

Request for Information Comment Summary Report on:

The President's Council of Advisors on Science and Technology (PCAST) Report Entitled "Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward"

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Executive Summary

On December 8, 2010, the President's Council of Advisors on Science and Technology (PCAST) released a report entitled *Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward*. PCAST is an advisory group of the nation's leading scientists and engineers who directly advise the President and the Executive Office of the President. PCAST is administered by the Office of Science and Technology Policy (OSTP). PCAST makes policy recommendations in the many areas where understanding of science, technology, and innovation is key to strengthening U.S. economy and forming policy that works for the American people.

To better understand the implications of the PCAST report's recommendations on ONC's programs, ONC issued a Request for Information (RFI) on December 10, 2010, to seek public comment. The RFI sought general feedback as well as responses to nine specific questions. When the RFI comment period ended, 105 comments were timely received. Multiple stakeholders throughout the health care system provided written comments including:

- Electronic health record (EHR) and personal health record (PHR) developers, as well as other health information technology (HIT) companies;
- Information technology (IT) infrastructure experts, electronic health information exchange organizations and standards development organizations (SDOs);
- Health care providers, pharmacies and pharmacy organizations, health plans, and their respective associations; and
- Patient advocates, privacy advocates, state and local governments, and individual citizens.

The public responses yielded a rich and descriptive collection of thoughts on the recommendations put forth by the PCAST Committee in regards to the ingenuity of the report's proposals, and to how ONC should act on these recommendations. For the purpose of synthesizing the comments, ONC staff divided the commenters into stakeholder groups and then identified theme messages among the comments in relation to the nine questions that ONC posed in the RFI. Overall, the comments received touched on the following themes:

- Timelines
- Effects on ONC Programs
- The Implementation of PCAST Recommendations
- Privacy and Security
- Standards

Timelines

Many commenters supported the PCAST recommendations that focused on increasing information exchange capacity before meaningful use Stage 2. However, a majority of commenters were concerned about the timing implications related to fully implementing the PCAST recommendations in the midst of meaningful use Stage 2 and 3 in addition to other forthcoming regulatory compliance dates, such as the switch from the *International Classification of Diseases, Ninth Revision (ICD-9)* to the *International Classification of Diseases, Tenth Revision (ICD-10)*. Commenters also expressed concerns that patient safety could be affected due to the competing priorities of releasing Stage 2 requirement and allowing sufficient time to test Stage 2 certified EHR products. Commenters suggested that the PCAST recommendations should serve as a long-term strategy, rather than an immediate deviation from efforts already underway.

Effects on ONC Programs

Most commenters encouraged ONC not to reinvent the wheel during the Medicare and Medicare EHR incentive programs and to leverage the successes already achieved by ONC and private sector. Commenters also raised concerns regarding the potential financial impact to ongoing ONC programs (funded by grants and contracts) if ONC were to not implement PCAST's recommendations in a way that complemented work already underway. Some suggested doing pilots to develop and test PCAST's recommended technology solutions before being more widely implemented.

The Implementation of PCAST Recommendations

Many commenters echoed common themes of learning from and leveraging existing standards. A majority asked that health information exchanges (HIEs) and the electronic exchange of health information be the focus of future stages of meaningful use. As for the exchange of "atomic level" data, many agreed with the necessity of a Data Element Access Services (DEAS) structure, but recommended that such a program begin with pilot testing that also considers patient-linking and public trust issues.

Privacy and Security

Many commenters supported the concept of giving patients granular consent as envisioned in the PCAST report. However, many also worried that tagging patient privacy preferences to the data would lead to a static, rather than a dynamic, data control environment that prevented patients from updating their privacy preferences once the data was released and that this was only part of a complete approach to data protection. In addition, the research community largely supported PCAST's concept of creating a subset of de-identified data for the purpose research, though others were skeptical that data could truly be de-identified.

Standards

Most commenters stated that existing and emerging standards could meet PCAST's vision for interoperability and data liquidity. Commenters cited standards developed by the American National Standards Institute (ANSI) accredited SDOs such as ICD-10, Systematized Nomenclature of Medicine (SNOMED), and Logical Observation Identifiers Names and Codes (LOINC) and as implemented in HL7's Clinical Document Architecture (CDA). A few commenters, however, believed that current standards do not allow for the innovation, flexibility, or scalability that PCAST discussed in its report.

Beginning with Section 3, this document presents a detailed overview of the comments ONC received in response to the RFI. The summary is organized according to the nine questions presented in the RFI and then by the identified themes discussed above. Comments are restated as they were expressed and do not include or represent the Department of Health and Human Services' (HHS) views. This summary is available on ONC's website (www.hhs.gov/healthit).

1. Introduction

1.1 Background

On December 8, 2010, the President's Council of Advisors on Science and Technology (PCAST) released a report entitled, *Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward* (the PCAST Report).¹ PCAST is an advisory group of the nation's leading scientists and engineers who directly advise the President and the Executive Office of the President. PCAST makes policy recommendations in the many areas where understanding of science, technology, and innovation is key to strengthening our economy and forming policy that works for the American people. PCAST is administered by the Office of Science and Technology Policy (OSTP).

PCAST's report and its recommendations have significant implications for the nation's HIT agenda and the implementation of the Health Information Technology for Economic and Clinical Health (HITECH) Act, passed as part of the American Recovery and Reinvestment Act of 2009 (Recovery Act) (Pub. L. 111–5). On December 10, 2010, in order to gain public input regarding the PCAST report's vision, the Office of the National Coordinator for Health Information Technology (ONC) issued a Request for Information (RFI). The RFI specially sought comment on the following set of 9 questions. Comments on other aspects of the PCAST report were also welcomed.

1. What standards, implementation specifications, certification criteria, and certification processes for electronic health record (EHR) technology and other HIT would be required to implement the following specific recommendations from the PCAST report:
 - a. That ONC establish minimal standards for the metadata associated with tagged data elements.
 - b. That ONC facilitate the rapid mapping of existing semantic taxonomies into tagged data elements.
 - c. That certification of EHR technology and other HIT should focus on interoperability with reference implementations developed by ONC.
2. What processes and approaches would facilitate the rapid development and use of these standards, implementation specifications, certification criteria and certification processes?
3. Given currently implemented information technology (IT) architectures and enterprises, what challenges will the industry face with respect to transitioning to the approach discussed in the PCAST report?

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¹ The full report is available at <http://www.whitehouse.gov/administration/eop/ostp/pcast>

- a. Given currently implemented provider workflows, what are some challenges to populating the metadata that may be necessary to implement the approach discussed in the PCAST report?
 - b. Alternatively, what are proposed solutions, or best practices from other industries, that could be leveraged to expedite these transitions?
4. What technological developments and policy actions would be required to assure the privacy and security of health data in a national infrastructure for HIT that embodies the PCAST vision and recommendations?
 5. How might a system of Data Element Access Services (DEAS), as described in the report, be established, and what role should the Federal government assume in the oversight and/or governance of such a system?
 6. How might ONC best integrate the changes envisioned by the PCAST report into its work in preparation for Stage 2 of Meaningful Use?
 7. What are the implications of the PCAST report on HIT programs and activities, specifically, health information exchange and Federal agency activities, and how could ONC address those implications?
 8. Are there lessons learned regarding metadata tagging in other industries that ONC should be aware of?
 9. Are there lessons learned from initiatives to establish information sharing languages (“universal languages”) in other sectors?

Appendix A contains a copy of the RFI published in Federal Register Volume 75, No. 237, December 10, 2010, 76986–76987.

1.2 Scope

Public comments were accepted between December 10, 2010 and January 19, 2011 and a total of 105 comments were timely received at the end of the comment period. Multiple stakeholders throughout the health care system provided written comments including:

- Electronic health record (EHR) and personal health record (PHR) developers, as well as other health information technology (HIT) companies;
- Information technology (IT) infrastructure experts, electronic health information exchange organizations and standards development organizations (SDOs);
- Health care providers, pharmacies and pharmacy organizations, health plans, and their respective associations; and
- Patient advocates, privacy advocates, state and local governments, and individual citizens.

The sections that follow summarize the RFI responses first by question and then, where applicable, the relevant theme(s) (timelines; effects on ONC programs; the implementation of PCAST recommendations; privacy and security; and standards) the comments addressed. The summary does not analyze the relative merits of the responses, nor is it exhaustive or representative of the full content of responses.

2.1 RFI Question One

What standards, implementation specifications, certification criteria and certification processes for EHR technology and other HIT would be required to implement the following specific recommendations from the PCAST report?

2.1.1 RFI Question One, Part A

That ONC establish minimal standards for the metadata associated with tagged data elements.

Build on existing art

Commenters including vendors, providers, standards development organizations (SDOs), patient advocates, pharmacies, and individuals all emphasized the need to leverage and build on existing metadata standards, registries, taxonomies and vocabularies. They asserted that the health care industry had already made significant progress in these areas and that the standards development process is laborious and time-consuming. Provider associations, EHR vendors, health plans, hospitals, infrastructure experts, and pharmacies strongly focused on the need to build reference implementations in order to assist in demonstrating “best practices.”

Use a consensus driven process

There was broad alignment among commenters that ONC should establish minimal standards for the metadata associated with tagged data elements. Many vendors, pharmacies, providers, health plans, SDOs, and multiple associations largely agreed that establishing these standards would require an open, consensus-driven process that includes discussions among a variety of subject matter experts and stakeholders. One EHR vendor respondent specifically stated that this must be a process that is consistent with OMB Circular A-119, rather than a top-down federal mandate. In addition a laboratory association suggested that a single standard with a tracked version number should be established through SDOs. This standard would include the input of all stakeholders on such key issues as defining what metadata to acquire and transmit, defining patient privacy choices, and identifying data sources for metadata.

Utilize existing XML-based standards

Many commenters said an entirely new healthcare eXtensible markup language (XML) variant would be unnecessary and encouraged the government not to “reinvent the wheel.” Vendors, SDOs, providers and several associations articulated that the health care industry has made significant progress toward using XML for computable health data tagging and exchange and suggested that the government needed to glean from what has been already learned in this industry about using XML. One EHR vendor suggested that ONC establish a body for metadata tag development, maintenance and governance for the extensive amount of metadata tagging that will be necessary.

