Servicio Andaluz de Salud
CONSEJERÍA DE SALUD

Indra

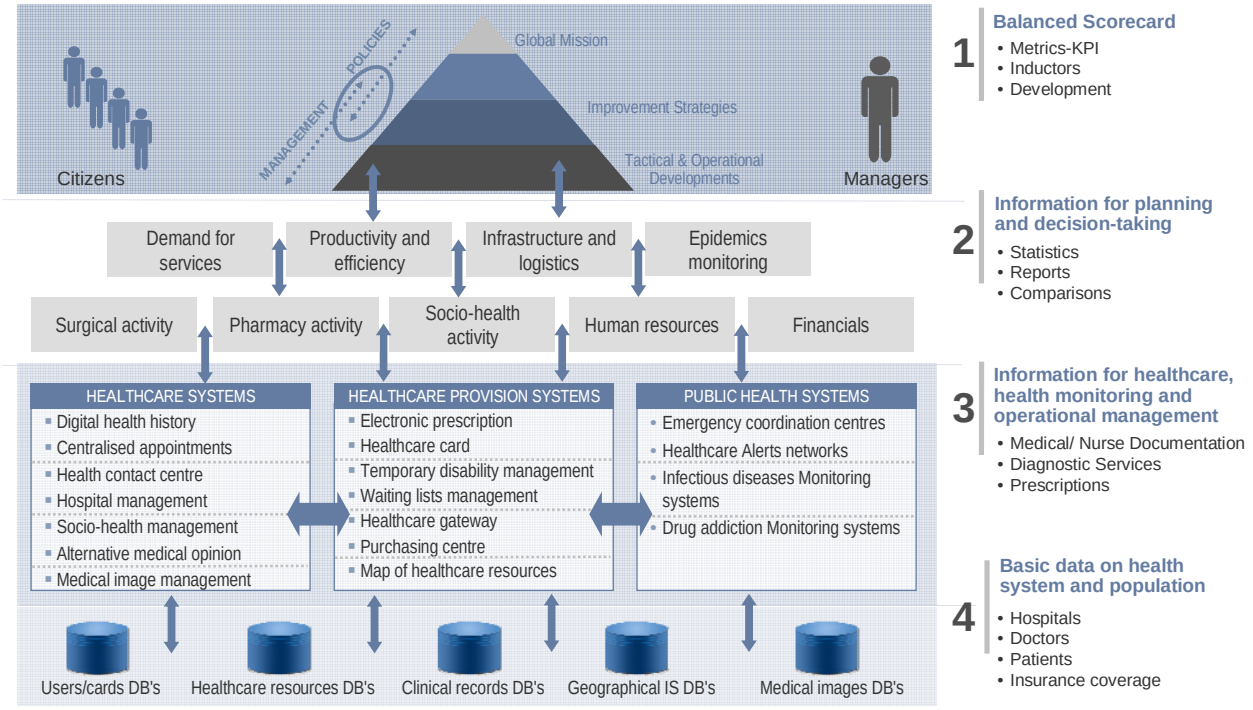
Information Analysis in Health Systems

Health Systems are characterised by their great diversity regarding the need for information analysis, among which we find supporting information for daily practice, and strategic management and planning. These needs can only be met by an adequate scheduling of the collection of base information and arranging the corresponding analysis components. All this will allow improving service provision in the clinics and will also aid the decision-making process.

As in most of the fields of endeavour, health systems are characterised by their great diversity regarding the need for information analysis. Thus, if we ask about this at different levels of health organisation, we will obtain answers with specific and differentiated demands, according to their particular needs. If we ask a hospital manager, for example, we will obtain a different response to that which we would obtain from the physicians, and of course, different to an answer we would obtain from the Health System's Management. Even within each one of these groups we will obtain different answers. As an example we could find needs such as:

- Aids for management and decision-making.
- Health Follow-Up.
- Comparison of activity between hospitals or health centres of the same type.
- Measurements of Health Care levels.
- Indicators on the cover provided.
- Indicators on Health Care Quality.
- Behavioural Patterns.
- Treatment Efficacy.
- Pharmaceutical Expense.
- Indicators on the Use of Operational Systems.
- Error Control.
- Detection of improper practices.
- Population segmentation.
- Trends and Patterns.
- Projections and Future Analyses.
- Research.

As you can see, the range of possibilities for data analysis is very broad.



