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The Health Level Seven
HL7 EHR Clinical Research Functional Profile, Release 1
(Based on the HL7 EHR-S Functional Model, Release 1)

HL7 EHR Clinical Research Functional Profile, Release 1

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Preface

i. Notes to Readers

Release 1 of the Clinical Research Functional Profile, based on the HL7 EHR-S Functional Model (FM) Release 1, February 2007, and EHRCR User Requirements Document, Release 1, February 2008, has been registered with the HL7 EHR Technical Committee and is currently being balloted at the normative level.

ii. EHRCR Functional Profile Working Group

The EHRCR Functional Profile Working Group is comprised of dedicated individuals from the United States and the European Union in the following industries: pharmaceutical, biotechnology, clinical research technology vendor, healthcare technology vendor, and federal regulator. Decisions made by this team (as specified in the EHRCR User Requirements Document, Release 1) were reviewed and commented on by an international group of key stakeholders. Their opinions have been taken into consideration while formulating this functional profile. The EHRCR Working Group would also like to express it's appreciation for the many talented individuals who contributed to the HL7 EHR-S Functional Model, upon which this work is based.

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Miguel Valenzuela	Pharma Development Quality, Head of Enterprise Systems QRM	Roche Products Limited

iii. Realm

This profile was developed with both the US and EU realm in mind. We feel that it is highly applicable to any setting (including non-US and non-EU) in which clinical research is being performed. We recognize that in these settings it may be applicable to modify the language used to describe potential users of the system. The EHRCR Functional Profile Working Group invites feedback and participation from members of HL7 or other standards development organizations, as well as clinical research stakeholders from any part of the world in which clinical research is being performed.

iv. Changes from Previous Release

Release 1 of the EHRCR Functional Profile was balloted in April 2008, resulting in approval at the HL7 Committee Level. Release 1.1 (this document) has incorporated persuasive comments from this ballot cycle. These primarily fall into the following categories:

1. Clinical research regulations were cited in criteria and have now been removed to a reference table in Section 10, References
2. In the previous profile version, CDISC CDASH had been recommended as a standard prior to its first official release. CDISC CDASH V1.0 was released on 1-Oct-08 and is now being referenced with this version of the EHRCR functional profile. CDISC CDASH is the emerging standard for clinical research data elements. This functional profile has used CDASH as a source for determining whether the HL7 EHR-s Functional Model has sufficient requirements for clinical research data elements or whether additional elements

need to be added. At the "Essential Now" level, several data elements have been added to support clinical research, namely in the areas of research identifiers (study name, investigational site identifier, research patient identifier), research subject characteristics, and physical exam findings. These are a minimum data set for clinical research to use data from the electronic health record system (as identified by CDASH "Highly Recommended" variables). We are requiring the data for clinical research to be represented as standard, discrete and structured data elements, such that a standard mapping to CDASH can be performed upon export of data from the EHR system.

3. Criteria relating to the ability to correlate healthcare patient IDs to research patient IDs have been clarified.
4. Criteria relating to de-identifying patient have been clarified
5. Example lists in criteria have been removed or moved to description areas

See file: "BallotComment_EHR_CRFP_R1_I1_2008MAY_Amalgamated with resolutions May 29 2008 sorted final" for complete details (listed on project website www.ehrcr.org).

1. EHR/Clinical Research (EHRCR) Functional Profile: Introduction

Welcome to the EHRCR Functional Profile project of the Clinical Research Working Group.
The EHRCR Functional Profile is intended to provide high-level requirements necessary for using electronic health record data for regulated clinical research, and to further provide a roadmap toward an evolutionary process of integrating the environment that provides both patient care and data for clinical research. This functional profile is aimed at encouraging EHR vendors to incorporate functions into their products that are necessary to utilize the Electronic Health Records as a direct data source for clinical studies. It is intended to provide one overall view of the needs of regulated clinical research with respect to electronic patient records.

The project is aimed at developing a Functional Profile that identifies critical capabilities for the conduct of regulated clinical research utilizing EHR systems. Our efforts will establish conformance to the HL7 EHR-S Functional Model Release 1, under the auspices and direction of the HL7 EHR Technical Committee. We have developed a set of requirements for using EHR systems in the conduct of regulated clinical research. These requirements have been mapped into this functional profile and identify those portions of the HL7 EHR-S Functional Model that apply to clinical research, and further identify additional functionality toward facilitating ease of this use for those involved in clinical research, thus providing EHR vendors with conformance criteria that are specific to regulated clinical research in the HL7 formats. Further to this HL7 Ballot effort, these requirements are being mapped against the EuroRec EHR certification repository and research-specific additions to this repository are being requested. This effort will provide a mapping between HL7 EHR-S and the EuroRec EHR Repository. Specific references to clinical research regulations and how they are mapped into this functional profile can be found in section 10.2.

