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EHR 2.0 – new Electronic Health Record concept EMR 2.0

Applying the principles of Internet information management

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Introduction

The electronic health record (also known as electronic medical record or EMR) is mandatory for 21st century health care, but it can not be implemented by applying old-school data integration approaches. We have to acknowledge that this is a new problem and it requires an innovative solution. This white paper outlines an alternative approach to implementation of a nation-wide, easily accessible electronic health record solution based on the “publish – discover” paradigm successfully used on the global scale to manage immense volumes of non-integrated information available through the Internet.

Limitations and hidden pitfalls of current approaches to EHR

Why won't the current approach to implementing a nation-wide electronic health record work? The overwhelming complexity of integration will kill it. In a sense, all current EHR architectures are based on integrating different health care service providers (hospitals, physicians, community care centers, dedicated EHR infrastructure elements, etc.) into an interoperable network of health information repositories that can somehow exchange and manipulate health data using a predefined set of rules. This point to point integration model physically cannot scale in a practical manner to accommodate the size and ongoing change in health care industry. Even in a best case scenario, where the various stakeholder groups agree upon the restrictions and costs imposed by this model and do their best to implement it, such a system will be permanently in semi-functional state because of:

- POS patient information system upgrades
- New standards
- New regulations
- New business requirements
- Ongoing progress in the health care information management field

All these factors multiplied by the scale of health care industry and the number of involved parties will ensure that such EHR system has to be permanently updated / reintegrated, or frozen, denying any significant changes. Neither is a viable option.

There are other questions with the current EHR model that are not clearly addressed in EHR blueprints:

- What is the master Electronic Health Record copy?
- Where is it stored?
- How is it accessed and updated?

The answers are not obvious. It's not a coincidence that EHR related documents provide no answer beyond pointing to the distributed nature of

EHR. Indeed, the questions are trickier than they might seem; any “master copy” model implies a central EHR repository as the most efficient answer but the health care service providers will never give up their multitude of information management systems for one centralized predefined solution. It would mean an enormous cost of transition and there are no compelling benefits that can justify such transition in their eyes. In other words they do not see what’s in it for them. Meanwhile, there is no way to avoid some sort of centralized repository of EHR information. Querying every POS for patient data every time information is required is not an option. Unfortunately, it is impossible to build a functional nation-wide Electronic Health Record solution without clear answers to these fundamental questions.

To summarize, we have to find practical answers to the following three major questions:

- How can we reduce significantly the complexity and cost of integration?
- How can we provide an easily accessible and updatable EHR master copy while minimizing limitations imposed on health care service providers regarding patient information management systems they use and the way they store patient data?
- How can we reduce health care service providers’ transition costs?

Electronic Health Record 2.0 – publishing instead of integration

How can the complexities of large scale integration be avoided? Avoid integration. EHR is beyond the applicability limits of the integration approach. The solution is the “publish – discover” approach successfully used on the global scale to manage immense volumes of diverse information available through the Internet.

Learning from the principles of Internet

Here is a typical routine for looking up some information on Internet:

- Select a keyword or a set of keywords
- Run the search using your favorite Internet search engine
- Work with search results

The better the keywords you use, the more relevant the search results are. Assuming that there are three websites containing your keyword, only these websites will be returned. Though there is no any integration between your browser and these websites, you are able to access the required information when you need it. It is even aggregated in a very basic way.

Let’s take a look how this principle can be applied to implementation of scalable and cost efficient electronic health record system.

