



## SPECIAL ARTICLE

## Services portfolio of a department of Endocrinology and Clinical Nutrition

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Received 6 December 2010; accepted 4 January 2011

### KEYWORDS

Services portfolio;  
Endocrinology;  
Clinical Nutrition;  
Health care  
management

**Abstract** Endocrinology and Clinical Nutrition are branches of medicine that deal with the study of the physiology of body glands and hormones and their disorders, the intermediate metabolism of nutrients, enteral and parenteral nutrition, the promotion of health through the prevention of diet-related diseases, and the appropriate use of the diagnostic, therapeutic, and preventive tools related to these disciplines. The development of Endocrinology and Clinical Nutrition support services requires accurate definition and management of a number of complex resources, both human and material, as well as adequate planning of the care provided. It is therefore essential to know the services portfolio of an ideal Department of Endocrinology and Clinical Nutrition because this is a useful, valid and necessary tool for optimizing available resources, increasing efficiency, and improving the quality of care.

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### PALABRAS CLAVE

Cartera de Servicio;  
Endocrinología;  
Nutrición;  
Gestión sanitaria

### Cartera de Servicios de Endocrinología y Nutrición

**Resumen** La Endocrinología y Nutrición es la rama de la Medicina que se ocupa del estudio de la fisiología y patología del sistema endocrino, del metabolismo de las sustancias nutritivas, de la nutrición natural y artificial, de la promoción de la salud mediante la prevención de las enfermedades relacionadas con la dieta y de las correspondientes técnicas diagnósticas, terapéuticas y preventivas utilizadas en estas áreas del conocimiento médico. El desarrollo de estas actividades requiere la definición y la gestión de una serie de recursos complejos, tanto humanos como materiales, así como una correcta planificación del trabajo asistencial. Por lo tanto, resulta imprescindible conocer la Cartera de Servicios de un Servicio/Sección o Departamento de Endocrinología y Nutrición, ya que es una herramienta necesaria, válida y útil para optimizar los recursos disponibles, aumentar la eficacia y la rentabilidad de la actuación médica y mejorar la calidad de la asistencia.

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Endocrinology and nutrition is a specialty of medicine covering the following fields of action:

1. *The physiology and pathology of the endocrine system*: the study of synthesis, secretion, and the metabolism processes of hormones, messengers, and local factors, and also of their mechanisms of action, effects, and interactions with other hormones. It also deals with the diagnosis and treatment of changes in any of the above processes.
2. *The physiology and pathology of metabolism*: the study of the metabolism of the different immediate principles, vitamins, and trace elements, as well as the diagnosis and treatment of metabolic changes. Within this area, special mention should be made of the diagnosis and monitoring of patients with diabetes mellitus, obesity, dyslipidemia, and changes in bone metabolism.
3. *Clinical nutrition*: the study and application of the theoretical bases of feeding and nutrition in healthy and ill subjects, and also of the fundamentals, the development, and the application of clinical nutrition (oral, enteral, and parenteral).
4. *Laboratory methods*: understanding and using the different methods and techniques required for the diagnosis and treatment of the diseases with which this medical specialty deals (RIA, IRMA, ELISA, molecular and cell biology, genetic studies, immunohistochemistry, tissue culture).
5. *The study of the epidemiological, preventive, and rehabilitation aspects* related to the conditions dealt with by endocrinology and nutrition.

This specialty has two aspects: organ and system-specific (endocrinology) and agent-specific (nutrition).

### Definition of services portfolio

A services portfolio should be defined because this is the main tool for organizing a hospital unit or department, not only for work definition and distribution, but also for delimiting the roles of specialists in endocrinology and nutrition from those of physicians in other hospital departments, not to mention their interactions with the latter and with primary care teams.

To sum up, a portfolio of services is required to know the resources that will be required to carry out these activities, to know how they should be used, and to know how these goals are to be achieved.

In 1997, an expert panel of the Spanish Society of Endocrinology and Nutrition (SEEN) negotiated a services portfolio of endocrinology and nutrition with the Spanish national health system. The Care Committee of the SEEN (CASEEN) is currently updating its services portfolio taking into account the progress made both in its own specialty and in medicine in general since that date.

### Functions of the departments/sections of endocrinology and nutrition

Endocrinology and clinical nutrition departments provide specialized care in the different healthcare areas of the public health system.

Specialized care is provided by central, medical, and surgical departments, which represent the mainstay of hospital organization within the public health system.

Each department of endocrinology and nutrition is responsible for the care of the population within its healthcare area regarding its specific field of competence, since it centralizes information, resources, and decision-making. The department is ultimately responsible for the health of the population in its healthcare area in the endocrine and nutritional fields.

Departments of endocrinology and nutrition must carry out different functions for which a number of human and material resources are required in order to achieve a level of excellence:

#### A. Care function

##### A1. In the hospital area:

A hospital department of endocrinology and nutrition may provide final and central services, depending on the types of patients seen by endocrinologists.

A1.1. Care of patients admitted to the endocrinology department for endocrine and/or metabolic diseases, particularly patients with diabetes mellitus.

A1.2. Care by the nutrition unit of hospitalized patients with nutritional conditions.

A1.3. Resolution of referral reports of hospitalized patients with endocrine, metabolic, and nutritional diseases.

A1.4. Care of patients attending the endocrinology and nutrition outpatient clinic for:

- Endocrine or metabolic function tests.
- Monitoring of feeding behavior disorders.
- Assessment of continuous blood pressure or glucose monitoring.
- Initial treatment of type 1 diabetes with no ketoacidosis.
- Treatment of diabetic decompensation.
- Monitoring of gestational diabetes.
- Monitoring of patients on intensive treatment with insulin or insulin infusers.
- Assessment and dressing of diabetic foot.
- Treatment of specific nutritional deficiencies (administration of intravenous iron, vitamins, trace elements, etc.)
- Administration of outpatient artificial nutrition requiring hospital infrastructure.
- Dysphagia screening test.
- Health education of groups and individuals.
- Transfer of pediatric patients with endocrine or nutritional diseases.
- Treatment of thyroid ophthalmopathy.

A1.5. Hormone function tests (stimulation and suppression dynamic tests). Test procedures, control, and supervision.

A1.6. Body composition tests and metabolic studies.

A1.7. Health education (individual or in groups) for patients with metabolic and nutritional disorders, mainly diabetes mellitus and obesity.

A1.8. Centralized control of the food distribution system of the hospital. Preparation of the

coded diet manual, planning of optional and therapeutic coded basal diets, including special diets. Control and supervision of compliance with the diet code.

