Interoperability of Electronic Health Records and Personal Health Records

Key Interoperability Issues Associated with Information Exchange

By Simone Pringle and Alex Lippitt

KEYWORDS
Clinical history, electronic health records, personal health records, EHR, PHR, interoperability, information exchange.

ABSTRACT
As patients receive medical care, their clinical history may be tracked and recorded by multiple electronic systems developed by independent vendors. Medical providers might use electronic health record (EHR) software tailored to the needs of trained medical personnel, whereas patients may interact with personal health records (PHR). The purpose of this essay is to identify the key interoperability issues associated with the information exchange between these two types of systems and offer an approach for enhancing interoperability.

This article is part of a series of unpublished essays titled A Community View on How Personal Health Records Can Improve Patient Care and Outcomes in Many Healthcare Settings, a collaborative project of Northern Illinois Physicians For Connectivity and the Coalition for Quality and Patient Safety of Chicagoland. For further information on how you can obtain copies of the complete work, contact the principle Dr. Stasia Kahn at Stash5@sbcglobal.net.

As patients receive medical care, their clinical history may be tracked and recorded by multiple electronic systems developed by independent vendors. Medical providers might use EHR software tailored to the needs of trained medical personnel, whereas patients may interact with PHRs. The purpose of this essay is to identify the key interoperability issues associated with the information exchange between these two types of systems and offer an approach for enhancing interoperability.

System of record is the term used to describe a computer-based storage system which is considered to be the authoritative data source for a particular type of information. The system of record is considered to have the “official” version of the information. Information pertaining to a patient’s clinical history is typically distributed among multiple electronic systems, such as EHRs and PHRs, each of which is the system of record for at least a portion of the medical history. The patient’s neighborhood pharmacy may contain the most accurate record of the patient’s prescription medication history. Insurance companies will have the most accurate claims-based data. The primary care provider’s EHR might have the best clinical summary, while the patient’s PHR might be the best source of self-monitored medical data, such as blood glucose or health journals (e.g. migraines, mood, etc).

Information exchanges between independent systems of record with overlapping data content naturally face significant challenges. Though the most significant challenges in our time relate to socio-political, legal, and ethical considerations, whenever any portion of a patient’s health record is exchanged among EHR and PHR systems, the functional quality of the exchange is dependent upon the extent to which the technical implementation addresses interoperability between the systems of record.
Building true functional interoperability—not just sharing data—requires addressing several different components: the provenance of the data (consideration of how the data was collected to get to its current state – what events drove the collection of the data and the human workflows that define what the data is); and the data schema (the definition of how the data can be represented in a structured format for uniform parsing).

Representation of the data as a controlled vocabulary within the data schema, to achieve semantic interoperability, when possible: the software tools that enable data exchange (e.g., Web services), security considerations; and data federation or integration architecture (e.g., central data repository synchronization or distributed queries or hybrids).

Each may be discrepant among systems of record and technical solutions must allow the flexibility to interact while maintaining a coherent management of the data. Simply put, it is not reasonable to rely on interoperability solutions that are wholly focused on addressing systemic identity mismatches and fail to account for variance in the controls and quality of the data that is entered into the system. In fact, developing interoperability requires addressing both software tools and data.

An example that illustrates the challenges of reconciling data from among multiple systems of record can be found in the financial world, with regards to security measures in the payment card industry (PCI). PCI regulatory compliance will typically require that various security tracking and logging systems be time-synchronized to make it possible to trace the step-by-step activities of individuals who may attempt to gain unlawful access to individuals’ credit card data. This requirement establishes the need for the coordination of systems as disparate as those used for controlling physical premise access (electronic key card), video surveillance recordings, and database logs. PCI compliance in this context imposes the requirement that disparate Systems of Record rely on standardized protocols and services such as the Network Time Protocol (NTP), facilitating time-based record reconciliation.

