

Austria's Path Toward Nationwide Electronic Health Records

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Summary

Objectives: This article discusses current planning activities in Austria after legislation has been passed to introduce the electronic health record (EHR).

Methods: After describing similar activities in several other countries, the authors explore the current situation of healthcare telematics and imminent steps toward the implementation of a lifelong EHR.

Results: Substantial efforts have been made to coordinate healthcare telematics in Austria since the mid-1990s. One result of these efforts was the definition of a framework for electronic data exchange. A number of standardization projects were also implemented. Major steps have been taken as part of an ongoing healthcare reform to promote the use of healthcare telematics. One important example is a national initiative whose objective is to implement the EHR. This initiative is extensively discussed along with other national activities related to healthcare telematics.

Conclusion: This EHR initiative has prepared the ground for extensive planning that is currently under way to implement a lifelong EHR in Austria on a national level. Introducing the EHR will have a strong impact on Austrian healthcare and should be performed in concert with international activities. The authors offer a number of practical recommendations for the implementation of an EHR on a national level.

Keywords

Medical record systems, computerized public health informatics, computer communication networks, standards

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1. Introduction

Increasing specialization has greatly accelerated progress in modern medicine but requires a high level of multidisciplinary collaboration. The body of data collected for individual patients is continuously growing as novel techniques of clinical assessment are being developed. Efficient collaboration between physicians and/or healthcare facilities can only be ensured by exchanging these data. As a consequence, clinical information management has become a key technology in modern healthcare.

Consolidating all information available on individual patients in a single electronic health record (EHR) has been a subject of extensive discussions within the medical informatics community [1]. Records of this type would enable physicians and nursing staff to access complete medical histories in a standardized way. Introducing the EHR for all citizens of a country has the potential of significantly improving healthcare.

ELGA^a is the name of the national EHR initiative that was recently launched in Austria after legislation had been passed by parliament to reform the national healthcare system. The present article will first present a number of national activities toward establishing an EHR. Subsequently it will outline the status quo of healthcare telematics and current plans for a national EHR in Austria.

2. National Efforts in Other Countries

Numerous countries are performing activities toward introducing electronic health records. These activities are being monitored as part of the Austrian ELGA initiative to learn from the experience that other countries have collected with their own approaches. A detailed discussion of the ELGA initiative is provided in Section 3.6 of this article.

Particularly important are any relevant activities carried on by the European Union and the general requirements it has defined because Austria is a member state. However, this chapter will also discuss activities in countries bordering on Austria and activities in other countries that are expected to have a significant impact on future developments. All these activities are being closely monitored as part of the ELGA initiative.

2.1 European Union

The European Commission presented an action plan for a European e-Health Area in 2004 [2]. All member states are required to take measures aimed at supporting interoperability of e-health services. Examples include identifying and outlining EHR standards and developing a common approach to patient identifiers. Measures to facilitate access to healthcare/information and services for EU citizens should be taken by 2008. Examples include the support of healthcare networks offering services such as e-referral or e-prescription or health insurance cards. The action plan also requires member states to disseminate best practices. Institutions for e-health monitoring shall be established to

^a German acronym meaning “lifelong electronic health record”

evaluate progress and to develop recommendations for future measures.

2.2 Germany

The German health card is the planned departure point for an EHR to be introduced in four phases. Stages 1 and 2 of this implementation plan concern insurance data, the European health insurance card, and e-prescription. These early phases will cover all German citizens on a mandatory basis. Stage 3 would introduce a voluntary emergency record and medical drug documentation. Stage 4 would extend the functionality of the health card by patient invoices, EHR and referral letters [3]. The German ministry of health has issued a preliminary test and migration plan for implementation [4]. Only stages 1 through 3 are covered by this plan for the time being. It is expected that the current test phase for stage 2 and preparatory phase for stage 3 will be completed by April 2007. No information has been made available on the implementation schedule for phase 4.

