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Review Paper

Current Status of the World Health Card Systems

Abstract: The perspective of our health card project has progressively changed from that of a pilot within a local environment (hospital, practice, community, etc.) to a large and national dimension. The interest of the many actors involved in health cards (healthcare authorities, insurance companies, social security agencies, standardization bodies, manufacturers, system integrators, etc.) is focusing increasingly on the role that the health card may have as an enabling component within the global communication and information system that will interconnect all points of care and services in a national healthcare system.

Keywords: IC Card, Health Card, WG7, Interoperability, Eurocards, CARDLINK.

1. Historic Overview of Health Card Types

The first demonstration of a variety of international card projects in the healthcare sector was held in 1991 at the first European Health Cards Conference in Barcelona. Most of the projects were using cards with a magnetic strip or relatively simple IC technology. The majority of pilot projects using ICs were undertaken in France, some of them started as early as 1985. In 1991, Germany was just about to move from the originally planned magnetic-strip card to a card with a 256 byte memory chip for all 1,200 different German Sickness Funds. In Health Cards '93 in Marseilles, cards were using magnetic strips, microprocessors, and some cards were equipped with a memory chip[1].

2. Health Card Projects Around the World

Two countries in Europe (France and Germany) have traditionally been leading the development of health card technology and its implementation. Several other countries are now moving in the same direction.

2.1 European Health Card Projects

Eurocards has established an unofficial framework for coordination of ongoing projects where representatives from all European countries and interested actors (industry, insurance companies, policy makers, healthcare authorities, researchers, system integrators, etc.) are brought together to discuss and share a comprehensive technical, social, and legal framework for data card applications, based on the various relevant experiences in Europe and elsewhere[2]. The working groups of the implementation of cards in health care have developed a comprehensive approach to the use of health cards for administrative, emergency and clinical purposes, and specified recom-mendations for data architectures, data set and application rules. The work of the European groups has been conducted under the auspices of the Commitée Europeen de Normalisation (CEN) and its work is tested in R&D work and pilot projects[1,2,3,4]. Their programs include (see Table 1):

1. CARDLINK, DIABCARD (where 10 regions in 9 member states are introducing a common interoperable emergency card),
2. Trusthealth (a new project in the 4th Framework Program of the EU that is considering application of a professional card in the context of the healthcare system in Sweden, Belgium, Germany, and Norway),
3. Collaboration with the Canadian projects in Quebec,
4. G7 actions on global healthcare networks in Eastern Europe, North America and Japan.

2.1.1 Germany

Germany introduced a health insurance card in 1989 which was distributed between 1993 and 1995 to all insured citizens[4,5]. The card, holding administrative information, allows access to healthcare services and medical and pharmaceutical prescriptions, and is an essential element in processing the physicians' claims for reimbursement (Table 2).

Table 1. European Union Health card projects

EU-Pilot	Purpose	Members
CARDLINK	Emergency card	Ireland, Italy (2 regions), Germany, Spain, The Netherlands, Greece, Portugal, Finland
DIABCARD	Diabetes as an example of chronic diseases	Germany, Spain, Italy, Austria, France, Greece
Trusthealth	Professional card	Sweden, Germany, Norway, Belgium

2.1.2 France

The second country with a nation-wide implementation of smart cards is France. In 1996, France passed a law to introduce an electronic health insurance card for all citizens by 1998, together with a professional card for physicians and nurses[6]. By early 1999, 60 million French citizens will be able to access their own medical and insurance information via Intranet communication.

. The French Government decided in January 1997 to launch a nation-wide Intranet card project called Reseau Santé Social (RSS). This network will be based on the Internet standards (TCP/IP and SMTP for mail). The private operator was decided in June 1997. This private operator, commissioned by a public body, will provide access to any healthcare provider, directly or through any secondary network interconnected to the RSS, and will accept any on-line service provider that respects a set of ethical rules. The access to the RSS will be controlled by the health professional card (CPS, carte du professionel de santé).

The French RSS could be easily interconnected with any other healthcare network in Europe, with a few conditions are obeyed:

1. Agreement on technical standards (TCP/IP, SMTP).
2. Agreement on encryption algorithms and protocols which includes creation of at least one Trusted Third Party (TTP) in each country.
3. Agreement on health professional directory structure.

It is worth mentioning that there is hope that the success of the French experience will lead to more harmonization and standardization of a European or even a G7 card[6].

2.1.3 Spain

Spain is in the pilot phase of a national project to issue a social security card to all citizens[3].

2.1.4 Other European countries (Italy, Belgium, Greece, The Netherlands, Slovenia, and others)

Other European countries have announced guidelines or plans for national implementations (see Table 3) [3].

