The exercise of building a health information system (HIS) is becoming more and more popular. The Internet search engine www.google.com provides about 377 000 references for the keywords ‘health information system’ and PubMed gets 16 120 hits. Many stakeholders are active in this field, ranging from IT companies to international organisations, such as the European Union. In its parliament decision, the European Union defines this task in the following way:

There is in particular a need to ensure, relying on competent and relevant expertise, appropriate sustainable coordination, in the area of health information, of activities in relation to the following: definition of information needs, development of indicators, collection of data and information, comparability issues, exchange of data and information with and between Member States, continuing development of databases, analyses, and wider dissemination of information.²

This statement reveals the multifaceted and multilayered nature of a HIS. This is also seen when analysing the search results from PubMed. The American Health Information Management Association, for example, stresses the role of the computer-based patient record (CPR) in building a nationwide electronic highway to link health records and exchange needed information.³ The CPR as the fundamental source of health information is acknowledged by many authors.

We must be able to assess and ensure value – i.e. appropriateness, effectiveness and cost – of health services, apply that knowledge in each and every patient encounter, and track the impact of clinical decisions through an analysis of aggregated databases.⁴ Also some audacious goals for the year 2008 have been presented: ‘a virtual healthcare databank, a national healthcare knowledge base, and a personal clinical health record’.⁵ There are also warning voices:

Organisational and national policy control of health care face direct and radical challenges through perverse effects of otherwise beneficial developments, and early action is needed.⁶
The benefits of CPR have also been questioned; nevertheless, operational information systems are seen as a prerequisite for the successful operation of a health-care system.

There are already some established parts of the reporting component of a HIS available for field-testing. One of the most longstanding is the ‘Health for All’ database by the World Health Organization. An example of a national system may be found in Sweden, Finland, the Netherlands, and in Germany. However, these innovative applications represent only a limited part of a comprehensive HIS. They include many elements such as statistical reporting, epidemiological and quality systems, but many elements are also missing, like links to evidence-based decision making.

In order to structure national efforts in building a comprehensive HIS, work has also been done on the theoretical framework behind these kinds of systems. This framework may be used in presenting a ‘topographic map’ for a HIS. Figure 1 shows one such map linking together different elements listed in the references and exercises above.

The basic data for any HIS are situated mainly in clinical databases or electronic patient records (EPRs), which, together with evidence-based decision-making systems and databases (see, for example, www.ebm-guidelines.com/), form the clinical part of a HIS. From these databases, coded, classified and aggregated information is transferred to administrative or statistical parts of the system. The clinical databases keep the clinical data in order and linked with the correct patient. The evidence-based decision support and expertise system provides the clinician with the latest critically reviewed scientific information.

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**Figure 1** Topographic map for a health information system (modified and developed from Nenonen and Nylander)
The administrative or statistical part of the system may be divided into three elements with distinctive roles.

1. A business reporting system that provides information on the production and use of services for benchmarking purposes, and also for management at local, regional and national levels. This has traditionally been called ‘healthcare statistics’.

2. An epidemiological information system that contains information on the incidence and prevalence of diseases or health conditions, living habits and health risks; it also serves the purposes of disease surveillance and an early warning mechanism.

3. A quality system that ensures the high quality of services provided to the population.

It is of utmost importance to identify these different roles to avoid confusion and loss of money in building a HIS. For instance, a business reporting system for inpatient care cannot fulfil the need for epidemiological data about type II diabetes, and a system for outpatient statistics cannot serve as an early warning system for product hazards.

All these five main elements naturally have several subsystems, some of which are presented in Figure 1. The administrative data in clinical registers include items such as address, contact and billing information for the patient. The classical statistical system includes inpatient and outpatient data, causes of death statistics, economic statistics (system of health accounting), etc. The three elements of the administrative/statistical system also get information from other data sources such as annual reports and scientific research.

Traditionally, both international and national stakeholders have concentrated on building the input system for a HIS, and the output side of the system has remained relatively thin, often limited to a few printed reports with exhaustive tables. For an optimal HIS, the output or feedback part of the system is, however, its most important element. This feedback mechanism must start at the clinical database level, providing healthcare professionals with information on their client population, its health needs, its use of services and quality of care. It also reminds the healthcare staff and the patient about planned or agreed tests, check-ups and appointments. This is a vital element of evidence-based decision support, along with filtered, digested and organised results from scientific research.

The feedback loop should operate also on a broader scale, at local, regional, national and international levels. Output from the three main elements of the administrative/statistical system should be linked to the clinical information system, into which is integrated the evidence-based decision support system providing, for example, benchmarking information for the practice, information on prevalence and incidence of important public health problems, etc. This evidence-based support system is needed both in clinical decision making by healthcare personnel and in administrative decision making by healthcare managers and administrators on different levels. These three elements should also have active links to scientific research, promoting, for instance, register-based studies and large epidemiological studies. This feedback can also act as the basis for aggregated data for use in resource planning and quality assurance at strategic level.

Thus the concept of a HIS may be turned into something with a structure and a function. Maps such as the one presented here may help different stakeholders to build either individual elements of a HIS or a comprehensive HIS for their needs. The input is a good place to start, but it may not yield the desired end results. Including a reporting system or different end-user layers into the system is a good way ahead, but it is not the fulfilment of the idea of a HIS. Only when we have a functioning feedback loop incorporated into evidence-based decision support can we really start talking about a health information system.

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