2. Background (HL7, EHRCR Working Group)

Founded in 1987, Health Level Seven (HL7) is a not-for-profit healthcare standards development organization (SDO) accredited by the American National Standards Institute (ANSI). While traditionally involved in the development of messaging standards used by healthcare systems to exchange data, HL7 has begun to develop other standards related to healthcare information systems. In 2002, a newly formed HL7 EHR Special Interest Group began development of a functional model for EHR systems, was subsequently promoted to a full technical committee (EHR-

TC), and in 2004 published the EHR-S Functional Model as a Draft Standard for Trial Use (DSTU). The Functional Model underwent membership level ballot in September 2006 and January 2007, and it was approved as standard in February 2007. The EHR-TC intends that unique functional profiles be developed by subject matter experts in various care settings to inform developers, purchasers, and other stakeholders of the functional requirements of systems developed for these domains.

Through an invitation from the HL7 EHR Technical Committee in October 2006, the global EHRCR Functional Profile working group was organized in December 2006 by the eClinical Forum and the PhRMA EDC/eSource Taskforce, both not-for-profit professional associations supporting bio-pharmaceutical research. The EHRCR Working Group is a collaborative effort between the bio-pharmaceutical and healthcare industries and associated vendors and regulators, having members from each of these stakeholder groups as active participants. The goal is to expand and adapt the functionality of EHR and associated systems, networks, and processes to support clinical research. The first deliverable of this group was a User Requirements Draft Document, released to all stakeholders in November 2007 for review and comment. This document outlines the basic approach of this group and provides a mechanism for broad feedback on user requirement, which was used to refine the EHRCR Functional Profile prior to submitting for ballot in February 2008. The work of the EHRCR Working Group is funded by Gold Level partners, Procter and Gamble, Pfizer, and Eli Lilly, PhRMA, and other pharmaceutical industry contributors. More information on the EHRCR Working Group can be found at www.ehrcr.org.

3. Why this profile is needed

Electronic Health Records are viewed by government agencies, payers, epidemiologists as well as the clinical research community as a quantum step forward in meeting their respective needs. The current EHR environment can be described as on the rise and accelerating in its importance and adoption priority. The expansion and government-encouraged use of EHR systems in hospitals and physician offices means that patient data are increasingly being maintained electronically. Recent reports suggest that 20-25% of US healthcare practices use electronic medical/health record systems. Within Europe, these figures vary greatly among countries but in some areas are nearing 100%. There has been significant media attention given to the national efforts of the US and the European Union (EU) to develop Nationwide Health Information Networks (NHINs). It is appropriate to consider *now* how clinical research can utilize these healthcare systems and avoid redundant collection of data, while complying with government regulations.

The Pharmaceutical and Biotech industry has made significant progress in the execution of regulated clinical studies. This has, in part, been the result of advances in the collection of patient data. The traditional paper-based clinical studies (utilizing paper case report forms) have given way to systems that support Electronic Data Capture (EDC) of clinical research data. Advances in information technology with regard to regulatory compliant software applications, telecommunications and more importantly the internet, has enabled clinical research data to be collected and reviewed in near "real-time". It is estimated that a third of regulated clinical research is conducted using EDC systems. Currently however, data must be transcribed into the EDC system from a variety of sources. These include paper-based patient records and those maintained in Electronic Health Records (EHR) systems that may be in use at the investigational site (i.e., hospitals, doctors' offices, clinics, etc). This constitutes a duplication of effort for the study site personnel and raises the potential error rate.

Neither EDC nor EHR systems have all that is required to serve the purposes of the other (i.e., healthcare or regulated clinical research). In the case of regulated clinical research, the research sponsor must not have exclusive control of the investigator's patient data. Regulatory agencies want to ensure that data cannot be compromised either accidentally or intentionally. Therefore, the investigator must hold the source (independent of the sponsor's database and not under the

sponsor's control). Additionally, investigators are required to maintain accurate case histories for each of their patients. Increasingly, the investigational sites that are conducting clinical trials using sponsor-supplied EDC systems also have EHR systems that require input of some of the same patient data. The result is often the creation of a third record of information, on a paper copy that is printed from the EHR system. This paper copy may be used to transcribe information into the EDC system and placed in the patient's file to satisfy a regulatory requirement for source data verification, thus adding the burden to maintain paper files to the investigational site. With a sponsor provided EDC system, the trial data must either be printed out or provided electronically to the investigator to maintain once the clinical study has finished. This duplication of data and the tasks related to entering, maintaining and archiving result in costs which will grow with the increasing use of electronic data sources (i.e., through the progress of national initiatives to create an eHealth environment in which all patient health records will be electronic).

While a solution might be to use data directly from EHR systems for regulated clinical research purposes, this cannot be done at this time. The number of different systems and architectures make it difficult, if not impossible to integrate with EDC systems on anything greater than a one-to-one integration, which is not economically feasible. Many EHR systems do not have ways to either integrate or export data. Data in these systems are often unstructured (i.e., textual as opposed to data fields to collect individual, identifiable data items). Additionally, EHR systems are not controlled by clinical research regulations. As stated above, the result is often the creation of a third record of information (either via paper or an investigator-controlled, regulatory-compliant eSource system) to meet regulations. Thus, initiatives toward building standards are critical to the future success of this effort.