In our understanding, treatment of these demands could be grouped in the following levels:

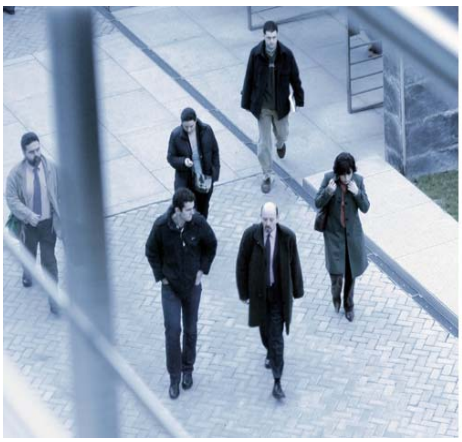
- Master Data, characterised in that it is formed from records containing the data itself.
- Operative level, the main characteristic of which is supporting the provision of Health Care.
- Tactic level, directed towards operating management and planning of the health system.
- Health System Management, the main objective of which is strategic planning.

According to this classification, the operating level is characterised by its closeness to data at origin and its more broken down management. This is the information intended for primary users of the information systems: health professionals. This information will be presented by means of the operational systems themselves: health background, electronic prescriptions, demographic information systems, etc. Their main benefit consists in providing better quality and more efficient health care at the clinics.

Additionally, in health systems many management decisions implying the consumption of resources are taken at the operational level: the professionals themselves; therefore health systems face the challenge of offering healthcare professionals access to more elaborated indicators. The tactic level, however, is characterised by a more elaborate processing of the base information such as to facilitate operative management, health planning, health vigilance and epidemiological vigilance. This information also provides a comparison between health resources, identifying the points to be improved by yield analyses. The target of this information is middle management, the dashboard being the most suitable instrument for presenting it.

Finally, the management level makes a more specific use of this information: strategic planning. Its main characteristic is conciseness and its most suitable presentation is based on indicators and deviations with respect to the strategic objectives set, so as to know the real performance of the resources assigned and the adhesion to the policies and objectives set.

Outside the management and operation itself we find a differential characteristic of health systems: research. This research becomes an arduous task if operational systems and the corresponding tools for base information analysis are not available. This complexity is especially evident in the universe on which research itself is based upon. Thus, regional medical background, for example, allows analysing a broad group of patients which would be difficult to approach by other means.



Information Analysis Model

The Information Analysis Model, which responds to these premises, is made up of a series of modules that allow making use of the information according to the different needs of the health system.

Although a broad and complete model is defined in order to encompass all the possibilities for analysis, this does not mean that all modules must be applied, but only those considered necessary, without this diminishing functionality or possibilities for evolution.

This model is made up of the following modules of analytical levels:

Operational Environment

Each operational module has lists, consultations and functionalities that allow daily management, this being the first level of data analysis used by system users. The data used for these basic consultations is completely up to date, since the information is consulted directly on the operational system. These consultations are restricted, preventing system overload, their intention being purely of aid to daily operation and management.

Operational Data Store

This is a Data Store for Operational Data that serves as a replication system for all the information the organisation considers relevant and susceptible of being analysed.

This database is organised according to information entities that are replicated from the operational systems (and may come from different sources) for subsequent detailed analysis and research.

In the extraction and load processes, data conversion and transformation is minimal since it tries to provide replicated operational data in order to process it afterwards without affecting the operation of the origin system in any way. Data loading is thus fast and it is periodically updated according to the characteristics and analysis needs of each one of the stored entities.

Data Warehouse

Corporate Data Warehouse made up of different Datamarts that analyse complete areas of information. Creation of a Data Warehouse by the progressive incorporation of different Datamarts allows obtaining short-term partial results and gradually increasing the processing system. The functionality and advantages of this part of the system are those characteristic of data warehousing and the most suitable Business Intelligence tool for the needs of the organisation must be chosen for its implementation. Additionally, we would like to highlight the differences between the Operational Data Store, ODS and the Data Warehouse, DW. Both are complementary systems and the existence of one does not preclude the convenience of the other. Providing Data Warehouse systems in this type of environment is essential, since they are the heart of the information analysis. On the other hand, the convenience of having an ODS will depend both on the size of the operational systems, on whether their availability is critical and on certain type of exploitations whose particular characteristics do not allow a previous definition of the analysis needs, such us research or occasional requests of information.

Medical Care Indicator Module

A customised module providing predefined indicators previously agreed by the Health System and which are made available to all the levels of the hierarchical structure of the organisation, reaching the maximum level of detail: the data and indicators can be handled by the professionals in a simple and agile manner, without the need for advanced knowledge of information analysis. In this case, the indicators are shared by professionals of the same type, which provides transparency and compa-

rability since pre-established and common criteria are provided for the entire organization.

Although this module is really an information processing system, it is presented to the health professionals as just another module containing the appropriate indicators, homogenous with the operational modules and transparent regarding information architecture.

