An Oracle Technical White Paper
November 2010

Interoperability: A Key to Meaningful Use

ORACLE

Executive Overview

The American Recovery and Reinvestment Act of 2009 (ARRA) has earmarked approximately $19 billion to help physicians and hospitals achieve "meaningful use" of health information technology (HIT). At its core, ARRA's landmark meaningful use initiative is meant to help providers collect and store different combinations of electronic patient data—allergies, medication history, lab results, clinic visits—in an electronic health record (EHR) and then securely share this data with other health entities and governmental agencies. These capabilities will most certainly raise healthcare organizations to a new level of efficiency. But even more importantly, they will enable safer, more accountable, and more personalized care.

One of the chief hurdles to providers' achieving meaningful use and secure health information exchange (HIE) is the actual interoperability of their HIT systems with other entities' systems. The ability for providers' systems to speak the same language and recognize the formats, structure, and care codes in their communications will be critical in determining the success of the meaningful use initiative and the ability to improve care levels. Further, an organization's level of interoperability will become a new competitive benchmark.

This Oracle white paper will discuss the key criteria and importance of meaningful use and secure health information exchange, the critical role of system interoperability in realizing meaningful use, and the Oracle technologies that today are empowering providers to move forward with their goals of enhanced care and operational efficiencies.

The Meaningful Use of Technology

What constitutes the "meaningful use" of HIT, and why is it important not only to healthcare providers but also to patients, researchers, taxpayers, and policy makers? What must physicians and hospitals do to comply with meaningful use requirements, and when? What are the incentives penalties related to meaningful use compliance? And how does the interoperability of providers' HIT systems affect the ability to achieve meaningful use? This white paper will delve into these topics and present solutions from Oracle that are already enabling providers to improve efficiency and care levels.

Healthcare's Information Technology Trails Behind

In discussing meaningful use and interoperability, let's first look at the current state of HIT. It's no secret that although medicine itself has made major advancements over the past several decades, the technology of healthcare is still largely rooted in the last century. Many industries, including telecommunications, securities trading, and retail merchandising, invested heavily in information technology (IT) in the 1990s and have moved far ahead of healthcare in their ability to electronically capture, store, and send data. The healthcare industry as a whole has been slow to adopt new technologies to manage patient information, and most physicians continue to rely on paper records—leaving room for inefficiencies and medical errors.

Today's health IT challenges affect not just providers, but all healthcare stakeholders. Among the challenges that must be addressed:

- 31% of surveyed hospitals report data security breaches.
- Data cannot be de-identified for research and public health purposes.
- Care teams cannot collaborate with patients and families because they cannot all view the same EHR.
- An estimated 100,000 deaths per year in the U.S. alone are due to preventable medical errors.
- Data remains missing, inaccurate, and nonstandardized.
- The unnecessary duplication of tests, medications, and treatments adds to rising healthcare costs.
- Systems cannot integrate data from various sources—even those from within the same organization.
- Health information analysis and related research are hindered by lack of clinical data warehouses; only clinical data "silos" exist.

The Rollout of Meaningful Use

To encourage a higher level both in care and efficiency, ARRA set aside funding to help healthcare organizations improve their utilization of HIT, with the ultimate goal of increasing efficiencies in healthcare while improving care delivery and patient choice. Of the recovery funds, an estimated $37 billion is earmarked to help modernize HIT systems, with approximately $19 billion of this amount being for the meaningful use of technology, particularly in regard to patients' health records.

The U.S. Department of Health and Human Services (HHS) explains meaningful use in this way: "To achieve 'meaningful use' of the EHR (Electronic Health Records) technology, providers must use the technology in a manner that improves quality, safety, and efficiency of healthcare delivery; reduces healthcare disparities; engages patients and families; improves care coordination; improves population and public health; and ensures adequate privacy and security protections for personal health information."

