centered on control of blood glucose is insufficient for achieving adequate control of diabetes[11]. Without the provision of comprehensive care, adequate and stable control for the patient will not be achieved. This is the case even if excellent health services are available, with free or very low cost availability of primary medical and hospital care, self-management materials, insulin, and Oral Hypoglycemic Agent (OHG) .

The International Diabetes Federation (IDF) has established levels of care (standard, comprehensive, and minimum) for various aspects of diabetes, including glycemic control and complications[12]. The IDF document also presents evidence supporting its recommendations for diabetes control.

To improve control of diabetes and reduce the frequency of its chronic complications, patient education must be an integral part of medical care. Care should also take into account the biological, emotional, and socio-familiar aspects of each case, such as the structure and organization of the patient's family and his or her decision-making capacity. This global approach to the problem is known as comprehensive care.

Toward this end, there is a current trend to incorporate humanistic areas within university-level biomedical curricula in an effort to achieve a comprehensive approach that takes into account not only the disease but also the human being.

For the purpose of designing a model program of education and care, based on the ideal comprehensive care, we need to define all aspects involved in the care of people with diabetes. These include primary prevention, treatment, psychosocial aspects, and education on physical activity and diet, among others, bearing in mind that all these elements are interrelated. Behavioral changes are very important in promoting healthy lifestyles and preventing or delaying the onset of diabetes and its complications.

Box 2

Risk factors for type 2 diabetes

- Age ≥ 45 (even if other risk factors are absent)
- Overweight (BMI ≥ 25 kg/m)
- Sedentary lifestyle
- Family history of diabetes (parents or siblings)
- High-risk ethnic origin, including African, Hispanic, Native American, Asian, or Pacific Islander descent
- Previous tests showing impaired glucose tolerance or impaired fasting glucose
- History of gestational diabetes or mother of a newborn weighing more than 9 pounds (4 kg)
- Hypertension (≥ 140/90 mm Hg) or using antihypertensive treatment
- HDL cholesterol ≤ 35 mg/dL (0.90 mmol/L) and/or triglycerides ≥ 250 mg/dL (2.82 mmol/L)
- Women with polycystic ovary syndrome
- Other clinical conditions associated to insulin resistance (e.g., severe obesity, acanthosis nigricans)
- History of cardiovascular disease

Source: ADA[13, 14]
BMI: Body Mass Index is equal to the weight in kilograms divided by the square of the height in meters.

Prevention in high-risk groups

Type 2 diabetes is most frequent in people who present one or more of its risk factors (box 2). Diabetes can be prevented through healthy lifestyle programs that promote proper eating habits, physical activity, and weight reduction[15, 16, 17]. Awareness is necessary at all levels of decision-making, both governmental and nongovernmental. It is important to have a healthy urban environment that allows people access to adequate and safe spaces for group or individual physical exercise, health kiosks in schools and public places, and vegetable gardens and community farms.

Diabetes detection

Diabetes screening should be considered for persons who have BMI $\geq$ 25 kg/m^2 plus one or more of the risk factors for type 2 diabetes. For persons who do not present these risk factors, screening should begin at 45 years of age. Early detection of diabetes permits timely therapeutic intervention which in turn helps prevent the emergence of chronic complications. Screening for diabetes in persons who have hypertension is cost-effective[18, 19]. Screening for type 2 diabetes can be recommended when there is full access to medical care that permits optimal metabolic control[18].

The American Diabetes Association (ADA)[20, 21] recommends that blood glucose levels be tested in all persons 45 years of age or older. If the test is normal, it should be repeated every three years.

Medical care

Medical care should be provided by a multidisciplinary team that includes professionals from different specialties, including a physician, nurse, nutritionist/dietician, physical education instructor, social worker, podiatrist, psychologist, ophthalmologist, and educator, among others. Medical care should include early diagnosis and treatment to ensure adequate metabolic control. Also essential are periodic checkups with appropriate laboratory tests, which facilitate prevention and early diagnosis of complications and make it possible to monitor the evolution of the disease.

Nutritional education and therapy

Education to help patients change their eating habits should cover:

- Personalized meal planning
- Selection and purchase of food (guided by a dietician/nutritionists)
- Food preparation, carbohydrate counting, glycemic index, and information on eating out
- Label reading
- Proper use of sweeteners
- Relationship between medication and meal plan
- Relationship between physical activity and meal plan

Nutritional education should be oriented toward the prevention of malnutrition (undernutrition, obesity, and overweight)[22]. In addition, it should provide guidelines for persons with diabetes on eating in non-routine situations, such as camping and parties, and when other illnesses are present.

Physical activity

Regular physical activity appropriate to the individual's condition should be recommended, taking into account any limitations related to complications such as diabetic foot, neuropathy, retinopathy, or heart disease. Physical activity can reduce atherogenic risk factors, improve sensitivity to insulin, and increase HDL levels. It also helps reduce obesity, contributes to emotional well-being, and can improve blood pressure and reduce the risk of type 2 diabetes[23].

In planning case management or prevention efforts, each person should set incremental goals until reaching the optimal level of physical activity. Incremental goals could include a gradual increase in the time spent on physical activity and appropriate modification of types of food in the diet, with provisions for what to do when the plan is not followed.

Diabetes education

Diabetes education is considered the basis of treatment and should

be promoted at all levels of care. It should be directed toward the entire population, with special emphasis on:

- People with diabetes, starting at the time of diagnosis and continuing through the rest of their life
- Family members and close associates of people with diabetes (in workplaces, schools, etc.)
- Health workers, including rural physicians, generalists and internists, nursing personnel, and health promoters in rural and peri-urban areas, all of whom should receive continuous education and updating
- Diabetes educators: they should be trained in all countries, followed by their accreditation as basic members of the health team
- Persons responsible for residential institutions such as prisons, children's homes, and homes for the elderly

Psychological support

Psychological support is recommended for everyone affected by diabetes: for adults at the time of diagnosis, and for children and their families at the time of diagnosis and, if necessary, on a continuing basis[24]. It is important to assess the overall well-being of people with diabetes in order to identify those who require psychological treatment. Psychological support can also play an important role in motivating and helping people change their behavior and adopt healthier habits.

Self-help groups or clubs for people with diabetes

These are important because they provide moral and material support, allowing people with diabetes to share their experiences in a setting of friendship and caring[25, 26]. The objective of these groups is to help people with diabetes maintain metabolic control.

Treatment and prevention of complications

This requires the participation of a team with expertise in all the scenarios of possible diabetes complications. To the extent possible, access should be provided to rehabilitation services for persons with irreversible injuries such as amputation or loss of vision.

Education takes on increased importance within the context of a comprehensive diabetes care program, since various studies have shown that the cost of an educational program is less than the cost of managing patients with acute and chronic complications[11, 27, 28, 29].

However, education will not be effective in the absence of an appropriate environment. It is therefore important to ensure the availability of physical and recreational activities, appropriate access to health care and comprehensive dietary plans that focus on health options rather than on restrictions.

Characteristics and objectives of comprehensive diabetes care

Comprehensive care for people with diabetes should be accessible, continuous, egalitarian, and effective. Toward this end, it should meet minimum international standards[12, 22, 30]; it should be available in all countries and to populations of different socioeconomic and cultural status; and it should be included at every level of health care, including home and community care as well as primary, secondary, and tertiary care. These levels, in turn, should be part of a well-structured system that allows each patient to access the level of care appropriate to his or her needs.

In order to achieve this, guidelines must define the functions at each level. The required services must be in place, and a minimum level of resources, at least, must be available.

The treatment team should be made up of specialized physicians (such as endocrinologists and/or diabetes specialists), pediatricians, diabetes educators, dietician/nutritionists, nurses, psychologists, physical therapists or physical education trainers, social workers, ophthalmologists, cardiologists, nephrologists, urologists, neurologists, and podiatrists. It is also important to have adequately trained, motivated, and informed health workers at the first level of care, such as general practitioners, primary care nurses, or physicians of other specialties.

In places with fewer resources, trained health promoters or health agents, who can be people with diabetes or community leaders, can play a role. Social workers and nurses in the community can serve as links between patients and the health services. At the same time, with appropriate training, they can follow up on patients and detect problems.

Minimum, desirable, or optimal levels of care can be established according to the technical and financial resources of a country or region for the primary, secondary, and tertiary levels of care[31].

According to the World Health Organization (WHO), a Comprehensive Care Team for adequate diabetes control should consist of a physician and a health educator. The physician in charge of the team should have diabetes training and should be able to provide continuous care, from diagnosis through monitoring of patients with established diabetes, some of whom may have chronic complications.

A specialized Diabetes Unit should include a diabetes specialist, an endocrinologist, or an internist with special training in diabetes, as well as a professional educator and other professionals such as a podiatrist and a nutritionist.

A Diabetes Center is a tertiary care unit that provides the complete range of diabetes care. It should have at least one endocrinologist; two professional educators from different disciplines; several physicians of different specialties, such as cardiologists, nephrologists, and ophthalmologists; and at least two professionals with related specialties such as psychologists, dieticians or nutritionists, and podiatrists.

The team, unit, and center should be complemented by other allied professionals, including social workers and health promoters. They should have access to biochemical laboratory tests for the monitoring and management of diabetes, even if the monitoring is done only with glucometers. The concept of a public health approach rather than a purely medical approach should be promoted in an appropriate manner at each level of care.

The Building Blocks concept can be applied to the model of care proposed by the WHO (Box 3)

Definition of the three working scenarios

Scenario 1 should provide people with the essential minimum services needed for diabetes control or treatment. In addition, this scenario should offer support for prevention and education. This is the scenario where the local diabetes associations can play an important and active role. Those working in this scenario face perhaps the greatest limitation in resources, but also have the greatest contact with the community.

Scenario 2 should provide the same indispensable minimum services and should, in addition, improve the quality of care and take a preventive approach to the treatment of diabetes and its complications.

Scenario 3 should offer advanced services for diagnosis, treatment, education, prevention, and especially treatment of complications, making use of specialized centers that provide high-quality care and access to state-of-the-art technology. This scenario can function as a scientific and educational reference for those working in more limited settings.

Box 3

Diabetes care by scenarios and levels

Level of care	Scenario		
	1	2	3
Tertiary			Diabetes center
		Specialized unit	Same as Scenario 2
	Comprehensive care team	Same as scenario 1	Same as scenario 1
Secondary			Diabetes unit
		Diabetes team	Same as Scenario 2
	Physician Basic education Basic treatment of complications	Same as Scenario 1	Same as Scenario 1
Primary			Diabetes team
		Physician Basic education Basic treatment of complications	Same as Scenario 2
	Health promoters, basic diagnosis, essential drugs	Same as Scenario 1	Same as Scenario 1

Characteristics of the scenarios

1) Characteristics of Scenario 3 (High Level of Resources)

In this scenario, there are sufficient resources for the prevention and control of diabetes. Diabetes education, both for the health team and for people with diabetes, will be a fundamental strategic part of a structured, intersectoral diabetes program that also includes research and evaluation.

Box 4

SCENARIO 3

- In this scenario, the population has access to specialized medical services.
- It includes an ongoing, structured education program that is evidence-based, with evaluation.
- It includes diagnosis, self-monitoring, monitoring, and follow-up.
- It assumes adequate availability of and access to medicenes and supplies needed to provide care for diabetes, cardiovascular risk factors, and diabetes complications.

This scenario features the following activities:

Primary prevention

In the general or at-risk population:

- Coordination with and among the country's health and education authorities
- Mass media campaigns
- Intensified efforts to detect risk factors for type 2 diabetes
- Promotion of healthy lifestyles (meal planning and physical activity)
- Implementation of programs for the adoption of healthy lifestyles

Secondary and tertiary prevention

At the individual level, for persons affected by various aspects of diabetes:

- Specialized diagnosis of complications
- High-technology treatment of complications
- Rehabilitation

Specialized evaluation and research on diabetes

- Epidemiological and clinical research
- Evaluation of structure, processes, and outcomes

DIABETES CENTER

2) Characteristics of Scenario 2 (Medium Level of Resources)

This scenario features limited resources for the prevention and control of diabetes. Diabetes education, both for the health team and for people with diabetes, will be a fundamental part of the strategies. All activities will be evaluated objectively.

Box 5

SCENARIO 2

- The population has limited access to specialized medical services.
- Evidence based it includes tructured educational program with evaluation.
- Diagnosis, monitoring, and follow-up.
- Limited availability of medicines on the essential list and of supplies for the treatment of diabetes and cardiovascular risk factors.
- Limited availability of treatment for complications.

This scenario features the following activities:

Primary prevention

In the at-risk population:

- Dissemination campaigns
- Intensified efforts to detect risk factors for type 2 diabetes
- Promotion of healthy lifestyles (meal planning and physical activity)
- Implementation of programs for the adoption of healthy lifestyles
- Serious efforts to reduce blood lipids

Secondary and tertiary prevention

- Specialized diagnosis of complications
- Treatment of complications
- Rehabilitation

Diabetes evaluation and research

- Epidemiological and clinical research
- Evaluation of structure, processes, and outcomes

DIABETES UNIT

3) Characteristics of Scenario 1 (Low Level of Resources)

This scenario which has the minimum level of resources needed for the prevention and control of diabetes. Diabetes education, both for the health team and for people with diabetes, will be a fundamental part of the strategies. All activities will be included in medical records.

Box 6

SCENARIO 1

- The population has access to basic medical services.
- Educational program with at least minimum evaluation.
- Diagnosed, monitoring, and follow-up.
- Availability of medicines on the essential list for treatment of diabetes.
- Epidemiological research is not available, but there are elementary resources for undertaking it.
- Basic information on diabetes.
- Integrated program that includes the community and local political authorities.

This scenario features the following activities:

Primary prevention

In the at-risk population:

- Preparation of materials for local dissemination
- Actions to detect risk factors for type 2 diabetes
- Promotion of healthy lifestyles (meal planning and physical activity)
- Implementation of programs for the adoption of healthy lifestyles
- Follow-up of cases

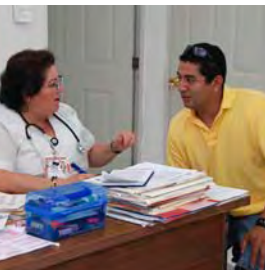
Secondary and tertiary prevention

- Diagnosis of the disease and its complications
- Self-monitoring
- Diabetes treatment (meal planning and physical activity) and prevention of complications (eyes, feet, microalbuminuria)
- Support groups (educational or mutual support)

Diabetes evaluation and research

- Basic epidemiological research
- Evaluation of results

COMPREHENSIVE CARE TEAM



Diabetes prevention according to levels of care

In general, diabetes prevention can be summarized as follows:

Primary prevention: Primary prevention takes place before diabetes appears, thus reducing the number of cases. It should be targeted not only to individuals at risk but also to the community at large. Primary diabetes prevention can be carried out through a structured program of diet and physical activity[15, 16, 17] for people who present risk factors such as central obesity (the high-risk approach). It also includes activities designed to reduce the frequency of risk factors in the populations (the population-based approach)[10, 32, 33]. These are geared to the promotion of healthy eating habits and a culture of physical activity, as well as healthy cities with spaces that facilitate both group and individual exercise, health kiosks in schools and public places, vegetable gardens and collective farms.

Secondary prevention: Secondary prevention consists of early detection of persons with diabetes and immediate and effective treatment of the disease. This includes diabetes screening programs.

Tertiary prevention: Tertiary prevention includes measures for preventing complications of diabetes and their associated disabilities. It has been shown that the proper control of diabetes and its cardiovascular risk factors reduces the development and progression of chronic complications[8, 9].