- **Top Management Indicator System**

This module is the final step in information analysis, since it contains the different control functions defined by the organisation with the indicators for analysis by the Top Management. It is the final level of the data processing model and it allows the Health System Management to identify alerts and trends in a general and grouped manner.

Data Protection

The protection of confidential data for the citizens is obviously an undeniable premise that all the previously defined data processing systems must comply with, according to all the safety requirements defined by current law.

The Information Analysis Model of the Andalusian Health Service

The information processing system for Citizen Medical Backgrounds, Diraya, of the Andalusian Health Service, responds to this modular approach to information analysis. We will now describe the main components of said system:

Citizen Medical Background (Operational Environment):

It has the necessary lists and customizable consultations for daily medical care management, such as, for example:

- Lists of patients appointed for consultation.
- Citizens involved in medical care programs.
- Requests pending processing.

Processing Databases (Operational Data Store):

It has a replica of the different entities susceptible of analysis, allowing to make queries and data retrieval that previously were not defined (research is one of the great beneficiaries of the potential of the ODS since it allows the reception of straightforward answers according to criteria appropriate at any moment), extractions of raw data intended for the different organizational levels that may require them and quick and precise obtaining of information not available in other systems (this is very useful for occasional requests of information or non repetitive data analysis). Examples of these entities are the following ones:

- Prescriptions.
- Allergies.
- Consultation follow-up sheets.
- Diagnoses.
- Vaccinations.
- Temporal Incapacity Reports.
- Constants.

Information Treatment Module (Data Warehouse):

The following Datamarts are currently available:

DM- Citizens. As an example.	**DM- Appointments**. As an example	**DM- Emergencies**. As an example.
♦ No. of users per professional. ♦ No. of citizens per type of insurance. ♦ No. of admissions, discharges and changes per health centre. ♦ No. of duplicates. ♦ No. of citizens per age, sex and town.	♦ Daily activity per professional. ♦ Accumulated % of frequentation with respect to the previous year. ♦ Accumulated % of frequentation of different citizens. ♦ % of specialist first consultations coming from primary health care per month. ♦ Ratio of appointments attended to appointments expected per centre. ♦ Delays in appointments distributed per percentiles and centres.	♦ No. of questionnaires and constants per province. ♦ % of diagnoses coded with ICD-9. ♦ No. of emergencies with anamnesis per centre. ♦ No. of emergencies with examination per centre. ♦ No. of drugs applied. ♦ Response time in primary care assistance per location. ♦ Average consultation response time per location and professional.

Diábaco – (Diraya Medical care Indicator Analysis Module):

In this module the indicators are grouped by subjects which are in turn subdivided in groups. The subjects currently registered are:

- Medical Care Activity. As an example:
  - ♦ Total No. of GP consultations in the centre.
  - ♦ % of nursing, paediatric, and GP professionals per centre.
  - ♦ Total No. of minor surgery consultations.
  - ♦ Total No. of home paediatric consultations.
  - ♦ No. of home medical emergencias.
- Usage Indicators. As an example:
  - ♦ No. of consultation follow-up per professional and type of professional.
  - ♦ % of citizens with allergies and contraindications sheets.
  - ♦ No. of nursing assessment sheets.
  - ♦ No. of vaccinations recorded.
  - ♦ % of users with problem sheets.
  - ♦ No. of social problems recorded.
  - ♦ % of clinical problems per citizen.
- Services Offered. As an example:
  - ♦ No. of polymedicated persons assessed.
  - ♦ No. of changes in treatment.
  - ♦ No. of adults with asthma assessed.
  - ♦ No. of persons with diabetes assessed.
  - ♦ No. of cases of HIV+ in follow-up.

- Medical Care Procedures
  - No. of users involved in the pluripathological patient care procedure.
  - Mean age of users included in the palliative care procedure.
  - No. of females involved in the cervix/uterus cancer procedure.
  - No. of females involved in the mammary cancer procedure.
  - No. of users involved in the heart failure with auricular fibrillation procedure.
- Indicators for Requests. As an example:
  - No. of requests for General Practice consultations.
  - No. of requests for nursing consultations.
  - Offers per health centre and type of consultation.
- Mental Health Activity. As an example:
  - No. of patients attended per age and activity bracket.
  - No. of psychiatrists and social workers per centre.
  - % of patients attended with diagnosis per month and centre.
  - % of visits outside the centre.
  - % of patients discharged per month.
  - No. of patients in group treatment per year.
  - % of family consultations.
- Professional Careers. As an example:
  - Diábaco offers a quick and direct access to a subset of the previously listed indicators that allows the evaluation of the professional's career.