- A1.9. Collaboration in the management of the hospital catering area through technical specifications for food purchase, receipt, storage, preparation, and distribution.
- A1.10. Nutritional screening and assessment of nutritional status of inpatients, whether amenable or not to undergoing nutritional intervention (oral, enteral, parenteral).
- A1.11. Prescription, control, and follow-up of patients on nutritional support (oral, enteral, parenteral) at the hospital.
- A1.12. Management of accesses for administration of artificial nutrition (venous lines or gastrointestinal tubes).
- A2. In the outpatient area:
- A2.1. **Outpatient clinic of endocrinology and metabolism:** responding to requests for consultations related to endocrine and metabolic conditions (especially diabetes mellitus, hypertension of an endocrine origin, dyslipidemia, and bone metabolism).  
The following will be done at the outpatient clinic of endocrinology and metabolism: a) clinical history and physical examination; b) requests for and/or performance of diagnostic examinations and procedures; c) the indication, performance, and monitoring of treatments or therapeutic procedures needed by patients; d) information on the diagnostic procedures performed and treatments prescribed in order to promote adequate patient compliance, continuity and safety care; and e) follow-up or discharge reports.
- A2.2. **Outpatient clinic of nutrition:** responding to requests for consultations related to nutrition and obesity from all other hospital departments and primary care services.  
The following will be done at the outpatient clinic of nutrition: a) the preoperative and postoperative follow-up of patients undergoing bariatric surgery for severe obesity; b) the care and follow-up of patients with nutritional disorders of any origin; c) nutritional education, preoperative assessment and/or nutritional support, and d) the prescription, control, and follow-up of patients on home nutritional support (enteral or parenteral).
- A2.3. **Health education clinic:** this is intended for all patients seen and monitored at the outpatient clinic, with special attention being given to metabolic and nutritional disorders.
- B. Teaching function
- B1. Pregraduate and postgraduate training in the medical areas of endocrinology and human nutrition and dietetics.
- B2. Training for resident physicians in the specialty of endocrinology and nutrition and other specialities.
- B3. Continued training of the healthcare staff in their health areas.

### C. Management functions

The management of departments, sections, or units of endocrinology and nutrition must be adapted to the structure of each center, so promoting the development of management units as models of excellence.

Functional models must follow the guidelines for final service in the field of endocrinology and for central and final services in the field of nutrition depending on the expertise of the hospital.

The management of all activities must be based on the Total Quality Management model, which optimizes efficiency in production. For this, the members of all departments, sections, or units of endocrinology and nutrition must commit themselves together with central management to:

- C1. Defining care, teaching, research, and quality objectives (production, complexity of care, resource utilization, expenses per process, pharmaceutical expenses, and so on).
- C2. Defining indicators in each of the activity areas and their corresponding standards.
- C3. Monitoring compliance with indicators.
- C4. Defining operational rules for the unit applicable to all of its members, who will be multidisciplinary teams in the case of clinical nutrition (pharmacists, dietitians, nurses) and diabetes mellitus (training nurses, podiatrists, and so on).
- C5. Organizing multidisciplinary units for:
- Feeding behavior disorders.
  - Morbid obesity-bariatric surgery.
  - Diabetes and pregnancy.
  - Infertility.
  - Bone metabolism disorders.
  - Gender identity disorders.
  - Diabetic foot.
  - Thyroid cancer.
  - High resolution ultrasound unit for thyroid nodules.
  - Dyslipidemia and cardiovascular risk.
  - Nutritional assessment and treatment of chronic diseases (cystic fibrosis, amyotrophic lateral sclerosis, etc.).
  - Adult metabolic diseases.
  - Nutritional advice on oncological committees.
- C6. Planning of care and teaching activities.
- C7. Coordination with primary care of the following activities:
- Agreement on patient referral criteria.
  - Preparation of updated reports to allow for the monitoring of therapeutic actions.
  - Preparation of common diagnostic and treatment protocols for highly prevalent diseases such as obesity, hyperlipidemia, thyroid dysfunction, diabetes mellitus, and osteoporosis.
  - Clinical sessions at healthcare centers. Creating the position of "consulting specialist".
  - Training courses aimed at primary care professionals.
  - Participation in committees with representatives of physicians, nurses, and managers to discuss problems in the field of health and to establish coordinated action lines.
  - Development of remote care programs.

- C8. Coordination with other specialties.
- C9. Control of expenses and cost-effectiveness.
- C10. Quality control. Setting up indicators, searching for areas for improvement, and assessing compliance with them.

#### D. Research function

- D1. Clinical research associated to care.
- D2. Performance of epidemiological studies related to endocrine and nutritional aspects.
- D3. Translational research.
- D4. Participation in public health campaigns mainly related to endocrine and nutritional diseases.

Once the functions of departments of endocrinology and nutrition are established, a services portfolio should be prepared to define both what is being offered and the human and material resources that will be needed to provide effective, efficient, and quality services.

## Human resources

### Physicians

The 1997 SEEN study and subsequent surveys performed in 1999, 2003, and 2006 on behalf of CASEEN estimated that the following physicians are required to cover the basic functions (care, teaching, research, and managerial) in both inpatient and outpatient settings: 1) at least one specialist in endocrinology and nutrition per 50,000 inhabitants for outpatient clinic care; 2) a specialist in endocrinology and nutrition per 300 beds for hospital care; 3) a specialist in nutrition per 100,000 inhabitants for outpatient clinic care; and 4) a specialist in nutrition "per 300 beds" for hospital care. In addition, it is recommended that an endocrinologist be available not further than 100 km away from any inhabitant.

At nutrition units, in addition to support from nursing staff, collaboration is required from food scientists, graduates in nutrition and dietetics, and specialist technicians (grade 2 vocational training) in clinical nutrition and dietetics because of their training profile.

### Specialized nurses

These are indispensable both for our specialty and for covering the whole spectrum of health education, and in particular for education in diabetes, clinical nutrition, and diet therapy. They also discharge functions at the day hospital.

### Graduates in human nutrition and dietetics

These are necessary for:

- Cooperation in the adaptation of the feeding systems established at each center.
- Developing dietary, preventive, or therapeutic information and education programs.
- Preparing dietary treatments prescribed by endocrinologists.

- Cooperating in the prevention of hospital malnutrition by assessing nutritional status.
- Nutritional assessment and the monitoring of oral nutrition within the multidisciplinary team directed by the specialist in endocrinology and nutrition.

In accordance with medical prescriptions, they will:

- Note the patients' dietary history.
- Prepare customized diets.
- Monitor and assess diets.

### Technicians specialized in nutrition and dietetics

These are necessary to:

- Control the food distribution system in the hospitalization area.
- Code the basal and therapeutic diets of the center.
- Plan and control the centralized food setup seven days a week in morning and evening shifts.
- Define, design, and calculate special diets not included in the diet code of each center.
- Monitor actual diet consumption by hospitalized patients.
- Prepare dietary treatments and education as prescribed by endocrinologists.
- Contact hospital staff and patients to detect errors in diets served and discover the reasons for inadequate diet consumption.
- Supervise and control, in collaboration with the catering service, the receipt, storage, and handling of raw materials.

### Food scientist/technologist

The food scientist or graduate in food science and technology is responsible for monitoring food safety through adequate application and evaluation of the system for analyzing risks and critical control points. If food-transmitted disease occurs, they will collaborate with the preventive medicine department in the investigation and control of the outbreak.

Hospitals must have at least one food scientist.

### Other professionals include podiatrists and psychologists

Some other professionals may be required for adequate care at units of endocrinology and nutrition, although their assignment to such units is not indispensable. However, their part-time collaboration or contribution within multidisciplinary units will be highly valuable.

### Administrative staff

The administrative staff is especially helpful for the transcription of clinical reports and the management of appointments either at the endocrinology and nutrition unit or at other medical or surgical departments in the same or other healthcare areas.

### Auxiliary nursing staff

Auxiliary nurses are necessary for such tasks as measuring weight and height, blood pressure and waist circumference, and caring for, maintaining, and requesting the materials required for the adequate operation of outpatient clinics.

The human resources required for the provision of effective, efficient, and quality care at an endocrinology and nutrition unit (section or department) are summarized in Tables 1 to 4 below.