2.2 Asia (Japan, South Korea, Taiwan, China, Hong Kong, Indonesia)[7]

In Asia, other than the experience of Japan and Taiwan and more re-

Table 2. German health card projects

Card Type	Project name	Project function	Place
chip cards	Versichertenkarten (VK)	health insurance card	national level, 75 million
	CARD	privately insured persons	national level
smart cards	Medical Patient Card MPK/A-Card	medical info. with emergency passport function	Koblenz (also a test site for the European project CARDLINK)
	Deficard	medical information	University of Bochum
	Dentcard	medical information for dentistry	University of Bochum
	OncoCard	medical information (cancer)	Heidelberg / German Cancer Research Center
	QuaSi-Niere	medical information (kidney)	QuaSi-Niere (Berlin district). A test site for HPC
smart cards: incl. crypto-processor	DIABCARD	medical information	Kassel
	Health Professional Card	administrative (with digital signature)	National Physicians Chamber
hybridcard optical + processor chip	Health Card	medical information for dentistry	Leverkussen

cently South Korea, health card systems are still in the developmental stage. In Japan, a number of pilot projects are under development, including medical, insurance, identification, and multifunction cards, to be used in metropolitan areas for both clinical and social applications, such as in the Takigawa city project in Hokkaido prefecture. In South Korea, a nation-wide plan of an identification card including access to medical information was decided to be implemented by the year 1998 (see Table 4).

2.3 United States of America and Canada

The USA has proposed a patient security card for entitlement to care and for access to the networked healthcare systems (see Table 5). On-going pilot projects in North America include a Health Passport (Western Governors' Association project)[8,9], the EBT (Electronic Benefit Transfer) card for social assistance, the integration of cards into CHINs (Community Health Information Network), an emergency card for military personnel [9].

In Canada, the health card history started in 1991 when the Quebec government decided to launch a pilot project based on using a smart card in the Rimouski area. The patient smart card was to serve as a portable information medium (health memorandum). The project was conducted from May 1993 to March 1995. Over 7,500 smart cards were distributed during the pilot project. In accordance with the recommendations made by

Table 3. Development of health card projects in Europe.

Country	Current status
Austria	Pilot of social security card and access to care (2 provinces.) Pilot on health card by a Ministry of Defence.
Belgium	Card for Social Security and access to care (plan announced by BCSS, call for tender in preparation).
Finland	Pilots for healtcare cards, participation in CARDLINK project.
France	Social security and health cards (law published, expected introduction 1998. A priori all French cards witll support EUR/G-7 interoperability data set). Professional card (law published, expected introduction 1998). Several pilot projects on health and emergency cards, participation of Santal in CARDLINK pilot.
Germany	Insurance card issued to 90% of the population. Several pilot projects for primary care and chronic diseases, emergency card pilots associated to CARDLINK.
Greece	Social Security card for seamen proposed. National plan for social security card announced. Pilot projects for health care and emergency card (CARDLINK).
Ireland	Primary care and emergency card. Main pilot site of CARDLINK.
Italy	Several niche projects (primary care, chronic diseases, prescription). Pilots of citizen's (multifunction) card, compatible with EU interoperability platform. Two regions pariticipating in CARDLINK pilot. National guidelines in preparation by Ministry of Health.
The Netherlands	Insurance cards (private insurance), national interoperability platform. Emergency card pilot (CARDLINK).
Spain	National Social Security carcd project (TASS) under development - pilot in Andalucia, nation-wide extension in 1997. Healthcare and emergency card pilots, also pilot of CARDLINK.
Sweden	Card as patient identifier for access to care. Pilots for medical and professional cards.
United Kingdom	Two pilots in early 1990s. Government Green Paper on ID card suggests that ID card could include medical information for emergency and E111.
Eastern Europe	Project in Bulgaria (medical card), Slovenia (health insurance card), Hungary (medical card, prescriptions), Czech Republic (access to care), Poland (medical card).

Table 4. Development of health card projects in Asia.

Country	Current status
China	Pilot projects in healhtcare (kidney dialysis, medical card systems) and immigration system.
Hong Kong	Medical cards in the Hospital Authority in Hong Kong.
Indonesia	Negotiation for medical cards.
Japan	Pilots in health professional cards, medical cards, insurance cards and multifunction (multi-service) cards.
South Korea	A nation-wide plan of an identification card includes access to medical Information.
Taiwan	Pilots in patient cards and health insurance cards.

the assessment report of the Rimouski pilot project[9], the Minister of Health is proposing a strategy of gradual and structured implementation of clinical application of the health smart card systems. In addition, the Ontario Ministry of Health piloted the service encounter card [9].