While there are similarities in the technical challenges faced by healthcare and other industries where independent systems of record interoperate, there are also unique considerations. In many contexts in healthcare, information exchange is reviewed by human intervention and it is still acceptable in some circumstances for data to be stored in a non-machine-processable format (free-text vs. structured data). Also, the quality of the data and errors are more substantial challenges and concerns.

Interoperability issues that hinder the fidelity of the automated exchange of information among healthcare systems, such as EHRs and PHRs, include:

**Data definition related:**
- Mismatches between vocabularies and differences between native data element definitions (naming, size, granularity, validation, etc.)
- Differences in code sets, including code set versions
- Scope of data—identifying which data is actually relevant for the exchange—avoiding information overload, particularly to providers
- Data federation / integration (systemic architecture)

**Workflow and change related:**
- Software interoperation (syntactic)
- Health “event” identification
- Data messaging – in automated environments, incompatibility of electronic messages
- Deltas of change for data updates – difficulty in separating what is new from what has previously been exchanged
- Currency – ensuring that newer data is not overridden by older data
- Mapping between newer and older versions of codes—it is rare for all systems of record to be on the same version

**Security, identity and quality related:**
- Translation of policy into technology
- Security and privacy—ensuring that only data approved for the pairing of partners is exposed and exchanged—access is provided on a documented consent basis
- Identity resolution—ensuring that the data exchanged is for the right person
- Quality of data (validity and reliability of data)
- Error correction and recovery—lots of reentry of data in many cases, potential to overwrite steps and be able to recover to what was there before data in error was applied

There are degrees to which interoperability issues can be addressed. The less the interoperability issues are addressed, the more data is “lost”. Technologists will often refer to the degree to which information exchange leads to loss of information as the “lossiness” of the exchange. It is desirable to minimize lossiness either by redesigning Systems of Record to comply with openly available specifications (such as industry standards) and/or by establishing conventions in the form of implementation guidelines.

When considering how to minimize lossiness, specific transactions should be considered, in which context the guidelines apply. Data reconciliation is a useful scenario to consider in the information exchange between systems of record, such as EHRs and PHRs, is how data is merged.

**DATA RECONCILIATION**

When EHRs and PHRs exchange data, a common objective is to update one or both of these systems with patient health information that is potentially missing from one system, but available in the other. In the case of a patient downloading medical history data to his/her PHR, this would be a similar activity to downloading a bank statement for the purpose of reconciling the most recent bank account activities such as deposits and withdrawals.

Systems of record have the benefit of being updated in the context of well defined transactions: the patient is prescribed a new medication, or has been diagnosed with a new condition, or has been recently hospitalized. The context of each transaction generally removes ambiguities (except in cases where the data is in fact “historical” such as a history of a chronic disease or prior operations (though these can be converted to a transaction context).

Figure 1 illustrates the changes affected into a System of Record as a result of two separate transactions (incoming “arrows”): change in prescription dosage and the addition of hospitalization information. In the case of the addition of hospitalization information, a new record is added to the data store. Records are represented as circles with data elements (e.g. discharge date, assisting doctor, etc.) being displayed as rectangular. The update transaction is shown as a change of data in a pre-existing element (e.g. prescription dosage was increased).
In contrast, the process of reconciling data among multiple systems of record, such as between EHRs and PHRs, can be akin to a forensic discovery effort, where transactional history is lost and recoverable audit trails are not kept. In such situations, reconciliation needs to be inferred from the changes that were affected in the system of record.

If an external system interacts with the system of record before and after the two transactions were executed (change to prescription dosage and addition of hospitalization data), it will need to contrast the before and after data and infer the changes that will need to be incorporated into its own storage area.