Reuse HL7 CDA

Commenters including software and EHR vendors and health plans suggested that data elements remain grouped in documents or data sets. They stated that the Integrating

the Healthcare Enterprise Cross-Enterprise Document Sharing (IHE XDS)/Integrating the Healthcare Enterprise Cross-Community Access (XCA) profiles, along with HL7 Clinical Document Architecture (CDA) (and others like the Digital Imaging and Communications in Medicine (DICOM)), already address the most obvious weaknesses in the solution sketched by PCAST, and should be used as a starting point. In addition, some commenters pointed out that for radiology diagnostic reports, metadata sufficient to enable effective sharing can be included at the document and document section levels in HL7's CDA.

Beware of losing critical clinical context

A few commenters contended that metadata tagging may increase the risk of losing critical clinical context. One pharmacy pointed out that tagged data does not directly support the storage, transmission or uploading of data in a coded format that attaches consistent meaning. Therefore, the focus should include a method of translating existing EHR data into a codified format that computer systems could then harness and use to improve healthcare delivery. A document model providing important aspects of contextual integrity and completeness should not be sacrificed to adopt a model that is more narrowly focused on data elements. Commenters also stated that choosing the right granularity of data-tagging is critical. It was noted that a record-centric approach that “wraps” reports with its own vocabulary-controlled metadata is not suitable as a broad exchange language and that strictly a disaggregated or atomic level approach is not suitable either. In addition, a standardized reference to the location in a taxonomy that defines this data element must be semantically clear. Commenters explained that this would require the semantic resolution of terms between different taxonomies as well as some specification of the mapping between the existing data elements and its values and the accepted data element definitions and standardized values. One IT infrastructure expert stated that this information needs to be available from a central repository using standard tools and/or interfaces. Furthermore, the establishment of minimal standards by ONC will be essential to the possibility of rapid success.

Take an approach that keeps metadata requirements to a minimum

Some commenters expressed concerns that the technical solutions proposed by PCAST were too complex and would not scale to widely distributed sources of data elements for one patient. IT infrastructure experts, EHR vendors, health plans, and providers among other respondent groups emphasized that a model-driven view is needed. These commenters stated that data attributes should be used as metadata tags and terminology/value sets to define the semantics of the metadata tags and that these metadata requirements should be kept to a minimum. Minimal standards should embrace “source tagging” which identifies the venue and time of entry of any DEAS content.

Utilize existing standards and initiatives

Most respondents, including several SDOs, EHR, PHR, and software vendors, associations, and health plans, indicated that ONC should leverage existing metadata registry systems which hold healthcare information that complies with ISO and ANSI standards (e.g., HL7, CDA, Organization for the Advancement of Structured Information

Standards (OASIS) Cross-Enterprise Security and Privacy Authorization (XSPA), ISO 13972, Archetype Definition Language), and that there is similar completed and ongoing work being done by with IHE, HL7, National Library of Medicine (NLM), Clinical Data Interchange Standards Consortium (CDISC), American Society for Testing and Materials (ASTM), Digital Imaging and Communications in Medicine (DICOM), Industrial Electronic Engineers (IEE), International Organization for Standardization (ISO), X12, Healthcare Information Technology Standards Panel (HITSP) and the Nationwide Health Information Network projects.

2.1.2 RFI Question One, Part B

That ONC facilitate the rapid mapping of existing semantic taxonomies into tagged data elements.

Use an open and transparent process

Many commenters stated that ONC needed to facilitate the rapid mapping of existing semantic taxonomies into tagged data elements. They noted the need for an open and transparent process to identify existing semantic taxonomies as well as detailed use cases to facilitate the mapping of tagged data elements into standards already in use today. A commenter suggested that the deployment of a national, free, semantic wiki governed by an appropriate oversight body could facilitate “mapping of existing semantic taxonomies onto tagged data elements.”

Build on existing art

Commenters again suggested that ONC should build on existing taxonomies and vocabularies and not reinvent the wheel where existing efforts have produced working code. They echoed that rapid mapping of existing taxonomies will be more useful than explorations into new or alternative taxonomies.

Use an iterative approach

Multiple commenters suggested that metadata tagging standards begin in the continuity of care document (CCD) and then be expanded to include computerized provider order entry (CPOE), lab results, and e-prescribing in the form of a staggered approach. They argued that such an approach would allow the vendor community time to respond to the new requirements and allow standards setting organizations to map metadata standards to the required exchange standards.

Harmonize existing taxonomies

Various associations, EHR vendors, health plans, pharmacies, software vendors, and SDOs all commented on the need to harmonize existing taxonomies. They noted that additional work would need to be done to create a range of document types to address the full variety of clinical and research use cases as developed by organizations such as the American Health Information Community (AHIC). It was also mentioned that it would be highly beneficial to develop cross mappings of overlapping terminologies and code sets. Commenters also expressed support for a federally supported, widely available mapping from Systematized Nomenclature of Medicine-Clinical Terms (SNOMED-CT) to ICD-9/ICD-10, because such a mapping was seen as a way to greatly facilitate the use of the appropriate terminologies for clinical care without requiring extensive technology investments in mapping to codes used for billing.

Take a model-driven approach

Several EHR vendors, health plans, and providers suggested that this work requires a model driven approach, arguing against the PCAST report’s assertion that middleware alone can facilitate semantic interoperability among legacy systems. An IT infrastructure expert emphasized the importance for ONC to support the task of mapping, but noted

that much more than mapping and the use of middleware would be required to implement PCAST's recommendations. Again, it was noted that an information model would be required to define the data attributes that should be used as metadata tags and terminology models/value sets to define the semantics of metadata tags. Commenters suggested that a national effort to create health related metadata standards should begin with a comprehensive modeling program to develop detailed clinical models. The models, they argued, needed to be complete, domain-specific reference models "hard coded" or invariant regardless of their use, but that could be reused and organized in archetypes and/or templates flexibly according to their use.

Take a Use Case-driven approach

One software vendor suggested that taxonomy selection through use cases should be considered, i.e., the ONC should facilitate an organization to make semantic taxonomy selection based on specific use cases.

Make it easy to adopt

One commenter emphasized that any new semantic taxonomies necessary should be simple and straightforward in order to provide vendors and health care providers with a clear path towards adoption.

Leverage existing organizations to do the work

One respondent suggested that the NLM might be the subject matter experts for mapping. Another suggested that ONC could contract with National Institute of Standards and Technology (NIST) or other organizations in the private sector to develop reference implementations.

Beware of taxonomy mapping risks

EHR vendors stressed that mapping cannot be rapidly accomplished without impacting overall quality, because mapping is an extremely detailed process the fact that there is little prior work in the development of metadata for the purposes PCAST described. It was identified that mapping carries risks, such as loss of meaning between the source and target concepts. It was also noted that multiple maps would likely need to be built, since maps must be developed according to their purpose and there would be many purposes for data exchange.

Consider Accredited Standards Committee X12 (ASC X12)

As one SDO pointed out, ASC X12 Healthcare Data Element Dictionary defines all relevant terms and the semantics of how the terms will be used in the context of transactions. Specifically, each data element contains universally assigned tags to locate unambiguous information about actual tagged data.

Consider existing vocabularies being used

Commenters contended that the use of SNOMED CT would provide the granularity required for accurate clinical documentation. Other "domain specific" vocabularies such as RxNorm and LOINC would be able to augment the number and variety of data elements that can be used. Commenters also discussed that ICD 9 Clinical Modification

(and ICD 10 Clinical Modification) elements should be derived from mappings from SNOMED CT rather than being considered as first order vocabularies. One EHR vendor recommended that Current Procedural Terminology (CPT) 4 should be abandoned altogether since it simply overlaps and restates terminology elements already found in the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD 9 CM). Commenters recommended that a survey of existing models and projects (e.g. Clinical Elements Model-Intermountain Health, Health Level Seven International Reference Information Model (HL7 RIM)) should be conducted and that existing models be updated based on the survey's results. A PHR vendor noted that in particular, HITSP utilized the US Health Information Knowledgebase (USHIK), now hosted by the Agency for Healthcare Research and Quality (AHRQ), to catalog data elements from ONC/AHIC use Cases. Furthermore, IHE profiles define the use of semantic terminologies (ICD 9 CM, SNOMED-CT, RxNORM, and LOINC) so that new concepts can be communicated without changes to underlying document definitions. Also, Health Level Seven (HL7), CDA, and Digital Imaging and Communications in Medicine Structured Reporting (DICOM SR) standards make it possible to reference specific taxonomies and coded value sets, including broad ones like SNOMED and LOINC and specialty-specific like RadLex.

2.1.3 RFI Question One, Part C

That certification of EHR technology and other HIT should focus on interoperability with reference implementations developed by ONC.

Build on real-world usage and pilots

One SDO stressed that an incremental process using an existing pilot or demonstrations (e.g., NwHIN, NwHIN Connect, and the Direct Project) could reduce the risk implementing unsuccessful large scale industry changes. Specifically, the Direct Project has demonstrated a working model for reference implementations that could be used in these efforts.

Use reference implementations to drive certification

ONC reference implementations should drive certification of EHR technology and demonstration of “best practices” for the next generation of Health IT, whether modular components or whole systems. Some commenters felt that it is essential to base certification as much as possible on ONC-developed reference implementations to realization of opportunities identified by PCAST. However other commenters stated that non-governmental organizations, such as standard development organizations, and not ONC, should create reference implementations. Commenters also suggested that certification criteria be based on requirements derived from in vivo use cases, not abstractions.

Use an open and transparent process

Several associations, EHR vendors, health plans, and SDOs indicated that an open, community-based, approach using real data should be used as greater involvement and transparency would be one of the requirements necessary to meet the requirements specified in the PCAST recommendations.