The government has defined goals, objectives, and measurements to be implemented during three stages; in brief, they are:

- Stage 1 (2011) – Capture/share data
- Stage 2 (2013) – Advanced care processes with decision support
- Stage 3 (2015) – Improved outcomes

In its current iteration, much of the impetus behind the meaningful use initiative is to accelerate the adoption of new technologies across a broad base of physicians and hospitals, and to increase efficiencies and care levels within the Medicare and Medicaid programs. Improvements in the use of HIT will also offer a higher level of transparency with regard to data. This new transparency can also help providers make better operational and clinical decisions, enable researchers to more quickly obtain aggregated data and incorporate it into their studies, and empower governmental agencies and health industry entities to more effectively set policy.

Requirements for Stage 1

In July, 2010, the U.S. Department of HHS released the final meaningful use criteria for stage 1. Covering use of technology, clinical quality measures, and reporting, these criteria for hospitals and individual providers include a set of mandatory requirements as well as discretionary options. More information on stage 1 meaningful use criteria is available at www.healthit.hhs.gov, but here are some of the highlights:

- **Use of EHRs:** Doctors must meet 15 specific requirements, plus 5 chosen from a list of 10 objectives, regarding their use of electronic systems to record patients' demographic data (sex, race, date of birth); their height, weight, and blood pressure; their medications; and their smoking behavior. And hospitals, in their use of EHRs, must meet 14 requirements, plus 5 chosen from a menu of 10 goals.

- **E-prescribing:** Doctors must electronically send an accurate and understandable prescription directly to a pharmacy, for a minimum of 40% of their prescriptions.
- **Computerized Physician Order Entry (CPOE):** More than 30% of the unique patients being seen by an eligible provider or admitted to a hospital must have at least one medication order entered using CPOE. Note: For stage 2, this number increases to 60%.
- **Clinical quality measures:** There are 44 clinical quality measures, of which physicians must comply with 6. Hospitals must comply with 15. In 2011, reporting will be through attestation; for 2012, electronic submissions will be required.
- **Electronic copies of patients' medical records:** For at least 50% of their patients, providers must make available an electronic copy of medical records within three business days of a visit.

Incentives for Compliance

ARRA authorized the Centers for Medicare and Medicaid Services (CMS) to provide reimbursement incentives for eligible providers that are successful in becoming meaningful users of certified EHR technology. The incentives for compliance can be substantial—and there are penalties for noncompliance.

Preliminary requirements are now being discussed for the second stage of meaningful use in 2013, such as raising the level of performance required for computerized physician orders, electronic prescribing, and other measures that have been incorporated in stage 1. By April 2011, the meaningful use panel will have gotten initial indications of the initiative's impact, based on the providers' reporting on stage 1 measures, and this will help guide it toward finalizing stage 2 criteria for 2013.

A New Paradigm for Patients

In addition to the significant operational and business efficiencies that providers can realize over time through the meaningful use of HIT and EHRs, their ability to offer patients a higher level of care will also improve. Because more vital patient information will be shared between stakeholders—including physicians, labs, clinics, hospitals, and the patients themselves—there will be fewer errors and unnecessary tests, and caregivers will have more information with which to make smarter medical decisions. As a result, care can be more personalized and patients will be empowered to take more control over their own health.

Enabling Health Information Exchange

Some of the criteria for meaningful use call for providers' sharing of patient data with other entities on a regional, state, and even national level. This next section discusses health information exchange (HIE)—the seamless, secure, electronic sharing of health data across networks.

HIE Initiatives Abound

In many countries around the world, providers and governmental agencies alike are actively pursuing initiatives focused on HIE. Many challenges remain, but the progress is encouraging. In the U.S., with the guidance of Nationwide Health Information Network (NHIN) standards, there currently are more than 230 active HIE initiatives, and of these, more than 70 are operational (i.e., currently transmitting data that is being used by stakeholders).

Major HIE initiatives in Asia, Europe, and Canada are being implemented, and like those in the U.S., they are beginning to bear fruit. Now more than ever, it's clear that the right information, in the right hands at the right time, can have a dramatic impact both on care levels and on the bottom line.

In the U.S., an HIE Roadmap

In the U.S., healthcare organizations now interact with major national initiatives such as the Public Health Information Network (PHIN), the NHIN, regional health information organization (RHIO) initiatives, and others; emerging federal and state drug safety laws add another layer of complexity to the task of exchanging data.