### Hospital material resources

Hospital activity in the field of endocrinology and nutrition covers:

- Hospitalization
- Laboratory (function tests)
- Emergencies
- Day hospital
- Referrals
- Outpatient clinics

Essential requirements for covering these activities include:

- *Hospital beds.* Approximately 1% of all hospital beds are required. However, data from the last CASEEN survey reflect the importance of outpatient care in this specialty by showing that only 0.58% of all hospital beds are assigned to endocrinology and nutrition. The increased number of day hospitals of endocrinology and nutrition may partly be responsible for the lower percentage of hospital beds as compared to the number estimated to cover all needs.
- *Offices.* At least one office on the inpatient floor. One office per physician to enable work to be carried out effectively.
- *Multi-purpose classrooms.* Three (two for diabetes education and clinical nutrition, and the third for clinical sessions, residents, etc.).
- Physical space for nutrition and dietetics
  - o Clean and dirty physical spaces and storage space reserved for clinical nutrition and dietetics, clearly separated for the preparation of enteral nutrition prescriptions. A sink, work surface, dishwasher (optional depending on whether the center recycles bottles used for the administration of enteral nutrition), metal shelves, refrigerator, work desk, chairs, and office shelves should be distributed in the different spaces available.
  - o An office close to the kitchen facilities assigned to clinical nutrition and dietetics where kitchen dieticians and/or food technicians may carry out the abovementioned dietary control activity.
  - o Laminar flow hood area for use by the pharmacy department for the preparation of parenteral nutrition mixtures.
- *Physical space for performing metabolic and nutritional function tests* (calorimetry, body composition techniques, etc.), separate from or integrated with the day hospital.

- Physical space for performing endocrine function tests, separate from or integrated with the day hospital.
- Physical space for day hospital care. Two to four beds are estimated to be needed to cover the demand for the care of patients who require hospitalization during the day. These beds should be devoted to:
  - o Decompensated diabetes requiring intermediate care between that provided at emergency and hospital admission.
  - o Complex or long lasting function tests.
  - o Feeding behavior disorders (severe anorexia and bulimia requiring daytime care).
  - o Patients on cyclic outpatient artificial nutrition programs who cannot receive nutritional support at home, and could be given such support at the center.
  - o High-resolution clinic for diabetes mellitus.
  - o Ostomy tube change.
  - o Calorimetric tests.
  - o Impedance tests.
  - o Anthropometric tests (psychometry).
- Space for hospital outpatient clinics:
  - o Physical space per each 150,000 inhabitants devoted to endocrinology.
  - o Physical space for the nurse trainer.
  - o Physical space reserved for nutrition by center, with a minimum of 12 m<sup>2</sup> per clinic.
- Visiting times for patients seen at the hospital outpatient clinic: 30 min for new patients and 20 min for repeated visits.
- Table 5 shows the numbers of beds and physical space required for clinical care at a hospital unit of endocrinology and nutrition by level of care.
- Table 6 shows the numbers of beds and physical space required by a day hospital of endocrinology and nutrition by level of care.
- Equipment required for hospital clinics and a day hospital of endocrinology and nutrition is shown in Table 7 and Table 8 respectively.

### Non-hospital activities

These occur at specialist clinics and health centers, and are intended to:

- Care for less complex conditions.
- Manage patient referral to hospital.
- Bring endocrinology and nutrition closer to each patient.
- Collaborate in prevention and education as related to endocrine and metabolic diseases, in particular the most prevalent, such as diabetes, obesity, dyslipidemia, hypertension, osteoporosis, etc. which affect more than 50% of the population.
- Facilitate connection with primary care.

The following are required for the non-hospital activities of an endocrinology and nutrition unit:

- Physical space for non-hospital clinics.
  - o Clinics: 1/50,000 inhabitants or fraction. Minimum space, 12 m<sup>2</sup> per clinic.
  - o Diabetes education clinic.
- Consultation time: 20 min for new patients and 15 min for repeated visits.

**Table 1** Requirements of specialists in endocrinology and nutrition

	Clinic	Hospitalization
Endocrinology and metabolism	2/100,000 inhabitants	1/300 or fraction
Clinical nutrition	1/100,000	1/300 beds or fraction

**Table 2** Requirements of specialized nursing staff

Nursing	Requirements
Clinical nutrition and dietetics	1/200 beds. Morning and evening shifts
Function tests	1
Diabetes educators	1/100,000 inhabitants

**Table 3** Requirements of technicians specialized in nutrition, administrative staff, and auxiliary nursing staff

Staff	Requirements
Dieticians	1/200 beds Morning and evening shifts
Administrative staff	One per department or section (full time)
Clinic auxiliary staff	One per clinic

- Equipment. Table 9 below lists the equipment required for non-hospital clinics of endocrinology and nutrition.

#### I. List of conditions seen in the specialty

##### 1. Hypothalamic-pituitary and pineal conditions

- Morphological changes
  - Tumors
  - Empty sella syndrome
  - Congenital abnormalities
- Functional changes
  - Hyperfunction
  - Hyperprolactinemia
  - Acromegaly
  - Cushing's disease

- Syndrome of inappropriate antidiuretic hormone secretion
- Other
  - Hypofunction
  - Panhypopituitarism
  - Isolated deficiency of any pituitary hormone
  - Diabetes insipidus
- c) Miscellaneous
  - Inflammatory, granulomatous, metastatic, or vascular diseases
- 2. Impaired growth and development
  - Growth hormone (GH) deficiency
  - GH resistance
  - Other

**Table 4** Staff required for a day hospital of endocrinology and nutrition

Staff	Requirements
Physicians	One, morning and evening shift
Nurses	One, full-time or morning and evening shift
Diabetes educators	One, full-time or morning and evening shift
Podiatrist	One, part time
Psychologist	One, part time
Nutrition nursing dietitian	One, full-time or morning and evening shift
Administrative staff	One, morning and evening shift

**Table 5** Space required for endocrinology and nutrition by level of care

Hospitalization	Reference hospital	Area hospital	Regional hospital
Beds	0.5%-1% of all beds	0.5%-1% of all beds	Optional
Offices	Minimum: 1/inpatient floor Maximum: 1/physician	One per inpatient floor	One
Multi-purpose classrooms	One for diabetes and nutritional education One for sessions	One for diabetes education	Shared
Endocrinology clinics	Physical space per 75,000 inhabitants	Physical space per 75,000 inhabitants	Shared
Nutrition clinics	Two by center	One by center	Optional
Function tests	One by center	One by center	Optional

## 3. Thyroid diseases

## a) Morphological changes

- Athyroidism
- Ectopia
- Thyroid cancer
- Goiter
  - Multinodular
  - Uninodular (thyroid nodule)

## b) Functional changes

- Hyperthyroidism
- Hypothyroidism

## c) Inflammatory changes

- Thyroiditis

## d) Iodine deficiency and excess disorders

## e) Miscellaneous

- Thyroid ophthalmopathy
- Euthyroid sick syndrome (a change in any thyroid function test in patients with other conditions)
- Resistance to thyroid hormones

## 4. Adrenal gland diseases

## a) Morphological changes

- Adrenal tumors
- Adrenal hyperplasia and hypoplasia

## b) Functional changes

- Hyperfunction
  - Cushing's syndrome
  - Hyperaldosteronism
  - Pheochromocytoma and paraganglioma
  - Virilizing syndromes. Congenital adrenal hyperplasia