Build on existing efforts

Commenters noted the need to build on existing processes for testing and certification. One SDO recommended that the IHE testing and implementation process will provide the foundation for interoperability testing and certification. IHE has worked in partnership with NIST and CCHIT in development of these testing tools and processes.

Build on existing art

Commenters recommended that reference implementations should focus on the use of existing standards and implementation guides, rather than trying to re-invent new standards for the same purposes.

Take a model-driven approach

An IT infrastructure specialist and EHR vendor both recommended that a model-driven approach for certification would be needed and that doing so would require implementation modeling tools capable of producing standard reference implementations and certification criteria. One example is Model Driven Health Tools

(MDHT) which is being developed by Open Health Tools. Work such as MDHT supports development and implementation of the CDA standard.

Build interoperability into certification

Several commenters underscored that interoperability is critical to safe and effective transmission of patient-centered data and that without criteria and certification, long-term meaningful use (e.g., a learning health system) cannot be realized. Under the current certification process, providers or hospital systems may invest in a complement of certified products, assuming that the products will successfully address meaningful use and result in a well-rounded EHR system, only to learn after implementation that the certified products are not interoperable. One EHR vendor stressed that the lack of attention to interoperability criteria within the current certification process is a deficiency and could pose challenges and impediments to long-term health information exchange. One software vendor suggested that specific information exchange capabilities, which could be defined and certified for an EHR, include a standard access interface to existing internal patient data. This interface should enable external tools (such as the proposed DEAS crawler) to dependably access this internal information. In addition, this interface should enable a standardized mapping process, allowing consistent tagged data elements based on standardized taxonomies.

Acknowledge the importance of data at rest

Several commenters including EHR vendors, physicians, software vendors and health plans raised concerns about the PCAST report's over emphasis on interoperability. For example, one EHR vendor argued that the PCAST report's focus on interoperability did not appropriately acknowledge the day-to-day use of EHRs by clinicians and the need for data integrity. The vendor explained that the interoperability PCAST described did not appear to account for the need for record structure even when metadata was to be assigned. They concluded that the middleware PCAST described would have to be tested across the various EHRs and EHR modules. Reference implementations will help ensure functionality and data integrity. Also, it is important that tagged data elements exist inside the EHR as well as in external messages and documents. With respect to metadata, one commenter added that certification should cover EHR system functionality and validate data at rest (within EHR systems) and data in motion (during interchange between systems) to ensure valid metadata content. Some commenters noted that certifying EHR systems ability to support "tagged data elements" would be difficult as the concept of tagged data-elements still needs a good deal of work and exploration to be fully realized in a practical way for healthcare.

2.2 RFI Question Two

What processes and approaches would facilitate the rapid development and use of these standards, implementation specifications, certification criteria and certification processes?

Leverage the S&I Framework

One vendor recommended that the Standards and Interoperability (S&I) Framework should be used to establish a unified approach that addresses the PCAST report's recommendations. Both an individual and an EHR vendor highlighted that the Direct Project model provides the process infrastructure needed to quickly define the specifications necessary for a record locator service based on a Web Ontology Language Resource Description Framework (OWL-RDF) indexing mechanism for RIM-based, metadata tagged data elements. While still using the Strategic Health IT Advanced Research Projects (SHARP) Program and Beacon Community Program provide examples for development, opening up the entire process to other interested groups will help crowd-source good ideas. It was suggested that creating implementation geographies similar to those being used in the Direct Project would work well.

Use an open and transparent process

The majority of respondents believe that there needs to be broad industry participation and assurance of openness and transparency. There are many publishers of tagging standards and (Synchronous Transport Module) STM technology providers who could assist here, but there should be a more transparent and easily understood process for engaging these players. According to a software vendor, the buy-in of all major stakeholders in the health care sector ranging from SDOs to early adopters would be critical to the rapid adoption of tagged data elements. One EHR vendor adds that any unilateral movement by ONC to adopt the Report's recommendations and needed standards without industry involvement could derail the existing EHR incentive programs. Another vendor stressed that ONC should use existing standards and implementation guides wherever possible, consistent with Office of Management and Budget (OMB) Circular A-119, to avoid introducing costly retraining, reengineering, and redevelopment especially when standards have been previously tested or deployed in HIT.

Build on existing efforts and art

Several respondent groups including pharmacies, States, PHR vendors, software vendors, SDOs, associations, EHR vendors, health plans, patient advocates, and individuals strongly emphasized the need to build on existing processes that work. These respondents strongly suggested an incremental approach that helps to promote rapid adoption, realization of tangible benefits, and simplicity. One pharmacy respondent in particular recommended that ONC build on the experience gained from similar shifts in industry standards (e.g. the pharmacy industry continues to develop transaction exchanges including clinical information query functions, medication therapy

management exchanges, and other business exchanges). Some commenters noted that work completed by HITSP and IHE can also be reused.

Adopt an incremental approach

Multiple groups such as EHR vendors, health plans, software vendors, SDOs, pharmacies, associations, and patient advocates all called for an incremental approach to implementing any PCAST recommendations. They contended that an incremental approach along with the demonstration of tangible benefit to front line clinicians would be a key to rapid adoption. Building on this point, one SDO specifically called out the immediate benefits to clinicians of access to information from peers, including narrative notes that are indexed.

Provide appropriate tools

One SDO noted that appropriate tools must be provided to assure the necessary standards and specifications can be supported. According to one software vendor, a common toolset (e.g., MDHT), collaborative workspace, open source, reference implementation, pilot demo and testing are all required.

Use pilots to demonstrate real-world effectiveness

One respondent recommends that ONC embrace pilot geographies model across multiple domains in achieving rapid development and use of DEAS. Also, according to one health care provider, selecting a few examples for demonstration of new technology and using a combination of contract staff working on standards harmonization could be an effective tool to move towards a new data centric tagged model for a simplified universal language.

Learn from or leverage IHE and MITA processes

According to a SDO and software vendor, IHE's process for implementation specifications has been proven to be effective. IHE works in annual cycles to define, publish, and test IHE profiles, which are implementation guides for the use of standards to achieve HIT systems interoperability. This iterative process allows sufficient time for research and deliberation by stakeholders and public comment in the 12 IHE clinical domains, while enabling rapid feedback and refinement based on implementation and testing experience by a broad segment of the HIT industry. Additionally, one State responded that governance like the Medicaid Information Technology Architecture (MITA) which includes stakeholder engagement, development of a set of service specification including standard-based interfaces and service level agreements is necessary.

Support existing standards development activities

A patient advocate highlighted the fact that standards development activities can take several years to move a new standard from concept to implementation. Efforts to hasten this process often have the unintended effect of excluding much of the volunteer labor force that are so crucial to ensuring the standards operate as intended at the point of care. ONC funding may be helpful to accelerate current standards development activities that are aimed to address gaps in achieving the meaningful use of certified

EHR technology and to support participation of clinical advisors in the standards development process. Also, providing resources to professional organizations and SDOs (e.g. to develop HL7 version 3 (HL7 V3) and RIM) that are developing clinical templates was noted as a way to help facilitate adoption.

2.3 RFI Question Three

Given currently implemented information technology (IT) architectures and enterprises, what challenges will the industry face with respect to transitioning to the approach discussed in the PCAST report?

2.3.1 RFI Question Three, Part A

Given currently implemented provider workflows, what are some challenges to populating the metadata that may be necessary to implement the approach discussed in the PCAST report?

Legacy data may not map to structured metadata

One software company points out that legacy data may not be “mappable” to the new metadata. EHRs would need to be upgraded so in order to use computable data instead of free-text fields. Furthermore, most EHR software will need updates to conform to the production and consumption of metadata. Finally, reflecting an earlier comment, vendors and users will need to determine how data will be stored and used both for internal purposes as well as external purposes.

Metadata semantics will need to reflect workflows

One provider believed that workflow management is probably more important than a highly functioning EHR. In addition, that workflows should be reflected in the functionality of the EHR so that relevant information can then be exchanged with external systems.

Changes in architecture may impact governance

One individual pointed out that the PCAST recommendations call for dramatic changes in architecture (separating metadata storage from PHI data storage, perhaps precluding federated or regional PHI data stores, indexing and searching on data elements, etc) which would drive changes in governance as well as in the currently implemented HIE’s/RHIO’s. HIEs/ Regional Health Information Organizations (RHIOs).

Hardware and bandwidth limitations

Associations and individual physicians highlighted the lack of computing resources as a barrier. Specifically, they pointed out that there needs to be availability of computing resources and bandwidth to providers who may face severe latency issues, particularly with remote access. Therefore entities with poor hardware or low bandwidth will not be able to compile tagged patient data from multiple sources in a timely manner.

Commenters noted that even today many organizations do not have the computing power to allow their providers to take advantage of general purpose search and reporting features in current EHRs because it will slow operations or require technical support not available in small practices. One health care provider added that implementing the PCAST recommendations would require constraining the potential burden by limiting data queries to a few data elements and pre-indexing this data for rapid searching.

Compliance with existing regulations and organizational policy

Commenters raised that one of the challenges related to privacy and security oriented metadata would be the technological capability of health care providers to keep it current; particularly metadata that may be subject to repeated changes. They also noted that the variability across states could introduce additional challenges (e.g. where one state is opt-in and one is opt-out, with patients receiving care in both). One health plan stressed that health care is highly regulated and operates under well-established state medical records laws, state and federal privacy and security laws and regulations, medical liability laws, and other regulations such as those for clinical laboratory information and that every transition toward a new approach must comply with such applicable laws. Commenters noted that the industry currently faces significant challenges to comply with recent regulatory changes and that the Report's approach represents additional radical and untested change.

Real-time patient identity matching is unproven

Several software vendors, EHR vendors, health plans, and associations observed that patient identity matching will be a key problem with PCAST's recommendations. For each instance of a tagged data element to have a reference to a patient's PHI (particularly if it is matched in real-time) is both unstable and risky.