2.3 Switzerland

In January 2006, the Swiss parliament adopted a strategy aimed at establishing an information society with a focus on e-health [5]. A national e-health strategy defining objectives, costs, approaches and a schedule is being prepared. The prime objective in Switzerland is to safeguard the quality of patient care. The Swiss health card is considered to have great potential. The Swiss parliament has adopted a law taking effect in 2008 that will require all patients covered by health insurance to present this card for any healthcare-related transactions with practitioners, hospitals and pharmacies. Plans to introduce a national EHR are still in an early stage. Integrating the various regional approaches is considered difficult in Switzerland due to the country's federal structure.

2.4 United Kingdom

The NHS National Programme for IT (NPFIT) [6] comprises an initiative to estab-

lish a NHS Care Records Service (NHS CRS) to supply all British citizens with an EHR by 2010. The foundation will be laid by establishing a central database containing a summary record of each citizen's medical history that includes links to more detailed clinical information stored in local systems. These EHR systems can only be acquired from a small number of specially licensed providers. Citizens will be able to access their own health records through a standard web browser.

2.5 Denmark

The MedCom initiative [7] was launched with the goal of setting up a message-based national healthcare data network in 1995. Today, implementation is at a very advanced stage. Over 90% of all reimbursements and laboratory results, close to 90% of all prescriptions and discharge letters and more than half of all referrals were sent electronically in March 2006. Over the past three years, MedCom has focused on developing regional EHR databases that will be fed with standardized extracts from local systems to generate consolidated extracts that can be accessed through standard web browsers. The system has been implemented and tested in one county. Plans are to use this experience for nationwide implementation [8]. A national health portal providing EHR-based services has been implemented and can be accessed through www.sundhed.dk.

2.6 United States

The U.S. administration has outlined a plan to provide most citizens with EHRs by 2014. The ONC [9] office established for this purpose has developed a strategic framework including 12 steps for implementation. Among other items, this process includes a) certifying the functionality of EHR systems; b) nationwide EHR interoperability by promoting regional health information organizations for local data exchange and interconnecting them within a national health information network; and c) ensuring that patients can access their own health records.

2.7 Canada

An independent non-profit corporation named Canada Health Infoway was established after the government had announced in September 2000 to accelerate the development and adoption of modern systems of information technology in healthcare. One of the immediate priorities of this corporation is to develop and implement effective interoperable EHR solutions [10]. Infoway has embraced a seven-year plan to have interoperable EHRs in place across 50% of Canada's population by 2009.

2.8 Australia

The Australian implementation of a national health information network is called HealthConnect [11]. The aim of this project is to collect, store and exchange EHRs through a secure network with effective confidentiality safeguards. A trial is under way to evaluate whether the EHR architecture specified by the openEHR foundation [12] is suitable to meet the requirements of this project.

3. National Efforts in Austria

Austria is a federal republic composed of nine federal states. Maintaining public health is a responsibility of government. The provision of public healthcare services is incumbent on the federal parliament for legislation and on the federal government for execution. Not all responsibilities are exclusively the domain of the federal ministry of health. Some important duties are performed by other authorities, namely federal ministries other than the ministry of health, State governments and municipalities, and self-administrated public corporations (social security institutions).

A total of 272 hospitals with around 67,000 beds offer inpatient care in Austria. Roughly 70 percent of these beds are maintained by 133 public hospitals. A summary of the national hospital system is given in Table 1.

Sections 3.1 through 3.5 will discuss activities essential to Austrian healthcare tele-

matics that have already been completed and added greatly to the ELGA initiative.

Sections 3.6 through 3.8 will discuss ongoing activities. Table 2 gives a chronological rundown of essential milestones of healthcare telematics in Austria.

