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**KEY SUCCESS FACTORS IN IMPLEMENTING  
ELECTRONIC MEDICAL RECORDS IN  
UNIVERSITY HOSPITAL OF RENNES**

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## Acronims

ANAES	Agence Nationale d'Accreditation des Etablissements de Sante;
CHU	Centre Hospitalier Universitaire;
CMR	Computerized Medical Record;
CPR	Computer-based Patient Record;
DMP	Dossier Medical Personnel;
DMR	Digital Medical Record;
EHR	Electronic Health Record;
EMR	Electronic Medical Record;
EPR	Electronic Patient Record;
ERP	Enterprise Resource Planning;
GMSIH	Groupement pour la Modernisation du Systeme d'Information Hospitalier;
HEGP	Georges-Pompidou European Hospital, Paris;
HIS	Health Information Systems;
ICRS	Integrated Care Record Services;
IS	Informational System;
IT	Information Technology;
MR	Medical Record;
PC	Personal Computer;
PCR	Patient-Carried Record;
PHR	Personal Health Record;
PMRI	Patient Medical Record Information;
PMSI	Programme de Medicalisation du Systeme d'Information;
SYNAPSE	Système d'Information et de Pilotage de la Production de Soins et Médicale;
T2A	Système de Tarification à l'activité

*“In an attempt to arrive at the truth I have applied everywhere for information but in scarcely an instance have I been able to obtain hospital records fit for any purpose of comparison. If they could be obtained they would enable us to answer many questions. They would show subscribers how their money was being spent, what amount of good was really being done with it or whether the money was not doing mischief rather than good.”*

*Florence Nightingale, 1863*

## **1 Introduction**

The complexity of healthcare increased over the years and it became more and more likely that practitioners would not be fully informed about patients' present and previous health status and treatment. Practicing healthcare in this manner with lack of information had become a habit.

The use of modern information technologies, such as the availability of powerful computers and continuously developing software, new high-speed networks and inexpensive massive storage, along with the remarkable growth of the Internet and intranets, have led to an increase in the amount and availability of electronic health information. Physicians are bombarded with a “Brobdingnagian” amount of information, but the existent information sometimes is not systematized and well organized or it exists in a paper form, and its availability for health professionals is limited. Recently Health Information Systems (HIS) have been passed on to a qualitatively new and higher level. Thus the idea of a system that provides practitioners timely and efficient access to a patient's complete health history has become a reality.

Availability of relevant data offers tremendous opportunities such as supporting health care professionals in their day-to-day and research work, reducing clinical errors, and as a result increases the quality of health care provided. It is evident that the use of modern information technology in health care may offer also associated hazards<sup>[1]</sup>, for instance modern information systems are expensive; they may result in spending more time with the computer than with the patient, and possibly, when insufficiently designed, their failures may cause negative affects on patients and health professionals.

### **1.1 What is an Electronic Health Record?**

Electronic Health Records (EHRs) consist of software applications that provide integrated, longitudinal views of patient data. The information included in EHRs contains demographical

and health records, as a minimum. EHRs would provide several software applications in a networked environment, including clinical decision support, physician order entry, integrated communication with laboratories, imaging centers, and other facilities, and would include population health management. The Australian Electronic Health Records Taskforce Report<sup>[2]</sup> provides a definition of EHRs that includes all the components of comprehensive EHRs model: "An electronic longitudinal collection of personal health information, usually based on the individual, entered or accepted by health care providers, which can be distributed over a number of sites or aggregated at a particular source". The information is organized primarily to support continuing, efficient and quality health care. The record is under the control of the consumer and should be stored and transmitted securely.

Comprehensive, accessible Electronic Health Records have long been the "holy grail" of health information technology (IT) development<sup>[3]</sup>.

Electronic Health Records that represent electronic storage and immediate availability of information to authorized practitioners is often combined with the advantages of an electronic healthcare system, including enhanced access to medical information and greater efficiency. There are such opinions that full access to health information might bring cures for certain diseases, such as AIDS<sup>[4]</sup>.

EHRs make possible the sharing of data by electronic information exchange and lead to the uniformisation of medical documentation and better information management. A major source of medical errors is the handwriting. Medical records on a paper basis are not always properly performed and sometimes illegible prescriptions and medication orders that may result in side effects or drug interactions may occur. Even so, the key benefit of EHRs is not that they require computer entry but that they streamline processes. The most successful EHR systems improve workflow and efficiencies, enabling better management of the patient care process.

As the healthcare is getting more complex and more specialists are involved in patients' healthcare, paper records cannot keep practitioners completely informed. Records must be available electronically so that professionals can easily access and review a patient's history, including allergies and medication use, investigation and laboratory tests performed, and thereby to be able to deliver the best care possible.

There are several terms used for the electronic tools that replace paper medical records. The term EHR is accepted globally as the generic term for the vision of electronic patient care systems. Nevertheless terms such as CPR (computer-based patient record) continue to be used in some circles, adding to the confusion. The main difference between EHR and CPR is

that the first does not necessarily contain all information from pre-natal to postmortem information but focuses on relevant information for current or future care.

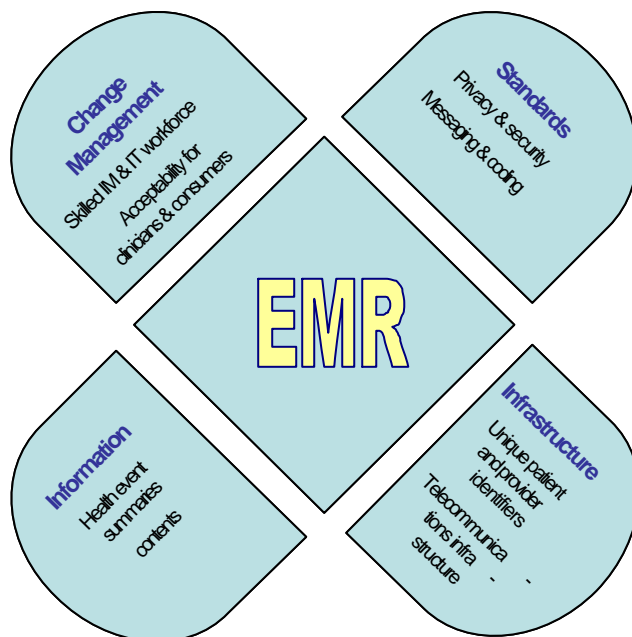
EHRs are known by various terms, each indicating a specific vision that differs from the others (see "Electronic Patient Care Terms" in the Annex 1). Some ten years ago the term computer-based patient record (CPR) was very common. Today, most provider organizations are working on electronic medical records (EMRs).

Electronic Medical Record is an electronic healthcare information record regarding one patient with full interoperability within an enterprise. An enterprise may be a clinic, hospital, health plan, or a health authority. This makes EMR different from EHR that is not limited to one health care enterprise. The goal for many providers is to create complete interoperability among the departmental systems. EMRs are based on special software linked in a networked environment between departments and services of an enterprise, and usually they are not interconnected with similar electronic systems from other enterprises.

## 1.2 Essential Components of Electronic Medical Records

Critical components and the key building blocks that have to be thought about and researched when implementing an EMR can be divided in four groups: (i) EMR standards; (ii) Infrastructure; (iii) Information; and (iv) Change Management. The EMR components are represented in the Figure 1.

**Figure 1. Components of EMRs**



The content, including both information and new functionality within an EMR, can be added to incrementally follow the implementation of the supporting infrastructure and can be dependent on requirements of separate enterprises.

## **1.3 Traditional versus Electronic Medical Records**

### **Limitations of Traditional Medical Records**

The limitations enumerated below are mostly those compared to Electronic Medical Records. Paper based medical records have a negative impact on optimization of information management in health care and as a consequence reduce productivity and quality of care provided. Productivity may decrease because paper records are often unavailable, important information may not be written on them, or the handwriting of a health professional may not be legible. The wasting of time is another important issue. The access of paper records may be a time-consuming work, since the paper can be in only one place at a time, and it can not be shared between two or more specialists from different places simultaneously.

Information in paper records are often duplicated, either by health professionals from different departments because of the lack of concordance among specialists, or during the time spans in the same department.

Paper records may also negatively influence the quality of care provided to the patient. Sometimes physicians have to deal with information regarding their patients' medications or preventive services in the form of lists or registries they have to fulfill, like problem lists or medication lists, preventive services information list, etc. The information in the registries may be sometimes duplicated and even contradictory in different lists or registries, so that the physicians may not keep track of some patients' problems and the quality of care may suffer.

Another disadvantage of paper based medical records is that they can not provide reminders for health professionals or patients that are needed for preventive services or disease monitoring. They can not also offer point-of-care decision support or support for practice guidelines, test ordering, drug prescribing, drug-drug interactions, encounter documentation and other actions.

Paper records are impediments to optimal quality assurance and quality improvement activities, and research. It is very difficult and time consuming, or sometimes impossible to get data on many process and outcome variables that are important quality markers, or data for research purpose, from paper records.



## Advantages of Electronic Medical Records

One of the most important advantages of EMRs is the accessibility of information. Searching and accessing medical information in EMRs becomes easier and less time spending. Since the information is introduced on system it can be simultaneously accessed by several authorized users in different locations connected to the network. The quality of information is also improved without the limitations such as missing pieces of data or handwriting legibility. The EMR databases could be accessed by authorized users through Internet or other telecommunication systems, so that physicians can be able to see or add their records at the hospital, at home, or even while traveling.

A survey conducted by the Medical Records Institute, Newton<sup>[5]</sup>, shows that providers rank the ability to share patient record information among healthcare practitioners and professionals within the enterprise as the number one benefit of EMRs, followed by better quality of care, improved clinical processes or workflow efficiency and clinical data capture, and reduction of medical errors.

There are also productivity advantages of EMRs. Physicians could access the information regarding the patient's history of disease before the patient's visit. Finding information in a computerized form became easier and simplified, since records can be searched and displayed by different parameters, as chronologically, by group of indicators, by problem, by provider etc. Laboratory data can be displayed in text form, in tables or graphically that is more convenient to interpret.

Electronic reminders that become available within the EMRs are very important tools which may be of great service for health professionals. Reminders can be useful in preventive services and disease monitoring. For example the system could remind when the patient should receive the next dose of medication or have a blood test.

The data entry is also simplified. Prescription writing tools can reduce the time required for medication renewals, particularly for patients taking multiple medications.

Support tools can assist professionals with direct visit note entry, eliminating both the cost and time delays inherent in dictation and transcription. Electronic records simplify the process even when charts are dictated and transcribed, since notes to be reviewed can be flagged, read, and edited electronically.

Administrative tasks are also simplified. Internal messaging within the EMR system can reduce time-consuming "phone tag" and manual chart transfers.

Electronic records could easily offer diverse type of data in the form of selected variables for quality assurance and quality improvement or for research activities. Quality assessment and improvement activities are greatly eased, since practice-level process and outcome data on clinical variables are readily accessible. EMRs could generate information reports for administrative, monitoring and evaluation purposes. Results-reporting functions can help ensure that abnormal findings are addressed.