Atomic data exacerbates the patient matching problem

A couple of commenters argued that contrary to the report's conclusions, patient identification and matching across healthcare data are substantially less precise when the unit of analysis is the individual data element. They contended that PCAST's recommendations could not be implemented without developing a solid record matching process, using either a national patient ID or a single, national approach to probabilistic matching that has a low error rate. They concluded that if medical records and data are disaggregated, the number of opportunities for error could increase exponentially.

Legal and data ownership issues

Health plans and health care provider associations highlighted legal and data ownership issues as a key challenge to transitioning to the approach recommend in the PCAST report. One hospital suggested that the questions that needed to be addressed include, for example: What happens when there are changes in the data? Will changes to the data require changes to the metadata or will a new layer of metadata be added? How does the recipient of a record ensure that the metadata is accurate and is readily able to determine the identity (for purposes of credibility) of the metadata author two or three modifications back?

Loss of clinical context

A number of respondents stressed that the individual data element approach divorces data elements from key contextual information and will not provide a complete or accurate basis for safe and effective clinical care.

Potential impact to patient safety

Some commenters noted that patient safety could be affected if there was an aggressive push to change existing systems, standards and workflows in order to implement the PCAST recommendations. One commenter pointed out that a concern among stakeholders that implementing privacy controls at the data element level, as suggested in the PCAST report, could fracture the medical record to the point where it loses context for clinicians and could compromise patient care.

Find the data granularity middle ground

Most commenters pointed out that achieving consensus on the right level of data granularity would be a challenge. Thus, the biggest challenge to the adoption and implementation of PCAST's recommendations would not be a technological one, but rather the ability of a diverse set of stakeholders to agree to a set of vocabularies and metadata that enables sufficient, but not immediately perfect search capabilities. Without the right balance, commenters argued that the proposed approach could fail to meet clinical requirements, or could pose too high a hurdle for IT vendors to implement. One software company believed that the HITSP C32 would be suitable to find a usable middle ground by specifying data models and a taxonomy for binding for a small set of the most important data elements. One commenter acknowledged that the current "document-centric" architecture is at odds with the PCAST data-centered vision, but also conveyed that a clinical note is more than the sum of individual data -- the context, sequencing and prioritization of data elements -- which cannot be expressed if data are separated. Rather than choosing one approach over the other, commenters suggested that a hybrid approach be pursued. One that allowed data to be transmitted in a document format, but also separated out as PCAST had suggested. Finally, one commenter noted that the medical community must find the right balance between the collection of desirable data elements and impact on health providers to collect them so that it is not overwhelming.

2.3.2 RFI Question 3, Part B

Alternatively, what are proposed solutions, or best practices from other industries, that could be leveraged to expedite these transitions?

Specific examples in other industries

In terms of best practices or examples to leverage from other industries, commenters pointed out that ONC should look to the implementation of the extensible Business Reporting Language (XBRL) by agencies such as Securities and Exchange Commission (SEC) and the Federal Deposit Insurance Corporation (FDIC), among others. Commenters also recommended that data exchange standards be considered from sources such as the Association for Cooperative Operations Research and Development (ACORD - P&C Insurance), Global Commerce Initiative (GCI- consumer products and retail), Society for Worldwide Interbank Financial Telecommunication (SWIFT - banking), Treasury Workstation Integration Standards Team (TWIST), and Voluntary Interindustry Commerce Solutions Association (VICS - supply chain management). Another commenter suggested looking at the banking industry and power industry as examples of overcoming data and power sharing challenges across multiple spectrums/institutions. One EHR vendor suggested looking at e-commerce standards developed by OASIS. Similarly, another commenter suggested that ONC follow the lead established by e-Commerce regulations governing transactions over the web (e.g. Model DEAS similar to PayPal or any banking entity).

Use an open and transparent process

As part of the proposed solution to reduce potential challenges to implementing the PCAST recommendations and to ensure a successful first design of the exchange and data mapping/tagging systems, multiple commenters believed that broad industry participation could be achieved if it were built on an open and transparent process. One EHR vendor respondent emphasized that EHR vendors and network experts, compliance experts and experts on the legal and logical limitations on exchange should all be involved.

Enable interoperability between different granularities of tagged data

According to some software vendors, EHR vendors, and associations, ONC should first build on currently developed/implemented document-level tagging approaches instead of element-level tagging, or at least enable interoperability among the two. In particular, one association stresses that EHR vendors need to begin work on a bi-directional translator that has the ability to mix discretely coded data with the text data until the universal exchange language is truly comprehensible.

Shared tools are needed

Commenters, including EHR vendors, suggested that open source tools be made available that could be used by anyone in the industry as such tools would help accelerate change. One commenter suggested that if national licenses for proprietary terminologies were purchased, then it would also help accelerate change. Also in doing

so, ONC, specifically, should create a freely available mapping portal and publish mappings as they are completed, along with tools to use the mappings.

Learn from current registries and information sharing architectures

To start with, there are many metadata registries holding health care information that comply with the ISO and ANSI standards. Also, a software vendor notes that existing technology focuses on tagging physical data documents rather than atomic data elements. For example one vendor's chart search feature uses Natural Language processing to tag free text while Latent Semantic Indexing (LSI) is used to analyze optical character recognition (OCR)-scanned documents and other metadata hierarchies. As such, the commenter argues that initial sharing should begin simply with scanned paper files, tagged with metadata, and exchanged via the IHE XDS sharing architecture.

Beware of the unique attributes of the health care industry

Commenters also pointed out that health care has its own unique attributes and nuances and that ONC should be cautious if it seeks to leverage the best practices and examples from other industries due to the fragmented nature of the health care industry.

2.4 RFI Question 4

What technological developments and policy actions would be required to assure the privacy and security of health data in a national infrastructure for health IT that embodies the PCAST vision and recommendations?

Privacy and security requirements must be factored into timeline and cost

Commenters recommended that ONC should keep in mind the cost that could be required to implement PCAST's recommendations according to the suggested timeline

Security protocols must be incorporated into ONC Programs if not already

A common theme throughout the comments was the need for ONC to incorporate security and privacy as foundational components rather than regarding them as remedies for specific deficiencies. Commenters noted that all programs needed to have a common and well-defined trust model that specifies strong, enterprise-level authentication, and authorization for users that are able to retrieve information through electronic health information exchange.

DEAS may have issues with patient matching

Some commenters raised concerns that the ability to match patients based on specific identifying traits and in the absence of a unique identifier would make it difficult to use data element access services (DEAS). Commenters noted that false positives or omissions would degrade performance and could also reveal incorrect information or disclose protected information to unauthorized users.

A security risk analysis is needed to achieve trust framework

Many different commenters recommended that a thorough security risk analysis be conducted that would take into account the potential threats and vulnerabilities implementing the PCAST's recommendation could introduce. Several privacy advocates encouraged ONC to evaluate the risks of interoperable IT systems and avoid mistakes past projects have made when pursuing interoperability such as neglecting some aspects related to security.

Effective privacy metadata must be dynamic

While many comments focused on the ability to exercise more granular control over the disclosure of data elements, there was concern from providers and vendors that privacy metadata linked to the privacy policy would not be sufficiently flexible, and therefore not allow for changes to the privacy policy or an individual's privacy preferences over time. These comments contended that statically-linked privacy metadata would result in "data-centric" rather than "patient-centric" privacy. They also raised concerns regarding the workability of statically-specified privacy metadata because it would have to be modified as an individual's privacy preferences change. Therefore it was suggested by many commenters that the privacy policies rely on explicit rules. In addition, one vendor added that the decision to disclose a data element cannot be made only on the basis of that element's metadata but also in the context of other related information.

Access to data for research is necessary

There was concern from research advocates that the increased emphasis on privacy metadata and consent, and increased granularity of patient consent would hinder the exchange of information for research purposes. The research community indicated that the ability of systems in the health network to de-identify health information would be critical to meet their needs for future projects. However, some privacy advocates were concerned that the algorithms used to de-identify health data are not entirely reliable.

The DEAS model needs to balance efficiency and privacy

Though some vendors expressed concern that searching and exchanging granular data elements could introduce performance problems, others were concerned that DEAS's would use internal databases to hold sensitive personal information in order to increase their efficiency. While commenters agreed that the efficiency of DEAS is important, ONC was encouraged to avoid a DEAS model that involved internal banks of sensitive patient information. In addition, if a DEAS model was adopted many commenters stressed the importance of ensuring certain privacy and security standards within the DEAS.

Federal government should help ensure DEAS privacy and security standards

Some commenters agreed that the government should play a role in ensuring certain privacy and security standards exist within the DEAS.

Need enhanced consumer privacy controls

Some commenters suggested that default setting could be programmed to sufficiently allow patients to be automatically "out" of the exchange system (where they must opt into the system to exchange their health information). However, others insisted that metadata enhanced consumer control allowed the best data segmentation by the individual. These commenters, from both the general public and vendor communities, said that the "opt-in" or "opt-out" privacy consent model is not workable. They indicated the need to have granular choices to adequately control the access to protected health information across the network.

Increasing privacy controls with metadata may have unintended consequences

One privacy advocate suggested that consent management could be centralized by a neutral privacy bureau that maintains privacy preferences on behalf of patients. In order to avoid over-reliance on explicit patient consent, some industry groups recommended that an individual's preferences should be backed up by end-user accountability and oversight of disclosures. Additionally, the end-users should be responsible for redacting patient health information to assist those patients unable to understand the consequences of the disclosure of their information. Alternatively, one vendor expressed concern that policies requiring information to be segmented or redacted may become more complex.

Provider liability issues must be addressed

Some health care providers noted that if patients are expected to have greater control over the disclosure of their health information that providers would need to additional liability protection from situations where they act on incomplete information about a patient's history. Another liability issue identified by vendors and providers involved inadvertent sharing of health information with unauthorized entities. These commenters pointed out that this type of liability may affect both the organizations that host the DEAS and those that are sources of health information.

2.5 RFI Question 5

How might a system of Data Element Access Services (DEAS), as described in the report, be established, and what role should the Federal government assume in the oversight and/or governance of such a system?