## • Hypofunction

- Addison's disease
- Hypoaldosteronism
- Congenital adrenal hyperplasia
- Other (resistance to steroid hormones)

## 5. Endocrine hypertension

## 6. Gonadal changes

- Sexual differentiation disorders
  - Gonadal dysgenesis and its variants
  - Seminiferous tubule dysgenesis and its variants
  - True hermaphroditism
  - Male and female pseudohermaphroditism
- Pubertal conditions
  - Early puberty
  - Delayed puberty
  - Early thelarche and adrenarche
- Cryptorchidism
- Gynecomasty
- Male and female hypogonadism
- Endocrine menstrual disorders
- Primary and secondary amenorrhea
- Polycystic ovary disease
- Hirsutism. Virilization
- Infertility (as part of a reproduction unit)
- Menopause. Male and female climacteric

## 7. Changes of phosphorus-calcium and magnesium metabolism

## a) Hypercalcemia

- Hyperparathyroidism

**Table 6** Space required for a day hospital of endocrinology and nutrition

Day hospital	Reference hospital	Area hospital
Hospital ward	1	1
Multi-purpose room (meetings, diabetes or nutritional group education, dining room)	1	1
Examination and dressing room	1	1
Healthcare staff office	1	1
Administrative office	1	1

**Table 7** Equipment for hospital clinics of endocrinology and nutrition

Equipment	Reference hospital	Area hospital	Regional hospital
Table, chairs, stretcher, folding screen, washbasin, work surface and closet, hand dryer	Indispensable	Indispensable	Indispensable
Computer terminals connected to Intranet/Internet	Indispensable	Indispensable	Indispensable
Sphygmomanometers (for normal weight, obese, and pediatric patients)	Indispensable	Indispensable	Indispensable
Light box	Indispensable	Indispensable	Indispensable
Telephone with external line	Indispensable	Indispensable	Indispensable
Reflex hammer	Indispensable	Indispensable	Indispensable
5.07 monofilament			
128 Hz tuning fork			
Ophthalmoscope	Indispensable	Necessary	Necessary
Height-measuring device	Indispensable	Indispensable	Indispensable
250 kg scale	Indispensable	Indispensable	Indispensable
Scale with handrails for morbid obese patients (weighing up to 250 kg)	Indispensable	Optional?	Optional
Scale up to 150 kg	Indispensable	Indispensable	Indispensable
Measuring tape	Indispensable	Indispensable	Indispensable
Harpender stadiometer	Indispensable	Recommended	
Height, weight, and growth velocity charts	Indispensable	Indispensable	Indispensable
Orchidometer	Indispensable	Indispensable	Indispensable
Rings for acromegaly. Vernier calliper	Necessary	Optional	Optional
Material for thyroid FNA (suction gun)	Necessary	Necessary	Optional
Ultrasound equipment	Necessary	Necessary	Necessary
Reflectometer or glucosensor plus corresponding blood glucose test strips	Indispensable	Indispensable	Indispensable
Urine test strips for ketonuria	Necessary	Necessary	Necessary
Urine test strips for microalbuminuria	Optional	Optional	Necessary, optional
Test strips for HbA1c	Necessary	?	?
Educational materials	Indispensable	Indispensable	Indispensable
Personal computer	One per physical space	One per physical space	One per physical space
DXA (dual energy X-ray absorptiometry)	Recommended		
Skinfold caliper	Indispensable	Indispensable	Indispensable
Impedanciometer and its software	Indispensable	Indispensable	Optional
Calorimeter and its software	Recommended	Optional	
Coded, basal, and therapeutic diets. Dietary recommendations	Indispensable	Indispensable	Indispensable
Continuous blood pressure and glucose monitoring equipment and its software	Indispensable	Necessary	Optional
Program for diet preparation and assessment of dietary records	Indispensable	Indispensable	Indispensable
Knee-heel measuring device	Indispensable	Indispensable	Indispensable
Hand dynamometer	Indispensable	Indispensable	Indispensable
Weighing chair for patients not able to stand	Indispensable	Indispensable	Indispensable
Platform wheelchair scale	Indispensable	Indispensable	Indispensable

- Paraneoplastic hypercalcemia
- Other
- b) Hypocalcemia
  - Hypoparathyroidism
  - Pseudohypoparathyroidism
  - Vitamin D deficiency and resistance. Rickets and osteomalacia
- c) Hyperphosphatemia and hypophosphatemia
- d) Hypermagnesemia and hypomagnesemia

- e) Osteoporosis
- f) Kidney stones
- 8. Hormone-producing gastrointestinal and pancreatic tumors
  - Gastrinoma
  - Insulinoma
  - Glucagonoma
  - Carcinoid
  - Other tumors (vipoma, somatostatinoma, etc.)

**Table 8** Equipment for a day hospital of endocrinology and nutrition

Day hospital	Reference hospital	rea hospital
Beds/care posts	2 to 4	2 to 4
Computer terminals connected to Intranet/Internet	Indispensable	Indispensable
HbA1c and DCA test strips	Indispensable	Indispensable
Urine test strips for ketonuria	Indispensable	Indispensable
Urine test strips for microalbuminuria	Indispensable	Indispensable
Non-mydrriatic retinal camera	Necessary	Recommended
Educational materials	Indispensable	Indispensable
Basal and therapeutic coded diets. Dietary recommendations	Indispensable	Indispensable
Oscillometer/Doppler	Indispensable	Necessary
Reflex hammers	Indispensable	Indispensable
5.07 monofilament	Indispensable	Indispensable
128 Hz tuning fork	Indispensable	Indispensable
Materials for dressing and intravenous infusion and intravenous continuous infusion pumps for either enteral or parenteral nutrition	Indispensable	Indispensable
Icebox for insulin and other medications	Indispensable	Indispensable
Continuous blood pressure and glucose monitoring equipment and its software	Indispensable	Necessary
Table, chairs, stretcher, folding screen, washbasin, work surface and closet, hand dryer	Indispensable	Indispensable
Sphygmomanometers (for normal weight, obese, and pediatric patients)	Indispensable	Indispensable
Light box	Indispensable	Indispensable
Nasogastric tubes	Indispensable	Indispensable
Nasoenteral tubes	Indispensable	Indispensable
Exchange ostomy tubes	Indispensable	Indispensable
Pulse oximeter for dysphagia screening	Indispensable	Indispensable

**Table 9** Equipment for non-hospital clinics

Equipment	
Table, chairs, stretcher, washbasin, work surface, closet, hand dryer	Indispensable
Light box	Indispensable
Sphygmomanometers (for normal weight, obese, and pediatric patients)	Indispensable
Telephone with external line	Indispensable
Reflex hammers	Indispensable
5.07 monofilament	Indispensable
128 Hz tuning fork	Indispensable
Ophthalmoscope	Necessary
Height-measuring device	Indispensable
Scale up to 200 kg	Indispensable
Impedanciometer	Indispensable
Measuring tape	Indispensable
Orchidometer	Indispensable
Reflectometer or glucosensor plus corresponding blood glucose test strips	Indispensable
Urine test strips for ketonuria	Indispensable
Test strips for microalbuminuria	Indispensable
Therapeutic dietary recommendations. Basal and therapeutic coded diets	Indispensable
Educational materials	Indispensable
Icebox for insulin and other medications	Indispensable
A PC at the endocrinology outpatient clinic	Indispensable
Ultrasound equipment	Necessary