3.1 Regional EHR Systems

Regional EHR systems were first established by interconnecting Austrian hospital information systems around 20 years ago. Regional data networks were developed that covered all public hospitals in specific federal states, including central patient registers. Thus physicians had an opportunity to electronically retrieve entire medical histories recorded at any of these hospitals. Medical records were maintained in electronic format at seven hospitals belonging to the Austrian general accident insurance agency and could be accessed from any of these facilities. Proprietary non-standardized forms were used to store and exchange these records.

Establishing a coordinated national system of healthcare telematics is somewhat complicated by Austria's federal constitution, which places the individual state governments in charge of most healthcare responsibilities. To overcome this problem, the Austrian ministry of health appointed the STRING^b commission in 1995. The task of this commission was to advise the minister on all issues related to healthcare informatics and to coordinate healthcare telematics between the federal states.

Electronic hospital information systems are used in all Austrian healthcare facilities. However, different systems are being used in different states at various levels of function and implementation due to the above-mentioned distribution of competencies. The extent of clinical documentation within these regional EHR systems varies with the degree of implementation.

3.2 MAGDA-LENA Framework

In 1998, the STRING commission developed the MAGDA-LENA framework [13] for electronic exchange of patient data in Austria. This framework outlines the technical and organizational aspects governing the development of an Austrian healthcare information network that will allow EHR content to be exchanged. A detailed description compared to the HIPAA regulations in the US [14] was given in a previous communication [15]. A number of standardization projects have been conducted under the auspices of the STRING commission to facilitate implementation of the framework by collecting experience in real-life environments, including a project on e-referral [16]. The framework was recently incorporated in a national regulation on healthcare telematics (see Section 3.5 below).

3.3 Social-security Chip Card

In 1999, parliament commissioned the central association of Austrian social insurance authorities to develop a social-security card system. The resultant system includes a chip card with a key for patient identification, an office card identifying healthcare professional's surgeries, and card-reading devices. The chip card is used to identify insurance holders and any family members covered under their name. The purpose of this card is to demonstrate to the physician that a person is entitled to receive services. The office card is only issued to practitioners in private practice, serving as their access key to functions of the chip-card systems and other administrative services (e.g. payment). This card does not meet the requirements of a health professional card because it identifies offices rather than individual practitioners. However, the need for a health professional card will arise on the way of introducing a national EHR in Austria. In early 2002, parliament expanded the functionality of the system to be used as a citizen card, which includes the option to store digital signatures and medical data on a voluntary basis. A comprehensive field trial to distribute the first cards was performed in 12/2004. The process of issuing the cards throughout Austria was completed by

Table 1 Structure of the Austrian hospitals. Source: Austrian Ministry of Health, Hospital Statistics 2003

	Hospitals	Bed count
Total	272	67 708
Care sector		
Acute care	190	53 347
Non-acute care	82	14 361
Care area		
General care	136	44 485
Specialized care	136	23 223
Type of hospitals		
General hospitals	108	41 954
Specialized hospitals	97	14 940
Sanatoriums	44	3755
Chronic-care facilities	23	7059
Public/private		
Public, non-profit	133	47 612
Private, non-profit	27	5253
Private, for profit	112	14 843
Size structure		
Less than 100 beds	68	3428
100–200	99	14 352
200–500	75	21 477
500–1000	21	15 353
1000+ (University clinics)	9 (3)	13 098 (5005)
Funding bodies		
Administrative (federal, state, municipal)	133	45 814
Social insurance authorities	40	5744
Private sponsors*	99	16 150
*Religious orders, congregations, individuals, societies, associations and foundations		

11/2005. Eight million Austrians now have the card. Around 12,000 physicians working for the Austrian social insurance authorities have office cards and card-reading devices in their offices.