Placing DEAS in HIEs would require ONC to update program plans

Commenters suggested that one potential solution could be to have DEAS's offered as a service by the state health information exchanges (HIEs) as way of bolstering the sustainability model for state HIEs. It was noted, however, such a change would require ONC to update the State HIE Cooperative Agreement plans.

Commenters did not offer a predominant opinion regarding the governance structure that could be established. One health plan commented that DEAS naturally belongs in the domain of HIEs which will have a market interest in providing that service directly or collaboratively across the nationwide health information network.

Leverage the experience of others

Several commenters suggested that ONC consider leveraging the experience of existing entities such as intermediaries, clearinghouses, record locator services and HIEs that today perform many of the envisioned DEAS functions. For example, one pharmacy group suggested that the use of intermediaries has been used in health care payment transactions, and most notably in pharmacy claims. One commenter pointed out that DEAS proposes an increase in scaling of old "record locator service", and cautioned that the government should assess the feasibility of this approach before proceeding.

Financial incentives may be necessary to spur development and use of DEAS

There was support for a variety of ways in which the Federal government could spur development of the DEAS, including the provision of start-up funding to support proposals or demonstration projects, sponsoring the development of software or an implementation specification (and/or making financial incentives available to vendors/organizations to provide DEAS services). Once the DEAS is established, one vendor suggested that the government, through its role as a payer, could provide incentives to encourage providers to share data and utilize the DEAS.

The federal government should establish standards for and certify DEAS:

Commenters supported the idea of the federal government playing a role in establishing standards and a certification process for DEAS.

There are challenges to a DEAS implementation that must be addressed

Several commenters mentioned the following challenges related to DEAS implementation:

1. *Scanning and indexing unstructured data*

A few commenters said that the PCAST report lacks an explanation for how a DEAS can scan and index information in medical records and noted that this could prove to be a technical challenge in designing a DEAS to deal with unstructured data such as scans of handwritten notes. As previously discussed, commenters noted that it would be important for this information to be available so that context would not be missing.

2. Sustainability

One hospital association expressed concern that the same sustainability challenges that currently plague HIEs would also be challenges for DEAS. The commenter proposed to mitigate this risk by allowing HIEs to provide the DEAS function. Another commenter suggested that the government should consider a similar approach to sustain the DEAS as the one taken with public utilities.

3. Human capital to support implementation

One commenter cited workforce training as an inherent challenge in supporting the implementation of this new approach and that experienced resources will be key to supporting an approach like the one recommended by PCAST.

DEAS privacy and security concerns

Among the comments related to privacy and security concerns with the DEAS, the predominant themes included the need for:

- strong authentication to validate users requesting information,
- access rules to determine who has access and for what purposes, and
- respect of patient preferences.

In addition, one commenter suggested conducting a careful cyber-security threat analysis to assess the level of risk associated with a DEAS

DEAS could act as privacy preference librarian

There was disagreement as to whether the privacy preferences should be bound to the data, as suggested in the report. One commenter agreed with the PCAST recommendations regarding access rules, while another expressed concerns with that approach and instead suggested the controls be determined based on minimal metadata and applicable policies, rather than binding the policy determination to the data. With regards to patient preferences, commenters noted that they could be available in a centralized rule-based privacy bureau, or the DEAS could serve as the adjudicator/librarian of the patient preferences.

National standards needed for DEAS

Commenters noted that a DEAS would require a set of national standards that describe both the data element and the content within that element. Commenters suggested the federal government could establish a standard format and designate minimum data requirements for each element. One commenter suggested that when appropriate, national standards developed by SDOs should be used. One patient advocacy group

expressed its support for a federal role in using standardized nomenclatures (SNOMED-CT).

Implementation specification needed for DEAS framework

To spur development of a DEAS, commenters suggested that ONC could make software or an implementation specification available for a DEAS framework. When developing this DEAS implementation specification, ONC could examine XDS and the experience of intermediaries and record locator services, in order to avoid duplication of existing specifications. Commenters noted that XDS offers many characteristics envisioned for a DEAS, including the aggregation of links of information so that information can be queried and retrieved. They also suggested that the IHE Cross-enterprise Document Sharing (XDS) and Cross-community Access (XCA) profiles provide a fully functional collection of DEAS capabilities and both profiles have been designed with metadata tagging as a core principle.

Use industry experts to develop DEAS

A couple commenters urged the ONC to use industry experts to develop DEAS. ONC should also engage industry experts and/or establish a federal advisory committee to facilitate the process of developing a framework for DEAS and its required content. One health plan suggested consulting with the leading search providers to learn how to better structure the data for collection and indexing. However, one vendor expressed that the role of the Federal government should be limited to enabling an infrastructure upon which the DEAS could be expanded and a process whereby stakeholders could reach consensus on common vocabulary and core syntax to access DEAS. This commenter felt that further intervention would only stifle and restrict innovation and evolution of DEAS.

2.6 RFI Question 6

How might ONC best integrate the changes envisioned by the PCAST report into its work in preparation for Stage 2 of meaningful use (MU)?

Standards need to be committed to rapidly

With respect to meaningful use Stage 2, commenters relayed that ONC would need to rapidly commit to standards in order to prevent implementation delays. One commenter pointed out that there could be risks related to introducing new, untested concepts like DEAS and a new universal exchange language into certification criteria adopted to support meaningful use Stage 2.

Reference implementations for PCAST recommendations are necessary

Commenters also noted, however, that the PCAST approach could enhance interoperability without an adverse impact on current programs, and recognized the overall opportunity some of the PCAST report's recommendations presented. In this respect, commenters suggested that ONC prioritize the development of reference implementations to support PCAST's recommended infrastructure and exchange language.

Testing and certification of middleware is essential

One commenter pointed out that the PCAST report calls for the use of "middleware" to map data and achieve semantic interoperability, which they believed was inconsistent with the current testing and certification process ONC had established. The contended that middleware would be implemented and used upon install (an "instance"), but that testing and certification is done by "product", not instance. Thus, the commenter concluded that testing and certification processes would need to change in order to make the middleware recommendation viable. One commenter recommended that ONC host the network of DEAS as public infrastructure while another noted that the DEAS-based systems must be made available by or before meaningful use Stage 2 if they are expected to be used.

Metadata standard should incorporate public health monitoring

Several commenters also suggested that ONC use the PCAST report's call for metadata development to address capabilities underrepresented in meaningful use (e.g. public health and biosurveillance).

2.7 RFI Question 7

What are the implications of the PCAST report on HIT programs and activities, specifically, health information exchange and Federal agency activities, and how could ONC address those implications?

Use a long-term, incremental approach

Though most commenters were in favor of more exchange requirements in upcoming meaningful use stages, they also encouraged ONC to take a long-term, incremental approach to implementing PCAST's recommendations. They expressed concerns that if too hastily adopted, the PCAST's recommendations would have a disruptive impact on current programs for health information exchange. Along those lines, commenters recommended that ONC start with pilot programs before implementing large scale change. Commenters strongly advised that timing and alignment of standards are critical to success and industry progress. They noted that the industry would need sufficient time for education, development, testing, certification and deployment of for activities related other Federal requirements such as meaningful use stage's 2 and 3, and the HIPAA V5010 and ICD-10 implementations. Commenters also relayed that creating an alternative data element architecture from that of the CDA would be needlessly disruptive to federal, state, and private HIT endeavors already underway that are making great progress.

Leveraging the nationwide health information network projects and HIEs

While some commenters explicitly referenced leveraging the nationwide health information network projects, others frequently suggested electronic health information exchange capabilities could be strengthened through additional work with HIEs. These commenters asked ONC to further support HIE activities, specifically calling for increased funding for HIEs, and to facilitate the development of sustainability models for HIE's.

Commenters across multiple stakeholder groups requested that ONC take steps to reflect the exchange requirements added to later stages of meaningful use stage 2 and 3 requirements in ONC's HIE-related funding such as ONC's HIE State Cooperative Agreement program. In addition, a couple of commenters pointed out that a new focus on exchange could require ONC to update or even rewrite ongoing ONC grants and contract language. These comments stressed that any refocus, even if it was necessary, would not take place without significant effort.

Implementation of DEAS will affect timeline of current ONC programs and HIEs

Several commenters, stated that the implementation of Data Element Access Services (DEAS) would further affect the timeline and design of current ONC programs, such as the establishment of the nationwide health information network and its governance plans. They also contended that moving forward with the implementation of DEAS could also have a ripple effect on HIE activities and the workflow of stakeholders utilizing HIEs. With respect to implementing a DEAS or DEAS-type programs, commenters

encouraged ONC that any DEAS-type activities should be included in state plans for health information exchange. Like provider directories, commenters felt that DEAS's would need to be incorporated early into state, regional and national infrastructure planning.

Ensure stakeholder buy-in

Multiple commenters advised ONC to get stakeholder buy-in and create mutually agreeable milestones for implementing the changes suggested in the PCAST report. One association suggested that ONC convene an industry stakeholder conference to reach consensus on the future direction of EHR adoption, standards, and HIE. In addition, one association suggested that additional types of public-private sector partnerships be established to complete the necessary work, such as one modeled after Infoway or the Continua Health Alliance.

Develop a work plan with key deliverables

Several commenters recommended that ONC prepare a work plan with key deliverables and milestones for integrating the PCAST recommendations into current ONC programs. Commenters also requested that ONC lead the coordination of several ongoing HIT activities (e.g., meaningful use Stage 2, the transition to ICD-10) because the HIT industry cannot simultaneously implement standards for all of these initiatives. Other commenters expressed concerns that implementing PCAST's recommendations amidst current rapidly progressing Federal initiatives may run up against workforce shortage issues. Therefore, these commenters stated that ONC should develop workforce training programs to sustain new programs focused on health data exchange innovations.

Use data models of accredited standards

Multiple commenters from across the stakeholder spectrum asked ONC to begin making improvements using existing standards and infrastructure as a base. These commenters believed that this approach would yield the same results envisioned by the report at a lower cost and would be far less burdensome on the health care and HIT industry. One commenter made the suggestion that ONC should be devoting resources to open, transparent and consensus-based development of data models of accredited standards to address the implication of PCAST recommendations on federal HIT programs and HIEs.