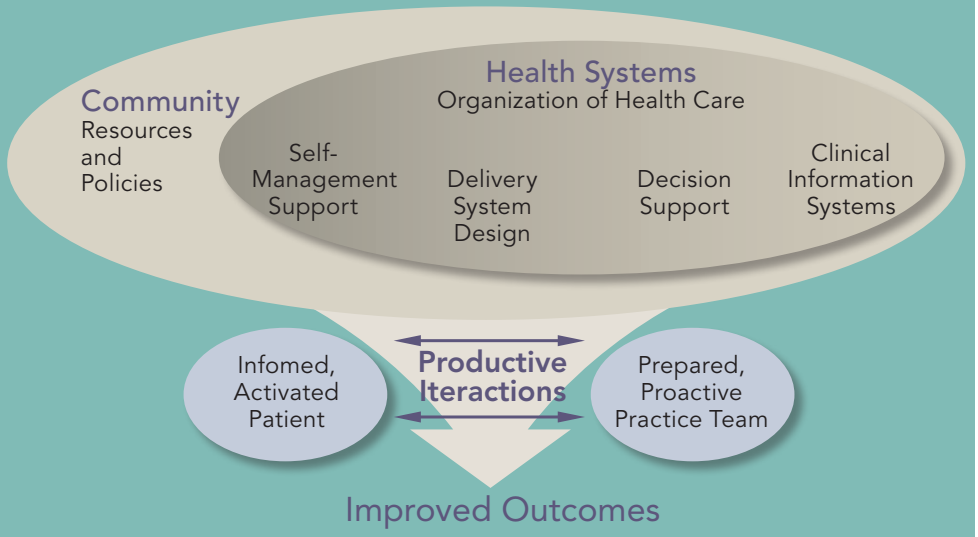
There should be guaranteed access to OAG and especially to insulin, which, because of its cost and complex clinical management, is often prescribed late or underutilized. To achieve optimum comprehensive care for persons with diabetes, it is important to facilitate access to self-monitoring materials and to laboratory tests on a schedule appropriate to each case.

Although not all settings have sufficient resources to provide comprehensive diabetes care at the same level of development, the services can be implemented in stages, as human and economic resources allow. It should also be kept in mind that different scenarios may apply to different population groups within the same country.

The Chronic Care Model

The Chronic Care Model[34] is a frame of reference for organizing medical care for chronic diseases. It recommends establishment of a productive interaction between the informed and activated patient and a well-prepared health team as a means to improve outcomes. The Building Blocks program encompasses all the components of this model, as described briefly below.

Box 7



The community. When resources are mobilized through the community, patients can be motivated to participate in programs based on community needs.

Organization of the health care system. In order to create an organizational culture and mechanisms that promote high-quality care in health facilities, it is necessary to have visible support from the highest levels of the health system and from those in charge of the services.

Self-management support. Patients must understand their role in controlling their disease and their responsibility for maintaining their health.

Delivery system design. Improving the health of people with chronic conditions requires transformation of a system that is primarily reactive, responding only when the person is ill, into a system that it is proactive, striving to maintain the person in the best possible health through continuous care.

Decision support. Decisions related to patient treatment need to be based on explicit and proven evidence-based guidelines.

Clinical information system. Effective care for chronic conditions is impossible without an information system that ensures immediate access to key records of individual patients, as well as to records of the population or group of patients served by the facility.

Box 8

Area of the Chronic Care Model	Aspects of Building Blocks for Diabetes Education and Control
Organization of the health care system	Continuous comprehensive care by levels of care and different technical capabilities (health promoters, nurses, general practitioners, specialized physicians)
Self-management Support	Diabetes self-management education
Delivery system design	Management by level of health care
Decision support	Evidence-based guidelines
Clinical information system	Monitoring of care, record cards, QUALIDIAB
Community resources	Clubs for people with diabetes, work with community leaders and civil society organizations

Adequate diabetes care

Preparation of clinical protocols

Box 9

Components of a comprehensive diabetes evaluation

Health care for people with diabetes should include the following components:[14]

Clinical history and health status

- Age and characteristics at the onset of diabetes (example: ketoacidosis, fortuitous diagnosis)
- Dietary habits, nutritional status, and history of bodyweight, growth, and development in children and adolescents
- History of diabetes education
- Review of previous treatments and response to therapy (previous measurements of A1c)
- Current diabetes treatment, including drugs, meal planning, results of glucose monitoring, and use of data by the patient
- Frequency, severity, and causes of ketoacidosis
- Hypoglycemic episodes
  - Knowledge about hypoglycemia
  - History of hypoglycemic episodes: frequency, severity, and causes
- History of diabetes complications
  - Microvascular: retinopathy, nephropathy, neuropathy (sensory, including history of foot injuries; autonomic, including sexual dysfunction and gastroparesis)
  - Macrovascular: cerebral vascular disease, peripheral vascular disease
- Others: psychological problems, dental diseases

Box 9

Physical examination

- Height, weight, Body Mass Index, waist and hip circumference
- Blood pressure, including determination of orthostatic pressure if indicated
- Examination of the ocular fundus
- Palpation of the thyroid
- Skin examination (search for acanthosis nigricans and examination of injection sites)
- Examination of the feet
  - Inspection
  - Palpation of dorsalis pedis and posterior tibial pulses
  - Presence/absence of patellar and Achilles reflexes
  - Test proprioception, vibratory sensation, and protective sensation with monofilament

Laboratory evaluation

- A1c (indicate if results for the past 3 months are not available) If results for the past year are not available, indicate:
- Lipid profile, including total cholesterol, HDL, LDL, and triglycerides
- Tests of liver function
- Test of albuminuria excretion with albumin creatinine index. Midstream urine specimen should be examined for possible evidence of urinary tract infection to help interpret microalbuminuria results.
- Serum creatinine and calculation of the glomerular filtration rate
- Thyroid-stimulating hormone in patients with type 1 diabetes or dyslipidemia, and in women older than age 50

Referrals

- Annual eye exam with dilation
- Family planning for women of reproductive age
- Nutritionist/dietitian
- Education in self-management
- Dental examination
- Mental health specialist if needed
- Podiatrist if needed

Establishing goals for changing attitudes and skills of health care providers

This approach can be used at each level of care. Just as the goals established for patients should be developed and evaluated on the basis of outcomes and behavioral changes, the same process can be used to help health care providers establish and evaluate goals that provide guidance for showing an improvement in outcomes. This approach will enable health care providers to develop the building-block process and measure feedback as it becomes available.

For example, at the **primary level**, health promoters can establish a goal to increase opportunities for people to do more walking in a given community. Footpaths can be developed, safety can be increased in poor or dangerous areas, and walking in shopping malls can be promoted, since they constitute a safe space. In cities, such measures might include closing off a major street one day a week for the use of bicyclists, runners, and walkers. Promoting opportunities to increase physical activity would be one building block in the process of behavior change. If people in a community have opportunities to change their behavior by increasing the time they spend walking, it could potentially lead to improved outcomes through reduction of risk for diabetes and cardiovascular disease.

At the **secondary level**, a building block in the behavior-changing process might be to train nurses to examine the feet of people with diabetes. Success could be measured in terms of the ability of nurses to conduct this examination and/or the number of individuals examined, by evaluating a demonstration by the nurse or by recording the number of patients whose feet were examined. The expected outcome would be a reduction in ulcers and/or amputations.

At the **tertiary level**, physicians could monitor themselves in terms of the number of patients referred for an annual eye exam. If the referred patients are effectively evaluated by specialists and there is adequate follow-up, the expected outcome would be a reduction in the incidence of retinopathy and fewer cases of vision loss or blindness.

Components of diabetes care

Building blocks in diabetes education: Diabetes self-management education

Within the comprehensive care framework, the education of persons with diabetes should be based on scenarios and levels of care. It should take into account the integrated universe of factors that help determine human behavior, such as habits, customs, and the family and the social environment surrounding the individual[35].

It is important not to separate diabetes from the person who lives with diabetes. People with diabetes have the daily experience of trying to manage their disease, and they should be aware of its serious consequences for their health. Thus, therapeutic diabetes education is understood as a teaching-learning process in which the patient develops self-management skills in relation to his or her own disease. As an integral component of treatment, diabetes education should be individualized, taking into account the individual's culture and personal behavior and clinical characteristics.

The health team should provide each diabetes patient with information and appropriate strategies based on his or her particular needs for treatment and disease management. Every contact with health professionals provides an opportunity for education. This should be based on problem-solving and the development of self-management strategies, helping patients acquire the information, knowledge, and skills they need to manage their diabetes and make day-to-day decisions. These decisions concern lifestyle and behavioral changes, as well as decision-making in emergencies [35, 36, 37].

The health team should have the skills and diagnostic tools to identify factors that may affect the person's commitment to treatment. The team needs to relate effectively to the person's family members and to other professionals involved in his or her care. It has been shown that the health team's commitment and training in strategies for education and behavioral change are a major factor in determining whether diabetes management meets its objectives[11, 36].

Elements of successful diabetes self-management education

Diabetes education should follow a four-step process of diagnosis, planning, implementation, and evaluation.

1. Diagnosis

Diagnosis is the first step in the education process. During diagnosis, information is compiled about the patient's experiences, beliefs, knowledge, and support (from the family or workplace). The health system should facilitate this information collection and documentation so that the time spent preparing the clinical history results in a record that is clear and useful, both for the family doctor and for others providing services to patients. Particularly helpful are preprinted forms containing all the items to be considered; health workers can fill in the blanks by marking with an X or providing short answers or numbers. It is also useful to have a record card with information on medication and other relevant data such as the existence of complications, which patients bring with them on every visit to the health center or emergency room.

Box 9 shows the components of a diagnosis and examples of data to collect for each component.

Educators and other health providers should continually review and update data on the patient's diagnosis throughout the period of diabetes self-management education. This ongoing reassessment will enable both patients and health professionals to continue to develop realistic and achievable goals for behavioral change.

2. Planning

The health team should use patient assessment data to develop an action plan that includes the establishment of goals. An open agreement with the patient about these goals will create a shared agenda that in turn will make it possible to measure the patient's progress. The goals should be realistic, achievable, and quantifiable.

3. Implementation

The next step is to turn the action plan into an educational intervention. During the implementation phase, educators should consider the methods, the setting, and the documentation needed.

Methods and setting

For newly diagnosed patients, education should begin immediately in the hospital, primary care clinic, physician's office, or diabetes association or club, and should continue for a period of weeks or months after diagnosis. Although some of the initial educational activities can be done in a group setting, most will be carried out on an individual basis. Continuing education can be formal or informal and can be conducted in group sessions or individually.

Creative approaches should be used in diabetes education. Innovative alternatives to traditional teaching presentations, such as skills demonstrations, role-playing, or games, should be offered. Although books and pamphlets are useful, educators should also explore other media such as videos, computers, and the Internet. In planning educational activities, it is essential to take into account the literacy levels of those who will be educated.

Settings that facilitate learning should be selected. Training centers, headquarters of diabetes organizations or diabetes support groups, clinics, hospitals, and doctor's offices are all acceptable. Both creativity and comfort help promote the learning process. In working with the elderly, attention should be paid to room temperature, site comfort, and legibility of written materials. Games, CD-ROMs, and the Internet can be useful in working with adolescents. Visits or tours to markets and restaurants, as well as purchase of footwear under the guidance of trained podiatrists, are creative ways to conduct education outside the clinical environment.

Documentation

Members of the health team should share information by documenting each patient's educational activities in a permanent medical or educational record. The record should include the diagnosis, the goals, the teaching plan with its objectives, an assessment of what was learned, and a plan for follow-up education and counseling.

4. Evaluation

Evaluation, outcomes measurement, and continuous quality improvement are terms used frequently in diabetes management and skills training. Broadly defined, evaluation is a method of determining the significance or value of a given study.

This is an essential step in the process of providing quality education, both at the programming level and with individual patients. Through the evaluation of programs, health care personnel can identify the interventions that are most appropriate and that produce the best outcomes at the individual and collective levels.

At the individual level, evaluation enables the patient and the diabetes educator to determine whether the behavioral goals agreed upon at a previous visit have been accomplished, whether they continue to be appropriate, and whether they have led to the desired outcomes. It is also important to evaluate the level of user satisfaction.

An outcome is defined as a measurable product and is the change in an individual's state or condition as a consequence of health care over time. Health care institutions compile data on a variety of activities. The outcomes most frequently associated with diabetes education programs fall into three categories: psychosocial (for example, quality of life related to diabetes, coping ability, self-efficacy), educational (learning and behavioral), and clinical (medical).

Health-related behavioral changes are unique and measurable outcomes of effective diabetes education. Behavioral outcomes can be achieved in several areas, including physical activity, meal planning and food selection, adherence to a medication regimen, blood glucose monitoring, psychosocial adaptation, problem-solving for glycemic variance (hyper- or hypoglycemia, sick days), and activities for risk reduction.

Box 10 lists several examples of the behavioral goals and related outcomes that can be measured to evaluate the effectiveness of the educational and skills training process for a particular patient. These outcomes are evaluated systematically through patient self-reporting in follow-up visits to the physician's office or in classes, and are revised as necessary.

The patient is more likely to achieve the desired outcomes if instruction focuses not only on clinical-metabolic outcomes but also on identification and implementation of specific, measurable behavioral goals. This combination will make it possible to implement realistic steps over specific time periods. For example, instead of a patient deciding, "I am going to increase my physical activity," a more effective commitment would be, "I am going to walk for 20 minutes, twice a day, at least 5 times per week."

Outcomes measures are data that describe the health status of an individual. To measure outcomes effectively, data must be collected over time and the data collection instruments must be administered on multiple occasions. Increasingly, outcomes measurement is considered one of the best ways to improve performance in providing health care.

Continuous Quality Improvement (CQI) is a methodology used to evaluate how satisfactorily an organization is providing care that meets given quality standards.

Box 10

Behavioral goals and expected behavioral outcomes for diabetes self-management training

Behavioral goal	Expected behavioral outcome
I will drink a diet (low calorie) beverage with lunch until my next visit to the clinic in 2 weeks.	Consumption of diet (low calorie) beverages instead of regular soft drinks.
I will attend a smoking cessation class once a week for the next month.	Reduction of cigarette smoking from 2 packs to 1 pack a day.
I will walk for 10 minutes every other day for the next week.	Establishment of a consistent physical activity routine.
I will check my blood glucose or blood sugar twice a day for the next 2 weeks.	More frequent measurement of blood glucose or blood sugar.

The first step toward providing a quality educational program is reflected in the following questions: I) Are patients receiving the information and services they need? 2) Are the methods used to provide these services effective?

Building blocks in nutrition

A well-planned diet is one of the cornerstones of the diabetes treatment. Without it, it is difficult to obtain adequate metabolic control. Moreover, diet, together with exercise, constitutes in many cases the only therapeutic measure. Even where medication is required these remain cardinal to the management of the patient.

The objectives of medical nutrition therapy are to: [38, 39]

1. Reach and maintain:
   Level of blood glucose in the normal range or as close to normal as possible.
   Level of lipids and lipoproteins that reduce the risk of vascular diseases.
   Level of blood pressure in the normal range or as close to normal as possible.

2. Prevent or at least delay development of chronic complications of diabetes through modifications to nutrient consumption and lifestyle.
3. Evaluate nutritional needs, taking into account cultural preferences and individual readiness to change.
4. Maintain the pleasure of eating, limiting food consumption only when this is supported by scientific evidence.

Nutritional requirements of people with diabetes are the same as those of non-diabetic individuals, and their diet should be no different than that of the rest of the household. Once the patient knows about food composition, the ingredients of recipes and the amounts that should be consumed, the appropriate portions can be eaten. A healthy diet should include foods that contain a balance of complex carbohydrates, whole grains, legumes, fruits, vegetables, low fat or skim milk, low fat or white meats, and fish. Making use of carbohydrate counting is one way of determining how much carbohydrate are required.

Nutritional therapy and type 1 diabetes

A practical guide to nutritional management of diabetes can be found in the CFNI Protocol for the Nutritional Management of Obesity, Diabetes and Hypertension in the Caribbean[40]
(available at: http://www.paho.org/English/CFNI/cfni-ProtocolNMODH1.htm)

Primary objectives:

1) To provide adequate energy for growth and development through a combination of an insulin regimen, proper eating habits, and physical activity.
2) To facilitate changes in diet and physical activity that will improve metabolic control.

It is recommended that patients who use insulin synchronize their meal plan with the prescribed therapeutic schedule. They should spread their meals throughout the day, for example, three or four small, main meals and snacks in between when necessary.

People with type 1 diabetes need to measure their blood glucose and adjust their insulin doses accordingly. Intensified (physiological) therapy that includes a multiple-dose regimen or use of an infusion pump allows for more flexibility in the timing of meals and snacks as well as in portion size, though attention must be paid to caloric requirements in order to avoid weight gain.