3.4 Electronic Index of Healthcare Providers

In 2001, the Austrian medical chamber created an electronic index of Austrian healthcare providers. This index is currently used to promote electronic exchange of clinical

^b German acronym meaning "standards and guidelines for the use of informatics in healthcare"

Table 2 Milestones of healthcare telematics in Austria

1980	HIS-based regional EHR systems
1995	Establishment of the STRING commission to coordinate healthcare telematics in Austria
1998	Framework for an Austrian healthcare data network; implementation of MAGDA-LENA I as a pilot standardization project
2000	MAGDA-LENA II
2001	Electronic index of Austrian healthcare providers
2004	Healthcare telematics regulation
2005	Implementation of e-card (social-security chip card)
2006	National roadmap for healthcare telematics

information by providing the data necessary to identify the role of any of these providers within the healthcare system. It is currently only available to practitioners, but there are plans to grant access to other healthcare-related occupation groups. The entries within the index currently do not refer to the corresponding office cards; this integration is, however, being discussed.

3.5 Healthcare Telematics Regulation

This regulation defines minimum standards to safeguard confidentiality, reproducibility and non-manipulation of communication activities [17]. Healthcare providers are required to verify that any parties requesting data are duly authorized by their identity and role (e.g. general practitioner or psychotherapist) before specific data are exchanged. The main source to obtain such verification will be a national e-health index of healthcare providers, to be developed from the existing index of healthcare professionals (see Section 3.4). Among other information, this index lists the names of healthcare providers, their unique IDs, their addresses for paper and electronic mail, their roles in the healthcare system, and their public keys. Entries to this e-health index can only be added by registration offices authorized by the minister of health. Healthcare providers outside of Austria can be registered. An alternative way to

demonstrate the identity and role of providers is by electronic certificates. Any other means than index entries or electronic certificates may be used in defined exceptional situations if strict documentation standards are observed. Any data exchanged must be encrypted to guarantee confidentiality. Digital signatures^c meeting defined standards are needed to ensure data integrity. The regulation became effective in 1/2005. A pilot version of the e-health index was released by the ministry of health in July 2006. The roles of healthcare providers will be one element of this register and a key element in defining which data can be accessed by whom.

Penal provisions have been installed for failure to meet any of these deadlines but will not be enforced before 1/2008 (transitional clause). Penalties will range up to € 5000 for failure to use encryption or valid signatures in data exchange and up to € 50,000 for illegitimate use of data.

3.6 The ELGA Initiative

As the number of regional EHR systems increased further after the turn of the millennium, the STRING commission recommended in 2003 that concrete plans for a nationwide EHR should be developed to avoid a multitude of isolated and incompatible solutions. This initiative was entitled ELGA, which is a German acronym meaning *lifelong electronic health record*.

ELGA was embraced by the ministry of health and incorporated into the 2005 Healthcare Reform Act [17]. This act includes a healthcare telematics regulation that governs several key aspects of ELGA and will cover the period until late 2008 [18]. Its article 7 on healthcare telematics and electronic health records makes it mandatory for the Austrian federal and state authorities to optimize the use of information and communication technologies in healthcare telematics. The federal and state authorities stated their commitment to introducing the EHR as well as e-prescription

and e-payment as a matter of priority. In addition to the main objective of improving collaboration, it is planned to create and monitor a mandatory framework for the use of health information technology in Austria. The state authorities gave their agreement with the proviso that all major milestones of introducing ELGA should be decided jointly by the federal and state authorities.

The following excerpt summarizes the essence of this agreement:

“The contracting parties agree that efforts in healthcare telematics and introducing the EHR shall aim for the following priority objectives: quality of healthcare; utilizing economical potentials of information and communication technologies; and harmonizing the national approach with measures taken in other European countries.

Current standards governing the rights of citizens and patients need to be developed further to guarantee that health data will be effectively protected. It must be ensured that relevant information is also supplied to population groups who either cannot or are not willing to make use of modern technology and that the volume and nature of these data will meet their information requirements.”

This document is a political commitment to ELGA but does not define any details on how to incorporate and migrate any legacy EHR databases to a nationwide system.