2.8 RFI Question 8

Are there lessons learned regarding metadata tagging in other industries that ONC should be aware of?

No comparable timelines

Several vendors observed there are no other industries that had implemented metadata standards in the timeframe envisioned by the PCAST report (i.e., 2015).

Healthcare semantics are uniquely complex

One vendor pointed out that in contrast to other industries, the health care industry deals with complex semantics. They opined that the metadata used for tagging will likely have to be more complex than other industries and that ONC would have to overcome issues posed by free-text and unstructured data.

Learn from tagging projects in other industries

Several commenters identified metadata tagging projects in other industries and recommended that ONC review those efforts. These commenters noted, however, that some of the metadata tagging projects are very different from the health care domain and range from energy and power management to book/library cataloging. They warned that an analysis of other industries may lead to a simplistic solution, inadequate for health care. Other commenters suggested that ONC should focus on the development of metadata in health care rather than investigating metadata tagging projects related to other industries.

Examples of metadata tagging in healthcare and other industries

Commenters pointed out several metadata tagging activities currently in use in health care and suggested that ONC could derive lessons learned from these activities as it pursues implementing the PCAST report's recommendations:

- Clinical Elements Model - Intermountain Health, HL7 RIM and upgrade existing models;
- England's Spine Care Record Service is similar to the DEAS infrastructure;
- European document-based solution epSOS use IHE XCA, CDA-based documents;
- Austria and France have selected a document-based metadata approach using CDA; and
- Radiology in particular Diagnostic Imaging relies on standard-based diagnostic image metadata.

In addition to the healthcare-related examples, commenters recommended that ONC investigate how the following projects make use of metadata tags:

- OPC foundation XML metadata used in the energy industry
- Open Financial eXchange (OFX) exchange is used to send financial information across institutions

- MARC, “machine readable cataloging” send queries to the NLM and the Library of Congress
- OWL-RDF was used for Geographic Information System (GIS) optimization and is being explored in supply chain product index optimization
 - www.aiim.org
 - www.bisq.org
- Knowledge management domain
 - www.kmpro.org
- National intelligence community
 - http://dni.gov/reports/IC_Information_Sharing_Strategy.pdf
- General internet searches on terms related to PCAST
 - www.taxonomystrategies.com/presentations/2008/Woodley-2008-07-24.pdf
- Case study of the potential for meta-tagged content to yield valuable knowledge.
 - www.WolframAlpha.com
- Google or Bing regarding how metadata is used in Search Engine Optimization
- SmartGrid
- Banking metadata
- Image metadata

JWICS and SCADA may elucidate security lessons

One commenter recommended that ONC evaluate the security lessons of the Joint Worldwide Intelligence Communication System (JWICS) and the System Control Data Acquisition (SCDA).

Learn from ongoing standards activities

Many commenters noted that certain health IT standards already provide metadata tagging (e.g., DICOM for images; X12 for administrative and claims information; and NCPDP XML, HL7 Version3, CDA, CCR for prescription and other clinical information) Some commenters also suggested that ONC learn from the standard development projects that did not adequately meet business needs (e.g. avoid the problems of the Cancer Data Standards Registry and Repository (caDSR) project) and understand why HL7 Version 3 has had slow adoption rates compared to that of HL7 Version 2.

2.9 RFI Question 9

Are there lessons learned from initiatives to establish information sharing languages (“universal languages”) in other sectors?

Other Industries Provide Useful Examples

Many commenters requested that ONC consider and leverage work done in a wide variety of information-sharing languages.

- *Natural Language*: One individual felt that some of the fundamental translation of the data points from the health record could be accomplished through the use of a natural language program which could highlight the essential details needed for exchange of data without hampering the physician's ability to manage the patient data as clinically relevant. They stated that his type of program is already integrated into a selection of "coding programs" used by hospitals throughout the nation for billing purposes.
- *DICOM*: A number of commenters suggest looking at DICOM. DICOM is a standard currently used for handling, storing, printing, and transmitting information in medical imaging. The commenters stated that this standard is widely used because it allows customer to manipulate images taken by vendor A's hardware on vendor B's software. In addition, they felt that DICOM allows for both open and proprietary tags, allowing a manufacturer to create an image which can be used on a competitor's device while still providing an incentive to innovate.
- *HL7*: Numerous commenters including many EHR vendors felt that the HL7 Clinical Document Architecture (CDA) codification of the Continuity of Care Document (CCD) is tightly specified and a prime example of XML / metadata markup as envisioned by PCAST. These comments stated that HL7's CDA already tags data elements at an atomic level, and includes vocabularies as well as data structure such as SNOMED CT. One example provided by an association was the National Library of Medicine (NLM) efforts related to laboratory tests. The commenter indicated that work done by the NLM related to transmitting laboratory results between care settings, state departments of health, and state laboratories is a good example of how data elements can be mapped to existing standards such as those of HL7. They explained that NLM mapped LOINC codes to metabolic conditions and hemoglobinopathies as part of the national newborn screening program and that these codes are sent via HL7 messages between exchanging entities. These messages include a tagged metadata element, unique identifier given to the patient by birthing hospital, state lab, state department of health, and numerical value for lab test result. One commenter believed that there was a major lesson to be learned in terms of the creation of “universal exchange languages” to improve information exchange, as seen with HL7 efforts. They contended that creating a new language does not, of

itself, result in significant improvements in information exchange. This commenter illustrated their point by stating that when HL7 created HL7 v3, a new set of XML-based messages with more detail and a more appropriate underlying data model, less than 7% of the messages are sent using the new message format. Instead messages are sent more often in HL7 v2, either using an XML or Electronic Data Interchange (EDI) format for the messages. Thus, this commenter believed that industry experience has shown that, while providing a new universal language is a necessary step for improving information exchange, it is not sufficient. They noted that by definition, data is both stored and transmitted in legacy formats and no matter how constraining these legacy formats are, conversion to a new language or standard is generally too costly an undertaking no matter what the benefits. Therefore, when creating a new universal language, ONC should also ensure that there is:

- A consistent, overarching referent index or “dictionary” of industry data elements; and
 - A mapping standard that defines a standard to create a map of legacy data elements to the industry referent index.
- *The Internet:* A few commenters stated that lessons for the health IT industry can be learned from the Internet model. They believed that the growth of the Internet shows that as networks expand the incentives for participation grow and, through rapid innovation by many participants, more robust methods of information exchange, better security and enhanced usability quickly develop. One comment from an association also added that a critical lesson to be learned from the growth of the Internet is that by enabling exchange of information at a very basic level, you establish a network and create incentives for participants to join. Thus, enabling a process that enhances the scope and usability of the network. This commenter went on to suggest that ONC support the deployment of such networks now, beginning with existing standards that describe sufficient metadata for tagging at the document/object level. In parallel, they suggested that ONC also support a process for engaging domain experts to refine standards for tagging individual data elements, and mapping terminologies and code sets to appropriate metadata tags.

However, one EHR vendor stated that the analogy in the PCAST report to the web is not really pertinent because they contended that HTML is a language for dealing with the display of text and multimedia content, not semantics and meaning. They stated that until recently, tags with semantic meaning were rarely used on the web, and have only just recently come into vogue for names and addresses.

- *Data Fusion Centers:* A health plan suggested that ONC look at the Data Fusion Centers used by the Department of Homeland Security (DHS) and Department of Justice (DOJ). The commenter pointed out that these Centers involve information exchange from different sources and that when this information is

exchanged and combined with appropriate analyses, it can result in meaningful and actionable information.

- *Global Justice Extensible Markup Language (XML) Data Model (Global JXDM):* A health plan also suggested that ONC look at the Global Justice Extensible Markup Language (XML) Data Model (Global JXDM), designed specifically for criminal justice information exchanges that is leverage by the National Information Exchange Model (NEIM). Global JXDM is an XML standard that provides law enforcement, public safety agencies, prosecutors, public defenders, and the judicial branch with a tool to share data and information in an effective and timely manner.
- *World Wide Web Consortium's (W3C) OWL-RDF:* A couple of commenters advised ONC to explore the use of the OWL-RDF web ontology language, which has been successful in Geographic Information System (GIS) optimization and is being explored in supply chain product index optimization. These commenters believed that the lessons from these implementations should be explored in order to support a "Direct-like" project to quickly implement the OWL-RDF semantic technology standards into a record locator mechanism for the rapidly expanding number of clinical data sources that use the RIM-based tagged data element already present in Federal specifications.
- *Banking:* Many commenters proposed that ONC look at the success of information exchange among financial institutions. Many believed that the ability of banking systems and ATMs to attain and display an individual's information from other banks was useful reference point from which ONC could learn. However, a few commenters were critical of the extent in which the banking analogy could be applied to health care. For example, one commenter pointed out that the Open Financial eXchange (OFX) was intended to allow seamless exchange of all of an individual's financial information across numerous institutions (e.g. banking brokerage, and insurance). Yet, adoption has been slowed because financial institutions have few business incentives to invest in modifications of their systems. This commenter felt that in the banking industry, there is not a sufficient incentive for institutions to work together so that customers could manage all financial accounts with one tool.
- *Other Examples:* These following examples of programs, industries, standards and languages were also put forth by responders because they involved information exchange electronically, usually using XML. Though one commenter states that these protocols continue to have interoperability issues.
- *ASTM standards:* A couple commenters suggested that ONC look at ASTM's Continuity of Care Record (CCR) that is expressed in XML.
- *Library of Congress's MARC record:* One respondent suggested that ONC study the Library of Congress's MARC Record System, which uses machine-readable

cataloging records that use Metadata Object Description Schema (MODS) and Metadata Authority Description Schema (MADS) scheme. Both MODS and MADS scheme are variants of XML scheme.

