



*The evaluation of a Health Information Exchange System:  
approach, outputs and strategy of the Veneto Region, in the  
northeast of Italy*

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## **SUMMARY**

The Veneto Region, in the northeast of Italy, is dealing with the deployment of a Health Information Exchange system that can share millions of different medical reports within the Regional Health System, aiming at improving the efficiency and quality of delivered health services. Such a complex project needs measurements or indicators that can provide feedback on the correct implementation and value achieved.

In our case report, we describe the unconventional use of the EMRAM score by HIMSS as a proxy measure of the exchange system potentialities. In particular, we re-coded the content of the EMRAM stages to define the link between the degree of digitization achieved by each organization and the potential of the information exchange system as a whole. The assessment results contributed to identify a suitable implementation strategy.

## **INTRODUCTION**

Data is driving the advances in healthcare,[1 - 5]. Given that electronic health-related data and its availability can enable new healthcare service models with a positive impact on patient outcomes,[6], the needs for evaluation tools to assess the deployment strategy is critical,[7 - 9]. This case report aims at contributing to this field, sharing the experience of the Veneto Region in the northeast of Italy,[10 - 13].

## **BACKGROUND**

According to the Italian Constitution, regional authorities are the local government entities that have legislative and administrative powers over the whole Regional Health System. They can decide health policy measures and timing, based on central government requirements. Regional authorities have the responsibility to fund local health authorities (LHAs) and hospital trusts (HTs) and to carry out regional health plans. LHAs and HTs provide community and hospital health services. LHAs are tasked with both funding and

providing health services while HTs, usually large hospitals, are only responsible for providing services.

The integration and the interoperability among the 21 Italian regional health systems (RHSs) is one of the core points of the national digitization program which began in 2012,[14]. In 2016, the Veneto Region has 21 LHAs and 3 HTs --- two university hospitals and one oncology research center --- which serve a population of about 5 million people.

The Veneto Region Authority (RV) is developing a health information exchange (HIE) system that can enable new organization models of healthcare delivery. The basic idea is to provide services closer to the patients' needs thanks the digitization processes. One example is the use of a mobile app --- based on the HIE system --- to reduce waiting time for chronic patients' drugs,[15].

The HIE system works by collecting information from all 24 LHAs and HTs. Millions of electronic documents, ranging from prescriptions and referral requests to different kinds of medical reports, each with its specific features (e.g. laboratory and radiology reports, discharge letters and ER report sheets). Afterwards, the information collected is analyzed to support clinicians. The final goal is fostering the adoption of new organizational models that can better manage demands and offerings of healthcare services,[16].

Such a system requires a clear picture of the digitization adoption process for each LHA and HT, but also at the regional level as a whole. A measurement that can summarize the digitization level can help identify and define a successful implementation strategy, considering the value of the information as an asset in healthcare,[17].

For these reasons the RV, the 21 LHAs and the three HTs agreed to start a program aimed at assessing the level of digitization and sharing the related data to support policymakers in the development of the HIE system.

## THE ASSESSMENT APPROACH

The implemented program takes into account different elements. First, the assessment must be led by an independent institution through a widely recognized methodology. Second, the program must provide information related to the regional healthcare IT market. This was an essential requirement of the assessment to be a sound support for the IT investment policy,[18]. Third, the project management of the initiative needed to be entrusted to a common regional institution. In this case, the aim was to adopt a regional viewpoint, rather than the single entity viewpoint inside the RHS.

HIMSS (Healthcare Information and Management Systems Society) and its electronic medical record adoption model (EMRAM) methodology was identified as the reference assessment framework. Arsenà.IT,[19] --- a regional research institute for eHealth innovation --- was appointed as project manager of the initiative.

In 2013, for the first time in the Veneto Region, the EMRAM assessment was given to the all LHAs and HTs of the regional territory, via an online questionnaire to the IT managers. The EMRAM methodology, based on eight stages, allows us to track progresses in the technological adoption compared to other healthcare organizations in Europe and around the world. This eight-stage maturity model measures the adoption and utilization of the electronic medical records functions required to achieve a paperless environment,[20 - 22]. The survey focused on different aspects such as statistics on the hospital structures and the related IT departments, software applications in use, and the electronic ordering process and medication safety. After three years, in 2016, the survey was given again to check the advancements and update the strategic regional plan.

We re-coded the eight stages in a different way to fit the EMRAM methodology to the RHS, trying to provide a measure that encompassed regional system capabilities (see table 1).