Nutritional therapy and type 2 diabetes

In obese people with type 2 diabetes, the first line of therapy is a low-calorie eating plan to control blood glucose and lipids and maintain normal blood pressure as well as reduce weight. This type of nutritional therapy and weight loss improves blood glucose levels in the short term and can result in better metabolic control over the long term[38]. Nevertheless, traditional dietary strategies and very low calorie diets do not have much beneficial effect in the long term because of lack of patient compliance, and they can even be harmful.

Nutritional recommendations for a healthy lifestyle can be applied to most patients with type 2 diabetes. However, since many of them also have dyslipidemia and hypertension, these recommendations should be accompanied by reductions in the intake of saturated fats, cholesterol, and sodium.

Persons who are overweight (BMI of 25 or greater) or obese (BMI of 30 or greater) should be managed with a low-calorie diet. An attempt should be made to reduce normal daily intake by 500 kcal/day. Most effective low-calorie diets contain 1,000 to 1,500 kcal/day[41]. In these cases it is recommended increasing the intake of vegetables, restriction of saturated fats, and elimination of fried food from the diet.

Normal-weight persons (BMI between 19 and 25) should follow a well balanced, normal-calorie eating food plan. If they have managed to maintain an acceptable weight with their habitual intake, the only changes might be modifications in the proportions of different food groups, with no change in total caloric intake. This is calculated as between 25 and 35 kcal/kg/day, depending on physical activity levels.

In underweight persons (BMI lower than 19) with no history of malnutrition, weight loss usually indicates lack of insulin or very poor metabolic control with significant caloric loss through glucosuria or muscular breakdown that is converted to glucose through transamination and then gluconeogenesis.

For patients being treated with insulin or insulin secretagogues, an important strategy is to learn how to apportion carbohydrates between meals and snacks. Regular exercise and lifestyle changes can facilitate long-term changes in bodyweight.

Proportions of nutrients

Proteins

It has been suggested that there should be only moderate amounts of protein in the diabetic diet in order to reduce the risk of nephropathy. However, there is no evidence to support the premise that high protein intake contributes to the development of diabetic nephropathy, nor has it been demonstrated scientifically that excessive protein intake increases glycemia levels[42, 43, 44]. Moreover, no relationship between high protein intake and glomerular hyperfiltration has been found in insulin-treated patients. While the foregoing may be true, one must bear in mind that there is interconversion of metabolites. As a result of which proteins consumed in excess of bodily requirement can be converted to triglycerides by way of acetyl coA which will eventually lead to increase in weight.

Several diabetes guidelines including those from the American Diabetes Association (ADA)[45] and the Latin American Diabetes Association (ALAD)[22] follow the RDA (Recommended Dietary Allowance) for the general population, namely, 0.8 gram of high-quality protein per kilogram per day in adults, or around 10% of daily calories. When glomerular filtration starts to drop, intake should not be restricted below 0.6 g/kg/day, in order to avoid malnutrition[46]. This should always be done under clinical supervision.

Carbohydrates and sweeteners

The percentage of calories from carbohydrates varies from one individual to another, based on the person's eating habits and targets for blood glucose and lipids. The recommended proportion, depending on treatment objectives, ranges from 45% to 65% of total calories. The person's metabolic profile and need for weight loss should be considered when determining the monounsaturated fat content of the diet. Restricting total carbohydrates to less than 130 grams per day is not recommended, as the brain and central nervous system have an absolute requirement for glucose as an energy source. Complex carbohydrates, which also have a high percentage of soluble dietary fiber, are found in legumes, grains, vegetables, and fruits, and they should be included in a healthy diet.

It is advisable to eliminate simple sugars (honey, brown sugar, molasses, white sugar) or reduce them to not more than 5% of calories in the diet, since they serve mainly as extra calories[21].

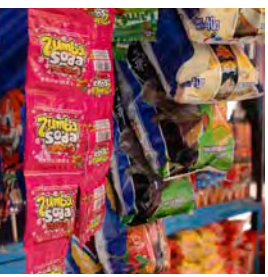
Moderate use of non-caloric sweeteners, such as aspartame, saccharin, acesulfame potassium, or sucralose, does not represent a health hazard. These are permitted as sugar substitutes when consumed according to the recommenda-

tions of the U.S. Food and Drug Administration (FDA). Their caloric value is insignificant.

On the other hand, sweeteners as sorbitol and fructose have the same caloric value as sucrose, and this fact should be taken into account when they are consumed in processed foods. It is also worth considering the added financial cost of such products.

Lipids

Lipids should account for less than 30% of total calories, with 10% or more in the form of monounsaturated fatty acids, less than 10% in saturated fats, and less than 10% in polyunsaturated fats. Omega-3 fatty acids (EPA and DHA) found in fish have a beneficial effect on triglycerides. It is also recommended that cholesterol intake be limited to no more than 300 mg a day and that intake of trans fatty acids be eliminated[47, 48].



If weight loss is desired, fats in the diet should be reduced. If this regimen is maintained over a long period of time, it contributes not only to weight loss but also to improvement in dyslipidemia and eventually to cardiovascular health.

Sodium

Individuals differ in their sensitivity to sodium intake, which is related to blood pressure. The recommendation for sodium is the same as for the general population: no more than 2,400 mg/day, equivalent to 6,000 mg/day of sodium chloride. This usually means a reduction in the usual salt intake which can be achieved by reducing adding salt to cooked meals and choosing a low sodium option of processed food.

Alcohol

The recommendations regarding alcohol are the same as those for the general population. It is recommended not to drink ever on an empty stomach; red wine is preferable because it contains phenols (antioxidants). The recommended maximum consumption is not more than two drinks a day for men and not more than one a day for women (1 drink = 12 oz. beer, 5 oz. wine, or 1.5 oz. distilled spirits).

Abstention from alcohol is recommended during pregnancy, and in hypertriglyceridemia, pancreatitis, hypertension, or neuropathy.

A person with diabetes who is already completely abstemious should not start drinking. Vegetables or fruits can provide antioxidants, particularly fresh grapes.

Vitamins and minerals

An adequate diet usually provides these micronutrients in sufficient quantity and supplements are ordinarily not necessary, but there are several exceptions. Individuals on long-term low-calorie diets should supplement their diet with iron and B-complex vitamins. Pregnant women should receive supplements of iron, folates, and calcium. Women with osteoporosis should receive calcium. Malnourished or elderly persons, depending on their particular deficiencies, may require supplements as recommended by their physician. Supplements should only be prescribed or recommended by health providers; mega dose formula should be avoided unless prescribed.

Pregnancy

Emphasis is placed on controlling blood glucose, ketone in urine, and weight, with the corresponding necessary adjustments. If the pregnant woman is obese, strict low-calorie diets are contraindicated because fasting in pregnant women can produce ketone bodies that can harm the fetus. The objectives of nutritional therapy are to provide adequate maternal and fetal nutrition, sufficient energy intake for appropriate weight gain, and mineral and vitamin supplementation. It is important to maintain optimal glycemic control through nutrition. Daily requirements are increased by 300 kcal a day, beginning in the second trimester, and by 10 grams of high-quality protein.

A woman with type 1 or type 2 diabetes who becomes pregnant need only adjust her meals and snacks to prevent the hypoglycemia that can result from the constant flow of glucose from mother to fetus. An evening snack is always necessary for preventing nocturnal hypoglycemia. The ADA recommends a snack at bedtime to prevent accelerated ketosis overnight[39].

The diet of a woman with gestational diabtes should provide sufficient energy to ensure good maternal and fetal nutrition, allow for adequate weight gain, and achieve and maintain normal blood glucose and the absence of ketones. Specific nutritional recommendations are determined individually, based on the personal characteristics and glycemic profile of each pregnant woman. Macrosomia is a potential danger in pregnant women with diabetes (whether she has type 1, type 2, or gestational). Sometimes is recommended necessary to give small doses of insulin periodically to ensure tight control of blood sugar and avoid chances of macrosomia.

Breastfeeding is recommended for mother with both pre-gestational and gestational diabetes. However, successful breastfeeding requires careful planning and

monitoring. Breastfeeding lowers blood glucose levels and requires energy and dietary supplements for the mother. But the requirements are the same as for lactating mothers who do not have diabetes, that is, an additional 500 kcal and additional 18 grams of high-quality protein per day.

Physical activity

Physical activity or exercise plays a key role in prevention of type 2 diabetes and other diseases related to obesity. The general recommendation is that people engage in at least 30 minutes of moderate physical activity on most days of the week[49, 50].

Physical activity is a fundamental aspect of diabetes management and should meet the following goals:

- Short-term: change from a sedentary lifestyle.
- Medium-term: exercise at least five times a week for 30 minutes (150 minutes per week).
- Long-term: increase frequency and intensity over time.

Intense exercise or competitive sports require preventive measures. People who use insulin should monitor blood glucose both before and after exercising.

Physical activity in severely decompensated patients with ketonuria (+) is contraindicated, since exercise worsens the metabolic condition. This can also occur in compensated patients who do not take appropriate measures. Before changing their patterns of physical activity, people with diabetes should be evaluated by their physician, with the appropriate diagnostic tests. It is important that the physical examination looks for sign and symptoms of diseases that affect the cardiovascular and circulatory system,

Box 11

Exercises for people with diabetes and loss of protective sensitivity

Contraindicated exercises	Recommended exercises
Treadmill	Swimming
Long walks	Cycling
Running	Rowing
	Exercises that are done while sitting
	Arm exercises
	Other non-weight-bearing exercises

References[49,50]

eyes, kidneys, feet, and peripheral nervous system. High-risk sports where the patient cannot receive immediate aid (mountain climbing, gliding, diving) are not recommended. Inspection of the feet before each physical activity should be emphasized. Some physical exercises are not recommended for people with loss of sensitivity.

Healthy habits

It is essential that all people with diabetes avoid or stop smoking. Smoking significantly increases the risk of developing macrovascular complications and poses an even greater risk than hyperglycemia in this regard.

Food and nutrition education

There are several phases of food and nutrition education, which should be planned and implemented in a parallel and complementary manner:

1. Training is provided for nutrition education specialists.
2. Food and nutrition education programs are made available at the different levels of care and in the different scenarios. These range from community and home care, in which health promoters and monitors play the principal role, through primary, secondary, and tertiary health care.
3. The functions of each group of educators at each level are defined and are well coordinated in terms of patient referrals.

Nutrition programs should be tailored to the available economic and human resources of each health service. It is recommended that standards be set for both minimum and optimal levels of care.

Carbohydrate (CHO) counting

Carbohydrate counting [51, 52, 53, 54] is a method that allows flexibility in the diet. The principal objective is to achieve a balance between control of blood glucose, insulin dosage, and carbohydrate (CHO) intake.

Foods contain variable amounts of carbohydrates, proteins, lipids, vitamins, minerals, and water. Carbohydrates are the components that have the greatest influence on blood glucose.
Usually, people with diabetes have restrictions placed on the types of foods they

can eat. By understanding how carbohydrate counting works, patients can enjoy a wide variety of foods, change their breakfast routines, go to a restaurant, and eat new dishes, all without elevating their blood glucose.

Carbohydrate counting has three levels. The most basic is for people with type 2 diabetes who are able to maintain good blood glucose with adequate meal planning and physical exercise, whether or not they also need oral antidiabetic drugs. At this level the concept of carbohydrate counting is introduced, with a focus on the carbohydrate content of each type of food. The patient determines his or her intake, knows the carbohydrate content of each food, calculates the carbohydrate intake, and plans meals accordingly.

The intermediate level relates food intake with medication, exercise, and blood glucose levels. Based on an examination of food consumption records and analysis of blood glucose values, strategies are developed to meet blood glucose targets.

The advanced level is designed for teaching to people with type 1 diabetes who use multiple doses of crystalline insulin or rapid-acting insulin. This makes it possible to correct insulin dosage and to analyze the insulin/carbohydrate relationship.

Algorithms based on 1 unit of insulin for every 15 grams carbohydrates (CHO) are effective and safe, so this can be used as a starting point.

Box 12

Remember which foods contain CHO

	CHO/100 g
Bread, cereals, rice, pastas, potatoes, corn	50–80 g
Legumes (lentils, beans, peas, etc.)	50 g
Fruit and fruit juices	10–20 g
Vegetables (green beans, lettuce, carrots, etc.)	< 10 g (also contribute vitamins, minerals, and antioxidants)
Dairy products: milk, yogurt	10 g

Sweets and pastries should not be eaten or should be restricted to no more than 5% of total calories. However, the carbohydrate content of these products is usually noted on the labels. If an appropriate portion is consumed, it will not lead to an elevation of blood glucose.

The content of sugar-free dietetic products should be also evaluate by reading food label information to determine the total content of carbohydrate.
This method includes adjustment of blood glucose in order to maintain good metabolic control throughout the day.
Insulin/carbohydrate relationship: This refers to the number of units of short-acting or rapid-acting insulin needed to metabolize the quantity of carbohydrate consumed in the main meals. It depends on individual sensitivity to insulin. It is calculated using the following formula:

$$\frac{\text{(capillary blood glucose} - 130)}{60}$$

The denominator is 60 if rapid-acting insulin is used and 50 if short-acting insulin is used.
Blood glucose targets are 90–130 mg/dL for basal and < 180 mg/dL for post-prandial.
For blood glucose correction, only fasting blood glucose levels are used.

Some examples:
Insulin bolus for meals: 1 unit rapid-acting insulin for every 15 g carbohydrates

- Actual pre-breakfast blood glucose: 180 mg/dL
- Target preprandial blood glucose: 130 mg/dL
- Carbohydrate intake at breakfast: 60 g
- Calculation of insulin dose needed to correct blood glucose:
  $\frac{180-130}{60} = 0.83 \text{ » } 1 \text{ unit}$
- Calculation of insulin needed for CHO intake, based on 1 unit per 15 g:
  60/15 = 4 units
- Total: 1 unit for correction + 4 units for breakfast = 5 units rapid-acting insulin

Rule of 500

This takes into account the total daily dose of insulin (for a 24-hour day), which is the total of basal plus bolus insulin. 500 is a constant standard value, which is then divided by the total daily dose of insulin. The result is the quantity of CHO that is covered by 1 unit of insulin.

Example: Total insulin administered by an individual in a day: 31 units.
If blood glucose levels are in the acceptable range, the calculation is carried out to determine how many units of insulin are needed to metabolize the CHO. Otherwise, the patient should wait a day until blood glucose is within the target range.
500/31 = 16.1. In other words, the insulin-to-carbohydrate ratio is 1:16.
Some authors have suggested using 450 rather than 500 for patients who have insulin resistance.

Box 13

Sample calculation of insulin-to-carbohydrate (I:C) ratio for an individual

BREAKFAST				LUNCH			
INSULIN		BLOOD GLUCOSE BEFORE MEAL		INSULIN		BLOOD GLUCOSE BEFORE MEAL	
5 units		121		4 units		143	
Food	Quantity	CHO	I:C	Food	Quantity	CHO	I:C
Milk	1 cup	10 g		Lettuce	1 cup	0	
Bran cookies	10 units	50 g		Rice	1 cup	40 g	
				Meat	1 portion	0	
				Orange	1 unit	20 g	
Total		60 g				60 g	
Bood glucose after meal: 112 mg/dl			1:12	Bood glucose after meal: 162 mg/dl			1:15

Method for determining the insulin sensitivity factor

This refers to the reduction in blood glucose level per 1 unit of insulin taken.
Rule of 1,800. Divide 1,800 by the total daily dose of insulin.
Example:
Total daily dose: 40 units
1,800/40 = 45. Therefore, 1 unit of insulin decreases blood glucose by 45 mg/dL.
To determine the insulin-to-carbohydrate ratio, multiply the insulin sensitivity factor by 0.33. The result is 14.85, rounded to 15.

It is important that the patient being introduced to this method receive, along with nutritional education, a list of the carbohydrate contents of foods that is as complete as possible. The educational program should also teach patients how to read food labels.

The patient who engages in physical exercise should also consider this expenditure of glucose and should eat a snack containing complex carbohydrates. The CHO content of the snack will be determined by capillary blood glucose levels before and after exercise, as well as by the timing and intensity of the exercise.

In general, 30 to 40 grams of CHO per hour of exercise is recommended in the case of high-intensity activities (for example, swimming, tennis, or soccer).