3.7 Current Activities under the ELGA Initiative

Based on these decisions by the Austrian parliament, the STRING commission has outlined a number of salient items on the implementation agenda for ELGA [19]. Several issues must be addressed:

- Content and standardization of ELGA records
- Organizational concept (logical storage architecture, system providers, participants, quality of data, etc.)
- Technical concept
- Legal foundation and confidentiality
- Organization of data security
- Cost-benefit analysis
- Existing national and international projects
- Model projects

^c The basis for using digital signatures in Austria was created by passing a signature law supporting private certification providers in 1999.

In May 2006 a professional consulting firm has been commissioned with developing a strategic framework to address these open points in an ELGA feasibility study. The key results of this effort were presented in January 2007 and are available in German language [20].

An ELGA consortium established by the federal government became active in September 2006 [21]. The first task of this consortium will be to break down the general requirements defined in the ELGA feasibility study to a level of detailed actions. More specifically, it will address the following points:

- Define strategic priorities on the path to ELGA and a roadmap for implementation
- Develop detailed proposals for funding
- Harmonize interests between all interest groups and partners (mainly to protect existing investments)
- Insist that those responsible establish lawful conditions and commit to accepted standards
- Perform crisis management
- Evaluate the results of the project

Political and strategic guidance for this ELGA group is provided by a steering committee made up of nine members (delegates from the federal government, state governments and health insurance authorities).

3.8 E-health Initiative with Participation of Industry

Furthermore the ministry of health has launched an e-health initiative [22] to coordinate all planning activities with industry experts. Bringing these experts on board is designed to expedite the process of implementing the results developed by the various task forces. Seven task forces have been established to address the topics described in Table 3.

The results of this initiative were presented in December 2005. Interest groups and experts were subsequently invited to contribute their comments by October 2006. A revised version incorporating these contributions was presented in January 2007 [23].

4. Discussion

We believe that three priority issues need to be resolved in connection with an Austrian EHR. They concern the legal provisions and privacy safeguards, the logical storage architecture as well as the content and standardization of data records. A discussion follows.

4.1 Legal Foundation and Confidentiality

The legal implications of data protection were a key concern of the STRING commission from the very outset. Therefore a task force to address these issues was immediately established after the recommendation to launch the ELGA initiative had been published in 2003. This task force has since presented a thorough analysis of legal requirements for the EHR. Special emphasis has been placed on the differences between voluntary and mandatory participation. Numerous reasons have been identified why a mandatory EHR does not seem legally acceptable. An appropriate legal basis will even be needed if the EHR is linked to patients' consent because acceptance cannot be realistically obtained and documented for each specific application of ELGA data.

The following suggestions were put forward in the ELGA feasibility study (see Section 3.7):

- Specific ELGA legislation should be passed and explicitly provide for citizens' rights in connection with the EHR (including the right to opt out). The law should make it mandatory for healthcare providers to document/maintain data and to make EHR content available. It should also define guidelines for supervision and penalties.
- Sensitive data should be labeled during writing. Access to these documents should be restricted, including any information on their very existence.
- Any parties accessing a personal EHR (whether in read-only or in read-and-write mode) should be logged and identified on the patient's request.

Table 3 Topics of the e-health initiative

Task Forces	Topics
1) National e-health strategy	Roadmap, checkpoints and benchmarking
2) Interoperability and standardization	Technological harmonization, software certification, conformity tests, accreditation
3) Patient identification, identity management and data maintenance	Identity management (patients and healthcare professionals), authorization concepts and roles, long-term maintenance and pseudonymization
4) Interconnecting healthcare and social security	Requirements on IT infrastructure, legal and technical requirements on healthcare providers, roadmap with milestones for interconnection
5) Citizen-oriented information systems	Portals and web services offering information on insurance services, disease prevention (including occupational accidents) and health promotion
6) Technical information systems	Nomenclature and terminology servers, knowledge databases, empowerment/e-learning of service providers
7) Telemedicine services	Home care, telemonitoring, second opinion, qualifications for offering on-line health services