Historically, when computerized systems automated data reconciliation (aka, merge), they typically engaged in a complex, multi-step process, with variable reliability depending upon the degree of data and protocol standardization, which includes:

- Establishing the scope and range of the exchange, e.g., all currently active medications, hospitalizations since the beginning of the year, complete medical history summary, etc.
- For each of the component data elements of a patient’s record (medication, problem, alert, etc.), decide whether this is a new or existing element, from the point of view of the target system. This requires a two-step activity of identifying and matching.
- For pre-existing records, additional steps are required to infer whether data has been updated since the most recent data exchange and if so, what the nature of the update was.
- Once the scope of the changes has been identified and the receiving system is ready to incorporate the updated data, the final process is to map from the source to the target data model. Since systems of record are independently designed, the criteria used for defining the scope of the exchange, identifying and matching and comparing for changes, are typically different for each implementation. This implies that each of the steps listed above will contribute to a degree of lossiness in the exchange of patient medical information.

The introduction of interoperability open standards, such as the ASTM CCR (Continuity of Care Record) and now its successor, the Continuity of Care Document, which maps the CCR into the HL7 CDA (Clinical Document Architecture), enables systems to map their internal models to a limited set of data exchange models, instead of having to map to multiple potentially proprietary data representations. These data interoperability standards do not necessarily help with the other sources of lossiness identified above, in particular with the identification of data updates (“deltas”) that occurred since the most recent synchronization point. An implementation guide may help provide guidelines that include support for standardizing on the exchange of transactional activity and simplify the forensic effort.

A next generation of standards and certification organizations is attempting to harmonize these standards into a common set that can be used by PHRs and EHRs alike. An example is CCHIT (Certification Commission for Healthcare Information Technology, found at http://www.cchit.org/), which started by certifying EHRs and is now expanding into HIEs (Health Information Exchanges) and PHRs. So far CCHIT certification activities have had a direct impact on EHRs, forcing consolidation and standardization.

ADDITIONAL INITIATIVES TO ADDRESS THE ABOVE

In addition to the collaboration between Northern Illinois Physicians for Connectivity and the Chicago Patient Safety Forum that resulted in A Community View on How Personal Health Records Can Improve Patient Care and Outcomes in Many Healthcare Settings, there are three parallel efforts with some overlap in southern Illinois, both in medical trading areas and mission. These groups include the Illinois Critical Access Hospital Network (ICAHN) beginning with Washington County and Salem Township Hospitals; Southern Illinois Healthcare; and the BJC Medical Group in St. Louis.

Our intention is to share information, work product, and problem resolution with these initiatives as much as possible. The three initiatives in Southern Illinois address a number of the challenges outlined above through the use of an intermediary “Community System of Record” for each patient, effectively creating a shared source of truth. Based on a set of business rules, each record is updated in near real-time based on on-going input from providers, hospitals, inpatient and outpatient nursing, patients and proxies / guardians, pharmacies, and payers, amongst other business associates. Each update/encounter/event from any member is pushed by the system of record to the community through database triggers, HL7 messages, CCR and CCD records, and the like, and is then either distributed (pushed) to other systems of record as appropriate, or pulled as needed when records are queried. Initially, development is focused on the building of the EHR, and patient input, reviewed and approved by providers. Once these efforts are more mature, than the data accumulated and continuously maintained can serve as a solid foundation for building PHRs that will get past the time-consuming, de-motivating, and inherently risky input of clinical data from patients.

This community system of record attempts to relieve each individual provider/chart system of record of many of the burdens of
health information exchange among electronic systems, such as EHRs and PHRs, by performing such services as:

**Data definition related:**

- Maintaining a “source of truth” and portable community health record including a CCD, a virtual extension of the eMPI (electronic Master Patient Index) and its demographic data; defined additional clinical documentation such as most recent vital signs, consult reports, and the like, as well as; historical data useful to management of chronic conditions, health management, predictive risk management.
- Reflection of community-agreed data sharing and data-quality business rules; for example, who is permitted to update the source of truth and under what circumstances, how discrepancies are resolved, etc.
- Mapping of disparate data definitions, code sets, and vocabularies.
- Appropriate review and approval of data before entry into the source of truth system, including provider sign off of lab results, consult reports, and the like for completeness, accuracy; and provider sign off of patient entered data such as family, medical and social histories.
- Patient review of source of truth data across providers and other data sources, analogous to reviewing their credit report for inaccuracy and completeness.