9. Ectopic hormone secretion
10. Multiple endocrine neoplasia
11. Polyglandular autoimmune syndrome
12. Diabetes mellitus
  - Type 1 diabetes mellitus
  - Type 2 diabetes mellitus
  - Gestational diabetes
  - Other (secondary diabetes mellitus, MODY, etc.)
  - Carbohydrate intolerance
  - Coordination of the management of chronic complications of diabetes mellitus
  - Coordination of diabetes education
13. Hypoglycemia
14. Disorders causing malnutrition or risk of malnutrition
  - Chronic or calorie malnutrition related to diseases causing chronic inadequate provision or the utilization of nutrients or an increased energy expenditure.
  - Acute or protein malnutrition related to acute conditions causing increased requirements or losses in patients previously stable and with an adequate nutritional status, such as those with multiple trauma, head trauma, sepsis, severe burns, multi-organ failure, etc.
  - Mixed (calorie-protein) malnutrition: this occurs in patients with chronic diseases causing calorie malnutrition on which an acute increase in requirements and/or losses is superimposed.
  - Deficiency states related to inadequate general or selective intake, or due to increased selective losses (e.g. gastrointestinal fistula or diarrhea causing a zinc deficiency state).
15. Feeding behavior disorders
  - Treatment of acute and chronic complications
  - Coordination with special psychiatry groups
    - Anorexia nervosa
    - Bulimia
    - Other feeding behavior disorders (binge and night eating)
16. Obesity
  - Overweight
  - Obesity
  - Coordination with specialized surgery, psychiatry, pneumology, anesthesia, and rehabilitation teams for the treatment of:
    - Morbid obesity
    - Complicated obesity
17. Dyslipidemia
  - Primary
  - Secondary
18. Congenital errors of metabolism and rare diseases
  - Glycogen storage disease
  - Galactosemia
  - Hemochromatosis
  - Wilson's disease
  - Phenylketonuria
  - Cystic fibrosis
19. Water and electrolyte disorders
  - Hyponatremia and hypernatremia
  - Hypokalemia and hyperkalemia

## A list of basal measurements, function tests, genetic tests, treatments, and anthropometric and body composition techniques used in the clinical practice of endocrinology and nutrition

### 1. Pituitary gland

#### 1.1. Basal measurements

- 1.1.1. FSH
- 1.1.2. LH
- 1.1.3. Adrenocorticotrophic hormone (ACTH)
- 1.1.4. Prolactin
- 1.1.5. Macroprolactin
- 1.1.6. GH
- 1.1.7. Thyroid-stimulating hormone
- 1.1.8. Insulin growth factor I (IGF-I) or somatomedin C
- 1.1.9. Free IGF-I (unbound to protein)
- 1.1.10. Insulin growth factor binding protein 3 (IGFBP-3)
- 1.1.11. IGFBP-1
- 1.1.12. Antidiuretic hormone or arginine-vasopressin
- 1.1.13. Alpha subunit of glycoprotein hormones
- 1.1.14. Beta subunit of FSH
- 1.1.15. Beta subunit of LH
- 1.1.16. Acid-labile subunit
- 1.1.17. GH-binding protein

#### 1.2. Dynamic tests

- 1.2.1. LH-RH stimulation
- 1.2.2. Clomiphene stimulation
- 1.2.3. Estrogen suppression
- 1.2.4. ACTH/cortisol after insulin hypoglycemia
- 1.2.5. ACTH/cortisol after arginine-vasopressin
- 1.2.6. Prolactin after TRH
- 1.2.7. GH after insulin hypoglycemia
- 1.2.8. GH after glucagon
- 1.2.9. GH after GH-RH
- 1.2.10. GH after effort
- 1.2.11. GH response after oral glucose overload
- 1.2.12. TSH stimulation with TRH
- 1.2.13. Dehydration test
- 1.2.14. Desmopressin test
- 1.2.15. Stimulation with LH-RH (gonadotropin-releasing hormone) analogues
- 1.2.16. ACTH after CRH (corticotropin-releasing hormone)
- 1.2.17. ACTH measurement after CRH stimulation in petrosal sinus catheterization
- 1.2.18. Integrated GH secretion (12 or 24 h)
- 1.2.19. GH after GH-RH (GH releasing hormone) plus growth hormone releasing peptide-6 (GHRP-6)
- 1.2.20. GH after GH-RH plus pyridostigmine

#### 1.3. Scans

- 1.3.1. Octreoscan (indium-111 DTPA octreotide scan)
- 1.3.2. Pituitary positron emission tomography (TEP)

#### 1.4. Genetic study

- 1.4.1. GH1 gene
- 1.4.2. GH receptor gene
- 1.4.3. Menin gene
- 1.4.4. PROP-1 and Pit-1 genes