## 1.4 The Impact of the Electronic Medical Records

*“If everyone wants EMRs and the sources of patient data are so abundant, why are EMRs so scarce?”* (Clement J. McDonald, MD)<sup>[6]</sup>

The US Institute of Medicine<sup>[7]</sup> notes that the development if EMRs should strive to improve patient safety, support the delivery of effective patient care, facilitate management of chronic conditions, improve efficiency and be feasible to implement.

Apart from some occasional contrary reports showing negative results<sup>[8, 9]</sup>, the majority of case studies from a broad spectrum of practice settings describe the successful application of EMR systems<sup>[10-12]</sup>.

The extensive use of EMRs, accessible to all professionals dealing with patient’s treatment or consultation, would substantially improve the co-ordination and quality of health care. There is increasing evidence of the clinical value of EMR systems<sup>[6, 11-16]</sup>. EMRs may provide clinical decision making support functions, particularly the capacity to promote adherence to guidelines in diagnosis, treatment and prescribing.

EMRs increase the health care efficiency by providing aggregated, regional and national data and improving co-operation between health professionals, since the EMRs give the possibility to multiple physicians to easily access the same patient’s record for purposes of consultation or cross-coverage.

Patient safety is expected to be increased and it is one of the benefits of the implementation of EMRs with electronic prescribing and reminder components. Utilization of such systems have been found to reduce the prescription costs, through encouraging generic prescribing, to reduce costs of test ordering and to improve health promotion interventions<sup>[17]</sup>.

With the implementation of EMRs more attention will be paid to primary care, towards a more holistic, proactive, disease management style of practice. There is a tendency observed worldwide towards to enable patient self-care. The possibility of accessing their health records through Internet gives the to patients new opportunities to better understand their health status and to convey the self-management skills that would make them more

effective partners. The information from EMRs accessible through internet should be specially adapted for patients. This information intelligently combined with personalized health information that is formatted to patients needs, such as patient orientated EMRs, would assist patients to make informed decisions about their care. Educated and empowered patients would increasingly demand a health care system that is high performing, consistent, safe and dependable.

There are a number of concerns regarding the use of comprehensive EMRs. One of the important concerns is the privacy of information. Some sustain that once the medical information is stored electronically it can be easily shared with many parties. Others say that there is also evidence of sharing paper based records and we do not have to be very concerned about it especially if all measures of data security are respected within EMRs systems.

Predictable high cost, time involved, training of health care professionals, and the possibility that physicians will spend more time with computers than with the patient are also concerns related to implementation of EMRs<sup>[6, 8, 15]</sup>.

Many studies demonstrate that computer-based decision making support can improve physicians' performance, and in some instances, patient outcomes<sup>[15]</sup>. Access to the latest research enhances a clinician's ability to provide evidence-based care. A list of reports show the favorable response that patients have to electronic records<sup>[15, 18-20]</sup>.

## **1.5 Physician's attitude towards EMR**

*"If electronic medical records are so great, why aren't family physicians using them?"* (Glenn A. Loomis, MD)<sup>[21]</sup>. This is the title of an article published in The Journal of Family Practice in 2002. The article is based on a study conducted in US that surveyed the differences in attitudes of doctors' using EMRs and those that do not use them. The author found considerable differences between EMR users and nonusers regarding attitudes and perceptions that impact the implementation of EMRs. Specifically, EMR nonusers exhibit the following important differences from users: (i) less perceived need for EMRs; (ii) greater concerns about EMR data entry; (iii) less confidence in the security and confidentiality of EMRs; and (iv) more concerns about the cost for installation and ongoing use of EMRs.

The implementation of EMRs may be described using the "chasm theory of marketing"<sup>[22]</sup>. The theory states that the early market of new product adopters often has different concerns in comparison with the mainstream market. This group lies apart from the mainstream, creating a chasm. Early market adopters are more willing to endure technical difficulties and

pure service to make a product work if it promises a competitive advantage, while mainstream users are more likely to look for widely used products that are inexpensive and easily assimilated into their current work environment with little organizational discomfort. Products developed for the needs of the early market are often too complex to meet the needs of mainstream users, and this is the case of EMRs. Consequently many new products are unable to cross the chasm, or considerable efforts should be done in order to convince the mainstream market to use those products. This theory may explain to some extent the slow adoption of EMRs by physicians.

Physician acceptance is crucial to widespread adoption of electronic medical records. Mazzoleni et al.<sup>[23]</sup> describe physician's satisfaction as "essential to the survival" of the system. Physicians are those that have to use the new system in their day to day work and the successfulness of an EMR in an enterprise environment depends to a great extent on their attitude. Implementations of EMRs that have failed<sup>[8]</sup> or have been plagued with difficulty<sup>[9]</sup> have often been those in which physician-users are dissatisfied.

There are many factors that can influence physicians' attitude and satisfaction towards EMRs. Among factors that may contribute or predict physician satisfaction with new EMRs are: gender, age, computer sophistication or familiarity with technology. Each of these factors may have a separate degree and direction of its influence on user satisfaction.

Other factors are related to satisfaction pertain to the user's perception of the implementation, as for instance security and confidentiality of medical information, initial EMR training. The satisfaction with a system is related to how useful it is perceived to be. Systems that are difficult to use often yield dissatisfied users. The ability of physicians to use the new system may also influence their satisfaction towards EMRs.

A successful implementation of EMRs depends much on commitment of clinical leadership. Lack of support from clinical or administrative leadership may lead to dissatisfaction with implementation of computer systems, while support by implementation staff and adequate training are factors that favor a successful implementation.

Some physicians worry about the way in with computers will affect their role as a health care provider and may express concerns that using a computer system will negatively affect the doctor-patient interaction. A question that may arise is how this relationship can be affected by the use of computer tools, in particular, Electronic Medical Record.

EMRs have been described to increase the efficiency of the physician-patient interaction, facilitating the electronic entry of information, and allowing for more timely access to information at the point of care<sup>[24]</sup>. However, other research in 2000 has shown that the

use of EMR systems may also have enduring effects on fundamental human reasoning and decision processes involved in health care<sup>[25]</sup>.

A study conducted by Patel VL et al. (2002)<sup>[26]</sup> describes the influence of EMR on traditional physician–patient communication. The authors’ opinion is that during physician–patient interaction, physicians represent medical problems mostly in terms of biomedical knowledge underlying the disease so that they capture the data from patients using their disease model. Patients represent their medical problems in terms of narrative structures of illness. While the disease is the dysfunction of the body, illness is the social and moral meaning attached to this dysfunction that involves the disruption of the patient’s normal life. The study shows that the physician–patient interview allows physicians to capture crucial aspects of the patient’s illness model, which are necessary for understanding the problem from the patients’ perspective. Use of EMR technology may lead to a loss of this relevant information.

## 1.6 Functions of an EMR

Functions that EMRs may have are sometimes confusing and not always clear because of the different existent view of professionals involved. C. Peter Waegemann (Medical Records Institute), in his status report on electronic health records<sup>[27]</sup> stated a list of ten key functions of an EMR system. These functions represent the minimum set of functionality of an EMR:

- *Recording function.* The recording function is often falsely considered the only main function of EMR. This function traditionally helped physicians to remember details about patients serving as “aide-mémoire” and continues to serve them on EMRs.
- *Sharing of information.* Since the health care systems became more complex and more health professionals are involved in the care of the same patient the exchange of information have become more and more essential. The sharing of patient medical information is important in order to reduce medical errors, to ensure a more efficient continuity of care and to increase the quality of medical care provided.
- *Order entry* is one of the most important components of an EMR.
- *Retrievability and accessing patient information* is a key component of the functionality that increases the efficiency. Particularly in cases where lots of information is stored for one patient, this function pulls together all relevant information and displays it to the health professional.
- *Built-in functionality for the key elements of health documentation.* It will not allow documentation or accessing of information that does not have unique identification of the

patient, is not accurate, is not complete, or timeless. This means that the system has interactive recording in which the user is prompted for specific information elements.

- *Authentication.* The system should identify the author of the record through device access control and seal the document after a digital signature has been attached. All the users should have their unique authentication signatures.
- *Audit activities.* The system must have a built-in way to audit all activities.
- *Overall security* must be assured within an EMR.
- *Interaction with decision support* must be provided.
- *Interoperability.* EMR system should be compatible with other systems.

## 1.7 International Trends

The United States is among countries where the use of modern information technologies in health care is very developed. However medical records are still predominantly paper based in US hospitals and primary care settings.

Although, in order to improve the quality of care and medical errors, development of electronic medical record systems has been repeatedly recommended for the wide scale use in the United States, the utilization of EMRs among Primary care physicians is still at very low level and lower than in some European countries<sup>[28]</sup>.

In 2003, the most frequent IT application used in physician offices in US was an electronic billing system. EMRs are used more frequently in hospital settings (31% in emergency departments and 29% in out-patient departments) than in primary care physicians, where the coverage is 17%.

In 2004, a plan was adopted in US with the steps needed to build a national electronic health information infrastructure with the goal of having EMR for most Americans within ten years. The main reason of the plan was to encourage health providers to use EMRs for storing clinical information<sup>[29]</sup>.

Among European countries the largest proportions of general practitioners using electronic medical records are: Sweden (90%); The Netherlands (88%); Denmark (62%); The United Kingdom (58%); Finland (56%); and Austria (55%). Only five percent of general practitioners in Portugal, nine percent in Spain and seventeen percent in Greece are using electronic medical records. The EU average is 29%<sup>[28]</sup>.

In Denmark, the National Board of Health has developed a basic information model for

electronic health record systems and for data access among EHRs. The model is process model demanding structured information based on period of care, problem orientation and cross-professional documentation. When implemented, it will be possible to follow the interventions made and assess the results achieved for a specific patient problem – regardless of which health care party provided the service. EHR systems are currently developed and implemented in several counties in Denmark by different providers. The systems are based on different information models and different technology platforms.

An Electronic Health Record Observatory was launched in 1998. The purpose of the Observatory is to support the realization of the national health IT strategy by monitoring and assessing the development, implementation and application of EMR in Danish hospitals. The Observatory focuses on implementation and dissemination issues and on questions related to integration of EMR-systems<sup>[30]</sup>.

In 2003, the Ministry of Health and Interior of Denmark approved a new IT strategy for the whole health-care sector for the period 2003 to 2007. The EHR Observatory is included in this strategy. The aims of the strategy are:

- EHRs in all hospitals by 1st January 2006;
- EHRs based on the national information model for EHR;
- Large scale national XML communication between & inside hospitals by 2005;
- Internet based secure health network by 2005;
- National health portal by 2004.

Electronic Medical Records are currently developed and implemented in regional areas the UK. The started projects are piloting different aspects of EMR development. Summaries of the lessons learned from these exercises have added to the body of knowledge about practical implementation problems and possible responses to these<sup>[15]</sup>.

The Australian Health Online Taskforce is working towards the development of national EHRs. The taskforce is charged with creating a national framework for the collecting, storing and sharing of information that will also remain flexible, able to be added to over time and useful to all the major stakeholders<sup>[2]</sup>.

Extensive work has been undertaken in Canada on a framework for EHRs. The proposed EHR system will operate by connecting many parts (interoperable), providing several options for technical requirements for implementation. I was proposed to build a system that would allow for providers to use their own existing EMRs, where they exist, and would enable the ongoing use of older existing systems, through the development of messaging standards.