Significant Progress on a Global Scale

Around the world, countries are forging ahead with national and regional HIEs. Here is a sampling:

- **Spain:** The Ministry of Health and Social Policy has built a robust national health information network, providing interoperability for the National Health System (SNS), which links the 17 regional health information organizations within the country. Millions of records and transactions are managed yearly, including a patient identification card and e-prescription.
- **Australia:** In New South Wales (NSW), Australia's most populous state, the Government Action Plan for Health stated as one of its key recommendations, "that NSW Health establish a Unique Patient Identifier (UPI) for every individual in NSW so that health care providers can identify with certainty the particular patient they are

dealing with, irrespective of where the patient has entered the health system." The implementation of a UPI sets up an infrastructure that will enable the public health system to deliver better patient care and continuity of care, reduce duplication of diagnostic testing and imaging and hence lower costs, and provide more cost-effective service delivery.

- **Canada:** Canada Health Infoway was created in 2001 as an independent, federally funded, not-for-profit organization tasked with accelerating the development of EHRs across Canada. As a strategic investor, they're working with Canadian provinces and territories with the goal of creating an EHR for 50 percent of Canadians by the end of 2010; by 2016, 100 percent of Canadians will have their electronic health record available to the authorized professionals who provide their health care services.
- **Singapore:** The Singapore Ministry of Health has announced that it will implement the National Electronic Health Record (NEHR) system, a key enabler of Singapore's vision toward a national, integrated health care system. Ministry officials said the NEHR is designed to improve the quality of healthcare for citizens, lower the costs of health services, and promote more effective health policies. Under the NEHR, key medical information, including patient demographics, allergies, clinical diagnoses, medication history, radiology reports, laboratory investigations, and discharge summaries, will be exchangeable among healthcare providers. Patients will benefit from proper, right-sited disease management and cost savings, as duplicate or unnecessary tests are eliminated and medication errors are reduced.
- **United Kingdom:** In 2005, the National Health Service (NHS) established NHS Connecting for Health, with the vision of having a more modern, efficient, patient-led health service, and to give patients more choice and control over their own health and care. Its key aims are to provide better, safer care for patients; to enable clinicians to increase efficiency and effectiveness; and to give healthcare professionals access to patient information safely, securely, and easily. NHS Connecting for Health is responsible for, among other initiatives, linking more than 8,500 general practices and their respective community health services in England to almost 300 hospitals.

Interoperability: A Critical Component of Meaningful Use

So far we've focused on meaningful use, ARRA criteria, and establishing connectivity with other entities. Now let's look at a critical component of meaningful use and the accurate, secure, and reliable exchange of health information: the actual interoperability of health organizations' systems across the continuum of care.

A Challenge—and a Key Enabler

True interoperability is a significant challenge to healthcare organizations—and a critical enabler of their meaningful use and HIE capabilities. An organization's level of interoperability can largely determine its ability to achieve meaningful use compliance and incentives; a competitive edge and a differentiated offering; higher efficiency in clinical, financial, research, and operational domains; improved profitability; and an enhanced ability to collaborate with business partners—current and new.

Interoperability is not new; healthcare entities have been exchanging information electronically for some time now. However, all too often the communication was rudimentary and there were misunderstandings between sender and recipient about the information being transmitted.

Today, at a basic level, interoperability means that healthcare entities can electronically communicate in a secure and accurate fashion. But interoperability also requires compatibility at a functional and semantic level; healthcare entities need to "speak" the same language. For example, if one lab's system utilizes a standards-based file format and set of lab codes, while another utilizes proprietary files and codes, it's very difficult—or impossible—to intelligently evaluate the health of a patient. And there are numerous services that complement the previous two functions and which require a standard format or shape in order for the data to be useful across entities. These services include such items as a healthcare master person index and health record locator, which will be discussed later in this white paper.

Data Should Follow the Patient

Today, there are new technologies and new methods for exchanging data that are being brought to bear regarding message infrastructure specifications. And in the U.S., some of the impetus for next-generation interoperability is coming from the government's creation of new standards and the inclusion of vocabulary in those standards.