- 1.4.5. GH-RH receptor gene
- 1.4.6. Other (SEEN website)
- 1.4.7. AVP (arginine-vasopressin) gene
- 1.4.8. AVP receptor gene
- 2. Thyroid gland**
  - 2.1. Basic measurements
    - 2.1.1. TSH
    - 2.1.2. Free thyroxine (FT4)
    - 2.1.3. Total thyroxine
    - 2.1.4. Total triiodothyronine
    - 2.1.5. Free triiodothyronine (FT3)
    - 2.1.6. Thyroglobulin (Tg)
    - 2.1.7. Peroxidase antibodies
    - 2.1.8. Thyroglobulin antibodies
    - 2.1.9. TSH receptor antibodies (TRAa)
    - 2.1.10. Selective TRAb
    - 2.1.11. Thyroid hormone binding proteins: Thyroid-binding globulin (TBG), thyroid-binding prealbumin (TBPA)
    - 2.1.12. Urinary iodine
  - 2.2. Dynamic tests
    - 2.2.1. TSH stimulation test with TRH (thyrotropin-releasing hormone)
    - 2.2.2. Human recombinant TSH (hrTSH) test for thyroid carcinoma monitoring
    - 2.2.3. Triiodothyronine (T3) suppression test
    - 2.2.4. Pentagastrin stimulation test for calcitonin
  - 2.3. Fine needle aspiration of thyroid nodules
  - 2.4. Thyroid imaging techniques
    - 2.4.1. Ultrasonography. Ultrasound equipment
  - 2.5. Thyroid scans
    - 2.5.1. Thyroid scintigraphy: I-131, I-123, Tc-99, thallium-201
    - 2.5.2. Perchlorate discharge test
    - 2.5.3. I-131 whole body scan
    - 2.5.4. PET-CT to evaluate metastases from thyroid carcinoma (elevated Tg with negative WBS)
    - 2.5.5. Admission for I-131 ablation therapy
  - 2.6. Genetic study
    - 2.6.1. RET proto-oncogene. Genetics
    - 2.6.2. TSH receptor gene
    - 2.6.3. Genes implicated in congenital hypothyroidism (PAX 8, PDS, TTF1, and TTF2)
    - 2.6.4. T3 and T4 receptor  $\beta$ -subunit gene
  - 2.7. Treatment with high doses of I-131
- 3. Parathyroid glands and phosphorus-calcium metabolism**
  - 3.1. Basic measurements
    - 3.1.1. Total and ionic calcium
    - 3.1.2. Phosphorus
    - 3.1.3. Magnesium
    - 3.1.4. Alkaline phosphatase
    - 3.1.5. 24-h urinary calcium and phosphorus
    - 3.1.6. Hydroxyproline
    - 3.1.7. Parathormone (PTH)
    - 3.1.8. PTH-related peptide (PTHrP)
    - 3.1.9. Calcitonin
    - 3.1.10. Calcidiol (25H-D3)
    - 3.1.11. Calcitriol (25 (OH)<sub>2</sub>-D3)
    - 3.1.12. Osteocalcin
    - 3.1.13. cAMP
    - 3.1.14. Protocollagen
    - 3.1.15. Neuron-specific enolase
    - 3.1.16. Bone alkaline phosphatase
    - 3.1.17. Tartrate-resistant acid phosphatase
    - 3.1.18. Deoxypridinoline and pyridinoline (collagen cross-links)
    - 3.1.19. N-telopeptide of type I collagen, NTx (urinary amino-terminal telopeptide)
    - 3.1.20. C-telopeptide of type I collagen (blood carboxy-terminal telopeptide, CTx or beta-cross-laps)
    - 3.1.21. Osteoprotegerin
  - 3.2. Dynamic tests
    - 3.2.1. Stimulation test with human synthetic parathormone for urinary cAMP
    - 3.2.2. Hydrocortisone suppression test for calcium (Dent test)
  - 3.3. Fine needle aspiration
    - 3.3.1. Cytopathological study
  - 3.4. Genetic study
    - 3.4.1. Vitamin D receptor. Polymorphisms
    - 3.4.2. Calcium-sensing receptor gene (CASR)
    - 3.4.3. CATCH 22 gene (Di George syndrome)
    - 3.4.4. Collagen 1 gene. Polymorphisms
    - 3.4.5. GnS1 gene (pseudohypoparathyroidism)
  - 3.5. Scans
    - 3.5.1. Thallium-technetium subtraction scintigraphy
    - 3.5.2. Tc-sestamibi scintigraphy
    - 3.5.3. Bone scan with bisphosphonates
  - 3.6. Bone densitometry
    - 3.6.1. Dual photon absorptiometry (DPA)
    - 3.6.2. Dual energy X-ray absorptiometry (DEXA)
- 4. Adrenal glands**
  - 4.1. Adrenal cortex basal measurements
    - 4.1.1. Plasma cortisol
    - 4.1.2. Salivary cortisol
    - 4.1.3. 24-h urinary cortisol
    - 4.1.4. Urinary free cortisol by HPLC
    - 4.1.5. ACTH
    - 4.1.6. Dehydroepiandrosterone sulphate (DHEA-S)
    - 4.1.7. Delta-4-androstenedione
    - 4.1.8. 17-OH progesterone
    - 4.1.9. 11-deoxycortisol
    - 4.1.10. Plasma aldosterone
    - 4.1.11. Plasma renin activity (PRA)
    - 4.1.12. 17-OH pregnenolone
    - 4.1.13. Deoxycorticosterone (DOCA)
    - 4.1.14. Transcortin (CBG)
    - 4.1.15. Plasma levels of very long-chain saturated fatty acids (C:26:0)
    - 4.1.16. Adrenal antibodies (21-hydroxylase antibodies)
    - 4.1.17. Androstenediol glucuronide
    - 4.1.18. Dehydroepiandrosterone
    - 4.1.19. Mitotane levels
  - 4.2. Adrenal cortex dynamic function tests
    - 4.2.1. Acute ACTH stimulation test (1  $\mu$ g or 250  $\mu$ g)
    - 4.2.2. Nugent test (suppression with dexamethasone 1 mg)
    - 4.2.3. Prolonged ACTH stimulation test
    - 4.2.4. Metopirone stimulation test
    - 4.2.5. Intense suppression test with variable dexamethasone doses

- 4.2.6. Stimulation test after deambulation for aldosterone and PRA
  - 4.2.7. Suppression test with saline infusion for plasma aldosterone, PRA, and plasma cortisol
  - 4.2.8. Deambulation test combined with furosemide IV for plasma aldosterone and PRA
  - 4.2.9. Captopril suppression test for aldosterone
  - 4.2.10. Dexamethasone suppression test for aldosterone and PRA
  - 4.3. Adrenal medulla basal measurements
    - 4.3.1. Plasma levels of catecholamines (norepinephrine, epinephrine, dopamine)
    - 4.3.2. Urinary levels of catecholamines (norepinephrine, epinephrine, dopamine)
    - 4.3.3. 24-h urinary metanephrines and normetanephrines
    - 4.3.4. Plasma metanephrines
    - 4.3.5. Urinary vanillylmandelic acid
    - 4.3.6. Homovanillic acid
    - 4.3.7. Neuropeptide Y
    - 4.3.8. 5-OH-indoleacetic acid
    - 4.3.9. Neuron-specific enolase
    - 4.3.10. Atrial natriuretic peptide (ANP)
    - 4.3.11. Chromogranin A
    - 4.3.12. Endothelin
  - 4.4. Adrenal medulla dynamic tests
    - 4.4.1. Clonidine suppression test for catecholamines
    - 4.4.2. Glucagon challenge test
  - 4.5. Cytopathological study
    - 4.5.1. CT-guided fine needle aspiration
  - 4.6. Adrenal scans
    - 4.6.1. Selenium-cholesterol scanning
    - 4.6.2. Iodine-123 or 131 metaiodobenzylguanidine (MIBG) scintigraphy
    - 4.6.3. Iodomethyl-norcholesterol NP-59 after dexamethasone suppression
  - 4.7. Genetic study
    - 4.7.1. 21-hydroxylase gene
    - 4.7.2. RET proto-oncogene gene
    - 4.7.3. DAX1 gene (congenital adrenal hypoplasia)
    - 4.7.4. 17-Alpha-hydroxylase gene
    - 4.7.5. 11-Beta-hydroxylase gene
    - 4.7.6. 3-Beta-steroid dehydrogenase gene
    - 4.7.7. CYP11B1-CYP11B2 hybrid gene
    - 4.7.8. SDHB gene (succinate dehydrogenase subunit B)
    - 4.7.9. SDHC gene (succinate dehydrogenase subunit C)
    - 4.7.10. SDHD gene (succinate dehydrogenase subunit D)
    - 4.7.11. StAR gene (lipoid congenital adrenal hyperplasia)
    - 4.7.12. Von Hippel-Lindau gene
- 5. Testis**
- 5.1. Basal measurements
    - 5.1.1. Total and free testosterone
    - 5.1.2. Dihydrotestosterone
    - 5.1.3. Basal FSH and LH
    - 5.1.4. Human chorionic gonadotropin (HCG)
    - 5.1.5. Beta-HCG
    - 5.1.6. Inhibin A
    - 5.1.7. Inhibin B
    - 5.1.8. Sex hormone binding globulin (SHBG)
    - 5.1.9. Androgen receptors
    - 5.1.10. Mullerian inhibiting factor (MIF)
- 5.2. Dynamic tests**
- 5.2.1. Testosterone measurement after HCG stimulation
- 5.3. Measurement of testicular volume. Prader orchidometer**
- 5.4. Spermogram**
- 5.5. Genetic study**
- 5.5.1. Karyotype
  - 5.5.2. Androgen receptor polymorphism
  - 5.5.3. BRCA1 (related to familial breast and ovary cancer)
  - 5.5.4. 17b-HSD type 3 gene (17 beta-steroid dehydrogenase type III deficiency)
  - 5.5.5. 5-Alpha-reductase gene
  - 5.5.6. DAX1 gene (hypogonadotropic hypogonadism)
  - 5.5.7. DAZ gene (azoospermia)
  - 5.5.8. Androgen receptor gene (AR gene)
- 6. Ovaries**
- 6.1. Basal measurements
    - 6.1.1. 17-Beta estradiol (E2)
    - 6.1.2. Progesterone
    - 6.1.3. Androstenedione
    - 6.1.4. Total and free testosterone
    - 6.1.5. Pregnancy tests
    - 6.1.6. Human chorionic gonadotropin (beta-HCG)
    - 6.1.7. Alpha-fetoprotein
    - 6.1.8. SHBG (steroid hormone binding globulin)
    - 6.1.9. Estrone
    - 6.1.10. Androstenediol glucuronide
    - 6.1.11. Placental lactogen 8.1
    - 6.1.12. Ovarian antibodies
  - 6.2. Dynamic tests
    - 6.2.1. Stimulation with GN-RH analogues
    - 6.2.2. Estrogen suppression
    - 6.2.3. Progesterone test
  - 6.3. Genetic study
    - 6.3.1. Karyotype. Genetic laboratory
    - 6.3.2. X chromosome FMR-1 gene (fragile X syndrome)
    - 6.3.3. X chromosome FMR-2 gene (fragile X syndrome, premature ovarian failure)
    - 6.3.4. SHOX-3 gene (Turner syndrome. Leri-Weil syndrome)
    - 6.3.5. SRY-3 gene (Turner syndrome. Pure gonadal dysgenesis)
    - 6.3.6. KAL1 gene (Hallaman syndrome)
    - 6.3.7. WY1 gene (gonadal dysgenesis with kidney disease)
- 7. Secreting gastroenteropancreatic tumors**
- 7.1. Basal measurements
    - 7.1.1. Insulin
    - 7.1.2. Proinsulin
    - 7.1.3. Gastrin
    - 7.1.4. Serotonin
    - 7.1.5. Urinary 5-hydroxy-indoleacetic acid
    - 7.1.6. Pancreatic polypeptide
    - 7.1.7. Vasoactive intestinal peptide
    - 7.1.8. Glucagon