Scenarios

The following boxes describe recommended actions for different levels of care in scenarios 1, 2, and 3.

Box 14		
TERTIARY LEVEL: Care by a diabetes specialist plus a complete health team, including dietician/nutritionists, kinesiologist, ophthalmologist, podiatrist; referral to other specialties.		
SCENARIO 1	SCENARIO 2	SCENARIO 3
		Routine monitoring of microalbuminuria is done. Other types of studies are available for monitoring patients, such as retinofluoresceinography, nerve conduction rate, electromyogram. A complete team is in place, including physicians from all related specialties, educators, dieticians/nutricionits, and psychologists, who network via telephone and the Internet to support management at other levels of care. Highly specialized surgical treatment is available for chronic complications such as renal transplant, bypass, etc.
	Diagnosis and treatment by a medical team consisting of a diabetologlist/endocrinologist, educator, and nutritionist. Access to self-monitoring supplies; daily self-monitoring in case of type 1 diabetes and at least three times per week in case of type 2 diabetes. The patient is evaluated annually by a team that includes specialist in ophthalmology, neurology, nephrology, cardiology, dentistry, etc.	Same as for Scenario 2.
Diagnosis and prevention of acute complications. Basic diagnosis of complications: cardiovascular diseases and diabetic foot.	Same as for Scenario 1.	Same as for Scenario 1.

Box 15		
SECONDARY LEVEL (Referral Health Center) Hospitals and specialty physicians' offices		
SCENARIO 1	SCENARIO 2	SCENARIO 3
		Networks of specialists for the treatment of complications. Records available on people with diabetes. Monitoring of treatment performed by other specialties. Records are available allowing regular contact with the third level of care. Renal transplant for those who need it.
	Treatment by a diabetes team consisting of a diabetologlist/ endocrinologist or an internist with special training in diabetes, a professional educator, and at least three health professionals from different disciplines related to diabetes care, which together provide a coordinated service. Ongoing training of health providers to ensure appropriate management of diabetes and its complications. Dialysis services for patients with renal failure.	Same as for Scenario 2
Treatment of hyper- and hypoglycemia. Basic treatment of diabetic foot. Basic diagnosis of cardiovascular disease.	Same as for Scenario 1	Same as for Scenario 1

Box 16

COMMUNITY LEVEL (Health promoters)
Family, workplace, and school

SCENARIO 1	SCENARIO 2	SCENARIO 3
		Health team: educator, visiting from primary care physicians' offices. Physical education instructor or monitors. Podiatrist for foot care. Multidisciplinary health practices. Formation of diabetes education support groups with people who are interested and involved in the subject.
	Follow-up of persons in the prevention program. Weight control. Nutrition and food hygiene measures through nutrition classes. Formation of associations or clubs of people with diabetes. Seminars, workshops, or conferences on specific aspects of diabetes care. Workshops on personal development.	Same as for Scenario 2
Physical activity (community monitors) and healthy diet. Basic advice on self-monitoring and insulin therapy. Training in diabetes management by health promoters.	Same as for Scenario 1	Same as for Scenario 1

Box 17

PRIMARY LEVEL: General or family medicine; training of health promoters

SCENARIO 1	SCENARIO 2	SCENARIO 3
		Diabetes program that includes the family; the community is involved in the fight to control diabetes through campaigns. Structured national diabetes program. Individual nutritional plan. Self-monitoring of blood glucose.
	Management of diabetes by a basic health care team (physician and nurse) through a moderately organized program for diabetes education. Primary prevention activities. Implementation of public policies for rural and marginal urban areas.	Same as for Scenario 2
Health promoters (physician or nurse if available) with at least minimum training in diabetes screening for high-risk groups, basic management of diabetes, and basic nutritional advice. Control of body-weight. Foot care.	Same as for Scenario 1	Same as for Scenario 1

Box 18		
HOME-BASED CARE		
SCENARIO 1	SCENARIO 2	SCENARIO 3
		Provide all existing benefits for diagnosis, treatment, education, prevention, and treatment of complications: specialized centers that provide quality state-of-the-art care. Advanced training in the prevention of diabetic foot and blindness. Structured physical activity program. Behavioral and family therapy to ensure treatment adherence Regular self-monitoring.
	Provide minimum indispensable to provide quality care; initiating a preventive approach to the management of diabetes and its complications. Periodic health check-ups. Family involvement in treatment and in educational activities. Use of basic control measures. The minimum should be access to glucosuria, but capillary blood glucose is preferable (with visual control if glucometry is not available).	Same as for Scenario 2
Give the patient the indispensable minimum resources for the control of diabetes. Basic Information on diabetes: diet, skills for management of insulin or oral medication, diabetic foot, physical activity, and knowing where to get help. Knowledge of signs and symptoms of hypoglycemia and hyperglycemia. Weight control and foot care.	Same as for Scenario 1	Same as for Scenario 1

Application of algorithms by scenario

This section presents algorithms for the diagnosis and treatment of diabetes mellitus in each of the scenarios described above. The algorithms provide guidance on activities and suggest the actions to take in each specific situation. The situations described are general and may not apply fully to every individual patient, so final decisions must be based on patient characteristics and on the experience of the health care staff. Local guidelines and protocols should be consulted in relation to specific situations. As far as possible, cardiovascular risk should be evaluated in all cases. A WHO document on cardiovascular disease prevention[56] provides a guide to risk, taking into account the presence of other factors such as diabetes, hypertension, and smoking.

Scenario 1 (low-resource scenario)

Diagnosis and classification of diabetes in Scenario 1
Management of diabetes in Scenario 1
Non-pharmacological treatment of diabetes in Scenario 1

Scenario 2 (medium-resource scenario)

Diagnosis and classification of diabetes in Scenario 2
Management of diabetes in Scenarios 2 and 3
Non-pharmacological treament of diabetes in Scenario 2
Use of oral anti diabetic (OAD) medication
Examples of evidence-based therapeutic objectives for people with type 2 diabetes

Scenario 3 (high-resource scenario)

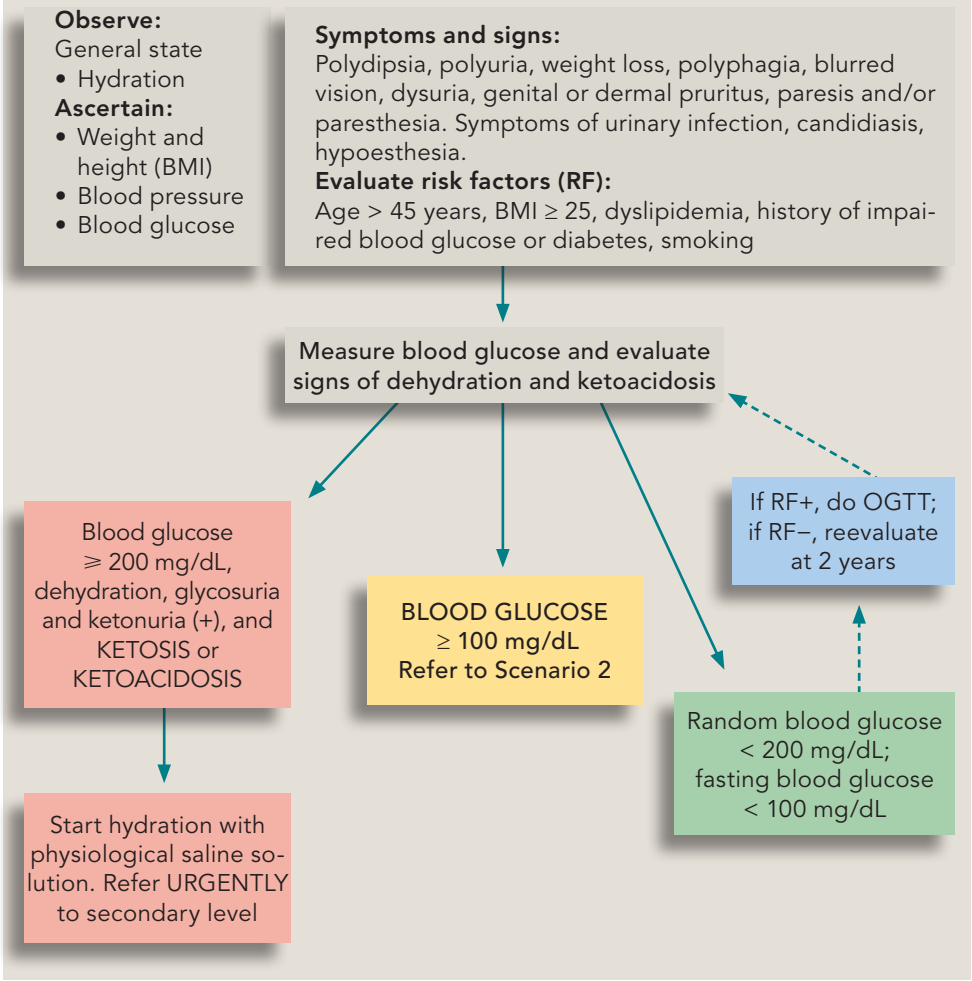
Diagnosis and classification of diabetes in Scenario 3
Management of diabetes in Scenarios 2 and 3
Non-pharmacological treatment of diabetes in Scenario 3
Use of OAD
Examples of evidence-based therapeutic objectives for people with type 2 diabetes

Algorithms for the prevention, diagnosis, treatment, and control of diabetes and its complications

Box 19

Scenario 1

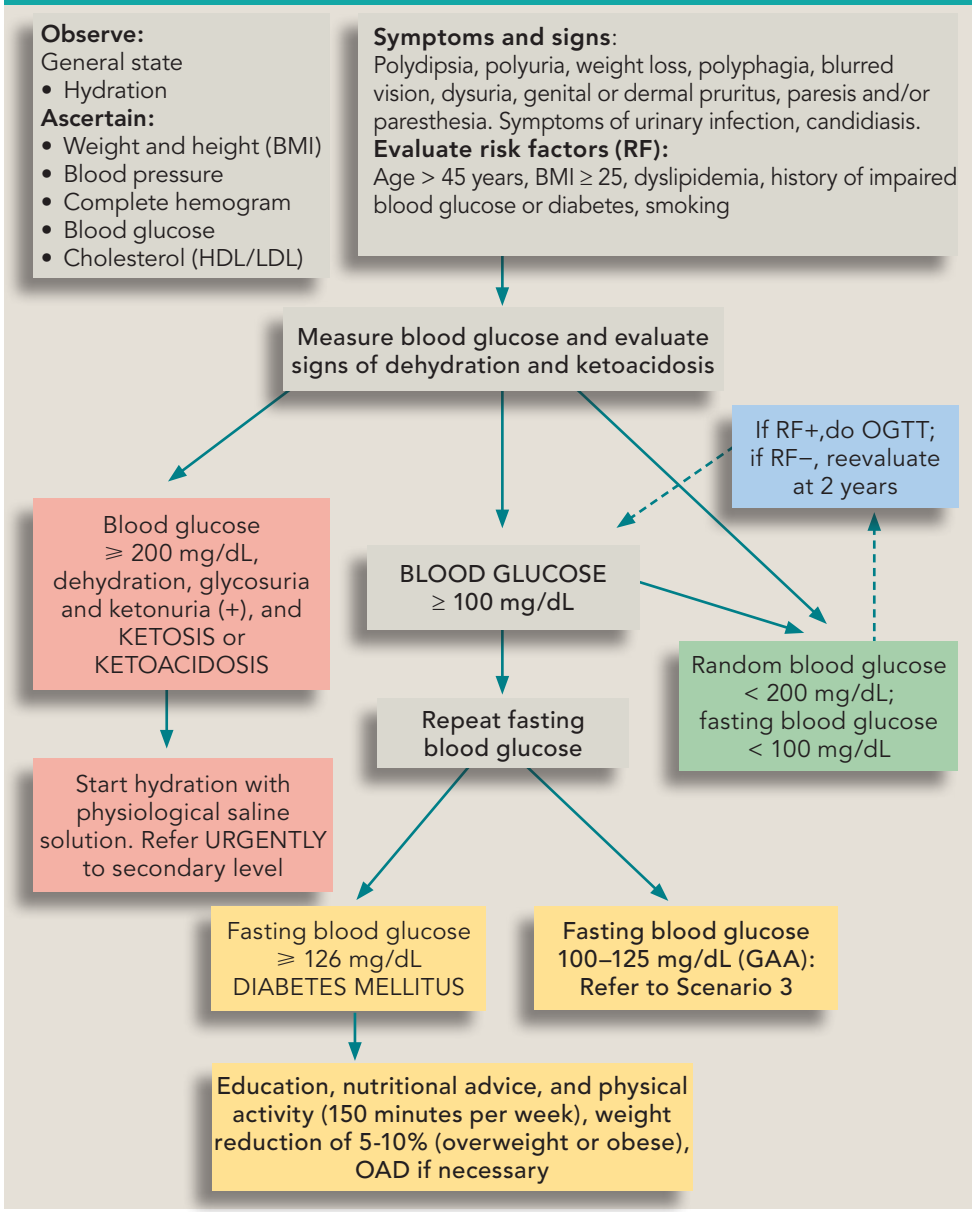
Diagnosis and classification of diabetes mellitus in adults



Box 20

Scenario 2

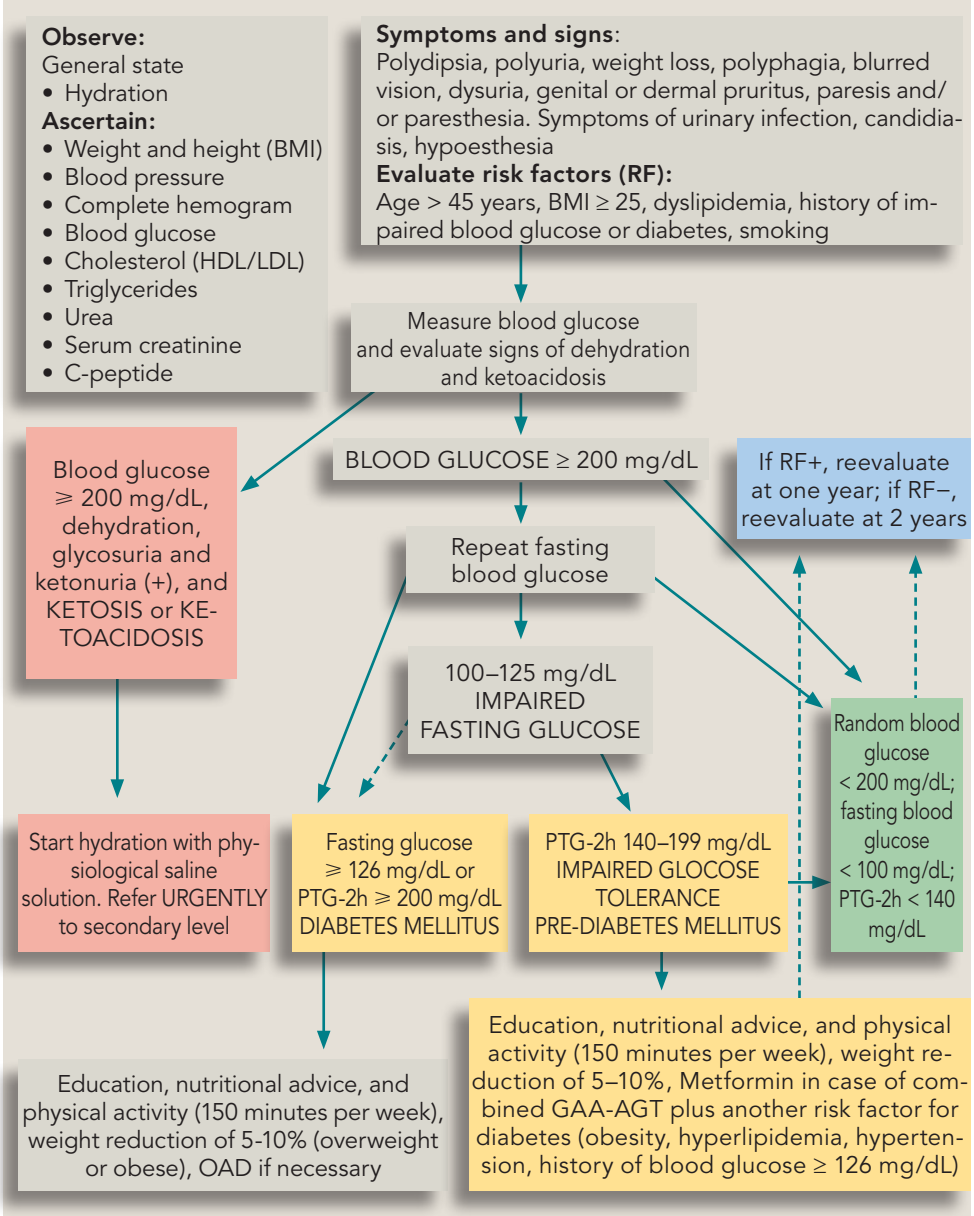
Diagnosis and classification of diabetes mellitus in adults