## 1.8 EMR. The situation in France

### Patients information and hospitals

Hospitals in France, as in the rest of the world, produce an important volume of information, very heterogeneous, about patients and professional activity, creating specific records for every patient as a result of legal and practical procedures that are not always completely followed<sup>[31]</sup>. This information remains mainly in paper based support, and the introducing of electronic support for this information has resulted mainly in duplicating information, and constructing different databases in the same hospital, together with the development of departmental software solutions. A lot of consequent problems are shown in literature, from poor information's quality and confidentiality, to some important and avoidable problems coming from drug interaction or allergies<sup>[32]</sup>.

Clinical information organization and storage in French hospitals follows no standards. The intention of having a common minimum information set for all the system didn't succeed (dossier minimum commun), and the "programme de médicalisation du système d'information (PMSI)" has oriented clinical data collection to statistical and administrative control. Health information systems are mainly used for administrative purposes, and little for improving quality in patient's benefit<sup>[33]</sup>.

### Electronic records in hospitals

Following Degoulet<sup>[34]</sup>, development of health informatics in French hospitals had not already lead to comprehensive EMR systems in the majority of hospitals. In 2004 only less than 10 hospitals had one comprehensive electronic system to record healthcare process, integrated in its HIS (hospital information system) and linked to their area of influence. The majority of hospitals work in a fragmented system of "vertical" applications for different medical specialities. The situation is acceptable for some department like radiology, laboratory or pharmacy, but is far less acceptable for healthcare departments, especially in multi-site institutions.

Reasons for this situation:

- First experiences with EEUU products did not succeed.
- Traditional under-budgeting for health informatics in hospitals, leading to small market and a lack of comprehensive well adapted software solutions, and a big markets and



software fragmentation.

- Excessive power of professional specialities in software buying decisions, looking for specific software, without connexion among them.

Some different aspects had to be addressed in order to develop HIS able to support one EMR in its potential meaning. As Fieschi<sup>[35]</sup> emphasized, the problem is not only technical, but (mainly) cultural.

## **Government putting pressure on hospital to change their organization**

In latest years the government is developing one strategy of “healthcare modernisation” with a double objective of quality improvement and cost containment. It is changing in a significant way the context of hospitals information systems. Some of the most important for EMR development are:

**a) Patient rights on MR.** Law as clarify patient’s central role in health information management, as he is the owner of MR. Confidentiality and patient’s rights pressure EMR to perform better in terms of security of data, but in access and content too.

**b) Accreditation.** Hospital’s governmental accreditation by ANAES is paying attention to the development of HIS and EMR in some different ways, from performance to security of data or quality improvement<sup>[36]</sup>.

**c) “Hôpital 2007”.** The “Ordonnance n 2005-406 du mai 2005 simplifiant le régime juridique des établissements de santé” starts a way to promote organizational change in hospitals. New issues arise, like progressive change of hospital’s financing towards pay-for-activity basis<sup>[37]</sup>, or new possibilities of internal organization like organization by pools or increasing internal contracting<sup>[38]</sup>. All those issues produce new information needs, related to clinical activity but with different aims. This increasing and heterogeneous needs demand can only be adequately faced by more comprehensive, globally oriented information systems, that allows the production of consistent information for different purposes.

**d) “Dossier Médical Personnel” (DMP).** The law of august 2004 started one process of creating the basis for a unique EHR for every French citizen. The potential possibilities of this tool are very important, in terms of patient’s pathways and patient centred healthcare system, and maybe in terms of monetary savings<sup>[39]</sup>, but the conditions, strategy and even the philosophy of this project are very well criticized too<sup>[40]</sup>. Anyway, the expected pressure for hospitals EMR can be important in terms of connectivity, security and quality of patient’s information. Some relevant ideas about how hospitals’ HIS can be developed in order to

cope with foreseeable DMP's deployment can be finding in GMSIH's last analysis on the subject<sup>[41]</sup>.

## **EMR and patient, towards a cultural change in French Health System?**

Problems in financing public health system and the willingness of developing a quality and patient oriented health system as make French government to develop one important legislative and administrative strategy that puts pressure on information systems. Even if the success of this governmental strategy can not be taken for granted, the impact on future HIS development can be very important, promoting HIS's development in this sense that can be resumed as: patient and quality oriented, collaborative for professionals, secure and open to the healthcare system.

The challenges for hospitals where clearly shown in 2003 by Fieschi's report<sup>[35]</sup>. Last year the author resumed his vision on the subject<sup>[42]</sup>. We present a resume of his approach.

- Individuals acceding to their records it's a democratic and unavoidable principle that has health benefits.
- Quality improvement has to be associated to professionals access to information and to the access to clinical decision support tools.
- Health professionals had to be associated to strategic level definition.
- Competence level of managers on information system field as to be improved.
- The state has to play an important role in the development of open health information system, limiting both technological and organizational risks, and putting pressure on hospitals for EMR's improvement.
- Hospital budgets will have to meet development needs.
- In the medium term, professional deontology will need to include cultural aspects on information's sharing and information's quality.

## **Strategical approach for EMR implementation following the experience of Georges-Pompidou European Hospital (HEGP), from Paris**

1. A process of linking a new (global) clinical information system to hospital's organizational strategy.
2. Organizing a global clinical information system based in transversal processes. Patient record will be in the centre of clinical software applications. The architecture will be developed starting with infrastructure, middleware (for applications integration), Health ERP and to finish with speciality modules (including nursing care module).
3. Developing a common patient record as the centre of information system.

Prescription has to be organized in the same module, reaching all potential benefits of structured common application for drug, tests and nursing care.

### **1.9 The situation in CHU Rennes**

#### **The Hospital**

The Centre Hospitalier Universitaire de Rennes (CHU Rennes) is one of 26 CHU in France (excluding Paris Public Assistance Trust and overseas CHUs), and it is ranking 12th in terms of turnover and activity. This kind of public hospitals are top hospitals in terms of size, complexity of provided services and complementary activities like training and research.

CHU Rennes has six different clinical sites with 50 care units, plus one medical emergency call-centre, two industrial centres (catering and laundry), and eight paramedical schools. The budget for 2003 was 350 million euros, with 8,73% of general and hotel expenditure. In the same year the hospital had 63.700 admissions, 355.000 out-patient consultations and 70.400 emergencies, together with 21.900 surgeries, 300 transplants and 4.400 births.

The degree of complexity in this type of organizations and their role in the French public health care system make their HIS and EMR initiatives a very important issue at country level, in terms of performance and quality of care, system modernization or financing balance.

## **HIS Development Strategy**

CHU Rennes has started the definition and implementing the process of a comprehensive HIS development strategy in the last years. The level and scope of this strategy can be seen in its title: "Schéma Directeur du système d'information et charges de travail". A new project has been developed with the aim of building an integrated clinical information system in CHU Reens through establishing a number of subprojects in different areas (e-training, support functions, paraclinic services, health care integrated information system for clinical units). The name of the project is "Système d'Information et de Pilotage de la Production de Soins et Médicale" (SYNAPSE).

In the frame of the above mentioned strategy, the HIS development is being designed with the participation of top management and will need to involve clinical managers and professionals for participating through project's framework and work groups. The SYNAPSE project is at its beginning stage currently, thus it is difficult to analyze it in order to see if the strategy is having good results in terms of professionals participation and comprehensive development of HIS.

## **The EMR**

EMR is in the centre of clinical information system which SYNAPSE project wants to develop in the hospital. This EMR is based on one common EMR, shared by all professionals, and other information that will be stored and delivered by other modules, based on special needs of clinical units or non medical professionals. This EMR strategy is complemented by specific software, like for emergency ward and surgical bloc.

The electronic storage of information is not new in the hospital. Existent databases are departmental, and the capacity of this system to share information between clinical units has been weak so far. The new proposed architecture will be a great change in the way the electronic information systems exist. By implementing EMR the possibilities of sharing information among hospital sites and units became reality, so that the EMR could be able to support a more patient oriented health care process.

## **2 Purpose and Objectives of the Study**

### **2.1 Motivation**

- The Electronic Medical Records (EMRs) are considered prerequisites for the efficient delivery of high quality health care in hospitals.
- The introduction of EMRs is a general tendency in all European countries.
- The way of implementation and the time experience of using EMRs vary among countries.
- The acceptance of EMRs by health professionals is considered to be crucial for the success of its implementation.
- The University Hospital of Rennes is in the initial phase of EMR System's implementation and there is a need of highlighting the most important issues to be addressed in order to obtain good results.

### **2.2 Study Purpose**

To describe the existent situation regarding the initial steps for implementation of a common Electronic Patient Information System in University Hospital of Rennes, to identify the main challenges, and to recommend activities to be developed during the process of implementation of the project.

### **2.3 Study Objectives**

1. To describe the existent situation and experiences on EMRs in the world and in CHU Rennes;
2. To identify the key success factors for the implementation of EMR in CHU Rennes;
3. To make recommendations for a successful EMR implementation

### **2.4 Limitations**

- Limited data available on EMR in France because it is not widespread among French hospitals;
- Short time to identify properly the subject profiles among the professionals of the hospital;
- The existence of very important simultaneous organizational changes in French hospitals.

## **3 Methodology**

### **3.1 Study design and methods**

This professional study has employed a qualitative approach. It is based on collection of available data concerning implementation of EMR and critical analysis of semi-structured interviews with different health professionals (The guide for the interview in Annex 2).

The method we used is a descriptive analysis of published literature and reports, and critical analysis of interviews

### **3.2 Data Collection**

The main sources of data are:

- specialized journals (articles, reports);
- professional literature (books);
- Internet search;
- own data and knowledge;
- discussions and working with academic and field tutors;
- open debate “Colloque Parlementaire: Le dossier medical personnel” among experts in the field of Information System for Health care sector in France (conference, Paris, 13 June, 2005);
- meetings and interviews with administrative and health professionals from CHU Rennes and CHU Nice.

### **3.3 Structure of the Report**

It is composed of three parts. Each part contains special subtopics with specific objectives:

#### **Part one:**

- General information and description of current situation in the world and in France regarding EMRs implementation based on bibliographical research and literature review;
- Description of existent situation in CHU Rennes;

## **Part two:**

- Evaluation of key success factors from previous experience of EMRs implementation in different countries;
- Experts' opinion in France;
- Description of interviews conducted on health and administrative professionals and identification of the main challenges for the University Hospital of Rennes during the project of implementation of EMRs.

## **Part three:**

- discussion;
- conclusion; and
- recommendations.

## 4 Key Success Factors for Electronic Medical Record Implementation

Successfully implementing Information System (IS) and Electronic Medical Records (EMR) in health care organizations appear is a difficult task. First, implementation of EMR is a process of mutual transformation: the organization and the technology transform each other during the implementation process. When this is anticipate, EMR implementations can be strategically intended to help transform the organization. Second, such a process can only get of the ground when properly supported by both central management and future users. A top down framework for the implementation is crucial to turn user-input into a coherent controlling force, creating a solid basis for organizational transformation. Finally, the management of EMR implementation processes is a careful balancing between initiating organizational change, and drawing upon IS as a change agent, without initiate to pre-specify and control this process.