- 7.1.9. Neuron-specific enolase
- 7.1.10. Somatostatin
- 7.1.11. Bombesin
- 7.1.12. Glucagon-like peptide 1
- 7.1.13. Cholecystokinin
- 7.1.14. Ghrelin
- 7.2. Dynamic tests
  - 7.2.1. Prolonged fasting test (insulinoma)
  - 7.2.2. Secretin stimulation test (gastrinoma)
  - 7.2.3. Acid secretion test: BAO (basal acid output)/ MAO (maximal acid output)
  - 7.2.4. Calcium-pentagastrin stimulation test
- 7.3. Scintigraphic techniques
  - 7.3.1. Octreoscan (indium-111 DPTA octreotide)
- 7.4. Genetic study
  - 7.4.1. SDHB gene (succinate dehydrogenase subunit B)
  - 7.4.2. SDHC gene (succinate dehydrogenase subunit C)
  - 7.4.3. SDHD gene (succinate dehydrogenase subunit D)
  - 7.4.4. Menin
  - 7.4.5. RET proto-oncogene
  - 7.4.6. Von Hippel-Lindau gene
- 8. Clinical nutrition and dietetics**
  - 8.1. Nutritional status assessment in inpatients and outpatients
    - 8.1.0. Nutritional screening questionnaires: Mini Nutritional Assessment (MNA), Malnutrition Universal Screening Tool (MUST), Nutritional Risk Screening (NRS) 2002, Global Subjective Assessment (GSS), and others
      - 8.1.1. Dietary history
        - Semi-quantitative questionnaires for nutritional survey
        - 24-h recall questionnaire for nutritional survey
        - Dietary diary
        - Computer software for diet preparation and assessment of dietary records/diaries
      - 8.1.2. Anthropometrics
        - 0-250 kg scale
        - Height-measuring device
        - Harpender skinfold caliper
        - Measuring tapes
        - Body mass index charts for children and adolescents
        - Dynamometer and reference charts for the Spanish population as a whole
      - 8.1.3. Body composition
        - Impedancimeter
        - DXA
      - 8.1.4. Dysphagia screening test
        - 8.1.4.1. Volume and viscosity tests
        - 8.1.4.2. Videofluoroscopy
      - 8.1.5. Special laboratory tests. Biochemistry laboratory
        - 8.1.5.1. Structural proteins. Creatinine-height index
        - 8.1.5.2. Visceral proteins
          - Total protein
          - Albumin
    - 8.1.5.3. Specific nutrients
      - Prealbumin
      - Transferrin
      - Retinoid-binding proteins
      - IGF-1
      - Sodium
      - Potassium
      - Total calcium
      - Ionic calcium
      - Phosphorus
      - Magnesium
      - Zinc
      - Iron
      - Copper
      - Vitamin A
      - Vitamin E
      - Vitamin D
      - Vitamin B12
      - Folic acid
      - Vitamin B1 and B6
  - 8.2. Artificial nutrition at the hospital
    - 8.2.1. Enteral nutrition. Nasogastric and nasojejunal tubes
    - 8.2.2. Ostomies
      - Percutaneous endoscopic gastrostomy
      - Percutaneous endoscopic gastrojejunostomy
      - Percutaneous radiological gastrostomy
      - Surgical gastrostomy
      - Surgical jejunostomy
    - 8.2.3. Parenteral nutrition
      - 8.2.3.1. Peripheral
      - 8.2.3.2. Central
  - 8.3. Artificial nutrition at home
    - 8.3.1. Home enteral nutrition
    - 8.3.2. Home parenteral nutrition
  - 8.4. Control of the diet distribution system in the hospital area
    - 8.4.1. Coding of basal and therapeutic hospital diets
    - 8.4.2. Planning of basal and therapeutic diets
    - 8.4.3. Centralized food setup control in the hospital kitchen
    - 8.4.4. Control of food purchase, receipt, storage, preparation and distribution
    - 8.4.5. Food studies
    - 8.4.6. Microbiological studies
  - 8.5. Calculation of requirements in patients eligible for artificial nutritional support
    - 8.5.1. Calorimetry
  - 8.6. Comprehensive care for patients requiring nutritional support
    - 8.6.1. Calorie-protein malnutrition
    - 8.6.2. Intestinal malabsorption syndrome
    - 8.6.3. Chronic diseases
    - 8.6.4. Congenital errors of metabolism
    - 8.6.5. Wasting diseases (tumors, AIDS)
    - 8.6.6. Infectious diseases (tuberculosis, AIDS)
    - 8.6.7. Critical patients (intensive care, extensive burns, etc.)

