Ilkka Kunnamo
ilkka.kunnamo@duodecim.fi

88 – How to Build an Ideal Healthcare Information System?

Ilkka Kunnamo, MD, PhD,
Adjunct Professor of General
Practice, University of Helsinki

An ideal healthcare information system (HIS) improves the quality of care and patient safety, and makes work easier and faster. Whilst achieving both of these goals, it also increases the cost-effectiveness of healthcare. The HIS should support the key tasks of the FD, particularly the provision of patient-centred and coordinated care, easy access and continuity.

Best available knowledge at fingertips

The first task of a HIS is to provide access to all medical knowledge and display it to both clinicians and patients in a format that is user-friendly. The knowledge must be searchable with any terms that the users come across in their daily practice and communication. The knowledge should be updated continuously and assessed for the quality of evidence with guideline recommendations transparently derived on the basis of the evidence. The recommendations should be graded for strength.

Personalized medicine and decision support

The total number of different data items (the sum of all diagnoses, tests, drugs, procedures…) is already about 100 000. This number will increase exponentially when whole-genome sequencing and analysis of gene expressions and proteins become routine. Computer systems are needed to integrate this data alongside available medical knowledge. Clinical decision support integrated with EHRs can already improve care and patient safety. It allows personalized medicine – the tailoring and application of guideline recommendations individually for each patient.

HIS supporting the specific tasks of the FD

The HIS facilitates communication between patients and their FD, as well as within the network of professionals that create virtual teams to provide patient-centred care. Patient empowerment is promoted through the sharing of medical knowledge, by supporting home measurements, and motivating and guiding self-care. Safe communication via personal health records, e-mail and video messages enables contact sometimes outside office hours, and simultaneously reduces long hours spent in the office and provides more flexible schedules for the FD. Continuity of care is improved.

The HIS supports the role of the family doctor as the coordinator of care. The FD has access to data recorded by other health professionals. Much of the data will be recorded by patients, either by themselves via intuitive user interfaces of personal health records (PHRs), or automatic monitoring devices. All professionals must have access to this data through consent of the patient. Correspondingly, data recorded by

professionals into electronic health records (EHRs) must be available for patients via their PHRs or via a national EHR archive. Measures of functional ability and quality of life are used in the assessment of patients and care planning.

The HIS protects the FD from information overflow and excessive workload by filtering important information, displaying summary data on one screen and prioritizing tasks. It gives primary responsibility to the patient as long as they are able to interpret the information. The HIS continuously monitors the data of all patients and simultaneously displays gaps in care to the FD. The HIS supports patient-centred care when a treatment plan is established by the patient, the FD, and multi-professional team. Care protocol templates are available for creating evidence-based plans, which are tailored to meet the goals and preferences of the patient. The HIS monitors that the goals set by the patient and FD together are met, and sends reminders to both the patient and the professional when necessary. Health inequalities will be reduced by targeting resources for people who have the most to gain from healthcare interventions.

A comprehensive decision support system is particularly helpful in the care of typical primary care patients with multimorbidity when discordant recommendations from single-disease guidelines need to be streamlined. The comprehensive medication review is a tool that analyses data from the EHR against decision support regulations and drug databases, checking evidence-based indications, laboratory monitoring alerts, warnings on reduced dosage in renal insufficiency, drug interactions and contraindications, potentially inappropriate drugs in the elderly, cumulative adverse effect risks of polypharmacy, maximum dosing and cross-allergies. The tool facilitates safe reduction in polypharmacy.

Practice and research united

An ideal healthcare information system (HIS) learns from every patient, every intervention and its outcome. Every data item in the electronic health record contributes to the body of medical knowledge as it is anonymously stored in a research database that contains the follow-up data of all patients. Associations can be detected, and hypotheses tested using such nationwide and international databases. Targeted, multi-centre randomized trials will be easy to perform by using software that automatically collects baseline and follow-up data from the EHR, and helps to record study-specific data on web-based electronic case record forms. The HIS also maintains a portfolio of the FDs experience in caring for different types of patients, and performing various interventions, and helps in identifying needs for continuous medical education.

Basic principles of HIS

To achieve these goals, certain basic principles need to be followed. The database where patient data are stored and the software applications displaying and processing the data must be separated and connected via open interfaces. This will allow the development of user-friendly software, including mobile apps, which are connected to the data. Competition in software development will improve usability. All data regarding each patient from both primary and secondary care must be accessible by means of the patient's permission ("one patient – one record"). Data confidentiality and safe communication between healthcare providers and their patients must be ensured. The coding of data must be nationally and internationally agreed to make automatic processing of the data possible, and allow high-quality software to be distributed across borders and languages. The key structured data set consists of a problem list, current medication list, results of measurements and laboratory tests, performed procedures, and functional assessment.

Responsibility of the whole population (for the FD, a list of patients and practice population) is enabled via patient data that can be aggregated, monitored, sorted and searched. Patient-centredness should be the guiding principle in software design, with virtual team building around patients, and patients themselves (not only professionals) as key users of medical software.

Take home messages

- Empowerment of patients is a strategic goal in building health information systems.
- Patient-centredness requires that one patient has one record – across primary and secondary health care.
- Coding of patient data allows processing by computer and enables clinical decision support, personalized medicine, and automation of many tasks.

- The primary care team can take care of the whole population via the information system and ensure that care can be offered equally to everyone who would benefit from health care interventions.
- Cross-sectional data from electronic health records of populations is used to create new knowledge.

Original abstract

http://www.woncaeurope.org/content/140-how-build-ideal-healthcare-information-system

References

- Grossman C, Gooldby A, Olsen LA, McGinnis M. *Engineering a learning health care system. A look at the future: workshop summary.* Institute of Medicine and National Academy of Engineering. The National Academies Press, Washington 2011. http://www.nap.edu/catalog.php?record_id=12213
- Hoffman TC, Montori VM, Del Mar C. The connection between evidence-based medicine and shared decision-making. *JAMA* 2014;312:1295-1296.
- Kawamoto K, Houlihan CA, Balas EA, Lobach DF. Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success. *BMJ* 2005;330:765
- Koopman RJ, Kochendorfer KM, Moore JL et al. A diabetes dashboard and physician efficiency and accuracy in accessing data needed for high-quality diabetes care. *Ann Fam Med* 2011;9:398-405.
- Wang CJ, Huang AT. Integrating technology into health care. *JAMA* 2012;307:569-570.

"Geisinger Health, a system that serves nearly 3 million residents in almost 50 counties in northeastern and central Pennsylvania, urges its nurses to reach out on social media to prospective candidates to promote its bonus and loan offers. Johns Hopkins All Children's Hospital highlights job opportunities and showcases departments and employees using Facebook Live, McDaniel says. How Ideal helps. We've worked with lots of healthcare organizations, from Ideal Image Medical Spa (which we did a case study on, actually) to one organization in the U.S. that we helped hire 80 new nurses just this spring. Prior to joining Ideal, John successfully launched and ran the North American office of a global HR tech company.