**Table 1**

<b>Stage</b>	<b>EMRAM methodology*</b>	<b>Model for the Regional Assessment**</b> Stage definition based on the regional mean value
0	Information systems for major ancillaries departments (laboratory, radiology, pharmacy) are not installed or data output from external service providers cannot be processed electronically	There is no exchange of data in the regional health services
1	Information systems for major ancillaries departments (laboratory, radiology, pharmacy) are installed or data output from external service providers are processed electronically	
2	Clinical data repository/electronic patient record allows collection and normalization of data from disparate clinical sources throughout the hospital	Presence of different digital data, but limited exchange
3	Clinical documentation as well as electronic ordering of physician and/or nursing care services; includes of medication administration (eMAR)	Some documents are structured and exchanged
4	Electronic ordering provides clinical decision support (based on rules engines) in at least one clinical service area and for medication	Starting to work in a clinical decision support service (CDSS) mode
5	Integrating image management solution (e.g. PACS) displaces all film-based images throughout the hospital	Electronic health records enable new delivery models
6	Clinical documentation interacts with advanced decision support (based on discrete data elements) and closed loop medication administration	Data analytics supports clinical strategy and programs
7	Complete EMR integrates all clinical areas (e.g. ICU, ED, outpatient) displacing all (medical) paper records in the hospital; continuity of care standards to exchange data; data warehouse used as basis for clinical and business analytics	Artificial intelligence (AI) at work

Source: \*HIMSS Analytics 2016, \*\*Arsenà.IT 2017

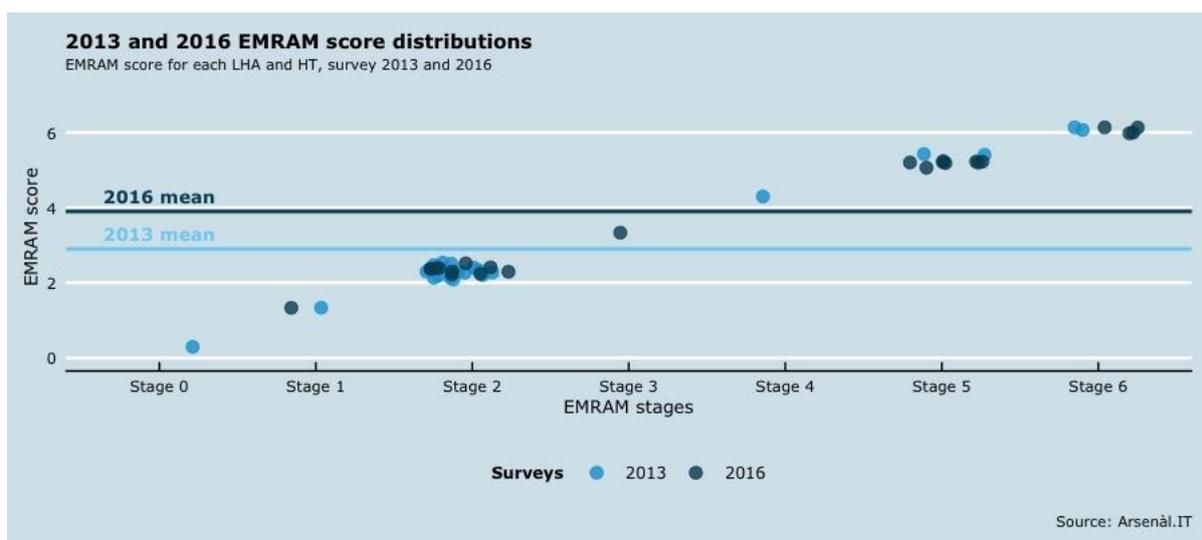
For these reasons, the regional value has been represented by the arithmetic mean of the EMRAM scores. The average value can take into account the different IT adoption levels observed as well as the regional sharing capabilities for the entire system.

## RESULTS

The EMRAM methodology was used for the entire regional health system twice, providing the assessment results for each single LHA and HT. The status of the regional system as a whole was analyzed based on the data collected.

The Veneto Region mean score was 2.9 in the 2013 survey (values ranged from 0.3 to 6.1) and 3.9 in 2016 (from 1.3 to 6.1). The median value adds more information on the distribution. In 2013 it was equal to 2.3; it became 4.2 in 2016. In 2013, 68% of our LHAs and HTs were classified into the second stage of the HIMSS scale and only 18% were in the fifth and sixth stage. In 2016, the proportions changed: 42% of our hospitals were on EMRAM stage 2 and 50% was into the fifth and sixth stages (see Figure 1). There was a clear shift toward digitization and the average value demonstrates that. The regional average indicates that the HIE system can collect different types of clinical documents and perform some first error-checking support for all subjects of the RHS.

Figure 1.