- 8.6.8. Mechanical dysphagia (achalasia, esophageal cancer, otolaryngological and maxillofacial conditions...)
- 8.6.9. Neurological dysphagia (stroke, Parkinson, dementia, amyotrophic lateral sclerosis, progressive supranuclear palsy...)
- 8.6.10. Postoperative patients
- 8.6.11. After bariatric surgery
- 8.6.12. Food allergy
- 8.7. Nutritional status assessment before oncological surgery
- 8.8. Treatment unit for feeding behavior disorders (anorexia and bulimia)
- 8.9. Genetic studies
  - 8.9.1. 5HT2A gene (serotonin receptor)
  - 8.9.2. Aldolase B gene (fructose intolerance)
  - 8.9.3. PAH gene (phenylketonuria)
- 9. Diabetes mellitus**
  - 9.1. Diagnostic procedures
    - 9.1.1. Basal blood glucose
    - 9.1.2. O'Sullivan test (oral glucose tolerance test with 50 g)
    - 9.1.3. Oral glucose tolerance test with 100 g
    - 9.1.4. Oral glucose tolerance test with 75 g
    - 9.1.5. Pancreatic reserve glucagon test
    - 9.1.6. Intravenous glucose tolerance test
    - 9.1.7. C-peptide
    - 9.1.8. Insulin and insulin resistance index
    - 9.1.9. Amyline
    - 9.1.10. Proinsulin
    - 9.1.11. Insulin receptors
  - 9.2. Antibodies. Laboratory of biochemistry
    - 9.2.1. Islet cell antibodies ICA-12
    - 9.2.2. Insulin autoantibodies (IAA)
    - 9.2.3. Glutamate decarboxylase antibodies (K-69)
    - 9.2.4. Tyrosine phosphatase IA2 antibodies
  - 9.3. Typing of HLA haplotypes and polymorphisms
  - 9.4. Insulin resistance study. Immunology laboratory
    - 9.4.1. Insulin levels, basal and after oral glucose tolerance test
    - 9.4.2. Insulin receptor study
    - 9.4.3. Bergman minimal model
    - 9.4.4. Euglycemic clamp
  - 9.5. Metabolic control techniques
    - 9.5.1. Glycemic profiles
    - 9.5.2. Glycosylated hemoglobin A1c (HbA1c)
    - 9.5.3. Fructosamine
  - 9.6. Special treatments for diabetes mellitus
    - 9.6.1. Diabetes and pregnancy clinical management (monitoring of pregestational and gestational diabetes. Preconceptional control in diabetic women). (in coordination with gynecology)
    - 9.6.2. Intensive insulin treatment
    - 9.6.3. Treatment with continuous insulin infusion devices
    - 9.6.4. Diabetes education. Specific materials.
    - 9.6.5. Transplant procedures (multidisciplinary transplant team)
      - 9.6.5.1. Pancreatic islet transplant
      - 9.6.5.2. Pancreas transplant
      - 9.6.5.3. Kidney and pancreas transplant
- 9.7. Procedures for diagnosing complications of diabetes mellitus
  - 9.7.1. Eye fundus. Non-mydratic retinal camera
  - 9.7.2. Microalbuminuria. Semi-quantitative test strips
  - 9.7.3. Peripheral neuropathy examination
  - 9.7.4. Autonomic neuropathy examination. Laboratory of electroneurophysiology
    - 9.7.4.1. Cardiovascular autonomic neuropathy
    - 9.7.4.2. Study of sweating
- 9.8. Genetic study
  - 9.8.1. Glucokinase gene (MODY 2)
  - 9.8.2. HNF 1 alpha gene (MODY 3)
  - 9.8.3. HNF 1 beta gene (MODY 5)
  - 9.8.4. HNF 4 alpha gene (MODY 1)
  - 9.8.5. IPF 1 gene (MODY 4)
  - 9.8.6. Kir 6.2 gene (permanent and transient neonatal diabetes)
  - 9.8.7. LMNA gene (partial lipodystrophy)
  - 9.8.8. Beta-2 adrenergic receptor gene (obesity, type 2 diabetes mellitus)
  - 9.8.9. Beta-2 adrenergic receptor gene (obesity, type 2 diabetes mellitus)
  - 9.8.10. PPAR gamma receptor gene (obesity, type 2 diabetes mellitus)
  - 9.8.11. AMPI (adiponectin) gene (obesity, type 2 diabetes mellitus)
  - 9.8.12. Isodisomy 6q (transient neonatal diabetes)
  - 9.8.13. Angiotensinogen gene, endothelial nitric oxide synthetase, plasminogen activator inhibitor, angiotensin receptor, angiotensin converting enzyme, methylenetetrahydrofolate reductase (diabetic vasculopathy)
- 10. Obesity**
  - 10.1. Monographic obesity clinic
    - 10.1.1. Comprehensive morbid obesity care (multidisciplinary team)
    - 10.1.2. Bariatric surgery
  - 10.2. Body composition and energy expenditure
    - Multi-frequency impedanciometer (body composition)
    - Anthropometrics (weight, height, waist and hip circumference, skin folds)
    - Calorimetry
  - 10.3. Intake assessment
    - 10.3.1. Questionnaires
  - 10.4. Special studies
    - 10.4.1. Leptin
    - 10.4.2. Adiponectin
    - 10.4.3. Resistin
    - 10.4.4. Neuropeptide Y
  - 10.5. Genetic studies
    - 10.5.1. See genetic studies in diabetes mellitus
    - 10.5.2. Leptin gene
    - 10.5.3. Leptin receptor gene
- 11. Dyslipidemia**
  - 11.1. Monographic dyslipidemia clinic
  - 11.2. Special studies

- 11.2.1. Apolipoprotein measurement (Apo A 1, Apo B, Apo C II)
- 11.2.2. LDL receptor studies
- 11.2.3. Study of abnormalities in enzymes involved in lipid metabolism (the measurement of plasma lipoprotein lipase activity after heparin)
- 11.3. Genetic studies
  - 11.3.1. Apo A 1 gene
  - 11.3.2. Apo B gene
  - 11.3.3. Apo CII gene
  - 11.3.4. Apo E gene
  - 11.3.5. LCAT (lecithin cholesterol acyltransferase) gene
  - 11.3.6. LH gene (hepatic lipase)
  - 11.3.7. LPL (lipoprotein lipase) gene
  - 11.3.8. LDL receptor gene
- III) Equipment required for the services listed in section II**
  - 1. Room for function tests
  - 2. Biochemistry laboratory
  - 3. Laboratory equipment
  - 4. Auxiliary materials
  - 5. Department of nuclear medicine
    - a. Nuclear medicine laboratory
    - b. Lead-lined room
  - 6. Radiology department. Interventional radiology equipment
  - 7. Pathology department
  - 8. Ultrasound equipment and a gun or syringe for puncture-aspiration
  - 9. Genetic laboratory
  - 10. Immunology laboratory
  - 11. Materials for enteral nutrition
    - a. Nasogastric tubes
    - b. Silicone nasojejunal tubes (6, 8, and 10 French)
    - c. PEG tubes
    - d. PEGY tubes
    - e. Administration lines
    - f. Containers
    - g. Commercial formulas
    - h. Enteral infusion pumps
  - 12. Equipment for parenteral nutrition
    - a. Continuous infusion pumps
    - b. Sterile laminar flow hood
    - c. Specific materials
  - 13. Metabolic control in diabetes mellitus
    - a. Reflectometer
    - b. Glucose test strips
    - c. Standard laboratory equipment
  - 14. Intensive insulin treatment
    - a. Continuous insulin infusion devices (“pumps”)
    - b. Administration lines
    - c. Special syringes for refilling infusion devices
    - d. Special catheters
  - 15. Peripheral neuropathy examination
    - a. 128 Hz tuning fork
    - b. Reflex hammer
    - c. 5.07 monofilament

## Further reading

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