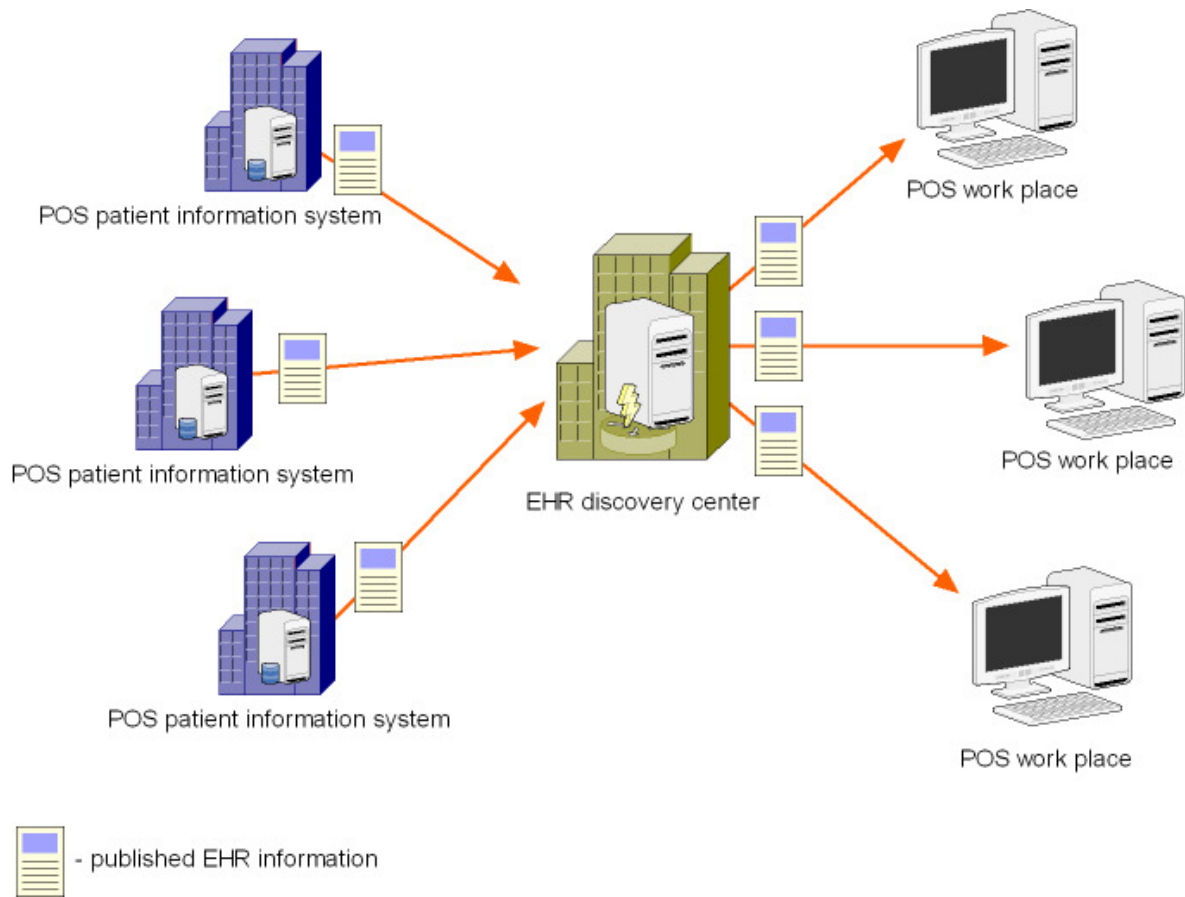


Fig. 1

Figure 1 represents a schematic view of the system. There are four elements:

- Point of service (POS) patient information systems represent all possible information systems used by health care service providers to collect and store patient data
- POS workplace represents a computer workstation or any other system that has access to a secure health information network
- EHR discovery center represents a facility that can index information available through a secure health information network and return search results on top of it; not unlike your favorite Internet search engine
- Published EHR information represents patient medical data published in form of HTML documents, XML documents, or RSS feeds, and available through a secure health information network

Here is how EHR 2.0 works...

Making EHR information available to health care professionals

- Step One: EHR information stored on a multitude of systems used by various health care service providers must be unlocked. To achieve this goal, the information is published into a secure health information network in the form of an HTML document, XML document, or RSS feed. This is a fairly straightforward exercise, not requiring any integration effort, and can be accomplished by building a simple web layer on top of existing systems. In a sense, it results in the creation of the secure health information "Internet" with restricted access.
- Step Two: The EHR discovery center performs regular indexing of the secure health information network and saves a cached copy of every published EHR document; this is the same routine as the one performed by Internet search engines. It can be done overnight or at any frequency required for a particular data source.
- Step Three: A health care professional who needs information about a specific patient accesses EHR discovery center's site and runs a search query using patient's unique identifier (as with any Internet search engine). Based on this search he or she gets an access to the patient's medical record aggregated from the cached information discovered during the last health information network indexing (within a 24 hour timeframe). Even if there is no unique patient identifier available, the required EHR information can be retrieved using a unique set of keywords such as combination of the first name, last name, date of birth, known medical data, and so on.

Updating an electronic health record

- Step One: A patient receives medical assistance from a health care service provider. As part of the process, the patient's record is created or updated using the POS's patient information management system of choice. This information is automatically published, indexed, cached, and made available through the EHR discovery center within the next 24 hours (see above).

As a result, the electronic health record for a specific patient is distributed among the different health care service providers but these pieces are discovered and aggregated into a single record by the EHR discovery center, providing a single copy that can be used across the country.

The benefits of EHR 2.0 (EMR 2.0)

The list of the benefits includes:

- **Minimum integration effort.** It may sound like an exaggeration but the sequence is as simple as follows:

- A health care service provider publishes the EHR information on secure health information network
- The new EHR data source URL is registered with the EHR discovery center
- The information is indexed and made available within the next 24 hours
- It is **based on proven Internet principles**, and therefore is able to accommodate the scale, complexity and ongoing change in health care industry.
- It **does not require new technologies or skills** since it is based on principles of the Internet information discovery and management.
- It **can be easily built on top of the existing health care information systems**. It allows a great deal of flexibility regarding the way information is published, indexed and aggregated, from the very basic aggregation currently used by the Internet search engines to sophisticated forms of aggregation and representation of information based on custom XML or RSS publishing.
- It will work even if the health care service providers will not follow exactly the standards defined for EHR information publishing. The information still will be discovered, indexed and made available. As a result, this concept **facilitates incremental improvements of the functional EHR system** through optimization of the search quality, aggregation algorithms and the quality and quantity of EHR data sources.
- It is **well suited for unstructured data manipulation** proven to be very important in health care.
- It is **cost efficient** both in terms of upfront cost and the cost of ongoing maintenance.
- It is a **self-organizing system** that allows various parties to evolve at their own pace, minimizing interdependencies and associated risks.

Conclusion

The EHR 2.0 (EMR 2.0) concept briefly outlined in this white paper provides a new way to implement a scalable electronic health record solution. It helps to reduce the complexity of a large scale EHR system while at the same time answers the important “master copy” question without compromising the flexibility required by health care service providers regarding patient information management systems they use for internal needs.