Box 21

Scenario 3

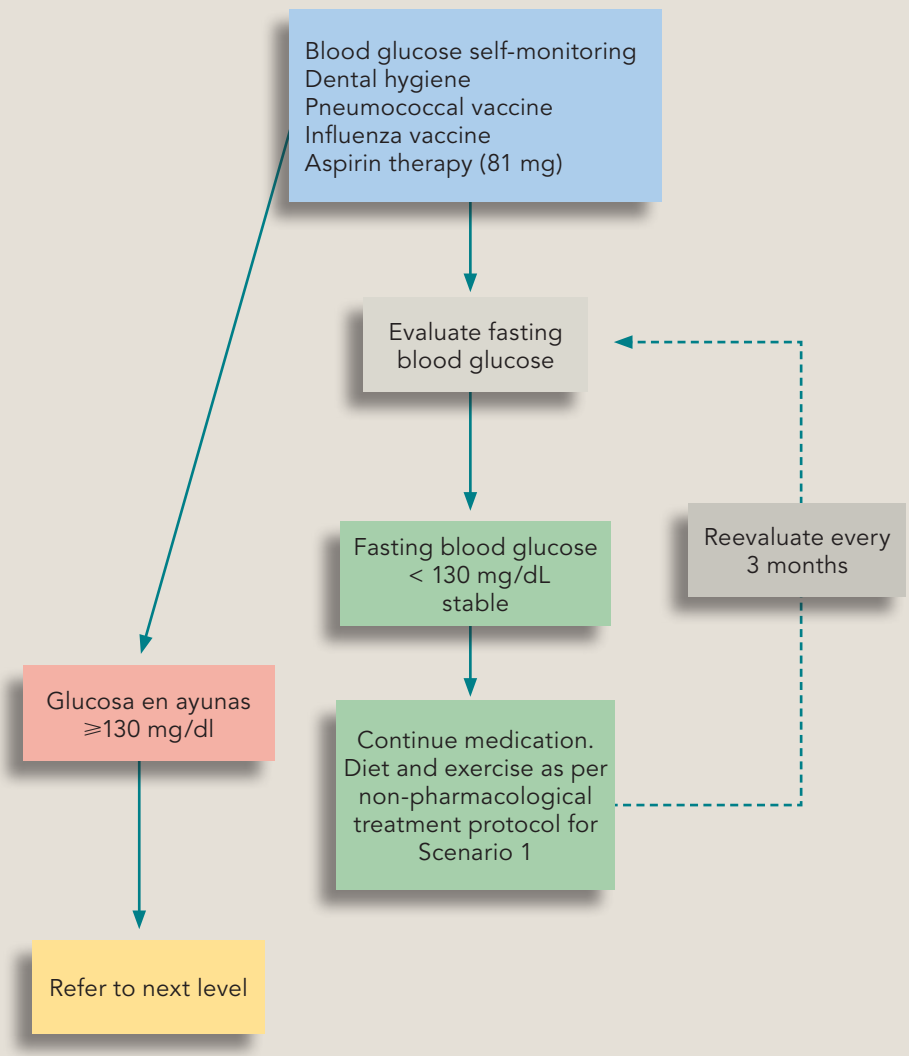
Diagnosis and classification of diabetes mellitus in adults



Box 22

Scenario 1

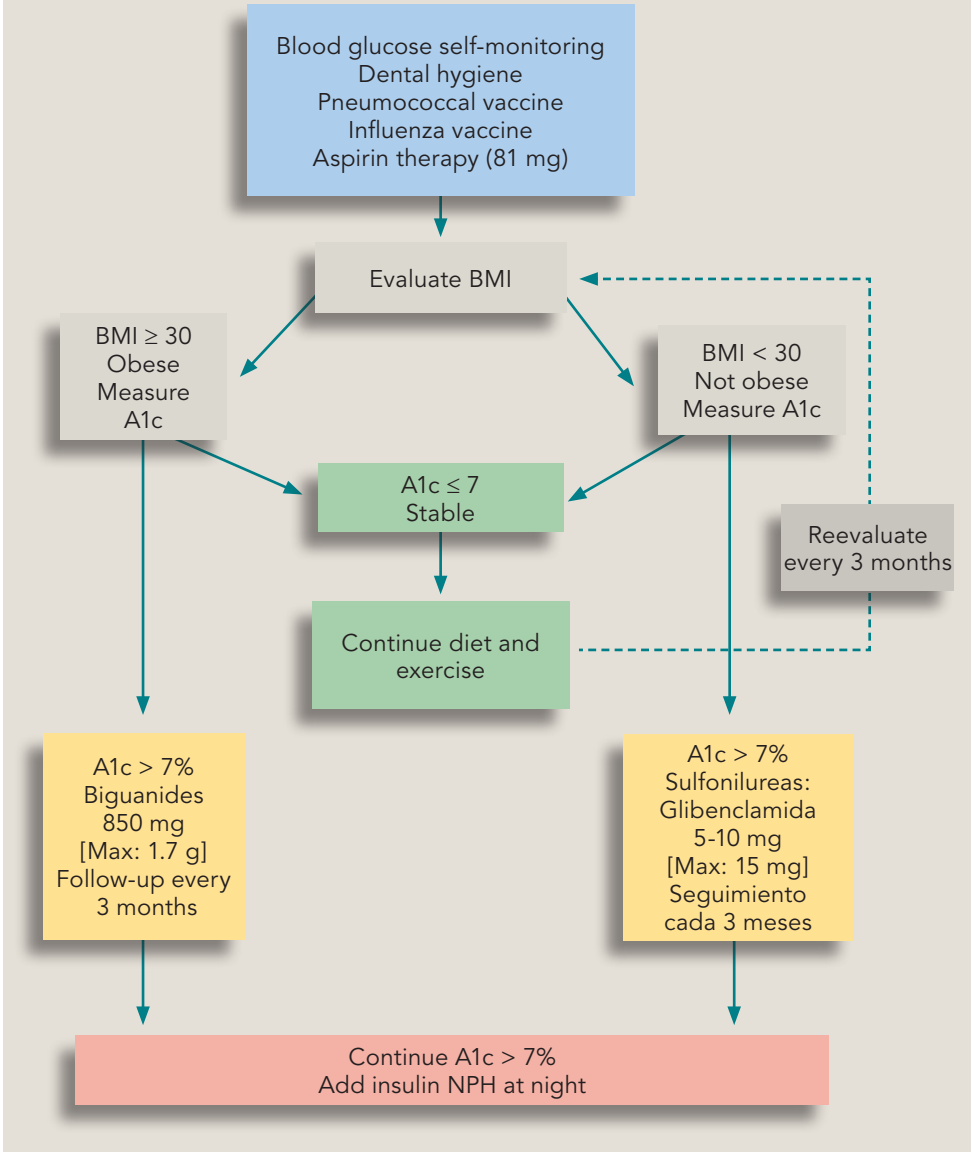
Management of diabetes mellitus



Box 23

Scenarios 2 and 3

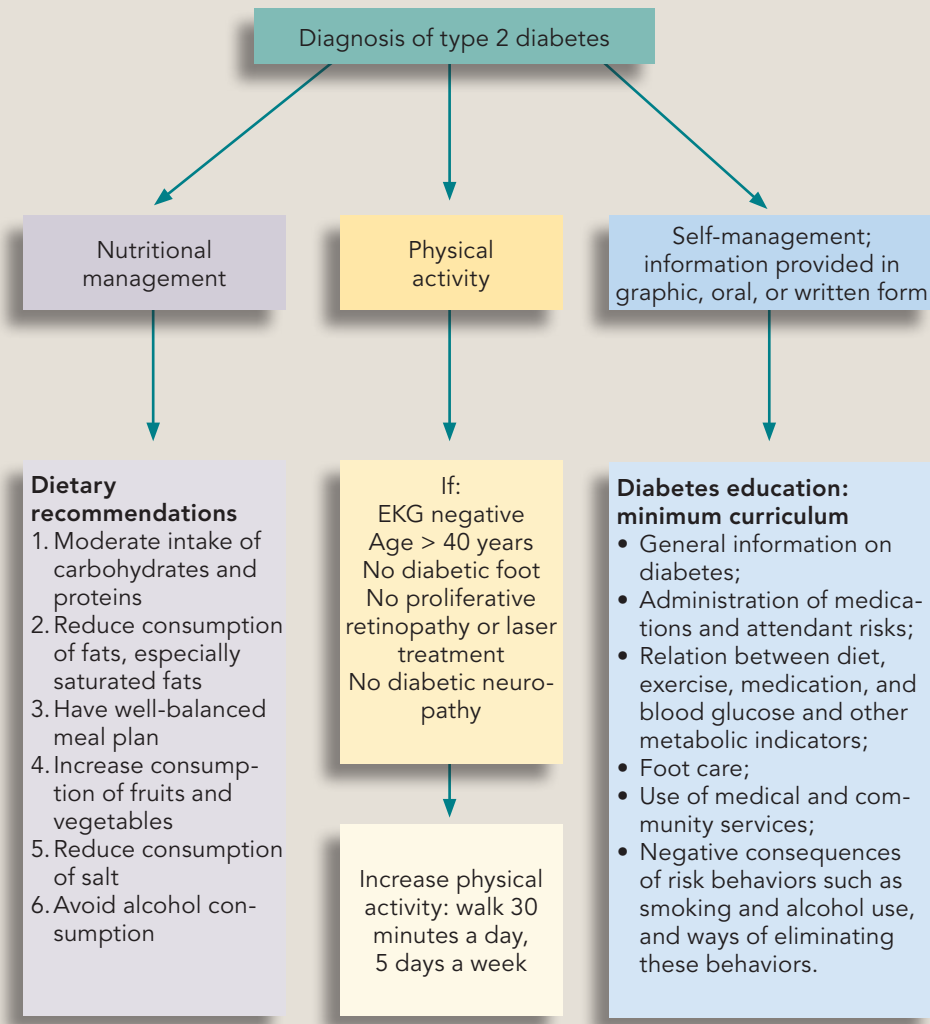
Management of diabetes mellitus



Box 24

Scenario 1

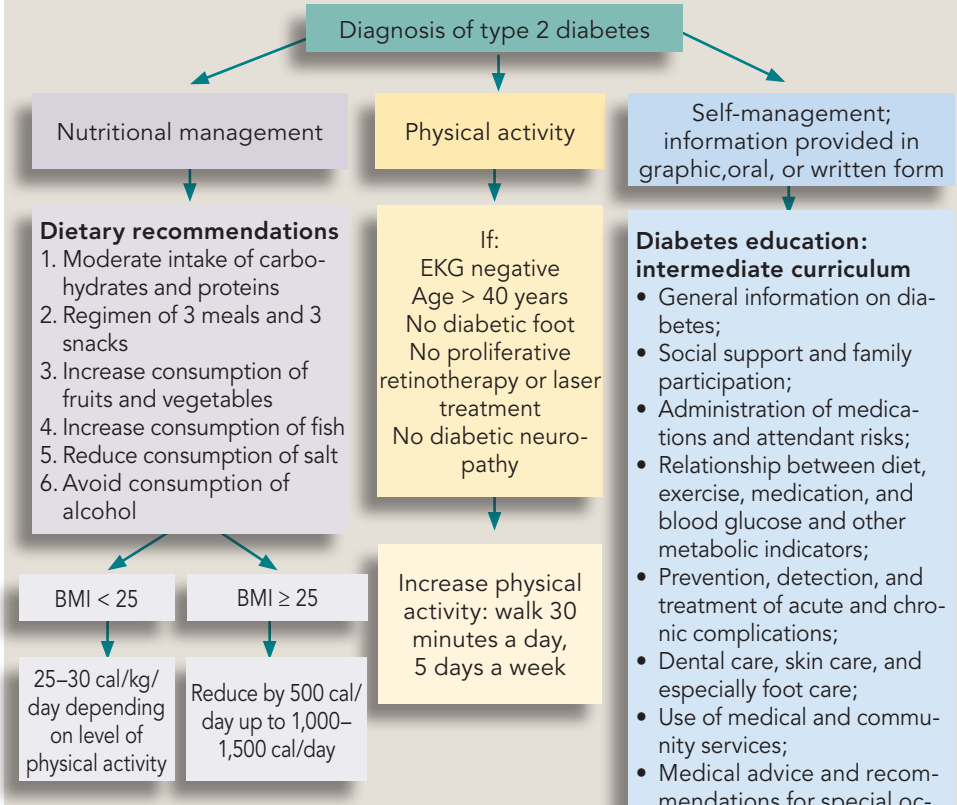
Non-pharmacological diabetes treatment



Box 25

Scenario 2

Non-pharmacological diabetes treatment



Model meal plan

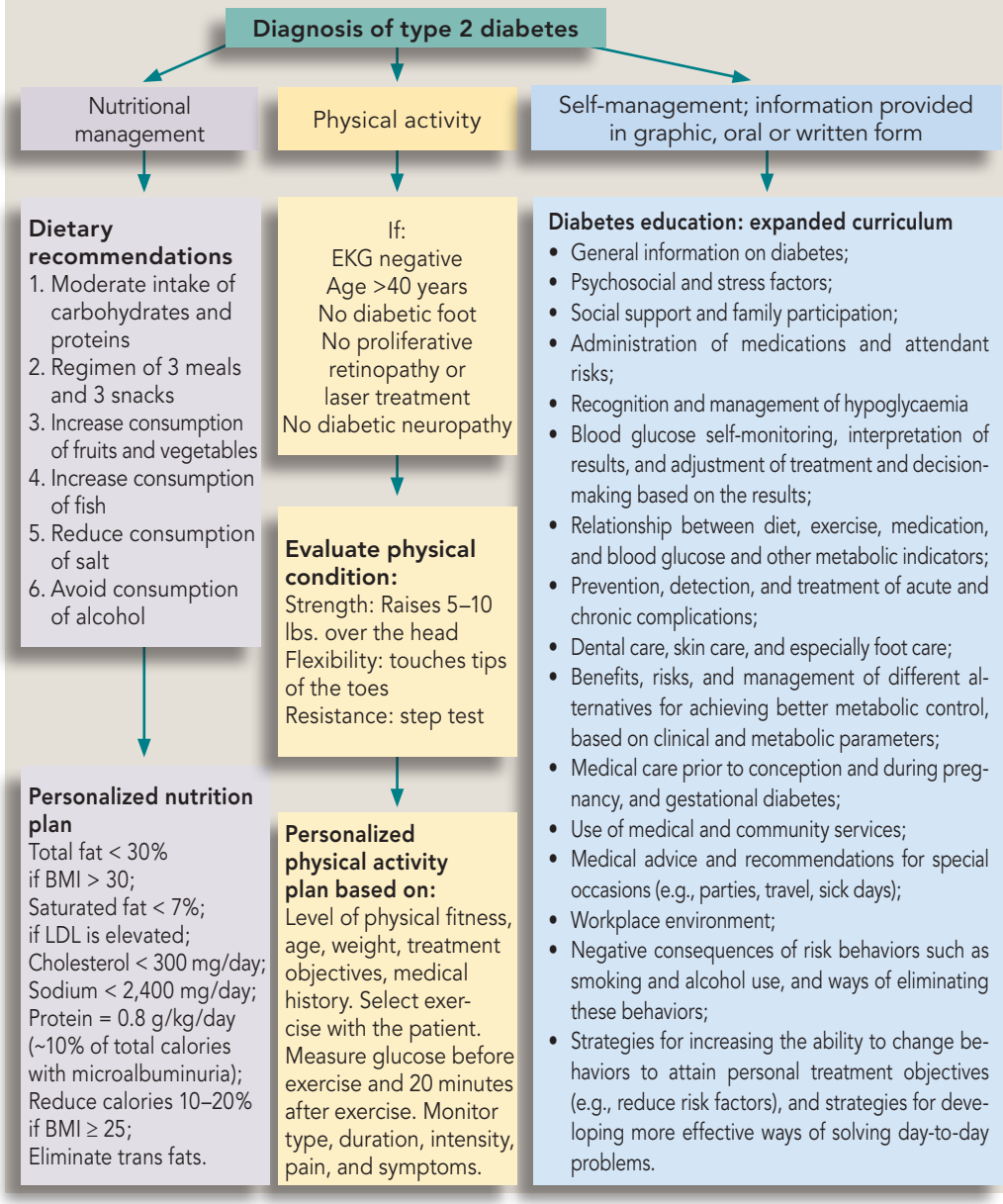
	CARB	MEAT	FAT
Breakfast	3-4	0-1	0-1
Snack	1-2	0	0-1
Lunch	3-4	2-3	1-2
Snack	1-2	0	0-1
Supper	3-4	2-3	1-2
Snack	1-2	0	0-1

