A Call for Industry-Wide Patient Demographic Interoperability

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Prepared by:

Ignacio Valdes ivaldes@hal-pc.org*

Acknowledgements:

Ross Koppel

Martha Adams

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Abstract

Background: The possible benefits of widespread adoption of Electronic Health Record/Electronic Medical Record (EHR/EMR) technologies are widely documented. Interoperability is essential to realizing these benefits. However, interoperability progress has been slow to date. Standards designed to exchange clinical information, such as FHIR, can be cumbersome and resource intensive to implement. In contrast, we focus on patient registration, which represents a critical first step in the use of any Health Information Technology (HIT) application. We propose that the existing IETF vCardDAV standard be mandated for use as a lightweight demographic interoperability mechanism among all HIT applications, including practice management.

Proof of Concept: As proof of concept, vCardDav was implemented in two different software programs. Programming time, as well as patient registration times using manual and vCardDav mediated entry were recorded. vCardDAV was successfully implemented with modest (10-20 hrs) programming time. Time savings per patient registration was an average of 48 sec per software.

Discussion: Implementation of vCardDAV is feasible in an outpatient setting using modest resources. However, widespread implementation will still require government involvement. Vendors will resist investing resources required to implement vCardDAV effectively. Implementation will also make switching between vendors easier, and therefore increase competition.

Conclusions: If mandated and implemented, vCardDav presents a feasible protocol for patient registration. Novel applications could emerge.

Keywords: Electronic Health Record, Electronic Medical Record, Basic demographic interoperability, standards adoption, workflow

1. Background and Significance

The American Medical Informatics Association (AMIA) Clinical Information Systems Working Group (CIS-WG) came to a consensus recommending that basic Patient Demographics Interoperability (PDI) be achieved using the IETF vCardDAV standard[1]. This consensus paper was authored and approved by vote of the American Medical Informatics Association (AMIA) Clinical Information System Working Groups (CIS-WG) membership with input from members of the association working group as well as from the larger AMA, HIMSS, and ONC community. The purpose of this paper is to briefly review the current status of PDI, report on a proof-of-concept implementation of vCardDAV, and call for mandating PDI across all HIT applications.

While some benefits of the widespread use of Electronic Health Record/Electronic Medical Record (EHR/EMR) are generally recognized [2-4], significant challenges remain. In particular, lack of interoperability is cited as a barrier to implementation [5] and to effective teamwork in primary care [6].

1.1 Definition of Interoperability

Health Level 7 (HL7) defines interoperability as 'the ability of two parties, either human or machine, to exchange data or information where this deterministic exchange preserves shared meaning.' Interoperability has been operationally defined to be 'the ability to import utterances from another computer without prior negotiation, and have your decision support, data queries and business rules continue to work reliably against these utterances' [7].

1.2 FHIR

In 2011, HL 7 developed a new clinical data standard, the Fast Health Information Resources

(FHIR) [8]. In 2017, Release 3 was published as the first Standards for Trial Use. FHIR describes data formats and elements, along with an application programming interface (API). Although implementations of FHIR already exist, it will require several more iterations to mature.

1.3 Challenges with Interoperability Standards

Standards designed to transmit clinical information are necessarily complex and can require large expenditures of money, time, and effort to implement. Moreover, there is little incentive for commercial vendors to implement interoperability [9]. Implementation costs as well as concerns over liability for data breaches provide disincentives for vendors. Exchanging clinical data is technically difficult and suffers from legal and organizational roadblocks [9].

1.4 The Argument for Focusing on PDI

There are multiple reasons for focusing on PDI. Using HIT applications effectively requires patient demographic registration (PDR). After adding patient demographics including name, date of birth (DOB), gender, address, phone number, and email, further processes such as creating a unique patient identifier can be completed. Most applications will not allow such further processes until registration is completed.

PDR is a common, time consuming and error prone task in outpatient practices. PDR often has to be accomplished not just once, but multiple times for each new patient. The following use case illustrates a typical new patient workflow in an outpatient psychiatric clinic. Patient calls to make appointment, scheduler takes patient demographic information over the phone and enters it into the EHR. If the provider has electronic pre-registration, patients also enter their own demographics. Patient is seen by clinician who orders a genetic test. Patient demographics are manually transferred to test ordering portal. Clinician also prescribes medication. Patient demographics are

manually entered into the eRX portal. Billing for the visit is accomplished through the practice management portal. Patient demographics are manually transferred into the practice management portal. In summary, patient demographics were entered four separate times, requiring multiples of staff time and potentially introducing errors. With experienced users, 1% is a common data error entry rate reported in the literature [10]. Eliminating redundant data entry will improve the accuracy of the database in each HIT application and therefore greatly reduce delays in patient care due to inaccurate data. Furthermore, both outpatient clinicians and patients may move from one office to another, repeating the series of PDR again.

Lastly, while clinical information is protected by HIPPAA privacy standards and may be considered proprietary by an EHR vendor, most of the demographic information required by HIT systems is publicly available and thus less sensitive. People routinely exchange demographic information electronically.

1.5 vCardDAV

The vCardDAV standard was developed in 1996 and has been updated to version 4. Although it is ubiquitous among e-mail, personal computer, web, map, and cell phone users [1], implementation in healthcare is almost completely lacking [11]. Of the three commercial HIT vendors used in an outpatient clinic, none currently support vCardDAV.

vCardDAV contains all the fields necessary for PDI: Name, date of birth (DOB), gender, address, phone number, email. It includes other useful fields such as date of death, photograph, email and custom fields. The first three fields (Name, DOB, gender) are usually sufficient in practice to uniquely identify a patient. If the data in any of the vCardDAV fields matches a patient already in the database, HIT software can display the potential match and allow the user to disambiguate. A

unique patient identifier can then be generated by the receiving HIT software, if appropriate.

vCardDAV does not require a centralized repository of data. Each vCard is generated dynamically and transmitted between users. While transmission of vCards is not secure, vCards can only be sent and received by authorized users of each HIT software. vCardDAV holds the possibility of drastically easing the burden of data entry on clinical staff working with heterogeneous HIT applications.