### 4.1 When is an EMR implemented successful?

A system can be a success economically: the implementation project may not have exceeded its budget, or management may have succeeded in reducing the administrative workforce by the target set in the implementation plan. “Success” could also mean that the system is up and running on time. Alternatively, it could mean not so much the real use of the system but the appreciation of this use by the users, or the appreciation of this use by those users’ managers. More specifically, for an order-entry system, a specific success measure could be a reduction in errors in medication deliveries.

Markus et al.<sup>[43]</sup> defined EMR success from several angles, including:

- Success viewed in technical terms;
- Success viewed in economic, financial or strategic terms;
- Success viewed in terms of the smooth running of proceedings of the operations;
- Success as viewed by the EMR-adopting organization’s managers and employees; and
- Success as viewed by the EMR-adopting organization’s customers.

“Success”, is a dynamic concept, not a static one. After sometimes many months or even years of hard work, managers and health care professionals alike might have changed their view about what a “successful” implementation of an EMR system might consist of.



Success, in short, has many dimensions: effectiveness, efficiency, organizational attitudes and commitment, users' satisfaction, patients' satisfaction – and not all parties in and outside of the implementing organization may agree about which dimension should be the most relevant. What is more, not all parties may agree just what the proper effectiveness measure is, or what costs and benefits should be incorporated in an evaluation of the system's efficiency. The question about the success of a system, then, becomes the question of success for whom<sup>[44]</sup>?

Implementing the EMR system is more complicated for several reasons.

- Use of system is not limited to a few well-trained administrators. With EMR, every physician will be using the system, many at the actual point-of-care as they interact with patients.
- Not only does each staff member need to be trained on the whole system, but they may be using it very differently.
- There are countless issues surrounding the conversion of existing data and charts into the new system.

The lessons learned from implementations summarized four critical factors most likely to cause sub-optimal or failed implementations. These four failure factors are:

- Unsatisfactory project management control
- Lack of communication
- Incomplete goal specifications
- Underestimation of project complexity

These factors must be considered in the context of the various stages and decision points of an EMR implementation.

In case studies of different countries such as USA, Canada, New Zealand, United Kingdom, Norway, Denmark, Sweden, Netherlands, all of which implemented the EMR system, we found that the EMR in comparable settings was viewed as a successful implementation - in organizational (hospital) context and in professionals (physicians, nurses, administrative staff) context.

## **4.2 Successful Implementation - Organizational Attitude**

## **Internal Project Leadership Team**

At the outset of EMR planning, it is important to create internal EMR committee and select the right people to serve in this important role, with a physician or office administrator in the role of chairperson. The best people for this group are the ones from each area more likely to be champions to EMR. People that will embrace change, contribute enthusiastically, and have the respect of their peers.

The goal in forming an EMR committee is dual: to gain enthusiasm throughout the working group that will spread to everyone in the practice, and to set up realistic project management processes and a group that is accountable for making sure they are followed. This committee needs to be familiar with the ultimate goals and benefits to working in a practice with a fully functional EMR system. This vision helps to carry everyone through the details making the necessary system changes.

Based on practice the project leadership team typically includes the following implementation personnel:

- EMR Implementation Manager - Coordinates the set-up of EMR. This includes coordinating the implementation meeting to better understand goals and workflow, developing installation and field-build timelines, directing training for all staff, and supporting the practice through the pre-live and post-live of EMR.
- EMR Field Engineer - Responsible for the installation and coordination of the all hardware and network configuration and responsible for ensuring critical stability. This includes being familiar with unique issues and needs, and making sure that the system is always up and running successfully.
- EMR Training Managers - Provide training to physician practices as they implement EMR. The training managers train users on the features and functionality of EMR while staying focused on the goals for the individual practice.
- EMR Client Support - Provides ongoing EMR support for practices.

All the EMR members of the team work together to ensure that options are all considered, the best decisions for practice are made, and any issues are handled as expeditiously as possible-from start to finish.

## **Communication and Motivation**

In practice not everyone is equally motivated to make the change a success. Once the leadership committee is in place, it is important to make sure that all the employees are motivated. It is important that everyone see the value from his or her own perspective. The EMR return the greater benefits when everyone is motivated to make EMR work because they see a personal benefit in their work day, not just because they have no choice.

People can handle a big change if they understand the importance of EMR implementation, and when they have the entire picture. One the thing to keep in mind is that if the end users have not seen the product demonstrated, it must be the job of the implementation team to make sure that everyone understands the benefits – the reason for the change.

Lack of communication is one of the leading causes of problems in the implementation of complex software solution. Creating a plan from the beginning to encourage good communications throughout the project make all difference.

## **Department Workflow Analyses**

The vendor and EMR committee leadership teams must have a complete understanding of the current workflow of the health care organization. It is important to understand every function of every job, to understand how tasks are accomplished prior to EMR implementation.

The internal committee with representative from every department must have educated the external implementation team on many of current task and workflow issues. The external team must educate the internal employees on the different options with the software, listen for opportunities to improve efficiency, and share ideas for different ways of doing things based on their experience in other implementations.

All medical professionals know that practices differ from one to another in a variety of ways. One cannot assume that the workflow of one department is like another. Indeed, a large part of the EMR vendor's responsibility is to listen to the internal EMR committee to understand the current practices and workflow. The result should be intelligent recommendations based on the specific needs of that practice.

## **Specific and Measurable Goals**

As the teams work together exploring current process and future options, they can better and more accurately set specific goals for required outcomes. In order to maximize the return on investment, specific goals must be established. Each department leader should have specific goals in place for their individual areas. Success must be defined ahead of time. Implementation is definitely not a matter of just setting up the software and sending in a trainer.

## **Strategy for Entering Existing Data**

Another critical factor for successful implementation an EMR system is putting together a strategy for entering the practice's old data. What portions of the existing charts are going to be included in the EMR, and how far back must go. When the decision has been made, a plan must be developed that addresses the challenge of getting this information into the new system.

The real value of an EMR system is seen when all users have access to data whenever and wherever they need it. When this happens, it is impossible for everyone not to notice the significant efficiency improvements that come from the software. The benefit of entering old data includes the ability to search and pull up the actual data quickly as well as the practical value of not having to go back and forth from paper to electronic as often or for as long of time period.

## **Sufficient Time to Training**

Training of the new EMR software should occur as part of comprehensive plan, not just time allotted on certain day for what the user thinks they want to learn. It is important to provide users with a short overview, give them the life-size picture and some details about the most often used features, and let them play with the system. One of the leading indicators of success is a familiarity with where things are located in the system, and this is only done through individual hands-on experience with the product. The greater sense of comfort a user can develop with the system and the various user interface screens before the formal training session begin the more effective that training will be.

The best EMR software packages offer a high level of flexibility to both individual offices and users. For example, some users of the same system may be interested in entering data

with pen units, while others may prefer tablet personal computers (PCs) or a computer keyboard. With the flexibility comes the need to ensure that all of these bases are covered in training. Training is crucial to successful implementation of the EMR system.

## **Ongoing Plan for Support**

One of the most important things that health care organization can accomplish as part of the training is to make sure that everyone is comfortable with most of software functions they will use most of the time, and make sure that everyone knows how to get the quickest answers if they get stuck or have question<sup>[45]</sup>.

### **4.3 Successful Implementation - Health Professional Attitude**

Introduction of an EMR in health care organizations result in changes on several levels. This includes changes for individuals and their jobs, departments as a whole, and for performance of the department's work. It also affects the structure and functioning of the entire organization, as well as the quality of both service and medical care which patients' receive<sup>[46]</sup>.

One of the largest barriers to EMR implementation and adoption is resistance from physicians, who refer to computer anxiety, increased time for orders, and decreased interaction with patients, and lack of integration with physician workflow among their primary concerns.

Health professional's acceptance plays important role in successful implementation of an EMR system. The expected benefits to all members' staff of hospital - include improved quality of care, improved information management, increased efficiency of practice, and decreased practice variability<sup>[6]</sup>.

The health professionals want to feel involved in projects that require them to change and maintain considerable effort. They need to feel benefit for their effort. If direct personal rewards seem small while requirements seem great, they need at least to believe that there is a truly compelling reason to make the change - from paper based to EMR system.

Hospital managers must understand the needs and expectations of their staff. They also should have a good understanding of their state of readiness for this innovation, and for change generally.

Credibility and support from the user community must be earned every day during and following implementation. First, the system must perform reliably. In addition, there must

be opportunity for ongoing user input. The doctors want to be heard, understood, taken seriously, acknowledged, empathized with, and responded to quickly.

Ongoing users input are necessary. These include phone, e-mail, onsite support personnel, and personal contact with members of the implementation team and vendors. User meetings are extremely helpful. These provide an opportunity for new feature announcements and introductions. More important, users learned from each other, and this can be especially effective. Informal discussions at department or work group meetings, and more formal presentations address different needs.

Continuous and immediately available user support is absolutely necessary. When clinicians are in the thick of seeing patients, they are frequently running behind, over-scheduled, and under a variety of pressures. Even momentary unavailability of the system or delayed ability to perform some task is unacceptable. If they need an answer about a hardware problem or how to perform a task such as generating an uncommon order or coding an unusual diagnosis, they want help immediately. Five minutes later is frequently too long because before then they need to be on to the next task.

## **Human Computer Interface and Potential Benefits**

The context and navigation issues discovered during different studies can be the essential attribute for a successful EMR and to the importance of efficiency. A user-friendly EMR will effectively balance information needs with screen real estate, or risk adding unnecessary burdens to clinician workflows. The EMR must support clinical workflows and have interfaces that are easy to understand and navigate. This is consistent with the studies in which physicians register a loss of overview when they are required to go to many different fields on many different screens to enter many details. Supported tasks should be time-neutral, if not timesaving, by making it easy to perform common tasks such as printing patient letters and instructions. The software must also take into account the user's entire workflow, including a variety of practice styles, and not just the workflow relating to the task at hand.

What do clinicians want most when actually start to work with the EMR? Speed and performance. The system must be fast and easy to use, and the user interface must behave systematically<sup>[47]</sup>. Users generally expect sub-second performance for most operations and will become increasingly impatient if response time exceeds 2 to 3 seconds. Clinicians of this feature can quickly glance at a selected patient's problems, medications, previous hospitalizations, notes, family history, and allergies. When clinicians perceive the time is completely non-productive, even short waits will be intolerable. The system must also

make sense in the context of the clinician's practice and workflow. Users must perceive that the system supports instead of interferes with the performance of their jobs as they define them<sup>[48]</sup>.

"Users are supportive of systems which support their work patterns, their professional status, and professional values such as impact on patient care, professional autonomy, relationship between physician and patient, and the art and science of medicine"<sup>[49]</sup>.

The issue of authority and autonomy will affect acceptance. Important questions arise: Will the EMR system enable administrators to monitor or control physician practice behaviour and decrease departmental independence or professional decision making? Is there a shift in the balance of power between health professionals and managers, between the institution and attending physicians?

Fortunately, the potential benefits of EMR system are also substantial. Communicating the potential rewards truly is important. Health professionals clearly understand the importance of readable charts and ready access to prior notes and other data. The paper record is often unavailable or unreadable or the information may be misfiled or awaiting filing. When appropriate and not overly intrusive, alerts, reminders, and decision support may improve both the quality and efficiency of the physicians and nurses.