- *SCORM*: One commenter suggested that ONC also look at the Sharable Content Object Reference Model (SCORM). SCORM is a collection of standards and specifications for web-based e-learning. SCORM is a specification of the Advanced Distributed Learning (ADL) Initiative, which comes out of the Office of the United States Secretary of Defense. SCORM 2004 introduced a complex idea called sequencing, which is a set of rules that specifies the order in which a learner may experience content objects. This standard uses XML, and it is based on the results of work done by the Aviation Industry CBT Committee (AICC), Instructional Management Systems (IMS Global), Institute of Electrical and Electronics Engineers (IEEE), and Ariadne.
- *Federal Bureau of Investigation(FBI) Virtual Case File (VCF), Federal Aviation Administration (FAA) Air Traffic Control modernization and Government Open Systems Interconnection Profile (GOSIP)*: A couple commenters pointed to these information exchange systems and stated that were eventually abandoned and deemed failures. The agencies that created these standards attempted to implement them in sudden, massive upgrades and were unsuccessful because stakeholders did not adopt them.
- *ICAM*: The Integrated Computer-Aided Manufacturing (ICAM) is a US Air Force program to develop tools, techniques, and processes to support manufacturing integration and has influenced the computer-integrated manufacturing (CIM) and computer-aided manufacturing (CAM) project efforts of many companies. One commenter suggested that the ICAM trust framework be review for as a model for secure sharing of information.
- *Dublin Core’s Metadata Initiative (DCMI) Abstract Model*: One commenter pointed to the Dublin Core’s Metadata Initiative (DCMI) that provides an open forum for the development of interoperable online metadata standards for a broad range of purposes and business models. The DCMI Abstract Model builds on work undertaken by the World Wide Web Consortium (W3C) on the Resource Description Framework (RDF) to provide an information model which is independent of any particular encoding syntax.
- *Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH)*: The OAI-PMH is a protocol developed by the Open Archives Initiative. It is used to harvest (or collect) the metadata descriptions of the records in an archive so that services can be built using metadata from many archives. The protocol was also suggested by a commenter because it uses XML over (Hypertext Transfer Protocol HTTP).

No Adequate Analogy: Multiple commenters, many of them vendors, caution ONC that although many lessons could be learned from other industries, there were no business sectors of which they were aware that have a single “universal language” covering the scope of the business, from supply chain to production to delivery of goods and services, to billing. They encouraged ONC to keep in mind the lack of precedent in other industries that approach the massive scale of metadata tagging, fragmentation and voracious capacity requirements for health information – including needs for robust management of health records and protection of personal health information.

Examples of Countries Looking at Health Data Exchange

Several commenters provided examples from other countries.

- *England:* England originally started out building a system using individual data elements. However, they have now moved to a CDA system of exchanging data. Commenters believed that this change occurred because England realized that data elements may not be the most effective means of broad-based information exchange and that it would be better to send the data elements in the context of a document. Commenters went further to say that they felt countries and regional networks that adopted an incremental approach from the outset have been very successful at relatively low cost and little disruption.
- *Finland:* Commenters on Finland’s experience felt that Finland is a sophisticated user of IT and that ONC can learn from their issues and successes based on CDA versions. The commenters pointed out that the national IT architecture of Finland has gone through several stages, varying in the degree of centrality versus point to point networks. Commenters pointed out that Finland had early issues moving forward because they standardized on a very simple XML document – CDA Release 1 – which provided the minimum metadata required for discovery and management. Finland has since adopted Clinical Document Architecture, Release Two (CDA R2), which the commenters said raised the level of data element encoding, supporting distributed decision support.
- *European network called epSOS, Austria, and France:* Commenters called attention to these country initiatives of health information exchange and metadata tagging. They specifically pointed out that these countries also use the CDA model of exchange.

3. Conclusion

This summary report represents the collective thinking of stakeholders across the health care industry regarding the PCAST report's recommendations. ONC will continue to study and analyze the suggestions offered and share them with the HIT Policy Committee's PCAST Workgroup.

The following concepts and messages emerged from the majority of RFI respondents:

Timelines

- Many commenters were glad to see PCAST recommendations push toward an increased focus on information exchange before the release of meaningful use Stage 2.
- A majority of commenters, however, expressed concerns about the effects of trying to fully implement the PCAST report's recommendations in the midst of rolling out meaningful use Stages 2 and 3 along with other changing standards such as the move from ICD9 to ICD10. They contended that there could be negative effects on patient safety.
- Many commenters suggested that the PCAST report's recommendations be a long term strategy rather than an immediate deviation from the current groundwork that has already been laid.

Effects on ONC Programs

- Most commenters encouraged ONC to leverage the success of ongoing programs and to avoid reinventing the wheel in the midst in the EHR incentive programs.
- Many stated that the fully implementing the PCAST report's recommendations could require much of the ongoing federal HIT grants and contracts to be redesigned and that that could impose substantial costs to current participants.
- Many commenters suggested that ONC begin with pilots to develop and test PCAST technology solutions.

The Implementation of PCAST Recommendations

- Commenters supported the continued efforts to have HIEs be part of the solution and noted that they may be capable of providing DEAS.
- While many commenters agreed that a DEAS structure would be necessary to implement PCAST recommendations of atomic-level data sharing, most cautioned that the creation of a DEAS infrastructure should begin with much pilot testing and pay close attention to patient-linking and public trust issues.

Privacy and Security

- Many commenters supported the concept of giving patients granular consent as envisioned in the PCAST report.
- Many commenters also echoed concerns that tagging patient privacy preferences to the data would lead to a static, rather than a dynamic, data control environment that prevented patients from updating their privacy preferences once the data was released.
- Commenters from the research community were supportive of PCAST concept of creating a subset of de-identified data for the purpose research.

Standards

- Many commenters echoed that ONC should learn from and leverage existing standards that incorporate metadata concepts.
- Some commenters recommended that ONC pursue the approach outlined in PCAST because they believed that current standards do not allow for innovation and flexibility or allow scalability and that today's predominantly document-centric environment would not support PCAST's recommendations.
- Other commenters contended that PCAST's interoperability and data liquidity goals could be met with existing and emerging standards.

Appendix A. RFI Text

Federal Register/ Vol. 75, No. 237, December 10, 2010, 76986–76987

DEPARTMENT OF HEALTH AND HUMAN SERVICES

National Coordinator for Health Information Technology

Request for Information Regarding the President’s Council of Advisors on Science and Technology (PCAST) Report Entitled “Realizing the Full Potential of Health Information Technology To Improve Healthcare for Americans: The Path Forward”

AGENCY: Department of Health and Human Services.

ACTION: Request for Information.

SUMMARY: This document is a request for comments regarding the recently released PCAST report and its implications for the nation’s health information technology (HIT) agenda and ONC’s implementation of the Health Information Technology for Economic and Clinical Health Act (HITECH Act).

DATES: *Comment Date:* To be assured consideration, comments must be received at one of the addresses provided below, no later than 5 p.m. on January 19, 2011.

ADDRESSES: Because of staff and resource limitations, we cannot accept comments by facsimile (FAX) transmission. You may submit comments by any of the following methods (please do not submit duplicate comments). • *Electronically:* You may submit electronic comments on this request for information at <http://www.regulations.gov>. Follow the “Submit a comment” instructions. Attachments should be in Microsoft Word or Excel, WordPerfect, or Adobe PDF. • *Regular, Express, or Overnight Mail:* Department of Health and Human Services, Office of the National Coordinator for Health Information Technology, Attention: Steven Posnack, Hubert H. Humphrey Building, Suite 729D, 200 Independence Ave., SW. Washington, DC 20201. Please submit one original and two copies. Please also allow sufficient time for mailed comments to be received before the close of the comment period. • *Hand Delivery or courier:* Office of the National Coordinator for Health Information Technology, Attention: Steven Posnack, Hubert H. Humphrey Building, Suite 729D, 200 Independence Ave., SW., Washington, DC 20201. Please submit one original and two copies. (Because access to the interior of the Hubert H. Humphrey Building is not readily available to persons without Federal government identification, commenters are encouraged to leave their comments in the mail drop slots located in the main lobby of the building.)

FOR FURTHER INFORMATION CONTACT: Steven Posnack, Director, Federal Policy Division, Office of Policy and Planning, Office of the National Coordinator for Health Information Technology, 202–690–7151.

SUPPLEMENTARY INFORMATION: *Inspection of Public Comments:* All comments received before the close of the comment period will be available for public inspection, including any personally identifiable or confidential business information that is included in a comment. Please do not include anything in your comment submission that you do not wish to share with the general public. Such information includes, but is not limited to: A person's Social Security number; date of birth; driver's license number; State identification number or foreign country equivalent; passport number; financial account number; credit or debit card number; any personal health information; or any business information that could be considered to be proprietary. We will post all comments received before the close of the comment period at <http://www.regulations.gov>. Follow the search instructions on that Web site to view public comments.

I. Background

On December 8, 2010, the President's Council of Advisors on Science and Technology (PCAST) released an important new report entitled "Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward" (the PCAST Report). (The full report is available at <http://www.whitehouse.gov/administration/eop/ostp/pcast> and also available on ONC's Web site <http://healthit.hhs.gov>). PCAST is an advisory group of the nation's leading scientists and engineers who directly advise the President and the Executive Office of the President. PCAST makes policy recommendations in the many areas where understanding of science, technology, and innovation is key to strengthening our economy and forming policy that works for the American people. PCAST is administered by the Office of Science and Technology Policy (OSTP). PCAST's report and its recommendations have significant implications for the nation's HIT agenda and the implementation of the HITECH Act, passed as part of the American Recovery and Reinvestment Act of 2009 (Recovery Act) (Pub. L. 111-5). ONC seeks public comment on the PCAST report's vision and recommendations and how they may be best addressed.

II. Solicitation of Comments

ONC seeks comment on the questions below. Comments on other aspects of the PCAST report are also welcome.