1 CARB = 1 portion = 15 g = 60 cal.
1 MEAT = 1 portion = 28 g = 7g protein + 5 g fat = 50–100 cal.
1 FAT = 5 g fat = 45 cal.
1 VEGETABLE = 1–2 portions/day are not counted

Box 26

Scenario 3

Non-pharmacological treatment of diabetes



Box 27

Use of oral antidiabetic (OAD) medication

Group/drug	Dosing/ Initial dosage [maximum]	Indication	Action	Advantages	Contraindication	Side effects
Biguanides Metformin	Start with 500 mg once or twice daily with meals 500 mg [2,500 mg]	Obesity Dyslipidemia Insulin resistance	Reduce hepatic glucose output and delay glucose absorption from the gut	Do not cause weight gain Lower LDL cholesterol Do not cause hypoglycaemia	Age > 80 years Heart failure Pregnancy Renal insufficiency	Gastrointestinal disorders Anorexia Lactic acidosis (Rare)
Sulphonylureas Chlorpropamide Glibenclamide Glyburide Microglyburide Glipizide Glipizide* Glimepiride	Short acting drugs preferable for use in the elderly. Start with a low dose and increase as necessary 250 mg/day [500 mg] 5.0 mg/day [15 mg] 2.5 mg/day [20 mg] 1.5 mg/day [12 mg] 5.0 mg/day [40 mg] 5.0 mg/day [20 mg] 1.0 mg/day [8 mg]	Insulin deficiency Fasting glucose > 250 mg/dL Postprandial glucose > 300 mg/dL	Stimulate insulin release	Low cost Effective	Pregnancy Lactation Terminal renal disease (Serum creatinine > 2.0 mg/dL)	Hypoglycemia Weight gain Allergy to sulfa drugs (rare)
Alpha-glucosidase inhibitors Acarbose Miglitol	Start with low dose 25mg 2-3 times daily (Take with the first bite of each meal) increase to maximally tolerated dose 25 mg before the main meal [100 mg] 25 mg before the main meal [100 mg]	Obesity Insulin resistance Postprandial hyperglycemia	Reduce intestinal absorption of carbohydrates	Do not cause hypoglycaemia	Pregnancy Renal disease Chronic intestinal disease Cirrhosis of the liver Ketoacidosis	Gastrointestinal disorders
Thiazolidinediones Pioglitazone Rosiglitazone	Can be used as monotherapy or in combination with oral agents or insulin 15 mg [45 mg] 4 mg [8 mg]	Obesity Insulin resistance Postprandial hyperglycemia	Increase insulin sensitivity	Beneficial effects on lipids and blood pressure	Heart failure Liver disease Use of oral contraceptives Pregnancy Caution when used with insulin	Moderate weight gain Water retention
Meglitinides Repaglinide Nateglinide	Multiple dosing regime is necessary 0.5 mg [4.0 mg] 60 mg [120 mg]	Insulin deficiency Variable meal time Renal failure	Increase insulin release	Rapid on-off effect due to short half life	Pregnancy and lactation Type 1 diabetes Hypersensitivity to the drug	Hypoglycemia Weight gain Gastrointestinal upset

* delayed release

References[22,30]

Box 28

Characteristics of different types of insulin administered subcutaneously

Type of insulin	Onset of effect	Peak effect	Duration
Crystalline or regular	0.25-1 h	1.5-5 h	5–8 h (according to dosage)
Rapid-acting insulin analogues Lispro, Aspart, Glulisine	10 min	1 h	2-4 h
NPH	0.5-2 h	4-12 h	8–24 h (according to dosage)
Detemir insulin analogue	1-2 h	None	10–18 h (according to dosage)
Glargine insulin analogue	0.5-2 h	None	24 h
Inhaled insulin	32 min	1.5-5 h	5-8 h

Source: ALAD Guidelines[21].
Note: In the case of premixed dosages, the onset and duration of the effect as well as the time of peak effect will vary.

Box 29

Insulin therapy regimens most commonly used for persons with type 2 diabetes mellitus

The figures in parentheses correspond to the percentages of the total dosage most often recommended.

Regimen	Before breakfast	Before lunch	Before supper	At bedtime
Basal + oral antidiabetic (OAD)	OAD during the day			NPH
Basal with Glargine OAD	In DM2 there is no significant difference between various times of Glargine administration, as long as it is once a day at the same hour.			
Basal with Detemir OAD	Detemir	Nothing	Detemir	Nothing
Basal (conventional)	NPH	Nothing	Nothing	NPH
Premixed (conventional)	NPH/regular 70/30	Nothing	NPH/regular 70/30	Nothing
Premixed (analogue)	N/Rapid analogue 70/30	Nothing	N/ Análogo rápido 70/30	Nothing
Intensive (conventional)	Average	Average	Average	NPH
Intensive with rapid analogue	NPH with rapid analogue	Rapid analogue	Rapid analogue	NPH
Basal-bolus with analogue	Rapid analogue	Rapid analogue	Rapid analogue	Glargine (am or pm)

Source: ALAD Guidelines.
Note: Total dosage and proportions should be adjusted based on the results of self-monitoring. An initial adjustment of approximately 2 units per dose is recommended when human insulin is used. For more information, consult specialized texts on the use of insulin, insulin analogues, and incretins, such as the ALAD Guidelines[21].

Box 30

Examples of therapeutic objectives

Examples of evidence-based therapeutic objectives for people with type 2 diabetes

Objective	Intervention	Effect	Evidence level
Improve metabolic control	Reduce A1c	Reduction of macrovascular complications	Randomized controlled studies
Reduce bodyweight	Regular program of physical activity	Improved control of blood glucose	Cohort studies
Reduce blood pressure tension below 140/90 mgHg	Lifestyle modification, behavioral change, medical treatment	Reduction of cardiovascular risk	Randomized controlled studies
Reduce serum lipids	Lifestyle modification, behavioral change, medical treatment	Reduction of cardiovascular risk	Randomized controlled studies
Ensure compliance with aspirin therapy	Behavioral change, treatment with aspirin 75–162 mg/day	Reduced risk of recurrence of cardiovascular events	Randomized controlled studies
Stop smoking	Smoking cessation program	Reduction of cardiovascular risk	Randomized controlled studies

Box 31

Body Mass Index (BMI) Chart

Weight	lbs	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215
	kgs	45,4	47,6	49,9	52,2	54,4	56,7	59,0	61,2	63,5	65,8	68,0	70,3	72,6	74,8	77,1	79,4	81,6	83,9	86,2	88,5	90,7	93,0	95,3	97,5
Height																									
ft/in	cm																								
5'0"	152,4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
5'1"	154,9	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	36	37	38	39	40
5'2"	157,5	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	33	34	35	36	37	38	39
5'3"	160,0	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	32	32	33	34	35	36	37	38
5'4"	162,6	17	18	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	31	32	33	34	35	36	37
5'5"	165,1	16	17	18	19	20	20	21	22	23	24	25	25	26	27	28	29	30	30	31	32	33	34	35	35
5'6"	167,6	16	17	17	18	19	20	21	21	22	23	24	25	25	26	27	28	29	29	30	31	32	33	34	34
5'7"	170,2	15	16	17	18	18	19	20	21	22	22	23	24	25	25	26	27	28	29	29	30	31	32	33	33
5'8"	172,7	15	16	16	17	18	19	19	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	32	32
5'9"	175,3	14	15	16	17	17	18	19	20	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	31
5'10"	177,8	14	15	15	16	17	18	18	19	20	20	21	22	23	23	24	25	25	26	27	28	28	29	30	30
5'11"	180,3	14	14	15	16	16	17	18	18	19	20	21	21	22	23	23	24	25	25	26	27	28	28	29	30
6'0"	182,9	13	14	14	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28	29
6'1"	185,4	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28
6'2"	188,0	12	13	14	14	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27
6'3"	190,5	12	13	13	14	15	15	16	16	17	18	18	19	20	20	21	21	22	23	23	24	25	25	26	26
6'4"	193,0	12	12	13	14	14	15	15	16	17	17	18	18	19	20	20	21	22	22	23	23	24	25	25	26

Underweight Ideal Overweight Obese Extremely obese

Underweight =12-18 Normal healthy weight = 18-24 Overweight (25-29 KG/M2)

Obese= 30-39 Extremely obese= 40+

Monitoring

The quality of care for diabetes mellitus and other chronic diseases should be monitored in order to make the adjustments necessary for meeting the targets established in the clinical protocols.

Scenario 1

For Scenario 1, monitoring should make use of a minimum set of data on the activities carried out, as well as clinical examinations and laboratory tests. An example of the data record form, with instructions for filling it in, is presented in Annexes 1 and 2.

Scenarios 2 and 3

For Scenarios 2 and 3, administration of the QUALIDIAB questionnaire is recommended. Copies of the QUALIDIAB tools can be obtained at no cost from the Center for Experimental and Applied Endocrinology (CENEXA), in La Plata, Argentina. Annexes 3 and 4 present an adaptation of the QUALIDIAB questionnaire, as well as instructions for collecting the data.

Annex 1

Patient Monitoring Record

Instructions:

1. Write the name of the unit and the health provider.
2. Write the patient's name, sex, date of birth, and address.
3. Mark √ in the appropriate box if the patient has any of the listed complications. Fill in another box if the complication that the patient has does not appear on the list, e.g., cataracts or blindness.
4. Write the date of the visit or consultation.
5. Measure and record blood glucose, blood pressure, and lipid profile. Use separate lines for total cholesterol, LDL, HDL, and triglycerides.
6. Explain to the patient his or her goals, following the protocol for non-pharmacological diabetes treatment. Mark √ in the appropriate box if education on diabetes is provided. Using the following codes, indicate the specific educational subjects: (1) Nutrition; (2) Physical activity; (3) General information on diabetes; (4) Drug administration and its risks; (5) Relationship between diet, exercise, medication, and blood glucose and other metabolic indicators; (6) Foot care; (7) Use of medical and community services; (8) Negative consequences of risk behaviors such as smoking and alcohol use, and ways of eliminating these behaviors.
7. Note electrocardiogram (EKG) results.
8. Ask the patient to remove shoes and socks and examine the feet. Mark √ in the corresponding box.
9. Examine the ocular fundus once a year or refer the patient to an ophthalmologist or optometrist for examination. Mark √ in the corresponding box if the exam has been carried out or the patient has been referred for an annual examination.
10. Ask about use of tobacco and alcohol. If the patient reports use, write T+ and/or A+ in the corresponding box.
11. Measure weight and height and find the Body Mass Index (BMI) in the corresponding table.
12. Note prescribed medication and dosage.
13. Consider the use of aspirin (dosages 80–100 mg/day) as a preventive measure for the cardiovascular system. If this is indicated, mark √ in the corresponding box.
14. Consider and prescribe immunization against influenza or pneumococcus if this is available. If this is indicated, mark √ in the corresponding box.

Patient Monitoring Record

Health unit/area: ..... Physician: .....

Patient name: ..... Sex: M ☐ F ☐ Dietician/ Nutritionist: .....

Address: ..... Date of birth: __ / __ / ____

Complications	Yes	Date	Complications	Yes	Date	Complications	Yes	Date	Complications	Yes	Date
Hypertension			Heart disease			Stroke			Retinopathy		
Neuropathy			Neuropathy			Diabetic foot			Amputation		
High cholesterol											

Date	Blood glucose/ A1c	Measurement		BMI	Lipid profile		Educa-tion	EKG	Examination		Tobacco/ alcohol use	Treatment		A S A	Immuni-zations
		Blood pressure	Weight/ height		Test	Value			Foot	Ocular fundus		Medication	Dosage		

Pan American Health Organization

Regional Office of the World Health Organization

Cuadro 32

Standards for diabetes care

	Component	Frequency	Description
CONSULTATIONS	Blood pressure	Each visit	<130/80
	Eye exam	Once a year	Ophthalmologist/optometrist
	Dental exam	Every 6 months	Tooth and gum exam
	Brief foot exam	Each visit	Remove socks and shoes
	Complete foot exam	Once a year	If high-risk, refer to a podiatrist
	Influenza vaccine	Once a year	As available
	BMI	Each visit	18.5-25.0 Kg/M2
LABORATORY	Hemoglobin A1c	Every 3–6 months	< 7%
	Triglycerides	Once a year	< 150 mg/dL
	Total cholesterol	Once a year	< 200 mg/dL
	LDL cholesterol	Once a year	< 100 mg/dL
	HDL cholesterol	Once a year	> 40 (men), > 50 (women)
	Abumin / urine creatinina	Once a year	< 30µ/mg (spot)
	Electrocardiogram (EKG)	Once a year	Normal
EDUCATION	Treatment objectives	Each visit	Discuss with the patient
	Blood glucose	Monitoring	Recommend according to need
	Healthy diet	Each visit	Always recommend
	Physical activity	30 minutes, 5–7 times/week	Recommend according to need

ANNEX 2

QUALIDIAB questionnaire and instructions

Instructions for completing the QUALIDIAB questionnaire

General instructions:

- The questions should be answered using only the information that appears in writing in the medical record.
- The date should correspond to the date of each file or clinical report.
- Blank circles should be filled in with an X.
- Tables should be filled in with numbers.
- Lines or boxes should be filled in with text.
- Dates should be entered with two digits for the day, two digits for the month, and four digits for the year (DD/MM/YYYY). Example: 29/10/1954.

Yes-No questions:
All the information refers to what it is written in the file. Mark "YES" if the information is in the file. Mark "NO" if it is recorded as NO in the file, or leave blank if the information is not available.

Anthropometric measures and biochemical exams and measures
Enter the most recent data in the file, for the period up to 12 months before the file is reviewed. If measurements are shown for visits earlier than 12 months before the review date, leave the space blank.

Sections of the form, with instructions for each section

Entry dates:
Date: Enter the date when data were collected from the file.
Country: Enter the name of the country collecting the data.

Record/center:
File number: Write the number of the record or of the patient's file from which the information is obtained.
Center/unit: Write the name of the health center, clinic or unit where the patient's file is located.
Locality: Write the city, parish or municipality where the health center, clinic or unit is located.
Personnel profile of the unit: Mark an X for Non-physician if the person responsible for care is not a medical doctor; General practitioner if the person responsible is a general practitioner; Specialist if the person responsible is an endocrinologist or diabetes specialist; and Team if the patient received care in the unit from a specialized physician, diabetes educator, nutritionist, and psychologist.
Type of unit: Indicate whether the unit is at the primary, secondary, or tertiary level of care (health center, clinic, general hospital, referral hospital).

Basic patient data:

Male or female: Mark with an X whether the patient is a man or woman.
Surname(s): Write the surname(s) of the patient.
Given names: Write the first and middle name(s) of the patient.
Date of birth: Write the date using the format (DD/MM/YYYY).
Age at diabetes diagnosis: Write the age in years for the patient when first diagnosed, if this information is in the file.
Address: Write the street name and number of the patient's residence.
Locality: Write the locality/city/municipality/parish where the patient lives.
Department: Write the department/province/state/canton where the patient lives.