For example, there are now standard structures for how to represent a patient's summary record, including visit history—even if the patient was seen in different medical settings—lab results, medication history, and allergies, along with personal information such as name, age, address, and more. And there are standardized code sets for lab tests. As interoperability evolves and standards are finalized, a physician or hospital staff member will be getting a more complete, more accurate picture of a patient when they electronically receive that patient's record from another caregiver. This is because the source and the target will be speaking the same language, not only in structure but also in vocabulary and terminology.

"Private and secure health information exchange enables information to follow the patient when and where it is needed for better care. The federal government is working to enable a wide range of innovative and complementary approaches that will allow secure and meaningful exchange within and across states, but all of our efforts must be grounded in a common foundation of standards, technical specifications, and policies."

– Dr. David Blumenthal, National Coordinator for Health Information Technology, 2010

Oracle's Approach

To ensure the best outcomes for patients and providers alike, a myriad of heterogeneous technologies must coexist and interoperate effectively. True interoperability should not require the replacement of existing systems; rather, an approach that is centered on enabling existing systems to extend their reach is the key to linking systems together and achieving HIE. In this context, interoperability is not limited to simply tying applications together; it must incorporate a common set of enabling technologies that can tie an entire healthcare organization together, automating long-running transactions and enabling higher efficiency.

Oracle's top-to-bottom approach utilizes an interoperability platform that can complement or replace the functions dominated by a select few vendors in recent years. This platform approach is aligned with the implementation of regional and national HIEs through the application of existing commercial-off-the-shelf (COTS) technologies.

Oracle Solutions and Products

Oracle has responded to the challenges of interoperability on a global level. The following sections will discuss a variety of Oracle technologies that enable the interoperability that is required in order to achieve meaningful use and HIE .

Oracle Health Information Exchange: An Integrated Suite of Products for HIE

Helping to drive the progress of HIE and the achievement of meaningful use is Oracle Health Information Exchange, an extensible, open, standards-based suite of products built upon a reliable technology infrastructure for the secure exchange of electronic health information. These products empower global healthcare entities to reduce costs, enhance revenues, and—most importantly—to improve patient care.

In addition to helping solve the challenges of meaningful use, these products enable providers to comply with governmental regulations and to realize a higher level of personalized healthcare.

- **Governance and compliance:** Moving forward, providers will experience even higher demands from federal and local agencies to establish and maintain compliance with an evolving range of regulatory requirements, including meaningful use reporting. Oracle Health Information Exchange products enable these organizations to manage risk by implementing systems to safeguard critical patient data—while ensuring that these patients have access to their own health information. They also help providers with the auditing and enforcement of government-mandated e-trading partner legal contracts, reducing the risk of collaboration with business partners.
- **Personalized healthcare:** The secure sharing of health data across networks can help providers move toward a model of personalized healthcare, whereby they can better meet patients' expectations for transparency and security—and safely utilize longitudinal patient information, such as disease states or reactions to certain medicines, to provide higher-quality care. Also, Oracle Health Information Exchange products enable providers to support translational research by more quickly getting critical data to—and from—the point of care, and establish the consent management needed to deliver care that is more personalized.

Next, we'll present the key components of the Oracle Health Information Exchange suite of products:

1. Oracle Health Sciences Information Appliance
2. Oracle Health Sciences Information Gateway
3. Portals and Applications

1. Oracle Health Sciences Information Appliance

Oracle Health Sciences Information Appliance v1.0 is a software—i.e., virtual—appliance delivered as an Oracle VM Template Assembly (TA) that supports secure electronic communication of health information. Its TA architecture includes a DMZ Gateway template and a datacenter adapter template, along with adapter plug-in template integrations that provide both data persistence capabilities and integration with consumer/provider end-user applications. In various implementation combinations, Oracle Health Sciences Information Appliance TAs support federated HIE, including enterprise, regional, statewide, or NHIN HIE models that can be highly distributed, highly centralized, or hybrid in nature.