The change is a constant today. Various constituencies in the organization see the advent of the EMR as a means to introduce or enforce policies designed to accomplish a variety of goals. New tasks for clinicians include diagnostic coding (DRG – Diagnosis Related Group), clinician order entry and prescribing, and more prevention reminders. With all the initiatives combined, clinicians find they are expected to do more in less time<sup>[50]</sup>. Successful implementers will also find ways to protect physician egos, keeping them "on board", and to plan end-stage fun (rewards)<sup>[51]</sup>.

#### **4.4 Factors influencing the successful implementation of EMRs**

Based on the EMR literature, the researchers classify the hypothesized factors into five categories (see Annex 3. Conceptual Model of EMR Implementation) with:

- 1) *Organizational environments, including top management support, effective project management, measurable goals, workflow analysis, communication and motivation*

Many studies have stressed the importance of top management support as a necessary ingredient in successful EMR implementation<sup>[52-55]</sup>.

Since EMR is a highly integrated information system, its design, implementation, and

operation require the complete cooperation of line and staff members from all departments of the hospital. Top management support can play a useful role in setting disputes and in providing clear signals to any doubts. Top management must create an environment for implementing an EMR system and obtained results and must be seen as a participant in the implementation. Top management support in EMR implementation has two main facets:

- Providing leadership; and
- Providing the necessary resources. Willingness to provide the necessary resources is another indicator of top management commitment to the EMR project. The implementation could be seriously handicapped if some of the critical resources (e.g., people, funds and equipment) are not available.

According to Dennis Lock, “project management has evolved in order to plan, coordinate and control the complex and diverse activities of modern industrial and commercial projects.” There are five major parts of project management:

- Having a formal implementation plan;
- A realistic time frame;
- Having periodic project status meetings;
- Having an effective project leader who is also a champion, and
- Having project team members who are stakeholders.

The formal project implementation plan defines project activities, commits personnel to those activities, and promotes organizational support by organizing the implementation process<sup>[56]</sup>.

Having a realistic time frame is very important. If the target completion time schedule were unrealistically short, the pressure to rush through would result in the implementation being carried out in a random manner. On the other hand, if the implementation delayed for too long, people would tend to lose faith and/or patience, which also will result in low morale and resistance. Conducting periodic project status meetings in which each team member reports progress and problems is an invaluable means for evaluating the progress of the EMR implementation. Selecting the right project leader is also important for the project implementation success.

## *2) People characteristics, including education & training, and user involvement both at system requirements definition and EMR project implementation*

Education and training refers to the process of providing management and employees with the logic and overall concepts of EMR system. Thus, people can have a better understanding



of how their jobs are related to other functional areas within the hospital. The user is the people who produce results and should be held accountable for making the system perform to expectations. The main reason for education and training is to increase the expertise and knowledge level of the people within the health care organization. Three aspects concerning the contents of training are:

- Logic and concepts of EMR;
- Features of the EMR system software; and
- Hands-on training.

Concept training shows the people why the EMR system is implemented and why changes to the EMR system are necessary, while functional training helps overcome the fear for computer systems since managerial people would fear that they are computer illiterate and they would lose power if manpower is reduced due to computerization, and the education can help overcome such fear.

User involvement refers to participation in the system development and implementation processes by representatives of the target user groups. System implementation represents a threat to users' perceptions of control over their work. User involvement is effective because it restores or enhances perceived control through participating in the whole project plan. There are two areas for user involvement when the company decides to implement an EMR system:

- User involvement in the stage of definition of the hospital EMR system needs, and
- User participation in the implementation of EMR system.

Often health care organizations do not recognize the impact of choosing the right internal employees with the right skill set. Internal resources of a hospital should not only be experts in the hospital's processes but also be aware of the knowledge of information systems application. Involving users in the stage of defining organizational information system needs can decrease their resistance to the potential EMR system, since by which users have feelings that they are the people who choose and make the decision.

### *3) Technical problems, including suitability of software & hardware and data accuracy*

Due to the lack of professional expertise and experience on developing EMR systems in-house, many health care organizations prefer to buy "off-the-shelf" systems to shorten the EMR implementation cycle. More or less they can't fully meet the organization's needs, especially when the health processes of the hospitals are unique. Thus, to increase the chance of success, management must choose software that most closely fits its

requirements. EMR vendors use different hardware platforms, databases, and operation systems and certain EMR packages are only compatible with some hospitals' databases and operation systems. Thus, health care organizations should conduct requirements analysis first to make sure what problems need to be solved and select the EMR systems that most fit their requirements. The hardware then is selected according to the specific EMR systems' requirements. Two main aspects should be cared when selecting software and hardware:

- Compatibility of software/hardware and hospital's needs;
- Ease of customization.

#### 4) *EMR vendor commitment, including vendor support*

Three dimensions of vendor support are classified:

- Service response time of the software vendor;
- Qualified consultants with knowledge ability; and
- Participation of vendor in EMR implementation.

The consultants should possess good interpersonal skills and be able to work with people. Software vendors should be carefully selected since they play a crucial part in shaping the ultimate outcome of the implementation.

#### 5) *Cultural impact including organizational culture*

Organizational culture defined by Schein<sup>[57]</sup> as “a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems”. Since organizational culture is embedded in national culture, two aspects related with organizational culture are identified to be associated with EMR implementation success:

- Conflict level of the culture embedded in the EMR package with the customer's organizational culture;
- Level of collectivism in the organizational culture.

Krumbholz and Maiden<sup>[58]</sup> claimed that the clash between the culture embedded in the EMR package and current organizational culture affects the EMR implementation success.

## 5 Expert's Group

During the morning and afternoon of June 13th one important meeting focused on new EHR national strategy took place in Paris (Republic Assembly). The meeting was organized by two congressmen, main stakeholders were invited and more than 300 expert and professional participated. This EHR strategy is addressed to have one EHR for every citizen stocked in one external server (regionally centralized). One doctor will be responsible for creating this EHR, with information from the different health organizations that have taken care of him, and with access to this information for the new professionals wherever and whenever needed, previous patient's acceptance of this access.

We use EHR concept because is not completely clear for the experts which is the name of the tool. Two possible stands for the DMP are used, even if the first one is more used, and was the title of the meeting:

- "Dossier Medical Personnel". It emphasizes both medical and patient importance.
- "Dossier Medical Partagé". It emphasizes medical and shared aspects. But is not clear if it means shared among professionals or it includes the patient.

This EHR is external, the owner is the patient, and will be constructed and used by different healthcare organizations. This instrument is not already in place, in fact it will be monitored in the near future. This EHR is not the one that we are discussing about on this paper, but, as it was stated in the conference, it will be mainly updated by patient's information coming from hospitals. So the hospital information system, and specially their EMR, has been pointed out as a key success factor for future implementation of this external EHR.

We present here different experts' opinions that were presented during this meeting and addressed different points that will be very important for near future development of EMR in hospitals. It seems that it won't be possible in the future to think about EMR in one French hospital without integrating somehow the system perspective (patient centred, secure but open system and interoperability as key aspects to be included).

### 5.1 Reasons for EMR

All experts emphasize two main reasons: quality of care improvement and healthcare costs contention. The opportunities in quality are quite common, but the expected results on costs are quite different, about quantity and about sources of cost's limitation. These reasons are the same for internal hospital EMR.

## 5.2 EMR Deployment

Experts were presenting two different approaches for the EMR deployment process:

- to develop all organizational and national information system challenges and clarifying all ethic, data security, financing and other issues before deployment of EMR.
- to proceed in a pragmatic basis, clarifying a minimum of context (legal, financial and organizational) and start sharing information, using the existing situation to improve it as the same time that it is used.

Both approaches are interesting, and it seemed that some path has to be founded between them. The debate is completely pertinent for HIS and EMR at hospital level, and the demand for an action-development strategy seem clear.

## 5.3 Limitation / success factors

All experts placed personal aspects (managers, professionals and patients) in first rank of importance, while technical aspects remains easier and related to budget allocation. Nevertheless, the limitations of actual hospital software and the constraints of actual industrial offer seems to play an important role in the current difficulties faced by hospitals in trying to adapt clinical consistent and easy-to-use EMR software to the daily activity of their professionals. In the same orientation, the industry accepts that the development of new electronic tools for sharing information and processing this information is needed.

Experts, from different positions, ask for a participative process that enables professionals to believe in EMR as a real tool for quality improvement from a clinical point of view, and to accept a progressively open and shared clinical information system, so called patient centred information system. Some ideas are presented, some of them reflecting positive things while other showing problems to face:

- French doctors are used to informatics.
- Health professionals feel the need of easier shared information.
- Health professionals are the users of EMRs, so their needs and visions had to be taken into account, in terms of clinical needs, information sharing needs, ergonomics and complementary tools.
- While implementing new EMR, professional's training needs and changes in workload has to be taken into account.
- The current HIS in hospitals, based on speciality software, had to change to HIS patient

based, so more care process oriented and with a more active patient's role.

- The current HIS in hospitals are too oriented to administrative and financial needs. The administrative information needs have to let room for clinical information needs as main orientation for EMR architecture design.
- Current MR are mainly paper based and medical speciality oriented. The lack of relevant information in paper MR is too important, and the sharing of information very limited. The need for a cultural change is clear, EMR can only be a tool for that purpose, and the standardization of paper based information a good way to start this process.
- Health authorities had to organize a comprehensive framework for EMR development, putting pressure and helping professionals and industry to speed up the process in a more practical and consistent way.

## **6 Interviews**

As it has been explained in methodology section, information was gathered among hospital's professionals by semi-structured interviews. After defining objectives and possibilities, and reaching professionals thru direction office, 8 interviews were conducted with CHU Rennes professionals. Those persons were linked somehow with "SYNAPSE" project or some other activities related to the clinical information's standardization or the development of HIS in the hospital.

Those persons were mainly professionals with administrative roles or clinicians with some administrative responsibilities. We present a resume of their opinions as it was stated in the interviews, grouped by concepts. The opinions will be discussed in the following chapter.

### **6.1 EMR concept**

The majority of interviewees doesn't make clear distinction between EMR as a repository for medical intervention's information related to one patient, and the electronic tools for developing those action linked to care.

### **6.2 Current situation**

#### **Current problems**

"There are separate databases for different departments in the hospital. Limit of accessibility of medical information. Especially availability of information on patients who have been hospitalized before".

"The information on patients is updated in a weekly basis and it is not synchronized between services."

"The statement of medical activities in patient's records is still poor in the hospital, even in paper format. This is a cultural problem that has to be addressed."

"We have limitations in software and hardware if we want to develop a hospital EMR".

#### **Process situation**

"The working group (on clinical information standardization for MR) is assessing the content

of a common list of items to be included in patient's record, and the rest will be builded in specialties modules, developed by every department."

"We have the ANAES guide that provide a frame for developing the shared contents or our EMR, and the willingness to build up an EMR without doubling patient's information."

"Lack of participation among professionals in the process of designing a patient record."

"The process of developing standardized information before starting an EMR is a good way to improve (quality and access to data), but too slow and with insufficient results until now."