The advantages and disadvantages of vCardDAV are listed in Table I.

Table I. Advantages and disadvantages of vCardDav.

Advantages	Disadvantages
• exists as an implemented, documented, IETF proposed standard now in version 4	• can be a lossy (versus lossless) protocol, particularly in older implementations
• supported by many current non-HIT applications	• limited scope, not created specifically for HIT
• ubiquitous among smart phone users	• little to no security in transit between systems
• Supported by QR code	
• Software libraries for major programming languages exist	
• Software validators exist	
• Data transport mechanisms exist, do not require specialized knowledge or permission to setup and use	
• Extensible, can include HIT specific fields such as patient's preferred pharmacy	
• Nature of data exchanged is less sensitive to privacy and security concerns	
• Can be implemented alongside other HIT interoperability protocols	

1.6 vCard and FHIR can coexist

Importantly, vCard can coexist with FHIR. In Figure 1, vCard is used to obtain patient demographics from the patient, as well as transmit it between different HIT applications. The mapping between the FHIR patient resource and vCard is shown in Table II. FHIR, in contrast, can be used for clinical information after PDR. Widespread PDI would facilitate all interactions by making the initial, crucial patient registration step easy and less error-prone [10].

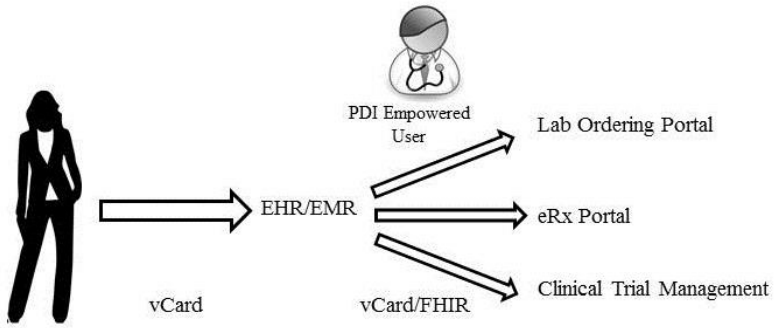

Figure 1. Potential flow of PDI using a combination of vCard and FHIR.

Table II. Mapping of PDI fields between vCardDAV and FHIR.

Patient Characteristic	vCard Dav 4.0	FHIR 3.0.1	Notes
Name	N, FN	name	FN has only letters, N is separated by semicolons
Gender	gender	gender	
DOB	bday	birthDate	
Picture	Photo	photo	
Physical Address	address	address	
Email Address	email	--------	
Responsible Party	agent	contact	
Deceased	DeathDate	Deceased, deceasedDateTime	

2. Proof of Concept

To explore the feasibility of implementing PDI using vCardDAV, we used a Veterans Affairs VistA EHR variant and an ePrescribing software. The EHR database contained ~ 10,000 patient records. First, we recorded the time it took for patient demographic data entry across eight patients. We then added PDI via vCardDAV to both software programs. Lastly, we tested the output.

The average time to enter patient demographics was 70 sec per HIT system. Based on the use case described in the Introduction, each new patient requires about 5 min just for entering demographics. Programmer time to implement and test vCardDAV import and export in a Veterans Affairs VistA variant was approximately 10 hours, in the eRx software it was 20 hours. Transfer of demographic data using vCardDAV took 22 sec between the EHR and ePrescribing software, saving about 3.5 min per patient. The output was also successfully tested with Microsoft Outlook and GNUmed electronic health record.

3. Discussion

Mandating implementation of the vCardDAV standard basic demographics interchange across all HIT applications would be a useful, feasible, and critical first step towards interoperability. It would not interfere with adoption of FHIR. The programming difficulty for implementing this standard across applications and validating it against an existing software validator should be modest.

Implementation of vCardDAV will likely have to be mandated by the government to become

ubiquitous. Vendors can and will simply block implementation, since basic, universal demographics interoperability may increase competition by lowering the threshold required to transition to new systems [12]. The mandate should be made part of Meaningful Use reimbursement. All HIT software, such as portal ordering, practice management/scheduling and billing software should be included in the mandate. Validation of vCardDAV against a software validator should be required since past experience shows serious flaws in vendor interoperability implementations [13]. A Drag and Drop interface or user-friendly equivalent should also be a requirement. The possibility of drastically reducing the labor required for patient registration, check-in and the creation of novel, efficient HIT applications exists.

6. Conclusion

Despite billions of dollars spent, even the most basic interoperability remains out of reach. Industry acceptance or government mandate of PDI by the vCardDAV standard across all HIT applications would be an important critical first step toward achieving interoperable systems and creating an environment for efficient applications.

Clinical Relevance Statement

Mandating basic demographic interoperability using vCard improves the efficiency of outpatient clinical workflow. Patients may experience faster and more accurate registration, resulting in improved care.

Conflicts of Interest

The author declares that he has no conflict of interest in the research.

Protection of Human and Animal Subjects

No human or animal subjects were included in this research.

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Table II. Comparison between vCard Dav and FHIR 3.0.1 Patient Resource.

Patient Characteristic	vCard Dav 4.0	FHIR 3.0.1	Notes
Name	N, FN	name	FN has only letters, N is separated by semicolons
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Physical Address	address	address	
Email Address	email	--------	
Responsible Party	agent	contact	
Deceased	DeathDate	Deceased, deceasedDateTime	