Additional details confirmed our findings. One of the aims of the National Digitization Program, adopted by the Italian Government (national Digital Agenda), was to master the information needed for a reliable use of data across the country. One of the initiatives was to replace paper-based prescriptions with ePrescriptions thanks to direct support of all 21

Italian Regions. By the end of 2015, the most effective Region in implementing the ePrescription program was the Veneto Region where the level reached was (and still is) around 95%. The digitization process continued with the eReferral requests. Starting in mid-2015, the HIE system collected and exchanged these kinds of documents (it currently handles around 95% of all referral requests). At that time, the HIE system had already made 170 million medical documents available for exchanging, in addition to the 40 million ePrescriptions and 20 million eReferrals that are produced each year. In 2016, it also started the digitization process for the exchange of other different medical reports.

Moreover, new models of service delivery are in the testing phase --- an automated booking system and a mobile app --- both with the aim of providing easier access to regional healthcare services.

Starting in 2016, the Veneto Regional Authority officially included the EMRAM assessments in its evaluation to aid in designing the new eHealth strategy.

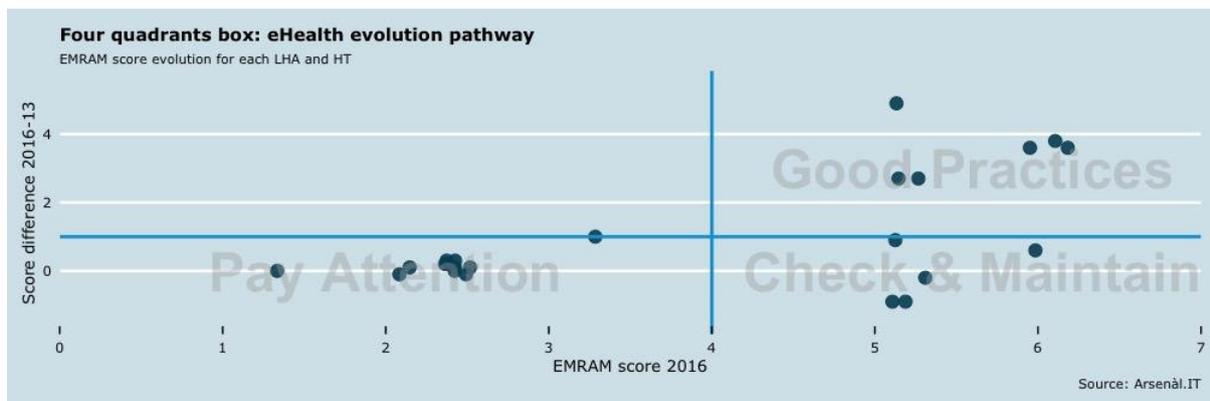
## **DISCUSSION**

Despite the increasing use of electronic health records around the world, limited experiences are available on the assessment of HIE systems, especially in the European context. This lack of experience in assessment stems from different sources. Lack of vision can weaken the need for an assessment, the absence of a common and shared evaluation measurement can undermine the commitment needed to realize the assessment itself, and also reduce the credibility of the program to implement. Addressing these obstacles means increasing the chances of success, or at least, decreasing the risks of failure.

One attempt in this direction was the use of the EMRAM score as a measure of the HIE systems capabilities. In this way, it is possible to define the link between the degree of digitization achieved by each organization and the potential of the information exchange system. This was an unconventional extension of the meaning of the EMRAM score, but an

effective tool to monitor and define a strategic plan. For example, Figure 2 shows a first interpretation of the assessment data. This representation can be useful to identify the actions to support both the single LHA or HT and the regional strategy. An intervention at the LHA or HT level can be designed to promote an overall improvement of the performance at regional level.

Figure 2.



Our experience showed that a widely recognized evaluation system fosters engagement and commitment of the organizations and their staff involved. Moreover, the clearer the assessment measure, the greater the chance for success of the initiative. In this sense, the EMRAM methodology can be a valuable starting point to assess the eHealth strategy at system level.

### Future directions

Although it is impossible to measure initiative success with one measure, the assessment model has to be fitted on specific objectives. Considering the Veneto case, we are looking for a measurement that can add more information to our IT adoption model to provide a better match with the full range of health services that the regional health system has to offer. For this reason, the final goal is a self-feeding assessment system, with a set of key performance indicators, in order to monitor all the main features of the HIE system.

A first step in this direction can be trying to understand how the HIE system could support the continuity of care, the coordination of a broad range of services composed not only of the acute or hospital care, but with different community (primary, mental and home care) and social (disabilities and family support) care services. The use of another HIMSS tool, the Continuity of Care Maturity Model (CCMM), could help to identify the progress in coordinating patient care across different service settings,[23].

The evaluation carried out can also enhance the definition of a new asset class: the Electronic Health Records. If electronic healthcare information has a value, we should be able to identify and measure it. Our case could be a first step toward this direction.

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#### **COMPETING INTEREST**

None.

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