Diabetes:

Classification: Mark an X in the box for the type of diabetes that the patient has, as it appears in the file: type 1, type 2, gestational, or other (secondary diabetes). Leave this blank if the classification does not appear in the file.
Year started oral antidiabetics: Enter the year in which the patient began to take oral antidiabetics to control diabetes, if this information is in the file; otherwise leave blank.
Year started insulin: Enter the year in which the patient began to take insulin to control diabetes, if this information is in the file; otherwise leave blank.

Context of the visit:

Mark "ambulatory" for an outpatient consultation at a hospital or health center.
Number of visits in the last 12 months: Count and enter the number of visits recorded in the clinical file during the 12 months prior to the date of review.
Date of last visit: Enter the date of the patient's last visit to the center/unit/health services.

Pregnancies:

Pregnancies completed in the last 12 months:
Mark if the information is recorded in the file: pregnancies in the 12 months before the current date (YES/NO).
If any, enter the events that resulted from the pregnancies: normal deliveries, abortions, perinatal deaths, birth defects, caesarean sections.
Enter the birthweight if the pregnancy resulted in a live birth.

Cardiovascular risk factors:

Smoking/alcohol: Mark YES if the file indicates that the patient smokes or uses alcohol; NO if the file indicates that the patient does not smoke or use alcohol. Leave blank if this information does not appear in the file.
Cigarettes/day: Enter the number of cigarettes per day that the patient smokes, if this information is in the file.

Drinks/week: Enter the number of drinks per week that the patient consumes, if this information is in the file.
Weight: Enter the weight of the patient in kilograms.
Height: Enter the height of the patient in centimeters.
BMI: It is not necessary to fill in this field if electronically entered.
Waist: Enter the circumference of the waist in centimeters.
Hip: Enter the circumference of the hip in centimeters.
WHR: It is not necessary to fill in this field.
BP max, BP min: Enter the blood pressure results in millimeters of mercury for the most recent visit.
Biochemical exam results: *Enter only the most recent results within the last 12 months.*
Record the results of biochemical exams for the patient: fasting blood glucose, random blood glucose, A1c, creatinine, proteinuria, quantitative or qualitative microalbuminuria (mark with X if positive or negative), cholesterol, HDL, LDL, TG (triglycerides).

Education:

Does the patient participate in . . .? Mark an X for each type of education noted in the clinical file, such as ongoing diabetes education or a diabetes support group or club.
Has the patient been taught how to . . .? Mark an X if the file notes that the patient has been taught how to select food, care for the feet, plan physical activities, take medications, identify/treat hypoglycemia, or adjust insulin dosage (for those patients that use insulin).

Self-monitoring:

Blood glucose: Mark an X if the file notes that the patient has blood glucose test strips and enter the number of times per week that the patient tests for blood glucose level.
Glycosuria: Mark an X the file notes that the patient has test strips for glycosuria and enter the number of times per week that the patient tests for urine glucose level.
Ketonuria: Mark an X the file notes that the patient has test strips for ketonuria and enter the number of times a week that the patient tests for ketonuria.

Chronic complications:

Mark an X for YES if the information was noted in the file at any visit, regardless of the date:
Microangiopathy: If the patient suffers from blindness, neuropathy, has received a renal transplant or dialysis, or has orthostatic hypotension, peripheral neuropathy, or erectile dysfunction.

Macroangiopathy: If the patient has suffered AMI (acute myocardial infarction), CVA (stroke), has had angina (angina pectoris, precordial pain) or claudication in the legs, or has undergone revascularization or amputation at or below the ankle.

Eyes:

Exam within the last year: Mark an X for YES if there is written indication of an eye exam within the last 12 months.
Complications: For the following fields, mark an X for NO if there is no information. If there is information on any of the complications for any date, mark an X for the right or left eye (if the eye is not specified, put a mark for the right eye). Mark an X for both right and left if both eyes are affected:
Photo-coagulation, vitrectomy, cataracts, glaucoma, maculopathy (or edema of the macula), or non-proliferative, preproliferative, or proliferative retinopathy. If there is a reference to retinopathy without specifying the grade, mark non-proliferative.
Visual acuity (with correction): Enter the visual acuity of the patient for the right and left eyes, if this information is in the file.

Feet:

Exam within the last year: Mark an X for YES if there is written indication of a foot exam within the last 12 months.
Appearance: Mark an X if any of the following changes were noted in the exam: deformation, dry skin, corns, infection, fissures.
Complications: For the following fields. mark an X for NO if there is no information. If there is information on any of the complications, mark an X for the right or left foot (if the foot is not specified, put a mark for the right foot). Mark an X for both right and left if both feet are affected:
Abnormal vibration sensitivity, abnormal response to monofilament, no Achilles reflex, no pedis pulse, healed sore, acute sore or gangrene, bypass surgery or angioplasty.

Acute complications and hospitalizations within the last year:

Enter the number of episodes of hypoglycemia, ketoacidosis, or hyperosmolar coma noted in the file.
Enter the number of days the patient was absent from work within the last year.
Note the causes of the last 3 hospitalizations of the patient and the number of days for each hospitalization.

Treatment:

Diet: Mark an X for YES if the file shows that the patient has received advice about diets and calories. Otherwise, mark NO.

Physical activity: Mark an X for YES if the file shows that physical activity or exercise has been recommended for the patient.
Oral hypoglycemics: Mark an X for YES if the file shows that the physician prescribed metformin, glibenclamide, or another similar drug for the patient. Enter the names of other oral hypoglycemic drugs if they are noted.
Insulin: Mark an X for the type of insulin (bovine, porcine, or human). Enter the number of units per day that the patient takes and indicate whether it is crystalline, NPH, and/or slow-release). If the patient uses premixed insulin, mark an X for YES and enter the proportions in percentages (e.g., 30/70).
Mark an X if it is noted whether the patient uses a syringe, an insulin pen, or an insulin pump. If there is no specific reference, mark the syringe option.
Enter the number of administrations per day that were prescribed.
Mark an X for YES if the patient uses insulin analogues and write the name of the analogue used.

Additional medication:

Mark an X if there is a prescription in the file for:
Hypertension: Prazosin (alpha blockers); Atenolol/Propanolol (beta blockers); Nifedipine (calcium blocking agents); Captopril/Enalapril (ACE inhibitors); Losartan/Valsartan (angiotensin-receptor blocking agents); Hydrochlorothiazide (HCTZ)/Furosemide/Chlorthalidone (diuretics); Methyldopa.
Dyslipidemia: Simvastatin (statin); Gemfibrozil (fibrate); others.
Other pathologies: Medications for cardiac insufficiency, neuropathy, ischemic cardiopathy, nephropathy. If the patient is taking another medication that has not been marked in the previous fields, enter the name of the medication under OTHER MED.
Aspirin: Mark an X for YES if the patient is taking aspirin as a blood thinner.

Health system coverage:

Mark an X for NO if the patient pays for all services, for PARTIAL if the patient pays in part for the services, or for TOTAL if the patient receives the following health services free of charge: medical care, biochemical (laboratory) tests, medications, reactive strips, hospitalizations.

Person responsible:

Write the name of the person filling out the form and any additional notes that are relevant.

QUALIDIAB

Declaration of The Americas
St Vincent Declaration
AMERICAS / EUROPE

REGISTRY

Patient's Record

Type ____ Number ____

Type: Audit ○ Interview ○ **Date** DD/MM/YYYY ____/____/____

CENTER

Category

Paramedic ○ GP ○ Team ○ Unit ○ Center ○

Telephone ____ ____ ____

PATIENT'S BASIC DATA

Collect only the first time

Male ○ Female ○

Last Name ____

Name ____

Date of Birth ____/____/____ (DD/MM/YYYY)

Province ____

Departament ____

City ____

Age at Diagnosis of DM ____ Years

DIABETES

Type 1 ○ Type 2 ○ Gestational ○ Others ○

Start on Pills (Year) ____ Start on Insulin (Year) ____

TYPE OF VISIT

Outpatient ○ Inpatient ○

Number of visit during previous 12 months ____

PREGNANCIES COMPLETED IN THE LAST 12 MONTHS (NUMBER)

Normal pregnancies ____ Abortions ____ Perinatal deaths ____ Malformations ____ Caesarians ____ Birthweight ____,____ Kg

CARDIOVASCULAR RISK FACTORS

Smoking NO ○ Yes ○

Cigarrettes/Day ____

Alcohol NO ○ Yes ○

g/week ____

Weight ____ Kg

Height ____ cm

BMI ____

Waist ____ cm

SBP ____ mmHg

DBP ____ mmHg

Fasting Glucose ____ mg/dl

Random Glucose ____ mg/dl

Microalb. Qualitative (+) ○ (-) ○

	Not available	Not done	Value	Reference Value
A1c	○	○	____,____ %	Ref. ____,____ % Máx.
A1	○	○	____,____ %	Ref. ____,____ % Máx.
Creatinine	○	○	____,____ mg/dl	
Proteinuna	○	○	____ g/dia	
Cholesterol	○	○	____ mg/dl	
HDL	○	○	____ mg/dl	
LDL	○	○	____ mg/dl	
TG	○	○	____ mg/dl	
Microalb. Quantitative	○	○	____	mg/g Creatinine ○ mg/24H ○ µg/min ○

DIABETES EDUCATION

HAVE YOU BEEN EXPLAINED HOW TO:

	NO	YES		NO	YES
Select Food	○	○	Identify / treat hipoglycemia	○	○
Take Care of your Feet	○	○	Adjust Insulin Dose	○	○

DO YOU KNOW YOUR TREATMENT GOALS?

NO ○

YES ○

SELF-MONITORING

Blood Glucose	Glucosuria	Ketonuria
Do You Have Strips? NO ○ YES ○	Do You Have Strips? NO ○ YES ○	Do You Have Strips? NO ○ Yes ○
Nº Times per Week ____	Nº Times per Week ____	Nº Times per Week ____

CHRONIC COMPLICATIONS

MICROANGIOPATHY

	NO	YES		NO	YES
Blindness	☐	☐	Nephropathy	☐	☐
Dialysis	☐	☐	Orthostatic Hypotension	☐	☐
Transplant	☐	☐	Erectile Dysfunction	☐	☐
Peripheral Neuropathy	☐	☐			

MACROANGIOPATHY

	NO	YES		NO	YES
Infarction	☐	☐	Intermittent Claudication	☐	☐
Stroke	☐	☐	Bypass	☐	☐
Angina	☐	☐	Amputation above ankle	☐	☐
			Amputation below ankle	☐	☐

EYES

Exam Previous 12 Months NO ☐ YES ☐

	NO	YES R	YES L		NO	YES R	YES L
Photocoagulation	☐	☐	☐	Maculopathy	☐	☐	☐
Victrectomy	☐	☐	☐	Retinopathy			
Cataracts	☐	☐	☐	Non Proliferative	☐	☐	☐
Glaucoma	☐	☐	☐	Pre Proliferative	☐	☐	☐
				Proliferative	☐	☐	☐

Visual Acuity (with correction) L Eye 20 / ☐☐ R Eye 20 / ☐☐

FOOT

Physical Exam NO YES

	NO	YES		NO	YES R	YES L
Deformity	☐	☐	Vibratory sensation abn.	☐	☐	☐
Dry skin	☐	☐	Monofilament sensation abn.	☐	☐	☐
Calluses	☐	☐	Achilles reflex abn.	☐	☐	☐
Infection	☐	☐	Pedal pulse absent	☐	☐	☐
Fissures	☐	☐	Healed ulcer	☐	☐	☐
			Ulcer/acute gangrene	☐	☐	☐
			Bypass/angioplasty	☐	☐	☐

Examined Previous 12 Months NO ☐ YES ☐

ACUTE COMPLICATIONS & HOSPITALIZATIONS DURING PREVIOUS YEAR

(Indicate No. episodes)

		Reasons for hospitalizations	days
Severe Hypoglycemia	☐☐	1-	☐☐☐
Ketoacidosis / coma	☐☐	2-	☐☐☐
Hyperosmolar coma	☐☐	3-	☐☐☐

Work absences (No. days / year) ☐☐☐

TREATMENT

LIFE STYLE

	NO	YES
Diet	☐	☐
Physical Activity	☐	☐

ORAL

	NO	YES
Metformin	☐	☐
Sulfonylureas	☐	☐
Meglitinides	☐	☐
Glucosidase inhibitors	☐	☐
Thiazolidinedione	☐	☐
Others	☐	☐

Which? ☐☐☐☐☐☐☐☐☐☐

INSULIN

(units/day)

	Crystalline	NPH	Lente or ultra lente
Bovine	☐☐☐	☐☐☐	☐☐☐
Porcine	☐☐☐	☐☐☐	☐☐☐
Human	☐☐☐	☐☐☐	☐☐☐

Analogous ☐☐☐ Which? ☐☐☐☐☐☐☐☐☐☐

Pre Mixed ☐☐☐ Percentage ☐☐/☐☐

No. injections / day ☐ Pen ☐ Pump ☐

ADDITIONAL MEDICATION

HYPERTENSION

	NO	YES
Alpha Blockers	☐	☐
Beta Blockers	☐	☐
Ca Channel Blockers	☐	☐
ACE Inhibitors	☐	☐
Angiotensin Recep.Bloc.	☐	☐
Diuretics	☐	☐

HYPERTENSION (Cont)

	NO	YES
Adrenergic Antagonists	☐	☐
Alpha Adrenergic Agonists	☐	☐
Others	☐	☐

DYSLIPIDEMIA

Statine	☐	☐
Fibrates	☐	☐
Others	☐	☐

MEDICATION FOR OTHER CONDITIONS

	NO	YES
Cardiac Insufficiency	☐	☐
Neuropathy	☐	☐
Ischemic heart disease	☐	☐
Nephropathy	☐	☐
Others	☐☐☐☐☐☐☐☐☐☐	

SOCIAL INFORMATION

COVERAGE

	NO	YES Partial	YES Total
Medical attention	☐	☐	☐
Laboratory tests	☐	☐	☐
Medication	☐	☐	☐
Strips	☐	☐	☐
Hospitalizations	☐	☐	☐

Person completing the form

Print name

Signature

ANNEX 3

Participants in PPECD activities

Workshop I: Building Blocks in Diabetes Education and Control

1–3 December 2001
Melia Juan Dolio, Santo Domingo, Dominican Republic

Participants

	Country	Name
1	Argentina	Juan José Gagliardino
2	Argentina	Olga Ramos
3	Argentina	Nestor Loreto
4	Barbados	Noreen Merritt
5	Bermuda	Rachel Blakeney
6	BeliZe	Beth McBride
7	Bolivia	Elizabeth Duarte de Muñoz
8	Bolivia	Sandra Verduguez
9	PAHO/Bolivia	María del Carmen Daroca
10	Brazil	Graca Maria de Carvalho Camara
11	Brazil	Cristina Facanha
12	Canada	Anne Belton
13	Chile	Rebeca Flores
14	Chile	Ligia Allel
15	Chile	Elena Carrasco
16	Colombia	Pablo Aschner
17	Costa Rica	Ana Gladys Arauz Hernandez
18	Costa Rica	Christine Karkashian
19	Cuba	Rosario García
20	Cuba	Rolando Suarez
21	Dominican Republic	Ivelisse Ramos
22	PAHO/Dominican Republic	Celia Riera
23	Ecuador	Edgar Vanegas Astudillo
24	Guatemala	Arely López de González
25	Honduras	Ruben Palma
26	Jamaica	Lurline Less
27	Jamaica	Errol Morrison
28	PAHO/CFNI/Jamaica	Godfrey Xuereb
29	Jamaica	Owen Bernard
30	Mexico	Concepción Torres Rodríguez
31	Mexico	Mónica Olivares
32	Paraguay	Felicia Cañete
33	Perú	Olga Nuñez
34	Perú	Martha Mora de García Belaunde
35	Puerto Rico	Betsy Rodríguez Zayas
36	Trinidad and Tobago	Zobida Ragbirshingh

37	Uruguay	Carmen Pisciottano
38	UK	Tony Elphick
39	PAHO/Washington DC, USA	Alberto Barceló
40	USA	Lucie Milanes
41	USA	Andrew Winters
42	USA	Martha Londono
43	USA	Aida Giachello
44	USA	Kathy Wishner
45	USA	Yianna Vovides

Workshop II: Building Blocks in Diabetes Education and Control

University of Miami, Miami, Florida, USA
12–13 May 2003

Participants

	Country	Name
1	Argentina	Juan José Gagliardino
2	Belize	Beth McBride
3	Bermuda	Debbi Jones
4	Bolivia	Elizabeth Duarte
5	Bolivia	Sandra Verduguez
6	Brazil	María Inés Schmidt
7	Brazil	Ethel Spichler
8	Canada	Anne Belton
9	Chile	Elena Carrasco
10	Guatemala	Patricia Orellana
11	Jamaica	Owen Bernard
12	Mexico	Agustín Lara
13	Nicaragua	Lucy Villagra
14	Trinidad and Tobajo	Zobida Ragbirshingh
15	USA	Linda Siminerio
16	USA	Charles M Clark
17	USA	Fernando Collado
18	USA	Andrew Boulton
19	USA	Bresta Miranda-Palma
20	Venezuela	Alexander Ester
21	Venezuela	Hermes Florez
22	PAHO-Jamaica	Gerardo de Cosio
23	PAHO-CFNI	Godfrey Xuereb
24	PAHO-WDC	Micheline Meiners
25	PAHO-WDC	Alberto Barceló

Acronyms and terminology

The following list includes institutional and medical acronyms and terms used in this publication. In most cases, acronyms are defined when first used in the text.