**Workflow and change related:**

- Scope of data—identifying which data is actually relevant for the exchange and avoiding information overload, particularly to providers.
- Maintaining audit trails of updates, including institutional/provider/patient sources, dates and times permitting, including reconstruction of a sequence of events in a patients care across all sources to reconstruct where care might have gone wrong and/or to learn from experience; drilling down into a particular component of care or demographic or clinical data such as a medication, chronic condition or episode of care; and maintenance of flow sheets shared between providers and patients related to health and disease management to help monitor progress, assess current situations, and develop goals and plans.
- Maintaining transaction and event status—orders without results, preliminary vs. final versions of documents, signed off and not signed off labs, raw vs. provider vetted patient input, etc.;
- Closed-loop clinical messaging to permit the patient, providers and institutions to identify inconsistencies, lack of completeness, and potential patient safety issues such as contraindicated medications, conflicting care and nutritional plans, and the like. Each one is tracked until mutual resolution;
- Responding to commonly accepted health “events” with updates to applicable systems of record;
- Enforcing data quality;
- Managing deltas of change for data updates through state control, keeping track of what data each system of record has;
- Currency—ensuring that newer data is not overridden by older data;
- Data messaging — repackaging of data to meet formats of systems of record; e.g., CCR vs. [CCD] vs. HL7, etc.

**Security, Identity, and Quality-Related**

- Security and privacy—ensuring that only data approved for the pairing of partners is exposed and exchanged;
- Error correction and recovery—audit trailing of all changes, never overwriting, ability to restore data if it is lost;
- Code version maintenance—reconciling older and newer versions of code sets; Application of interim changes;
- Identity resolution—ensuring that the data exchanged is for the right person.

Driving this approach is a “circle of care” approach of shared responsibility by the patient, the patient’s agents, and all providers who touch the patient. In many cases, a primary care provider or “health/medical care home” takes on responsibility for each individual's care. In addition to the PHR and EHR key elements may include the community “system of record and CCD/CCR-like repository; patient portal and/or PHR-accessible services and communications linking the patient to his or her providers for on-going interaction, such as questions, monitoring, and coaching; and record bank external to the community, often national in scope that the patient can maintain over a lifetime.

**PROPOSAL FOR A TECHNICAL IMPLEMENTATION GUIDE FOR CONNECTIVITY BETWEEN PHRS AND EHRS**

A number of technical issues stem from technical challenges that exist even outside the scope of healthcare applications and services. Attempting to address the entirety of technical issues that present themselves is a daunting task and one that, if taken in its broadest sense, is outside the scope of this publication. The proposed Technical Implementation Guide looks to the resolution of technical concerns from National Collaborative Efforts, including:

**The Healthcare Information Technology Standards Panel (HITSP).** HITSP is a cooperative partnership between the public and private sectors focused on enabling healthcare interoperability. The panel was formed for the purpose of harmonizing and integrating standards that will meet clinical and business needs for sharing information among organizations and systems.

**Certification Commission for Healthcare Information Technology (CCHIT).** This group was referenced in the prior section, in regard to its role in certifying EHRs and eventually Health Information Exchanges (HIEs). In 2009 CCHIT is beginning to certify HIEs, which will, by definition, need to address systems of record data exchange, as well as concepts such as “lossiness”. In addition, CCHIT formed a PHR Work Group in 2008 which developed Personal Health Record Certification Criteria submitted for public comment, test scripts and an alpha certification criteria test plan. The PHR certification program was supposed to have begun in 2009. However, it has been delayed to accommodate review of the program's compliance with privacy requirements promulgated by the American Recovery and Reinvestment Act of 2009 (ARRA).

**IHE (Integrating the Healthcare Enterprise, found at www.ihe.net)** is a global initiative that creates the framework for passing vital health information seamlessly – from application to application, system to system, and setting to setting – across multiple healthcare enterprises. IHE brings together healthcare information technology stakeholders to implement standards for communicating patient information efficiently throughout and among healthcare enterprises by developing a framework for
interoperability. This interoperability is demonstrated at HIMSS showcases. These showcases, taking the form of model electronic healthcare communities, demonstrate vendors exchanging data amongst hospitals, ambulatory care amongst and other healthcare institutions.