"The process needs an element of decision from the top management level, in order to speed up the process. The reflection among professionals won't be enough."

## **6.3 Ideal HIS**

### **Characteristics**

"Avoiding the risks, used (if not...), help for decision making (clinical and managerial), help assessment, that can evolve, comprehensive, that can help the cultural change (sharing information among departments and professionals)."

"Should be easy to implement and especially easy to use for health professionals and hospital managers."

"Good and fast interface, using latest tools to introduce information, helping clinical decision tools (like warnings), standardizing procedures and limiting administrative workload; open system, with good links between modules allowing interaction between different professionals; information's and user's trazability."

### **Advantages**

"HIS has to help professionals in their activities, offering new possibilities for quality improvement and assessment, starting from self-assessment."

"Advantages will be different for different professional profiles and duties:

Physician: it saves time, its safer, the quality (technical and perceived) will increase.

Clinical manager: it can help to better manage the team, homogenize practices, cost

management, and that it is a need of having management tools for pools, because of the size (professionals and budget).”

“To get information as quickly as possible; to decrease the number of investigations (less cost) and to increase the quality of care.”

“Increase the efficiency of the health care provided by health professionals. More tools to be used in hospital management.”

## **Problems**

“More problems for doctors in court, because of easier access to clinical information”.

“The patient have the right to access the information in their EMR, but we have to think how we made it possible and how we can solve the problems that can arise.”

“Some professional will have problems because lack of computer skills. In fact, EMR will be better used with future generations of professionals”.

“The patient-doctor relationship will change, and issues related to patient’s confidentiality and professional secret may arise.”

“There is a need of new and important investment.”

## **6.4 Expected results**

“a) The possibility of getting information on patients who have been transferred from other hospital units. b) Prompt information on patients hospitalized in the past. c) No need to perform unnecessary repeated investigations.”

“a) Better management of patient; b) Accessibility of information; c) Improved practice; d) More time spent with patient”.

“a) Easier for health professionals (doctors, nurses), because the information regarding patients would be available and accessible among services; b) Gain in time and efficiency; c) Security of data; d) More information is going to be collected; e) money saving; f) increasing of quality of care.”

“We will have more disaggregate information which we can use in order to conduct an activity reform that will let to save money”.



## Challenges for CHU Rennes

“To make chiefs services aware that they can benefit a lot from that instrument in order to manage pools.”

“Professionals are not really aware about the situation and they don't think there is an strategic problem on that. They are starting to better understand the need for improvement on health information because of accreditation process and the legislative process in the country and, lately, the DMP (dossier medical partagé) but we have to think about that.”

“Professionals may be reluctant to change, so they must feel themselves that this project is their project.”

“Some doctors will need to accept and to learn to work in a more open environment.”

“Access to the information has to be possible for all doctors treating the same patient, and access to information for other professionals has to be defined”. “Trazability of EMR access and evaluation of access has to be implemented and seen as a good way of ensuring the adequate use of professionals' access rights.”

## 7 Discussion

### The interviewees

The interviewees were all hospital professionals, all involved more or less directly in the process. It seems that their professional background and professional position are consistently related with their approach to the situation and their expectative. All interviewees are concerned about the professionals' future response to the use of EMR. Their opinion about what is more important for this purpose varies, but shows a common path, based on the clinical orientation of new HIS and EMR.

### The concept of EMR

As we stated in results, interviewees doesn't have a precise concept of EMR, but they know pretty well what they expect from it. We found the same situation in literature.

EMR can be perceived as a part of one more global concept, as it has been explained in the introduction. This is the concept used in CHU Rennes. In this conceptual basis EMR describe strictly the storage and access to all information about one patient's health and medical treatments received. Despite of its concrete scope, this concept is useful for engineers and HIS development managers, but it's not relevant for professionals, in two different ways:

- It doesn't refer to the use of information in care process. For professionals the access to information is important, but how this information is generated and re-elaborated is even more important, so performance on reports and prescription production, for example.
- It doesn't identify other professional's activity, even if they may need some connexion between modules (as medical prescription and nursing care).

So the way it is connected with the rest of the components of EHR is crucial in order to present it to the future users and to have their engagement in the project.

EMR is used too in the literature as a concept referring to all components of one patient clinical record. This approach takes the part for the all but its quite common. It seems to be the most accepted expert's opinion that patient centred clinical records are the most effective and the most desirable tools to ensure patient's safety and clinical pathways, and at the

same time to respect patient's privacy rights<sup>[34]</sup>.

We have found that the way interviewees approach the concept of EMR is linked to their approach of the project and what is important to develop EMR in CHU Rennes. We can expect clinicians' point of view near to interviewees who see EMR as a central tool for their work, linking access to patient's previous health data and health care previous actions, with clinical decision and prescription tools and easy management of patient's visits. So EMR is not seen as an information storage, but as a multi-task working tool. Current situation is seen as a difficulty for improving quality, and data access and its trazability, prescription or activity planning are parts of an EMR.

French law defines precisely which kind of documents constitute the MR, following the process of care in a hospital, and including the care provided not only by doctors but by nurses too. The public organism in charge of quality assessment and accreditation don't use "medical record" but "patient record" in "order to avoid the risk of understanding that medical record only belongs to doctors"<sup>[31]</sup>. So the content is not the problem, but change's organization. The legal and administrative context makes it something difficult to avoid, even for the near future, but it will be complex, so a pragmatic approach is necessary.

## **The ideal HIS**

Hospital information system is not seen as a new information's storage that can improve security and access to information, but a new technical way to change the provision of health services in the hospital. This change is related to quality of care (patients' safety and supported professional's decisions), improving the way professionals work together, and producing clinically acceptable ways of cutting costs (redundancies in tests). The references to an improvement of administrative control are marginal, and the global picture of interviewee's opinions is a HIS that puts the patient in the centre, following the positions seen two years ago in Fieschi's rapport<sup>[35]</sup>.

The general interest on data security is clear among politicians, experts and interviewees, as we have seen in results. One open approach seems the best way to ensure good utilization<sup>[59]</sup>. It is based on external security (protection against unaccepted access to data) and internal "trazability" (possibility to assess users' access to data).

## The situation in the hospital

The problems described by interviews follow experts explanations both in literature and in Paris meeting (point 2 of results). They are unavoidable but not impossible to improve, as some French experiences show<sup>[60]</sup>.

The way the issue has been developed in the hospital has different opinions among interviewees, but all thinks that it has been too slow and as no already involve the majority or health professionals in the hospital. These two issues seem very important in order to address the next steps of HIS implementation.

All interviewees think that the process of introducing EMR has started with a good orientation: first address the problem of MR's contents standardization. This issue was clearly pointed out in expert's meeting on DMP.

## The challenges

Challenges for CHU Rennes are mostly common from what we have seen in the literature. The only specific challenge is the one related to the current situation if we compare it with project's time schedule or next accreditation group visit. The speed of the process and the limited amount of results make one interview to think about introducing some external decisions, coming from top management level. It is in line with some studies and experts opinions that shows the need of a practical direction's involvement to lead change in the organizations, tacking risks and looking for professionals involvement at the same time<sup>[34, 35, 61]</sup>.

The other challenges presented by interviews are well known in literature, and seem to be especially relevant in French hospitals. The culture of limited information in MR, the fears about confidentiality and access to "professional information", or the needs for hardware and software are extensively explained in previous parts of this document. The clinical approach and professionals involvement and project's appropriation seems key issues for having professionals support. This is a clear conclusion of expert's group (point 2 of results).

Challenges related to professionals have two interesting different points:

- Chief Department Directors as a collective with specific point of view and specific needs, especially new pools' directors. But, at the same time, as a key target group for implementation success.

- Professionals seem to be out of the process, and with little awareness of the strategical importance of EMR and HIS for their future professional life and for their hospital. This is something that has been criticized in general managers perspective in France<sup>[34, 35]</sup>.

Finally we can said that we have think about success factors in EMR's design and implementation planning process, but is important to think about EMR's assessment (users satisfaction and healthcare quality improvement). In CHU Rennes, as in all other hospitals, a good balance has to be founded between thinking and discussing and tacking decisions. One good complementary process seems to be measuring the impact, and concrete methodologies should be used for that purpose. The experiences analyzed where many, here we present one Canadian example<sup>[62]</sup>.

They used two different series of success determinants, based on quality (HIS quality, information's quality and technical support to users) and the second one based on satisfaction (global HIS users satisfaction and utilization). It will be extremely important to find creative and consistent ways of assessing EMR's performance in order to follow the development of one open tool like this that will need professionals' acceptance and a continuous improvement process.

## 8 Limitations

### 8.1 Limitations in qualitative information gathering

We didn't interview professionals having at the same time three important characteristics for the subject:

1. clinicians working in the hospital and without any link with the project.
2. clinicians without administrative responsibilities.
3. clinicians with low research activities.

These three characteristics can define the group of professionals that are not participating in the process of clinical information standardization and that will be only working in patient care (no special need of statistics). Those professionals will use EMR only the context of patient care. They will be the majority of the EMR users, and they are not represented among the interviewees. We can call this group "users" for the only purpose of this explanation.

The nature and the limitations of our study made difficult to approach this big and heterogeneous collective. Some contacts were made, but finally no interview was achieved. So we are addressing the subject as it is perceived by the people who are dealing with the firsts steps of it, focusing the interest of this study.

Nevertheless, we saw how different interviewees were concerned about the potential response of this "users", and how to have their participation in future use of the EMR when it will be in place. So our approach is based on interviewee's expectations about professional's response and future appropriation of this tool, but the direct research on their opinions is not integrated in this study, and it will need another study. For that purpose, the opinions of the interviewees seem an interesting point of start, because it shows how this issue is currently addressed and which kind of problems are already expected.

## 9 Conclusions

The benefits of implementation of an EMR system in CHU Rennes are obvious both for patients and health professionals. Access to the information, increased safety and quality of care are the main positive aspects of EMR from the perspective of patient health. With the implementation of an EMR the health professionals will gain from the possibility to share health information regarding the patient among departments and sites. Elimination of order duplication and implementation of electronic reminders will make health care provided more efficient and cost effective. Availability of data will help clinical researchers, quality assurance and clinic managers, as well as financial managers, in their activities, making their work more efficient and resources allocation more consistent with clinical decision.

After the professional study conducted by our group on Electronic Medical Record implementation in the CHU Rennes we came to some conclusions regarding the possible key factors that could influence the successful implementation of the EMR in this hospital. From the information about this topic available in the literature as well as from the interviews conducted by us during the present study we found a large list of elements that can act as success factors in CHU Rennes ongoing process.

The factors are grouped in six categories representing different areas or activities involved in this process.

### 9.1 Context factors

The Health care modernization governmental strategy is influencing the way hospitals are developing their information systems. Different laws and administrative procedures are requiring from hospitals for more information, more integrated and with different purposes. New HIS will have to be able to deal with those increasing needs.

Main issues provoking this tendency are:

- Accreditation;
- DMP (EHR);
- T2A.