A1c:	Glycosylated hemoglobin
ADA:	American Diabetes Association
ALAD:	Latin American Diabetes Association
BMI:	Body Mass Index
CHO:	Carbohydrates
CQI:	Continuous quality improvement
CVD:	Cardiovascular disease
DHA:	Docosahexaenoic acid
DOTA:	Declaration of the Americas on Diabetes
EPA:	Eicosapentaenoic acid
IFG:	Impaired fasting glucose
IGT:	Impaired glucose tolerance
OAD:	Oral antidiabetics or oral hypoglycemic agents
PAHO:	Pan American Health Organization
BBDEC:	Building Blocks in Diabetes Education and
RDA:	Recommended Dietary Allowance
UKPDS:	United Kingdom Prospective Diabetes Study
WHO:	World Health Organization

References

1. **Wild S, Roglic G, Green A, Sicree R, King H.** Global Prevalence of Diabetes. Estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27(5):1047-1053.
2. **Barceló A, Aedo C, Swapnil R, Robles S.** The cost of diabetes in Latin America and the Caribbean. Bulletin World Health Organization 2003;81(1):19-27.
3. **Guilliford MC, Alert CV, Mahabir D et al.** Diabetes Care in Middle-income Countries: A Caribbean Case Study. Diab Medicine 1996; 13: 574-81.
4. **Wilks RJ, Sargeant LA, Gulliford MC, Reid ME, Forrester TE.** Management of diabetes mellitus in three settings in Jamaica. Revista Panamericana de Salud Publica 2001;9(2):65-72.
5. **Gagliardino JJ, de la Hera M et al.** Evaluation of the Quality of Care for Diabetic Patients in Latin America [Evaluación de la calidad de la asistencia al paciente diabético en América Latina]. Pan Am J Pub Health 2001; 10 (5): 309-317.
6. **Escobar MC, Degado I.** Diabetes y Calidad de la Atención en el Sistema Nacional de Servicios de Salud. República de Chile. Ministerio de Salud, 1999.
7. **Barceló A, et al**. Final Report: Institutional Response to Diabetes and Its Complications (IRDC)— An Evaluation of the Quality of Diabetes Care. Pan American Health Organization, (DPC/NC/DIA/66/1.3/273-04), Washington DC 2004 http://www.paho.org/English/AD/DPC/NC/dia-irdc-final-rpt.pdf
8. **Diabetes Control and Complication Trial Research Group.** The Effect of Intensive Treatment of Diabetes on the Development and Progression of Long-term Complications in Insulin-Dependent Diabetes Mellitus. New Engl J Med 1993; 329 (14): 77-86.
9. **United Kingdom Prospective Diabetes Study (UKPDS) Group.** Intensive Blood-glucose Control with Sulphonylureas or Insulin Compared with Conventional Treatment and Risk of Complications in Patients with Type 2 Diabetes (UKPDS 33). Lancet 1998; 352: 837-53.
10. **Organización Panamericana de la Salud**. Métodos poblacionales e individuales para la prevención y el tratamiento de la diabetes y la obesidad (CD48/5, 2008) http://www.paho.org/spanish/gov/cd/CD48-05-s.pdf
11. **Norris SL, Lau J, Smith SJ, Schmid CH, Engelgau MM.** Self-management education for adults with type 2 diabetes: a meta-analysis of the effect on glycemic control. Diabetes Care 2002;25(7):1159-71.
12. **International Diabetes Federation Clinical Guideline Taskforce.** Global Guideline for Type 2 Diabetes. ISBN 2-930229. Brussels, 2005.
13. **American Diabetes Association.** Screening for Type 2 Diabetes. Diabetes Care 2004;27:S11-S14.
14. **American Diabetes Association.** Standards of Medical Care for Patients with Diabetes Mellitus. Diabetes Care 2009;32(Supp 1):S13-S61.
15. **Pan X, Li G, Hu Y et al.** Effects of diet and exercise in preventing NIDM in people with impaired glucose tolerance. The Da Qing IGT and diabetes study. Diabetes Care 1997;20(4):537-544.
16. **Tuomilehto J, Lindstrom J, Erikson J, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukaanniemi S, Laakso M, Louheranta A, Rastas M, Salminen V,**

Uusitupa M. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001;344(18):1343-1350.

17. **Diabetes Prevention Program Research Group.** Reduction of the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002;348(6):393-403.
18. **Hoeger TJ, Harris R, Hicks KA, Dinahue K, Sonrensen S, Engelgau M.** Screening for type 2 diabetes mellitus: a cost-effectiveness analysis. Ann Intern Med 2004;140(9):689-699.
19. **Nashan DN, Herman WH.** Screening for diabetes: Can we afford not to screen? (Editorial). Ann Intern Med 2004;140(9)756-759.
20. **American Diabetes Association.** Report of the Standards of Medical Care in Diabetes - 2008. Diabetes Care 2008;31(Supp 1):S12-S54.
21. **American Diabetes Association.** Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 2003;25(Supp 1):S5-S20.
22. **Asociación Latinoamericana de Diabetes/Organización Panamericana de la Salud.** Guías ALAD de Diagnóstico, Tratamiento y Control de la Diabetes. ISBN 978-92-75-32918-4. Washington DC, 2008. (http://www.paho.org/Spanish/AD/DPC/NC/dia-guia-alad.pdf).
23. **Boule NG, Haddad E, Kenny GP, Wells GA, Sigal RJ.** Effects of exercise on glycemic control and body mass in type 2 diabetes mellitus: a meta-analysis of controlled clinical trials. JAMA 2001;286:1218-27.
24. **Anderson BJ, Wolf FM, Brackett J, Hoj Laffel LM.** An office-based intervention to maintain parent-adolescent teamwork in diabetes management: Impact on parent involvement, family conflict, and subsequent glycemic control. Diabetes Care 1999;22(5):713-721.
25. **Secretaria de Salud. Subsecretaria de Prevención y Control de la Salud.** Programa de Acción: Diabetes Mellitus. ISBN 970-721-001-X. Mexico City, 2001 (www.ssa.gob.mx).
26. **Ministerio de Salud Pública.** Guía Metodológica de Organización y funcionamiento de los clubes de pacientes con enfermedades crónicas no transmisibles. Managua, Nicaragua 2002.
27. **Pieber TR, Holler A, Siebenhofer A, Brunner GA, Semlitsch B, Schattenberg S, Zapotoczky H, Rainer W, Krejs GJ:** Evaluation of a structured teaching and treatment program for type 2 diabetes in general practice in a rural area of Austria. Diabetic Medicine 1995; 12:349-354.
28. **Gagliardino JJ; Etchegoyen G.** A model educational program for people with type 2 diabetes: a cooperative Latin American implementation study (PEDNID-LA). 2001; Diabetes Care 24(6):1001-7.
29. **Gruesser M, Bott U, Ellermann P, Kronsbein P, Joergens V.** Evaluation of a structured treatment and teaching program for non-insulin-treated type II diabetic outpatients in Germany after the nationwide introduction of reimbursement policy for physicians. Diabetes Care 1993 Sep; 16(9):1268-75.
30. **Caribbean Health Research Council.** Pan American Health Organization. Managing Diabetes in Primary Care in the Caribbean. 2006.
31. **Organización Mundial de la Salud.** Directrices para el Desarrollo de un Programa Nacional para la Diabetes Mellitus. Geneva 1991.

32. **World Health Organization.** The Prevention of Diabetes Mellitus and Its Complications. Geneva, 2009 (in press).
33. **Tuomiletho J et al.** Primary Prevention of Diabetes Mellitus. In Alberti KGMM et al., eds. International Textbook of Diabetes Mellitus. London, John Wiley, 1992:1655-1673.
34. **Wagner EH, Glasgow RE, Davis C, Bonomi AE, Provost L, McCulloch D, Carver P, Sixta C.** Quality Improvement in Chronic Illness Care. A Collaborative Approach. J Quality Improvement 2001;27(2):63-80.
35. **Funnell MM, Brown TL, Childs BP, Haas LB, Hosey GM, Jensen B, Maryniuk M, Peyrot M, Piette JD, Reader D, Siminerio LM, Weinger K, Weiss MA.** National standards for diabetes self-management education. Diabetes Care. 2009;32 (1):S87-94.
36. **Comité de Educación, DOTA**. Normas para el desarrollo de programas de educación sobre la diabetes en América. Rev Panam Salud Pública/Pan Am J Public Health 2001;10(5):349-53.
37. **Litzelman DK, Slemenda CW, Langefeld CD, Hays LM, Wlech MA, Bild DE, Ford ES, Vinicor F:** Reduction of lower extremity clinical abnormalities in patients with non-insulin-dependent diabetes mellitus. Ann Intern Med 1993;119; 36-41.
38. **M Franz, J Bantle et al.** Evidence-Based Nutrition Principles and Recommendations for the Treatment and Prevention of Diabetes and Related Complications. ADA. Annual Review of Diabetes. Diabetes Care 2002; Jan: 120-70.
39. **American Diabetes Association.** Nutrition Recommendations and Principles for People with Diabetes Mellitus. Position Statement. Diabetes Care 2001; 24(spp1): 544-547.
40. **Caribbean Food and Nutrition Institute.** PAHO/WHO Office of Caribbean Program Co-ordination. Protocol for the Nutritional management of Obesity, Diabetes and Hypertension in the Caribbean. PAHO/CAR/3.1/01.01 Barbados, 2004 (http://www.paho.org/English/CFNI/cfni-ProtocolNMODH1.htm).
41. **Heilbronn LK, Noakes M, Clifton P.** Effect of energy restriction, weight loss and diet composition on plasma lipids and glucose in patients with type 2 diabetes. Diabetes Care 1999;22:889-895.
42. **Ruggiero L, Glasgow RE, Dryfoos JM et al.** Diabetes Self-Management. Self-reported recommendations and patterns in a large population. Diabetes Care 1997;20(4):568-576.
43. **Nyberg G, Norden G, Attman P-O, et al.** Diabetic nephropathy: is dietary protein harmful? Diabetic Compl 1987;1:37-40.
44. **Ekberg G. Sjofors G, Grefberg N et al.** Protein intake and glomerular hyperfiltration in insulin-treated diabetics without manifest nephropathy. Scan J Urol Nephrol 1993;27:441-446.
45. **Nutrition Recommendations and Principles for People with Diabetes Mellitus.** Position Statement. Diabetes Care 2001; 24 (Supp 1): S44-S47.
46. **Levey AS, Adler S, Caggula AW et al.** Effects of dietary protein restriction on the progression of advanced renal disease in the Modification of Diet in Renal Disease study. Am J Kidney Dis 1996;27:652-663.
47. **Lichtenstein AH, Ausman LM, Jalbert SM, Schaefer EJ.** Effects of Different Forms of Dietary Hydrogenated Fats on Serum Lipoprotein Cholesterol Levels. N England J Med 1999;340:1933-1940.

48. **American Diabetes Association.** Nutrition Principles and Recommendations in Diabetes. Diabetes Care 2004;27:S36-S46.
49. **U.S. Department of Health and Human Services:** Physical Activity and Health: A Report of the Surgeon General. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Washington, DC, U.S. Govt. Printing Office, 1996.
50. **American Diabetes Association.** Physical Activity/Exercise and Diabetes. Diabetes Care 2004;27:S58-S62.
51. **Torlone E, Fanelli C, Rambotti AM, Kassi G, Modarelli F, Di Vincenzo A, Epifano L, Ciofetta M, Pampanelli S, Brunetti P.** Pharmacokinetics, pharmacodynamics and glucose counterregulation following subcutaneous injection of the monomeric insulin analogue [Lys(B28),Pro(B29)] in IDDM. Diabetologia 1994 Jul;37(7):713-20.
52. **Warshaw HS, Kulkarni K.** Complete guide to carb counting. American Diabetes Association. 2nd edition. ISBN 1-58040 -203 — 8, Alexandria, Virginia, 2004.
53. **Roson MI.** Conteo de Carbohidratos. Atención nutricional en el paciente con Diabetes tipo 1. ISBN 978-987-570-060-4. Buenos Aires, Argentina, 2007.
54. **Rabasa-Lhoret R, Garon J, Langelier H, Poisson D, Chiasson JL.** Effects of meal carbohydrate content on insulin requirements in type 1 diabetic patients treated intensively with the basal-bolus (ultralente-regular) insulin regimen. Diabetes Care 1999;22:667-673.
55. **American Diabetes Association.** Nutrition Recommendations and Interventions for Diabetes. Diabetes Care 2008; 31:S61.
56. **World Health Organization.** Prevention of Cardiovascular Diseases. Guidelines for Assessment and Management of Cardiovascular Risk. ISBN 978 92 4 15471 8. Geneva, 2007.

Box index

Box 1 Building Blocks in Misiones, Paraguay 14
Box 2 Risk factors for type 2 diabetes 16
Box 3 Diabetes care by scenarios and levels 22
Box 4 Characteristics of the scenarios: SCENARIO 3 23
Box 5 Characteristics of the scenarios: SCENARIO 2 24
Box 6 Characteristics of the scenarios: SCENARIO 1 25
Box 7 The Chronic Care Model 27
Box 8 Aspects of Building Blocks according to area for Diabetes Education and Control 28
Box 9 Components of a comprehensive diabetes evaluation 29
Box 10 Behavioral goals and expected behavioral outcomes for diabetes self-management training 36
Box 11 Exercises for people with diabetes and loss of protective sensitivity 42
Box 12 Remember which foods contain CHO 44
Box 13 Sample calculation of insulin-to-carbohydrate (I:C) ratio for an individual 46
Box 14 Recommended actions for tertiary level of care in scenarios 1, 2, and 3 47
Box 15 Recommended actions for secondary level of care in scenarios 1, 2, and 3 48
Box 16 Recommended actions for community level of care in scenarios 1, 2, and 3 49
Box 17 Recommended actions for primary level of care in scenarios 1, 2, and 3 50
Box 18 Recommended actions for home-based care in scenarios 1, 2, and 3 51
Box 19 Scenario 1: Diagnosis and classification of diabetes mellitus in adults 53
Box 20 Scenario 2: Diagnosis and classification of diabetes mellitus in adults 54
Box 21 Scenario 3: Diagnosis and classification of diabetes mellitus in adults 55

Box 22 Scenario 1: Management of diabetes mellitus 56
Box 23 Scenarios 2 and 3: Management of diabetes mellitus 57
Box 24 Scenario 1: Non-pharmacological diabetes treatment 58
Box 25 Scenario 2: Non-pharmacological diabetes treatment 59
Box 26 Scenario 3: Non-pharmacological diabetes treatment 60
Box 27 Use of oral antidiabetic (OAD) medication 61
Box 28 Characteristics of different types of insulin administered subcutaneously 62
Box 29 Insulin therapy regimens most commonly used for persons with type 2 diabetes mellitus 62
Box 30 Examples of evidence-based therapeutic objectives for people with type 2 diabetes 63
Box 31 Body Mass Index (BMI) Chart 64
Box 32 Standards for diabetes care 69

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