**American Health Information Community (AHIC),** sponsored by HHS, which pushed for PHR standards in 2007 and is contributing to the CCHIT Work Group efforts with public comments. HL7 which has contributed the Personal Health Record System Functional Model (PHR-S FM) to serve as a draft reference standard for PHR system functionality that is frequently cited in the CCHIT Personal Health Record Certification Criteria draft

**The Markle Foundation Personal Health Working Group** which has developed a broad PHR framework including available evidence regarding expected benefits of PHR/stakeholder (with a special emphasis on patients/consumers) requirements and concerns, and commercial experience to date. This group developed a shared vision and advocacy position. This framework is also frequently cited in the CCHIT Personal Health Record Certification Criteria draft.

ASTM which continues its healthcare work with Committee E31 focused on Healthcare Informatics including support of the PDF Healthcare standard developed jointly with the AIIM, the Enterprise Content Management Association. This is a hybrid standard based on PDF technology supported by Intel and others.

**Health Record Banking Alliance (www.healthbanking.org).** HRBA is a non-profit corporation formed to assist stakeholders in the promotion of community repositories of electronic health records. Health Record Banks improve the safety and efficiency of patient care, public health and medical research through the availability of secure and complete electronic lifetime health records.

While the above groups are pushing a commercially viable PHR forward, payors and others concerned with health quality measures; disease and wellness management with a focus on patient buy in to plan adherence; pay for performance (P4P); the patient-centric medical care home; and population and public health are pushing for standardized and interoperable PHRs as major components of health information exchange, patient and provider communication, care plan management and compliance, cost containment and focus on preventive health.

Many of us in the healthcare software world have been impressed on how payors in particular are coming to realize that their best interests now lie in interoperable, standardized PHRs and even collaboration in medical trading areas to support clinical quality improvement. We are finding a common cause in interoperable EHRs and PHRs an easier and easier sell in implementing our present and future health information infrastructure. Usable implementation guides give credibility to and reduce the risk of these ventures.

The creation and specification of implementation guides is a common practice in support of technical implementations that require the integration of multiple software data systems, even when a data/document exchange model is present. In the context of CCR-based integrations, a few implementation guides are particularly noteworthy: the ASTM CCR Implementation Guide (IMPL), the Retail Clinic CCR Profile of the Minute Clinic (MC) and the CCR/G API developed by Google (CCR/G). An important additional example would be HL7 CDA Templates (TEMPL).

**SCOPE**

A Community Health Record encompasses the technical infrastructure and processes that create an environment that allows providers and patients to collaborate on the creation and maintenance of an individual’s health record. The proposed Technical Implementation Guide for the White Paper for an Illinois Personal Health Record would be limited to technical specifications and constraints designed to eliminate—or at a least minimize—the extent of lossiness present in the exchange of patient clinical data between and among systems such as PHRs and EHRs. A Technical Implementation Guide is likely to be part of a larger set of policy artifacts that define clinical and administrative business processes and workflows.


It should be noted that the development of a Technical Implementation Guide should be undertaken as an iterative, multi-versed process, which at each revision captures sufficient information to support CHRI’s target use cases, to within acceptable levels of tolerance for variations of implementation.

**OBJECTIVES**

The primary objectives of the Technical Implementation Guide
are to document technical constraints that will achieve measurable/demonstrable interoperability standards and

- Allow for a choices related to applications and services appropriate to all stakeholders in a person’s healthcare; and
- Support and enforce the clinical and administrative requirements of a Community Health Record;
- While preserving the most accurate representation possible of the patient clinical data in multi-system exchanges.