2.4 Interoperability, Security and G7 Development

A meeting entitled "Global Information Society" was held in February 1995, sponsored by the European Commission and involving ministerial delegations from Canada, France, Germany, Italy, Japan, the UK and the USA. A decision was taken by the G7 governments to encourage the establishment of 11 pilot projects including the development of global healthcare applications[10]. The main objectives of establishing these projects were:

1. Harmonization of data sets and architecture at the G7 level and worldwide.
2. Technical and functional interoperability of applications and services worldwide.
3. Links between data cards and telematics networks.
4. Acceptability of data cards by satisfying demands for privacy and security[4].

Concerning interoperability, technical specifications for interoperability were discussed at three international meetings: Atlanta, May 1996; Frank-furt, June 1996; and Tokyo, December 1996. Subsequent meetings to develop these issues were held in USA and Brussels in 1997.

Two areas of interest have been identified for establishing international pilots of health cards, technically and functionally based on the agreed interoperability platform[10].

1. An international health card that would provide essential medical data, as well as an internationally harmonized administrative data set.
2. An international professional card that would allow the secure identification of healthcare professionals when accessing medical data and network services worldwide.

A full set of technical and functional documentation for interoperability has been prepared by the experts working in Eurocards and is now available and, a substantial part of it is also on the Internet (http:www.clinical-info.co. uk). This includes technical issues, data sets and architectures, software command libraries, organizational issues and also a discussion on the legal framework of the introduction of cards and the relationship between the parties involved, relevant data protection issues and social aspects [11,4].

The establishment of a worldwide cooperation between Canada, the USA and Japan, working together with the European terms in the G7 context, to launch common pilots based on converging interoperable platforms is also extremely relevant.

3. Remaining Obstacles

Main obstacles still remain and are still under discussion, such as:

1. The wide variety of clinical information and physician office systems currently in use (the EC interoperability platform can provide a solution to this issue).
2. The lack of multilingual translations of all coding systems for diseases, procedures or drugs which are currently in use, (CEN and other international bodies are working in this direction) [2].
3. The high initial costs involved in the implementation process.
4. Different legislation in different countries. (The EC Directive 95/46/EC is a legislative platform that forms the basis for the work of the EU countries in this direction).

Table 5. Development of health card projects in North America

Country	Current status
Iowa, Oklahoma and Columbia	Private pilot projects for medical information.
Hawaii	Oahu personal identification card by US Department of Defense.
Quebec/Canada	Pilot medical information and identification system.
Ontario/Canada	Ministry of Health.

4. Conclusions

Nationwide programs for the introduction of health cards have been initiated in several countries. Eurocards members, G7 representatives, health care and health card professional efforts are trying to provide the world with an infrastructure of health card systems where interoperability, security, and reliability are achieved.

References:

1. Shaefer O. World Review. In: Van den Broek L, Sikkel AJ, eds. *Health Card '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:3-6.

2. Doare H. The European overview. In: Van den Broek L, Sikkel AJ, eds. *Health Card '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:7-8.

3. Pernice A, Doare H. Health cards: An overview of the current key international issues. In: Van den Broek L, Sikkel AJ, eds. *Health Card '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997: 391-414.

4. Sembritzki J. German patient cards -from administrative to medical data- -harmonization and standards. In: Van den Broek L, Sikkel AJ, eds. *Health Cards '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:31-7.

5. Shaefer O. Introduction of chip technology to health administration & medicine in Germany. World Card Techn Mag 1995;1:16-7.

6. Sauret J. Information systems in healthcare situation in France. In: Van den Broek L, Sikkel AJ, eds. *Health Cards '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:27-30.

7. Takahashi T. The prospects of health cards in Asia. In: Van den Broek L, Sikkel AJ, eds. *Health Cards '97. Technology and Informatics 49*. Amsterdam: IOS Press, 1997:11-5.12. Tissot P. Multi application smart cards. Card Forum Intern 1998;2:44-5.

8. Williams JT. The Health Passport project- moving forward. In: Van den Broek L, Sikkel AJ, eds. *Health Cards '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:245-6.

9. Zimmerman JR. Healthcare chip card technology in North America. In: Van den Broek L, Sikkel AJ, eds. *Health Cards '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:9-10.

10. Gallagher M. The development and implementation of a pan European health card in nine countries. In: Van den Broek L, Sikkel AJ, eds. *Health Cards '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997: 281-8.

11. Eurocards Concerted Action, Working Group 2. *Glossary on Health Cards*. Brussels: European Commission - AIM DG XIII, 1994.

12. Cirre, P. Santal, the French way for a multi-purpose health card. In: Van den Broek L, Sikkel AJ, eds. *Health Cards '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:302-5.

13. Blobel B, Pharow P. Security infrastructure of an oncological network using health professional cards. In: Van den Broek L, Sikkel AJ, eds. *Health Card '97, Technology and Informatics 49*. Amsterdam: IOS Press, 1997:323-34.

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