CONNECT: Linking Providers and Networks

CONNECT is an open-source software solution that supports HIE at the local and national levels in the U.S. It uses Nationwide Health Information Network standards and governance to make sure that HIEs are compatible with other exchanges being set up throughout the country. Oracle Health Information Exchange solutions suite of products implements the CONNECT architecture and components with Health Information Organizations (HIOs). This CONNECT architecture can be used to set up an HIE within an HIO, and from there to securely share information with public and private HIE networks.

Oracle Health Sciences Information Appliance leverages the CONNECT reference architecture and Oracle server virtualization to provide a broad range of international standards–based Web services to HIE applications, in a management- and performance-optimized solution.

Oracle Health Sciences Information Appliance includes these key components:

- **Healthcare Master Person Index** provides a single point of reference to a patient, clinician, payer, or other healthcare entity within a healthcare organization or across HIE networks. It's a comprehensive offering for the standardization, matching, cleansing, and profiling of individual entities, ensuring that data is capable of being retrieved regardless of how many systems reference this entity with different identifiers or names. The result: a single source of truth for person management.

  Deployed in the largest healthcare settings worldwide, Oracle Healthcare Master Person Index employs cross-referencing of demographics and identifiers, along with a probabilistic and deterministic matching process. Complex algorithms for character uncertainty (phonetic errors, transpositions, character insertion, deletion, and replacement) are also used, and "junk" values—for example, John Doe or "ID #9999999"—are filtered. For maximum flexibility, Oracle Healthcare Master Person Index is open standards based for easier integration with third-party products—yet it's tightly integrated to all other Oracle healthcare product offerings, so it supports both initial projects and expansion as needed.

- **Health Sciences Record Locator** enables the registering and storing of documents by tracking document location. It supports centralized, federated, and hybrid data models, and facilitates interaction between the master patient index, registry, and repository in the query-and-response process.

- **Health Sciences Policy Monitor** aids providers in complying with governmental regulations, including those related to meaningful use, by centralizing EHR-access audit records and providing data to monitoring tools for the privacy officer.
- **Healthcare Data Repository** provides organizations and HIEs with a "gold-standard" terminology normalization functionality, supporting critical requirements for data aggregation and improved data quality. It enables a multiuse repository that supports a variety of deployment options such as document repository, HIE infrastructure, and application development. And it improves access to critical information, enabling healthcare analytics, detailed reporting, and timely information exchange with both internal and external entities.

Earlier we listed some of today's health IT challenges; below is a representation of how Oracle Health Sciences Information Appliance can help meet these challenges head-on:

Oracle Health Sciences Information Appliance offers significant benefits to a range of stakeholders:

- **For patients:** It enables secure, confidential, and timely access to patient information across providers, for more efficient treatment at lower costs and higher patient involvement in their own care.
- **For providers**: It accelerates the implementation of meaningful use objectives through scalable health information data capture, data transformation, data persistence, and data retrieval Web services. It also provides a platform for personalized, patient-centric healthcare.
- **For clinical researchers**: It ensures that optimum recruitment into clinical research is supported by consumer consent for release of health information and a complete set of phenotypic information.
- **For academia and life sciences companies:** It lowers the cost and time needed to obtain consumer consent for release of health information for research purposes, improving the research-dollar ROI. It also enables "cohort identification" for clinical trials and provides patient registries and a foundation for quality/efficiency research.
- **For payers:** It provides payers with key benchmark data, enabling them to perform analysis versus peers using de-identified data. It also enables payers to better understand future healthcare trends.

2. Oracle Health Sciences Information Gateway

Oracle Health Sciences Information Gateway leverages the CONNECT open-source application and Oracle server virtualization to orchestrate secure, health policy–based communications over the Internet for the protection in-flight of health information. This solution includes these two key components:

1. **DMZ Gateway** protects electronic health information by enforcing privacy policies regarding release of information, encrypting information in-flight over the Internet and ensuring NHIN compatibility.
2. **Datacenter adapter** enables the standardized orchestration of HIE business processes and supports release-of-information policies. It also ensures the encryption of information in-flight through the firewall and inside the datacenter.