These objectives may be seemingly at odds with one another, with the first broadening the inventory of available solutions, while the second narrows the choice spectrum to those solutions that are aligned with business and regulatory mandates. The Technical Implementation Guide will document the sets of technical specifications and configurations that will guide implementations that best meet a Community Health Record’s business needs in the most optimal fashion at any given point in time, so as to maximize the quality of the information being exchanged between systems. In point of fact, a Community Health Record’s business needs should be documented as part of the Technical Implementation Guide as desirable outcomes that are both demonstrable and measurable, validating the benefits of increased interoperability between the participating EHR and PHR systems.

CONTENT

The Technical reference model will contain references to use cases and requirements, overviews, including technical exchange protocols such as SOAP and HTTPS, messaging standards such as CCD/CCR and HL7, terminology and coding sets such as SNOMED CT and ICD-9, and integrated specifications and Standards Organizations such as HITSP and CCHIT; shared solution sets: Resolutions or partial resolutions in practice where applicable to interoperability between systems of record, lossiness etc., including consensus standards as applicable, Illinois Community Systems of Record, other national and outstanding challenges and proposed resolutions; and references to other technical implementation guides and templates (e.g. CCR/G).

BUSINESS USE CASES, WORKFLOWS AND REQUIREMENTS

Strictly speaking, the Technical Implementation Guide would not contain business use cases, workflows, and requirements, but rather it should contain references to specific business-centric artifacts that guide all aspects of implementation, including technical considerations.

While an exhaustive list of use cases does not exist at this point in time and is likely to evolve, the sampling below illustrates the breadth of clinical and administrative scenarios that would be supported by applications and services: referrals, transfer of care, ER visit, immediate care visit, hospitalization and discharge-inpatient care; hospital outpatient care; ambulatory care; guardian add/delete/change, demographics and identity management; nursing care, telemedicine and remote monitoring; ambulance service; med reconciliation; chronic disease and wellness management; critical care patients; and public health.

Interactions between patients and providers in the context of these encounters can lead to circumstances where patients and caregivers direct their software applications (PHRs and EHRs) to exchange data, exported from one system (System of Record) and imported to the other.

USE CASE SAMPLES FOR TECHNICAL IMPLEMENTATION GUIDE

An interesting partitioning of the use cases would be to consider exchanges that are intended for initial data population vs. updates to pre-existing systems.

Initial Data Population. It is not uncommon for the initial data population of PHR systems to be based on data stored in institutional systems, such as hospital or ER discharge, ambulatory data, claims-based data from an insurer’s system, pharmacy information system, etc.

When a PHR is being populated for the first time, there is no ambiguity as to how a particular entry (medication, condition, allergy, etc) is to be interpreted when coming from a source that has proven adherence to published standards; all data is new and it is expected that the target PHR will need to allocate new elements for each new entry being imported.

In this context, primary sources of data lossiness – as described earlier – are differences between the PHR and the source system's data models, mismatches in the selection of supported vocabularies, and differing data management practices (plus software interoperability and security).

Let us consider some examples of the technical challenges that may be faced when populating a PHR for the first time:

- The PHR may lack the ability to store certain types of data. In this case, source data will be lost when exchanged with the PHR. It is interesting to note that there is no definitive definition of what all PHR data models should contain. Multiple efforts in this space have been undertaken including efforts by the Markle Foundation as well as HL7.
- The PHR may not support coding systems from the source system (e.g. the PHR might not support CPT procedure codes). In this case, a conversion from unsupported to supported vocabularies, adding a column to indicate the coding system of the source, or even textual representation may be required.
- There may be different ways of representing and interpreting data within the same standard. Consider for instance, the flexibility of representation of family history data in the CCR standard, allowing for multiple ways to map conditions to specific relatives. If the PHR interprets the standard representation in a manner that differs from that of the source system, there is the potential for incorrectly storing the original data, either storing it redundantly or not at all.

IMPORTING TO PRE-POPULATED PHR

Importing data to a pre-populated PHR is riddled with the same issues as in the initial PHR population, as well as with additional challenges that were identified earlier pertaining to data merge.