4.2 Logical Storage Architecture

Austria favors a solution where all medical data collected for a patient is maintained locally by the various healthcare providers. The rationale for this choice are data protection consideration and to keep data ownership at the healthcare providers. A purely central solution is not an option in this situation although a purely decentralized solution does not seem practical either. Therefore a distributed architecture is favored. The only issue that remains to be settled is whether the central component in this distributed solution should include duplicates of local data or just reference links. Both scenarios would allow for EHRs including either complete or selected patient data. Any selection criteria might be defined by the patients, their physicians, or by law.

4.2.1 Version 1 – Duplicates

Data stored for a patient in local archives are transferred to his or her EHR in duplicate. This could be accomplished in three different ways:

- *Single nationwide archive.* Duplicates (complete or selected data) are transmitted to a central archive. Centralized maintenance of health records for all Austrians would be the simplest solution from a technical viewpoint, but safeguarding privacy would be a delicate task. This solution is unlikely to meet with public acceptance.
- *Patient-selected provider.* Duplicates (complete or selected data) are collected and maintained by a provider of the patient's choice. Candidates might include healthcare facilities or commercial IT providers [24-26].
- *Portable storage medium.* Duplicates are stored on portable media (chip cards, USB sticks, optical media, e-card). This scenario raises questions about how the data can be recovered if the medium is lost or how the data can be transferred in an organized fashion to and from the medium if the latter is not available.

4.2.2 Version 2 – Reference Links

All information would be stored and maintained locally with the various healthcare providers and facilities. Centrally maintained reference links would indicate where the original data records are located. Automated routines should be used to populate these registers with data from the various sources, thereby avoiding double entries.

The ELGA feasibility study commissioned by the ministry of health (see Section 3.7) favors a distributed EHR architecture based on a *central access right component* and a number of centrally maintained indices:

- *Index of healthcare providers.* To identify all healthcare providers taking part in ELGA. An electronic index of practitioners has already been introduced but does not cover all healthcare facilities in its present form (see Sections 3.4 and 3.5).
- *Nationwide master index of patients.* To integrate the distributed local medical

histories. This master index will list all citizens. Those opting out of ELGA will remain listed nonetheless to allow potential later opting in.

- *Document registry.* To maintain reference links to the original documents residing at the various healthcare providers.

In other words, maintenance of detailed information will remain solely in the hands of local healthcare providers. The Austrian approach differs in this regard from those adopted in other countries like the United Kingdom where all documents are transferred in duplicate to a central archive.

4.3 EHR Content and Standardization

A lifelong EHR takes a gradual approach to be meaningfully implemented. Opportunities and risks can be assessed more effectively if the concept is implemented step by step. Potential strengths and shortcomings can be identified earlier by evaluating the project as it develops. Thus any infringements on privacy or exercising discretion over personal health data can be more effectively controlled.

Communication processes and data content must be analyzed from various angles for objectives and user requirements during implementation. The content must then be standardized based on this analysis.

The ELGA feasibility study commissioned by the ministry of health (see Section 3.7) has come up with the following proposals:

- *Step-by-step implementation of ELGA.* Plans are to implement ELGA in a step-by-step approach. The first step would be to integrate patient data based on the three indices described in Section 4.2 (index of healthcare providers, nationwide master index of patients, and document registry with reference links to the original documents). The EHR would then be gradually developed through “adaptors” linking the various distributed documents to the indices. The proposed first documents will be discharge letters, laboratory and radiological results and medications.

- *Use of standards.* The three indices would be developed from the existing IHE XDS profile. Data would accordingly be accessed through the standardized IHE XDS protocols defined in that model. Other standards to be used in ELGA would include HL7 CDA and CEN 13606. The rationale for using HL7 CDA is its proximity to industry. In addition, this standard is clearly expected to prevail internationally. CEN 13606 has been recommended because of its advanced methodology and its obligatory nature as a European standard. Its use is therefore considered essential to ensure compatibility with European activities.