1. What standards, implementation specifications, certification criteria, and certification processes for electronic health record (EHR) technology and other HIT would be required to implement the following specific recommendations from the PCAST report:
 - a. That ONC establish minimal standards for the metadata associated with tagged data elements;

- b. That ONC facilitate the rapid mapping of existing semantic taxonomies into tagged data elements; c. That certification of EHR technology and other HIT should focus on interoperability with reference implementations developed by ONC.
2. What processes and approaches would facilitate the rapid development and use of these standards, implementation specifications, certification criteria and certification processes?
3. Given currently implemented information technology (IT) architectures and enterprises, what challenges will the industry face with respect to transitioning to the approach discussed in the PCAST report?
 - a. Given currently implemented provider workflows, what are some challenges to populating the metadata that may be necessary to implement the approach discussed in the PCAST report?
 - b. Alternatively, what are proposed solutions, or best practices from other industries, that could be leveraged to expedite these transitions?
4. What technological developments and policy actions would be required to assure the privacy and security of health data in a national infrastructure for HIT that embodies the PCAST vision and recommendations?
5. How might a system of Data Element Access Services (DEAS), as described in the report, be established, and what role should the Federal government assume in the oversight and/or governance of such a system?
6. How might ONC best integrate the changes envisioned by the PCAST report into its work in preparation for Stage 2 of Meaningful Use?
7. What are the implications of the PCAST report on HIT programs and activities, specifically, health information exchange and Federal agency activities, and how could ONC address those implications?
8. Are there lessons learned regarding metadata tagging in other industries that ONC should be aware of?
9. Are there lessons learned from initiatives to establish information sharing languages (“universal languages”) in other sectors?

Dated: December 7, 2010.

David Blumenthal

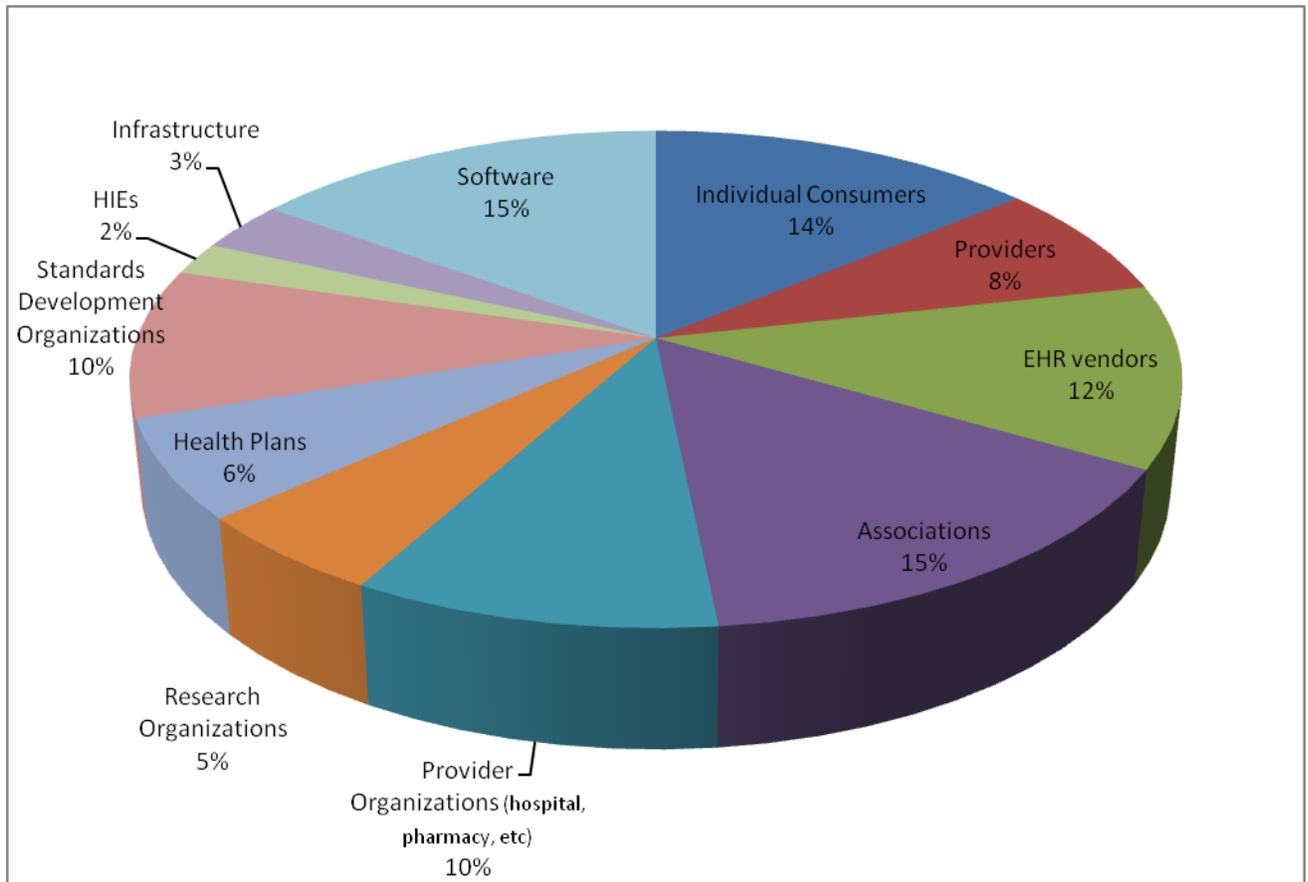
National Coordinator, Office of the National Coordinator for HIT.

[FR Doc. 2010–31159 Filed 12–8–10; 11:15 am]

BILLING CODE 4150–45–P

Appendix B. RFI Distribution of Respondents

Table 1. Classification of Respondents. The following table indicates the distribution of respondents by type.



Appendix C. Abbreviations

ACORD	Association for Cooperative Operations Research and Development
ADL	Advanced Distributed Learning
AHRQ	Agency for Healthcare Research and Quality
AICC	Aviation Industry CBT Committee
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ASC X12	Accredited Standards Committee x12
ATNA	Audit Trail and Node Authentication
caDSR	Cancer Data Standards Registry and Repository
CCD	Continuity of Care Document
CDA	Clinical Document Architecture
CDA R2	Clinical Document Architecture, Release Two
CDA A	CMEP Data Administration Application
CDISC	Clinical Data Interchange Standards Consortium
CIM	Computer-integrated Manufacturing
CMS	Centers for Medicare & Medicaid Services
CPOE	Computerized Provider Order Entry
CPT	Current Procedural Terminology
DCMI	Dublin Core's Metadata Initiative
DEAS	Data Element Access Services
DHS	Department of Homeland Security
DICOM	Digital Imaging and Communications in Medicine
DICOM SR	Digital Imaging and Communications in Medicine Structured Reporting
DoD	Department of Defense
DOJ	Department of Justice
DURSA	Data Use and Reciprocal Support Agreement
EDI	Electronic Data Interchange
EHR	Electronic Health Record
epSOS	European Patients Smart Open Services
EUA	Enterprise User Authentication
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FDIC	Federal Deposit Insurance Corporation
GCI	Global Commerce Initiative
GIS	Geographic Information System
Global JXDM	Global Justice XML Data Mode
GOSIP	Government Open Systems Interconnection Profile
HHS	Department of Health and Human Services
HDD	Hard Disk Drive
HIE	Health Information Exchange
HIPAA	Health Insurance Portability and Accountability Act
HIT	Health Information Technology
HITECH	Health Information Technology for Economic and Clinical Health
HITSP	Healthcare Information Technology Standards Panel
HITSP C32	Healthcare Information Technology Standards Panel – Construct 32
HL7	Health Level Seven International
HL7 RIM	Health Level 7 Reference Information Model
HL7 V3	HL7 version 3
HTTP	Hypertext Transfer Protocol

ICAM	Integrated Computer-Aided Manufacturing
ICD	International Classification of Diseases
ICD 9 CM	International Classification of Diseases, Ninth Revision, Clinical Modification
IEE	Industrial Electronic Engineers
IEEE	Institute of Electrical and Electronics Engineers
IHE	Integrating the Healthcare Enterprise
IHE XDS	Integrating the Healthcare Enterprise Cross-Enterprise Document Sharing
IMS Global	Instructional Management Systems
ISO	International Organization for Standardization,
IT	Information Technology
JWICS	Joint Worldwide Intelligence Communication System
LOINC	Logical Observation Identifiers Names and Codes
LSI	Latent Semantic Indexing
MADS	Metadata Authority Description Schema
MARC	Machine-readable Cataloging
MITA	Medicaid Information Technology Architecture
MODS	Metadata Object Description Schema
MU	Meaningful Use
NCPDP	National Council for Prescription Drug Programs
NEIM	National Information Exchange Model
NIST	National Institute of Standards and Technology
NLM	National Library of Medicine
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting
OASIS	Organization for the Advancement of Structured Information Standards
OCR	Office for Civil Rights
OFX	Open Financial eXchange
OMB	Office of Management and Budget
ONC	Office of the National Coordinator for Health Information Technology
OSTP	Office of Science and Technology Policy
OWL-RDF	Web Ontology Language Resource Description Framework
PCAST	President's Council of Advisors on Science and Technology
PDQ	Patient Demographics Query
PHR	Personal Health Record
PIX	Patient Identifier Cross-Reference
RDF	Resource Description Framework
RFI	Request for Information
RHIO	Regional Health Information Organizations
S&I	Standards and Interoperability
SWIFT	Society for Worldwide Interbank Financial Telecommunication
SCORM	Sharable Content Object Reference Model
SDO	Standards Development Organizations
SEC	Securities and Exchange Commission
SCDA	System Control Data Acquisition
SHARP	Strategic Health IT Advanced Research Projects (SHARP) Program
SHS	Secure Hash Standard
SNOMED	Systematized Nomenclature of Medicine
SNOMED CT	Systematized Nomenclature of Medicine-Clinical Terms
SOA	Service-oriented Architecture
STM	Synchronous Transport Module
TWIST	Treasury Workstation Integration Standards Team
VA	US Department of Veterans Affairs
VICS	Voluntary Interindustry Commerce Solutions Association

W3C	World Wide Web Consortium
XACML	eXtensible Access Control Markup Language
XCA	Cross-Community Access
XML	eXtensible Markup Language
XSPA	OASIS Cross-Enterprise Security and Privacy Authorization