Consider the following:

- A method for determining when portions of the patient's medical record are equivalent when different words are used to describe the same concept. How will the PHR identify that portions of the patient's medical record are identical? In general, there is no commonly agreed-upon identity mecha-
nism between independently developed systems. A PHR may list a patient-entered medication as ‘antibiotic’, while the EHR system may list the medication as ‘amoxicillin.’ Consider that even if the names matched, should the PHR consider a medication record the same if there are gaps in the date ranges identified in the two systems?

- A set of rules for overwriting data imported from external sources. Once a record is considered a “match,” should all imported data override the data contained in the PHR? Clearly not. For instance, if the PHR contains an entry for plan of care and the patient had listed, in his/her own words, medical instructions then importing data from an EHR should not cause the patient’s notes to be overwritten with the doctor’s notes. However, will merging of data sub-elements create an inconsistent result, with mixed information from the patient and provider? Alternatively, if each source and data element is kept and provenance maintained for each, it can become a navigation challenge to gain an understanding of the data.

- A set of rules must be created to avoid re-merging data in the PHR. How does the PHR avoid re-merging data? Consider the scenario where the PHR allows the patient to interact with the merge process, allowing certain merges to occur and preventing others. It would be irritating to the patient to have to review the same data each time synchronization with the source system (EHR) was initiated. This would be akin to balancing your entire checkbook every time you downloaded your bank statements.

- A set of rules for making deletions to a patient’s PHR. Is it reasonable to expect that the PHR should recognize that the source system deleted a particular record? Consider the case where an entry was incorrectly associated with the patient’s record. Once the mistake is identified, the EHR can be corrected and the erroneous record “deleted.” If the PHR imported that record at an earlier exchange, should it now recognize the deletion?

**EXPORTING FROM PHR TO EHR**

Typically, EHR data will not be overwritten as a result of interaction with a PHR. The EHR system will need to systematically extract from the PHR “patient-reported” data that will typically require the review of the assisting staff prior to incorporation into the EHR system. It is possible that the EHR system can implement a system of identifying “new” information originating from the patient and then provide a mechanism for clearly identifying it as patient-sourced.

In this case, importing from a PHR is less of a fully automated merge and more like the identification of changes for the purposes of enabling the controlled editing of the EHR data by the medical staff.

An alternative model is to consider the import as a “document snapshot” as opposed to using the data with the intent of directly importing.

**CLOSING THE LOOP EXPORTING FROM PHR TO EHR AND ON-GOING UPDATES**

EHRs and HIE (Health Information Exchange) community systems of record can play major roles in “refreshing” PHRs. Segregation of patient, provider, and payer data may be helpful, especially in the short-term, to work around “lossiness” issues in general, with EHR, HIE, and payer data maintaining its own internal integrity.

**CONCLUSION**

The automated exchange of patient clinical data is subject to a number of technical challenges. A tried and tested approach towards overcoming interoperability challenges is the creation of a set of agreements (technical implementation guide) aimed at minimizing circumstances where data is either lost or misinterpreted, supported, or approved by all participants. Implementing active enforcement and gaining trust from all participants is a prerequisite for the technical implementation guide to be effective. Community systems of record / sources of truth are amongst a number of alternatives yet to be proven in exchanging data between EHRs and PHRs.

The authors of the Community View on How Personal Health Records Can Improve Patient Care and Outcomes in Many Healthcare Settings, recommend the formation of a National Collaborative with representatives from the standards organizations referenced in this chapter, whose sole purpose would be to create a Technical Implementation Guide which will identify data exchange standards, controlled vocabularies, and processes for supporting data initialization and merge. JHIM

**Simone Pringle** is President and Co-Founder of Records For Living, Inc.—maker of the HealthFrame Personal health Record, and the HealthFrameWorks patient management services framework.

**Alex Lippitt** is Director, Community Solutions, for NextGen. Alex is heavily involved with implementing some of the most promising HIE initiatives. He has also served on HIE and HIMSS work groups, CMS and AHRQ expert panels, and a CDC-sponsored immunization registry working group.