5. Conclusions

The considerations outlined in the above discussion have prompted us to formulate a number of recommendations. These are mainly designed to resolve a number of pending issues related to current planning activities in Austria but can also be applied to similar EHR plans in other countries.

- *First recommendation.* A nationwide EHR should not be introduced at once, but its various elements should be phased in. The first step should be to support existing tasks of data exchange between healthcare facilities. Examples include discharge, report or referral letters. Electronic transmission of radiological findings would also be a useful application.
- *Second recommendation.* Introducing the EHR in Austria should be in line with international standardization efforts [27]. Special attention must be paid to CEN 13606, HL7 CDA and openEHR [12, 28, 29]. There is reason to expect a uniform international EHR standard to materialize after these three international players have agreed to join forces. Attention must also be paid to IHE [30] whose profiles (e.g. IHE XDS) have demonstrated how these standards can be utilized. While defining EHR architectures, the standards in question do not ensure semantic interoperability. It is therefore essential to enter commitments allowing EHR content to be successfully inte-

grated. Commitments of this type are being jointly developed by openEHR, HL7 and CEN in a project entitled "Detailed Clinical Model" on an international basis [31]^d.

- *Third recommendation.* Introducing a mandatory EHR for all citizens would infringe on constitutional privacy. Even a strictly voluntary EHR would still require a legal framework governing the handling of sensitive health data. These provisions should define a) types of health data to be included in the EHR; b) classes of healthcare providers allowed to participate in the system; c) requirements that patients have to meet to participate in ELGA; and d) situations that will authorize specific healthcare providers to retrieve data.
- *Fourth recommendation.* A distributed solution with duplicates of local data maintained in a single nationwide archive would presumably be the simplest option to maintain health records. Nevertheless, we recommend a scenario in which duplicates would reside with patient-defined providers. Alternatively, a distributed solution could be installed with central indices referring to locally maintained data. Solutions of this type would certainly improve public acceptance.

Aside from these specific recommendations, current plans to introduce an electronic health record in Austria clearly need to be in line with similar activities in other countries. Ideally the electronic health record should be introduced on an international basis, notably including a concerted European approach, because its impact on healthcare will be significant in all those countries.