### 9.2 SYNAPSE Project implementation

The well organized and integrated project would lead to successful implementation of the EMR. This kind of project is very complex and good results can not be achieved without

big efforts of all professionals involved. A good strategy followed with perseverance is a minimum required for that. The following factors are important in our opinion to achieve this result from the project implementation perspective:

- Effective project planning;
- Availability of financial resources;
- Proper organization of human and financial resources;
- Realistic time frame;
- Adequate organization of activities within the project;
- Good internal communication;
- Project perspective (ensuring minimum results in all subprojects);
- Project monitoring and evaluation;
- Clear decision making mechanism;
- Standardization of the information to be included in EMR;

### **9.3 Technical issues**

#### **Software Issues**

Software availability can be a limiting factor for HIS development. Available software on the market doesn't always meet all hospital's requirements, so hospitals can decide to stick for customized software applications that may have different limitations. The following factors may be categorized to this group of issues:

- Software market offer;
- Capacity of vendor provider to develop the proper software according to the needs of the hospital;
- Updating of software;
- Software following international communication standards.

#### **System performance issues**

Acceptability of an EMR by health care professionals is very often influenced by technical characteristics of the system. The way how the new system is perceived by physicians is mainly linked with system's speed and reliability, stability and security issues. All these

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factors, that are enumerated below could influence the professional's opinion that is considered to be one of the main aspect of a successful implementation.

- System easy to access and use;
- System able to evolve;
- Hardware performance;
- Upgrading of hardware;
- Professional identification;
- Patient identification;
- Security assurance.

## **Electronic tools**

Putting in place proper electronic tools with a good training and explanation may increase the acceptance and interest of physicians by benefits of these instruments, that can help them saving time, can decrease the number of errors and finally improve the quality and efficiency of care. Some of these tools are the following:

- Prescription, decision support, external access, reminders;
- Document automation;
- Electronic tools for clinical management;
- Applications for training and research purposes.

## **9.4 Factors related to professionals**

Computer literacy among health care professionals is becoming more and more common and it will increase in the future. The physicians that have little knowledge on information systems are more likely to have a negative attitude to the new system and by conducting training activities within the project their resistance can be decreased. The project has to take into account professionals' concerns and needs which are different among specialties. The information regarding the evolution of project activities and decisions should be presented to health professionals in a good and clear way in order to increase their credibility. Professional's participation in the process of developing the EMR has to be easy for them. Professionals' involvement has to produce concrete outputs that they could recognize. The described factors are in the list below:

- Positive attitudes of professionals towards IT technology;
- Training of professionals;
- Informed professionals;
- Involved professionals.

## **9.5 Factors related to hospital managers**

The top management support and attitude is playing an important role in setting disputes and in providing clear signals to any doubts. The management must create a good environment for implementing the EMR system.

- Top management leadership;
- Managers' attitudes to the project.

## **9.6 Factors related to patients**

The patient is the owner of his medical record that is stated by law in France. The recognition of the patient's rights may influence the development of the EMR system. The attitude of the patient can be influenced by the possibility of accessing his or her health information from EMR. This is also an important point that may contribute to faster developing of an EHR at national level. The factors related to patients are:

- Adapted access for patient
- Good patient attitude
- Informed patients about the new system

## 10 Recommendations

1. To ensure top management leadership of the project giving concrete signals and following up the process.
2. To develop a communication strategy in order to increase the knowledge of professionals at all levels in the hospital and to open ways of their better involvement.
3. To conduct one survey among professionals to assess their opinions and needs at this stage of the process.
4. To introduce some new working procedures for working groups introducing deadlines for their decisions.
5. Better cooperation with software vendors to match expectation and deadlines of both sides.
6. To define one strategy in order to obtain the commitment to the project of chiefs of hospital units.
7. To elaborate one strategy to ensure an acceptable development of all subprojects following the planning of the project.
8. To favor the interaction of patients' associations and working groups on the project.
9. To develop a monitoring and evaluation system adapted to the project's characteristics and its objectives.

# Annexes

## Annex 1. Electronic Patient Care Terms

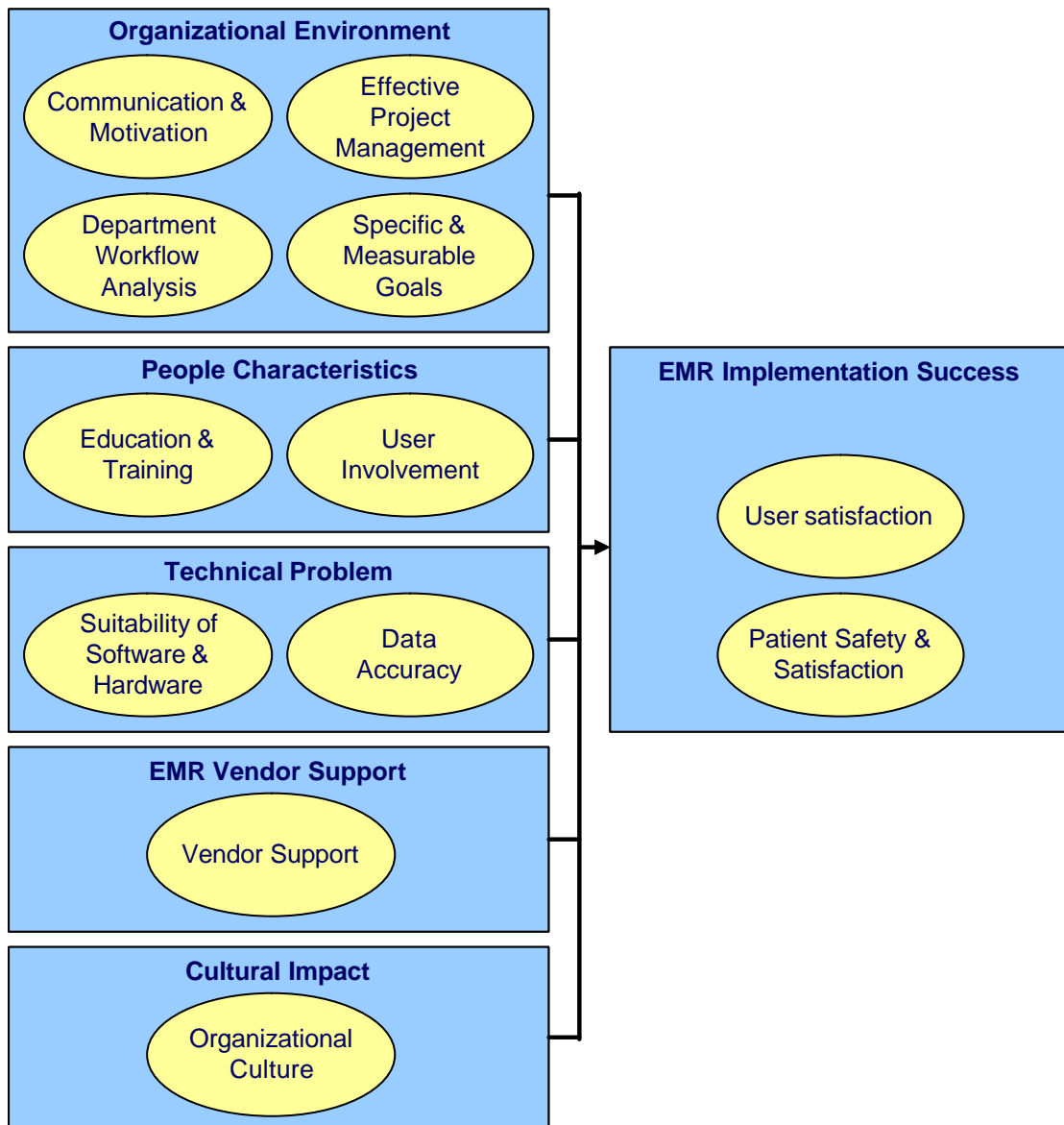
- EHR** (*electronic health record*) - Generic term for all electronic patient care systems;
- CPR** (*computer-based patient record*) - Lifetime patient record that includes all information from all specialties (even dentist, psychiatrist) and requires full interoperability (potentially internationally); unlikely to be achieved in foreseeable future;
- PCR** (*patient-carried record*) - All information contained on a token or card that patient carries;
- CMR** (*computerized medical record*) - Any document imaging-based system;
- EPR** (*electronic patient record*) - Similar to CPR but not necessarily containing a lifetime record and not including dental, behavioral, or alternative care; focuses on relevant information;
- EMR** (*electronic medical record*) - Electronic record with full interoperability within an enterprise (hospital, clinic, practice);
- DMR** (*digital medical record*) - Web-based patient record using "pull" technology (minimum of messages);
- PMRI** (*patient medical record information*) - Used in Department of Health and Human Services/National Committee on Vital and Health Statistics language;
- PHR** (*personal health record*) - Managed and controlled by patient, mostly Web-based;
- ICRS** (*integrated care record services*) - Term used in United Kingdom.

## **Annex 2. Guide for the interview**

### **Main points addressed during the interview with different professionals in CHU-Rennes:**

1. Professional characteristics
2. Participation in processes linked to the new Information System
  - 2.1. Issues
    - 2.1.1. Electronic Medical Records;
    - 2.1.2. Accounting for clinical activities;
    - 2.1.3. Nursing care;
    - 2.1.4. Other.
  - 2.2. Opinion regarding:
    - 2.2.1. Process;
    - 2.2.2. Current results;
    - 2.2.3. Expected results.
3. Clinical information (opinions):
  - 3.1. Standardization of medical information;
  - 3.2. Shearing of information (what kind of information and how the information will be shared);
  - 3.3. Security of data;
  - 3.4. Access to the information (who will be able to access and what kind of information);
  - 3.5. Relation between clinical and administrative information (needs and possibilities).
4. The Ideal Health Information System (HIS)
  - 4.1. How it should be?
  - 4.2. To what extent can a good HIS help professionals in their activities?
5. Expectations regarding the new information system:
  - 5.1. What are the main positive aspects?
  - 5.2. What are the possible weaknesses?
6. Challenges for CHU-Rennes
  - 6.1. in the designing of an Integrated Information System;
  - 6.2. in the implementation of Electronic Medical Records;
  - 6.3. the main concerns of professionals in the hospital about these processes.