Oracle Health Sciences Information Gateway empowers organizations to drive HIE initiatives and reduce the time and cost associated with research:

- **For providers:** It accelerates the implementation of meaningful use objectives through HIE—between certified and noncertified EHR modules and other health information organizations.
- **For academic medical centers:** It facilitates HIE for research purposes and patient care purposes at a very low IT cost.
- **For clinical researchers:** It reduces the cost of obtaining and executing on consumer consent for release of health information for clinical research purposes.

3. Portals and Applications

Portals and Applications present the business process GUIs for patients, providers, and other health information stakeholders. They are supported by Oracle Health Sciences Information Appliance and Oracle Health Sciences Information Gateway in an open, flexible, standards-based presentation environment, especially when displayed via Oracle's Sun Ray Client desktop virtualization solutions for maximum datacenter access control. Further, Oracle's life sciences applications are increasingly aligned and integrated with evolutions in HIE, patient care, and healthcare analytic applications.

Oracle Healthcare Data Model

As the cornerstone of Oracle's Enterprise Healthcare Analytics solution, Oracle Healthcare Data Model is a comprehensive and integrated data model for all of a provider's data—and a single source of truth for improved decision making and clinical performance throughout the organization. This data model, built specifically for healthcare providers, includes an expanding list of more than 1,000 entities and 12,000 attributes, spanning the clinical, financial, operational, and research domains. Now, providers can obtain the information that is essential for identifying best practices and optimizing enterprise performance, improving quality, and supporting the establishment of evidence-based practices. Further, Oracle Healthcare Data Model can substantially reduce the risk and TCO typically associated with a provider data warehouse.

This productized solution acts as a foundation upon which providers can deploy prebuilt business intelligence, analytic, data mining, and performance-management applications from Oracle. In addition, analytic applications from Oracle's rapidly expanding partner ecosystem include hospital infection control, medication-related adverse events, quality and outcomes reporting, patient registries, revenue cycle, and cost-allocation analytics and cohort identification. Because Oracle Healthcare Data Model was specifically engineered for ease of use for analytic application developers, it can easily be extended to accommodate customized applications for each provider's unique environment. Either way, starting with this product as a foundation will dramatically reduce development costs and time to value, and it will help realize the full potential of Oracle's analytics solutions.

Leverage the Advantages of Oracle's Experience

Oracle has two decades of experience with many of the world's largest enterprise-class data warehouses and has built clinical data repositories holding vast amounts of patient records globally. This experience, combined with the expertise of physicians, nurses, allied health professionals, and medical informaticists, has enabled Oracle to create a data model engineered from the ground up specifically for healthcare providers. By adopting Oracle Healthcare Data Model, providers can leverage Oracle's extensive data and information management expertise and support capabilities—along with the ability of Oracle and its partners to deliver new data integration and analytics products.

Navigating the Road Ahead

Looking ahead, today's HIT initiatives are on the right course—yet the road will not be without its twists and turns. As a leader in health sciences, Oracle is on the front lines of many key issues facing providers today, and with our proven experience and world-class, standards-based products, we're positioned for flexibility and strength—ensuring that our business partners will be better able to navigate safely through the curves.

Oracle's consultants complement Oracle health sciences products to provide a comprehensive solution, helping organizations to:

- Reduce project risk and improve quality with Oracle's distinctive resources and expertise
- Lower their total cost of ownership
- Realize faster time to value by leveraging Oracle's unique library of consulting assets and accelerators
- Address current and future challenges and opportunities

A New Model of Healthcare

Complying with meaningful use criteria and achieving true interoperability with other healthcare entities is a daunting challenge for any organization. By partnering with Oracle, the products, experience, and best practices required to meet these challenges are available now. And all of the benefits—including meaningful use incentives and increased efficiencies, reduced costs, and enhanced care—are attainable. Oracle stands ready to assist organizations in achieving a new model of healthcare.

Note: This document is for informational purposes only and may not be incorporated into a contract or amendment.

Interoperability: A Key to Meaningful Use
November 2010

Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
Phone: +1.650.506.7000
Fax: +1.650.506.7200
Oracle.com

Oracle is committed to developing practices and products that help protect the environment

1110