References

1. Jaspers M, Knaup P, Schmidt D. The Computerized Patient Record: Where Do We Stand? *Methods Inf Med* 2006; 45 (1): 29-39.
2. E-Health – making healthcare better for European citizens: An action plan for a European e-Health Area. Download site: http://europa.eu.int/eurlex/en/com/cnc/2004/com2004_0356en01.pdf
3. Die Gesundheitskarte. Download site: http://www.die-gesundheitskarte.de/fragen_und_antworten/finanzierung/details/kosten_einfuehrung.html
4. Die Gesundheitskarte – Grobplanung: Download site: http://www.bmg.bund.de/cln_040/nn_600110/SharedDocs/Gesetzestexte/Gesundheitskarte/GrobplanungTestregionen,templateId=raw,property=publicationFile.pdf/GrobplanungTestregionen.pdf
5. Strategy of the Federal Council for an Information Society in Switzerland, January 2006. Download site: http://www.infosociety.ch/site/attachdb/show.asp?id_attach=1028
6. NHS's National Programme for IT (Npfit). Download site: www.connectingforhealth.nhs.uk/programmes/nhsrscs/
7. MedCom initiative. Download site: www.medcom.dk
8. Bernstein K, Bruun-Rasmussen M, Vingtoft S, Andersen SK, Nohr C. Modelling and implementing electronic health records in Denmark. *Int J Med Inform* 2005; 74 (2-4): 213-220.
9. Office of the National Coordinator for Health Information Technology (ONC). Download site: www.hhs.gov/healthit
10. Canada Health Infoway Inc. Download site: <http://www.infoway-inforoute.ca/home.php?lang=en>
11. HealthConnect: A health information network for all Australians. Download site: <http://www.health.gov.au/healthconnect>
12. The openEHR foundation. Download site: <http://www.openehr.org/>
13. Burggasser H, Dorda W, Gambal J, Gell G, Ingruber H, Kotschy W, et al. Rahmenbedingungen für ein logisches österreichisches Gesundheitsdatennetz (MAGDA-LENA II); 2000. Download site: <http://www.meduniwien.ac.at/akh/STRING/>
14. Health Insurance Portability and Accountability Act (HIPAA); 2004. Download site: <http://www.hhs.gov/ocr/hipaa/>
15. Duftschmid G, Wrba T, Gall W, Dorda W. The strategic approach of managing healthcare data exchange in Austria. *Methods Inf Med* 2004; 43 (2): 124-132.
16. Austrian Standards Institute, ÖNORM K2202. 1999. Medical informatics – Patient referral. Download site: http://www.on-norm.at/index_e.html.
17. Healthcare Reform Act 2005. Download site: http://www.parlament.gv.at/pls/portal/docs/page/PG/DE/XXII/I/I_00693/fname_030664.pdf (in German language).
18. Agreement on healthcare organization and funding between the federal and state governments. Download site: http://www.parlament.gv.at/pls/portal/docs/page/PG/DE/XXII/I/I_00692/fname_030536.pdf (in German language).
19. Dorda W, Duftschmid G, Gerhold L, Gall W, Gambal J. Introducing the Electronic Health Record in Austria, Proceedings of MIE2005 – The XIXth International Congress of the European Federation for Medical Informatics. *Studies in Health Technology and Informatics* 2005; 116: 119-124.
20. Elga-Machbarkeitsstudie. Download site: <http://www.bmgf.gv.at/cms/site/detail.htm?thema=CH0415&doc=CMS1169796766007> or <http://www.arge-elga.at/>
21. ARGE-Elga. Download site: <http://www.arge-elga.at/>
22. Austrian e-Health Initiative. Download site: <http://ehi.adv.at>
23. Empfehlung für eine österreichische e-Health Strategie. Download site: http://ehi.adv.at/fileadmin/user_upload/adv_author/pdfs/konferenz20070126/Strategie_Emfehlung_der_e-Health-Initiative_Oesterreich_20070126_v2_02.pdf (in German language).
24. Shabo A. A global socio-economic-medico-legal model for the sustainability of longitudinal electronic health records. Part 1. *Methods Inf Med* 2006; 45 (3): 240-245.
25. Shabo A. A global socio-economic-medico-legal model for the sustainability of longitudinal electronic health records. Part 2. *Methods Inf Med* 2006; 45 (5): 498-505.
26. Dorda W. Die elektronische Krankengeschichte – Vorschläge zur Integration medizinischer Daten zu einer lebensbegleitenden Patientengeschichte. PhD-thesis. Technical University of Vienna; 1997.
27. Kabra D. Electronic Health Record Standards. *Methods Inf Med* 2006; 45 (1): 136-144.
28. CEN/TC 251. Health informatics – Electronic healthcare record communication. European Standard: European Committee for Standardization; work in progress. Report No.: prEN 13606. Download site: <http://www.cen251.org>
29. Beeler GW. HL7 version 3 – an object-oriented methodology for collaborative standards development. *Int J Med Inf* 1998; 48 (1-3): 151-161.
30. IHE Integrating the Healthcare Enterprise. Download site: <http://www.ihe.net/>
31. Wiki for the Detailed Clinical Models Collaborative. Download site: http://www.detailedclinicalmodels.org/wiki/index.php?title=Main_Page

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^d While commitments to SNOMED-CT, LOINC and NANDA are being discussed in Austria, a decision is not expected any time soon. The only standard that has been introduced for mandatory use is ICD-10 for purposes related to hospital funding.