### Annex 3. Conceptual Model of EMR Implementation



## References

1. Rigby M. *Evaluation: 16 Powerful Reasons Why Not to Do It - And 6 Over-Riding Imperatives*. Amsterdam 2001.
2. Care AA. *Health Information Network for Australia: National Electronic Health Records Taskforce Report*. Canberra: Australian Department of Health and Aged Care; 2000.
3. Benson T. *Why general practitioners use computers and hospital doctors do not - Part 1: incentives*. BMJ. 2002; 325: 1086–1089.
4. Waegemann CP. *EHR vs. CPR vs. EMR*. Healthcare Informatics. May 2003.
5. Medical Records Institute. *Survey on EHR Trends and Usage*. 2002 [Cited: 17 May, 2005]; <http://www.medrecinst.com/resources/survey2002/index.shtml>
6. McDonald CJ. *The barriers to electronic medical record systems and how to overcome them*. J Am Med Inform Assoc. 1997; 4: 213-221.
7. *Key Capabilities of an Electronic Health Record System*: US National Institute of Medicine; 2001.
8. Lawler F, Cacy JR, Viviani N. *Implementation and termination of a computerized medical information system*. J Fam Pract. 1996; 42: 233-236.
9. Wager K, Lee FW, White AW. *Life After a Disastrous Electronic Medical Record Implementation: One Clinic's Experience*. Idea Group Publishing. 2002.
10. Brenner S. *High tech solutions double productivity for local solo family practice*. MD News. 1996.
11. Ornstein SM, Garr DR, Jenkins RG. *A comprehensive micro computer-based medical records system with sophisticated preventive services features for the family physician*. J Am Board Fam Pract. 1993; 6: 55-60.
12. Churgin PG. *Introduction of an automated medical record at an HMO clinic*. MD Comput. 1994; 11 (5): 293-300.
13. Balas E, Austin SM, Mitchell JA. *The clinical value of computerized information services. A review of 98 randomized clinical trials*. Arch Fam Med. 1996; 5: 271-278.
14. Mitchell E, Sullivan F. *A descriptive feast but an evaluative famine: systematic review of published articles on primary care computing during 1980–97*. BMJ. 2001; 322: 279–282.
15. Bates DW, Gawande AA. *Improving Safety with Information Technology*. N Engl J Med. 2003; 348 (25): 2526–2534.
16. Wager KA, Ornstein SM, Jenkins RG. *Perceived value of computer-based patient records among clinician users*. MD Comput. 1997; 14: 334-336, 338, 340.
17. Kerr K. *Creating Quality in Primary Health Care Using Electronic Health Records*. Health Care & Informatics Review Online; 2004.
18. Ornstein S, Bearden A. *Patient perspectives on computer-based medical records*. J Fam Pract. 1994; 38: 606-610.
19. Legler JD, Oates R. *Patients' reactions to physician use of a computerized medical record system during clinical encounters*. J Fam Pract. 1993; 37: 2414.
20. Solomon GL, Dechter M. *Are patients pleased with computer use in the examination room?* J Fam Pract. 1995; 41: 241-244.
21. Loomis GA, Ries JS, Saywell RM. *If electronic medical records are so great, why aren't family physicians using them?* 2002; 51 (7).
22. Moore G. *Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Consumers*. New York: Harper Business. 1999.

23. Mazzoleni MC, Baiardi P, Giorgi I, Franchi G, Marconi R, Cortesi M. *Assessing users' satisfaction through perception of usefulness and ease of use in the daily interaction with a hospital information system*. Paper presented at: Proc AMIA Annu Fall Symp., 1996.
24. National Research Council. *For the record: Protecting electronic health information*. Washington, DC: 1997.
25. Patel VL, Kushniruk AW, Yang S, Yale JF. *Impact of a computerized patient record system of medical data collection, organization and reasoning*. JAMIA. 2000; 7 (6): 569-585.
26. Patel VL, Arocha JF, Kushniruk AW. *Patients' and physicians' understanding of health and biomedical concepts: relationship to the design of EMR systems*. Journal of Biomedical Informatics. 2002; 35: 8-16.
27. Waegemann CP. *Status Report 2002: Electronic Health Records*: Medical Records Institute; 2002.
28. Taylor H, Leitman R. *European Physicians Especially in Sweden, Netherlands and Denmark, Lead U.S. in Use of Electronic Medical Records*. Health Care news. 2002; 2 (16).
29. Catharine W, Burt ED, Esther H. *Use of Computerized Clinical Support Systems in Medical Settings: United States, 2001-03*. Centers for Disease Control and Prevention. National Center for Health Statistics. March 15, 2005.
30. Bernsteina K, Bruun-Rasmussena M. *Modelling and implementing Electronic Health Records in Denmark*; 2004.
31. ANAES. *SERVICE ÉVALUATION DES PRATIQUES. Dossier du patient: amélioration de la qualité de la tenue et du contenu - Réglementation et recommandations 11/2003*.
32. Penciolelli J, Duvaux C. *L'hôpital communicant (2ème partie) - Dossier médical personnel et iatrogénie médicamenteuse*. GESTIONS HOSPITALIERES. 2005; 01: 45-49.
33. Cecchi-Tenerini R, Laffon F, Laroque M. *Evaluation du système d'information des professionnels de santé. Rapport 2002-142 de l'Inspection Générale des Affaires Sociales 09/2002*.
34. Degoulet P, Fagon J. *L'hôpital communicant (1ère partie) - Stratégies de mise en oeuvre des systèmes d'information cliniques*. GESTIONS HOSPITALIERES. 2004; 12: 793-800.
35. Fieschi M. *Les données du patient partagées: la culture du partage et de la qualité des informations pour améliorer la qualité des soins. Rapport au ministre de la santé de la famille et des personnes handicapées*. 01/2003.
36. ANAES, Direction de l'Accréditation et de l'Évaluation des Pratiques. *Manuel d'Accréditation des établissements de santé. 2ème procédure d'accréditation. 11/ 2004*. ANAES Service de Communication. St-Denis La Plaine. 2004.
37. Martin H, Lehalle D, Banga B. *Qui a peur de la tarification à l'activité?* DECISION SANTE - STRATEGIE SANTE. 2003; 10 (198): 8-13.
38. Caillet R, Crie D. *Organisation par pôles de l'hôpital public. Réflexions pour l'hôpital 2007*. GESTIONS HOSPITALIERES. 2004; 10 (439): 596-602.
39. Durand-Zaleski I, Degoulet P, Depinoy D. *Dossier médical personnel: du projet à la réalité. (numero spécial)*. BULLETIN DE L'ORDRE DES MEDECINS. 2005; 3 (03).
40. *Le blog du dossier médical personnel*. [Cited: 18 May, 2005]; [http://www.dossier-medical.info/medical\\_patient\\_sante/dossier\\_sant\\_france/index.html](http://www.dossier-medical.info/medical_patient_sante/dossier_sant_france/index.html)
41. Bourquard K, Lovel E, Nini W. *Etude de l'alimentation et la consultation du DMP par les établissements de santé. Version 1.0 Validé 31/03/05*. GSMIH.
42. Fieschi M. *Hôpital communicant et système d'information. L'air et la chanson*. Gestions hospitalières. 2005; 01 (441): 762-768.
43. Markus ML, S A, D P, C T. *Learning from adopters' experience with EPR: problems encountered and success achieved*. Journal of Information Technology. 2000; 15:245-265.
44. Berg M. *Implementing information systems in health care organizations: myths and challenges*. Int J Med Inform. 2001; 64 (2-3): 143-156.



45. *Critical Success Factors for Practice-Wide EMR Implementations: Ten Steps to Maximize ROI*. [Cited: 24 May, 2005]; <http://www.misyshealthcare.com/Products/product+portfolio/whitepapers.htm>
46. Anderson JG, Aydin CE, Jay SJ. *Evaluating Health Care Information Systems: Methods and Applications*, Thousand Oaks, CA. Sage Publications, Inc. 1994: 7-8.
47. Sittig DF, Stead WW. *Computer-based physician order entry: the state of the art*. J Am Med Inform Assoc. 1994; 1: 108-123.
48. Kaplan B, Duchon D. *Combining qualitative and quantitative methods in information systems research: a case study*. MIS Quarterly. 1988; 12: 571-586.
49. Kaplan B. *Reducing barriers to physician data entry for computer-based patient records*. Top Health Inf Manage. 1994; 15: 24-34.
50. Krall MA. *Achieving Clinician Use and Acceptance of the Electronic Medical Record*. The Premanente Journal. 1998.
51. Lorenzi NM, Riley RT. *Organizational Aspects of Health Informatics: Managing Technological Change*. New York: Springer-Verlag. 1995.
52. Sum C, Yang K. *A Study on Manufacturing Resource Planning (MRP II) Practices in Singapore*. Omega. 1992; 21 (2): 187- 197.
53. Ang JSK, Sum CC, Chung WF. *Critical Success Factors in Implementing MRP and Government Assistance*. Information and Management. 1995; 29: 63-70.
54. Bingi P, Sharma MK, Godla JK. *Critical Issues Affecting an ERP Implementation*. Information Systems Management. 1999: 7-14.
55. Duchessi P, Schaninger CM, Hobbs DR. *Implementing a Manufacturing Planning and Control Information System*. Strategy and Organization. 1999: 75-91.
56. Sum C, Ang JSK, Yeo LN. *Contextual Elements of Critical Success Factors in MRP Implementation*. Production and Inventory Management Journal. 1997; 3: 77-83.
57. Schein EH. *Organizational Culture and Leadership*. Jossey-Bass, San Francisco. 1992.
58. Krumbholz M, Maiden N. *The Implementation of Enterprise Resource Planning Packages in Different Organizational and National Cultures*. Information Systems Management. 2001; 26: 185-204.
59. Trouessin G. *L'hôpital communicant (2ème partie) - Bâtir la confiance dans les systèmes d'information et de communication hospitaliers*. GESTIONS HOSPITALIERES. 2005; 01: 19-25.
60. *Des expérimentations pilotes. (numero spécial)*. BULLETIN DE L'ORDRE DES MEDECINS. 2005; 3 (03).
61. Charpentier P. *Les formes du management: La gestion du changement dans les organisations*. CAHIERS FRANÇAIS. 2004; (321): 29-36.
62. Sicotte C, Moreault M-P, Paré G. *La mesure du succès en matière de déploiement de Système d'information clinique*. Journées Francophones d'Informatique Médicale. Lille 12-13 mai 2005.

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## KEY SUCCESS FACTORS IN IMPLEMENTING ELECTRONIC MEDICAL RECORDS IN UNIVERSITY HOSPITAL OF RENNES

**Abstract:** An electronic Medical Record (EMR) is not just the future of Health care; it is the solution for high efficiency Health care today. Evidence suggests that implementation and adoption of EMR in the health care organizations are considered prerequisites for the efficient delivery of high quality health care in hospitals, and a positive return on investment for the practice.

**Study Objectives:** To describe the existent situation and experiences on EMRs in the world and in CHU Rennes; To identify the key success factors for the implementation of EMR in CHU Rennes; To make recommendations for a successful EMR implementation.

**Purpose of the study:** To describe the existent situation regarding the initial steps for implementation of a common Electronic Patient Information System in University Hospital of Rennes, to identify the main challenges, and to recommend activities to be developed during the process of implementation of the project.

**Design and method:** This professional study has employed a qualitative approach. It is based on collection of available data concerning implementation of EMR and critical analysis of semi-structured interviews with different health professionals.

The method we used is a descriptive analysis of published literature and reports, and critical analysis of interviews.

**Conclusions:** The benefits of implementation of an EMR system in CHU Rennes are obvious both for patients and health professionals. Access to the information, increased safety and quality of care are the main positive aspects of EMR from the prospective of patient health. With the implementation of an EMR the health professionals from CHU Rennes will gain from the possibility to share health information regarding the patient among departments and sites. Elimination of order duplication and implementation of electronic reminders will make health care provided more efficient and cost effective. Availability of data will help clinical researchers, quality assurance and clinic managers, as well as financial managers, in their activities, making their work more efficient and resources allocation more consistent with clinical decision.

**Key words:** Electronic Medical Records, Electronic Health Records, Hospital Information System, CHU Rennes, Success Factors, Patients, Quality of Care.

***The opinions expressed in the memoranda are not necessarily those of the schools that are members of the AESCULAPIUS network: these opinions must be considered to be those of their authors only.***