Both Food and Drug Administration (FDA) and International Conference on Harmonisation (ICH) provide requirements for clinical trial records, and the systems and processes that maintain them (e.g., ICH Good Clinical Practice (GCP), FDA Guidance: Computerized Systems Used in Clinical Investigations (CSUCI) and FDA Title 21 Code of Federal Regulations (CFR) Part 11). The same responsibilities of the investigator toward the accuracy of source data exists whether that data is hand-written on paper or entered and stored electronically. If data are entered and stored into an EHR or EDC system as the sole source and used in regulated clinical research, then that system must be compliant with these regulations (for example, data in EHR / EDC systems that are used as eSource for clinical trials, under current regulation, require authority checks such as ensuring that only authorized persons can access the system and maintaining a clinical research-compliant audit trail).

Healthcare in general is under tremendous time and cost pressures. Patient records predominantly serve the purpose of the medical care of the patient and are optimized toward this purpose. It would be inefficient and costly for a hospital or physician's office to carry out the meticulous documentation that is common in the bio-pharmaceutical industry unless the EHR system is designed to handle those tasks "behind the scenes".

The ideal environment then provides non-redundant systems and processes that allow the use of patient electronic health data for clinical research in a way that meets data protection, regulatory, and ethical research requirements and minimizes the challenges of clinical research for healthcare professionals. This environment would include regulated clinical research in the natural workflow of a clinical practice thus providing tremendous benefit (to all stakeholders) with minimal impact to the healthcare provider.

As EHRs become more widely utilized and more sophisticated, healthcare providers will begin to seek functionality that will add value beyond the core functions related to the provision of healthcare. The secondary use of healthcare data for quality reporting, quality improvement, outcomes assessment, and research will become a vital part of standard medical practice. Healthcare providers will eventually require EHRs that support and facilitate these functions and EHR vendors will need to respond.

For more information on this topic, this group recommends a discussion paper prepared by the eClinical Forum and PhRMA EDC/eSource Taskforce ("*The Future Vision of Electronic Health Records as eSource for Clinical Research*", September 14, 2006) that can be downloaded from www.ehrcr.org (under Documents). This paper describes the benefits to patients, healthcare providers and clinical research, by connecting healthcare and research.

4. Project Details:

4.1. Scope and Methods

Clinical computing is an evolving field and many of the functions desired of an EHR system may not be available at this time. Certain functions, such as EHR system interoperability across country/state/territory healthcare providers, may not be feasible or essential now. Nevertheless, it is important to outline major trends and articulate a vision for functionality (especially interoperability) for the future. Furthermore, the delineation of desirable functionalities for future implementation and adoption should guide vendors in their development efforts, and help purchasers develop and articulate their strategic vision for future functional requirements.

With this in mind, we began with a scope of the Clinical Research profile from the stand-point of what is necessary to be able to use data from any electronic system for the purpose of regulated clinical trials. A majority of this functionality is already identified in the HL7 EHR-S Functional Model as being critical for healthcare systems as well. Regulatory needs for clinical research that do not already exist in the EHR-S functional model were added to provide a "Core" (or "Essential Now") for clinical research. To this "core" we added features that would enhance the functionality such that the everyday workflow becomes easier and more natural for all stakeholders. With this version of the EHRCR Functional Profile, these "ease of use" features have been classified as "Essential Future". In release 2 of this Functional Profile, these "Essential Future" functions will be grouped into tiers showing a natural progression of features to be added over time. Only the "Essential Now" functionality must exist in order for data from EHR systems to be suitable for regulated clinical research.

When identifying requirements for an EHRCR, the following principles were followed:

- An EHR for Clinical Research Functional Profile will establish the requirements that identify non-redundant system functions and processes that allow the use of patient electronic medical data for regulated clinical research. (See a list of applicable clinical research regulations and guidance in Section 10, References.)
- The use of the EHRCR Functional Profile will ensure that data protection, patient privacy, and regulatory research requirements are met
- Data standards are essential for data collection, interpretation and exchange within the medical and research communities. Collaboration on common data standards (including EHR narratives) and data transfer standards will be needed to support both the implementation of electronic national health records for national health information networks and clinical research in order to fulfill all of the needs through the "Essential

Future" functions. EHRCR Functional Profile will endorse those standards as they become viable.

- In the EHRCR functional profile, all functions that are described in the HL7 EHR-S FM but do not relate to clinical research will be omitted. While these omitted functions may be critical to a functioning EHR system for healthcare, their omission from the EHRCR Functional Profile only indicates that their implementation is not necessary for clinical research. EHRCR user requirements that are not already part of the EHR-S FM are detailed and included in this functional profile (See section 9)
- "Essential Now" functions that make up the Core will include a minimum set of data for clinical research. This is basic information (which includes data relating to the safety of the product) that would be collected for all clinical trials, and is based on CDISC CDASH (Clinical Data Acquisition, Standardization and Harmonization) Version 1 (01.OCT.2008) "highly recommended" elements. The EHRCR Working Group believes this is a good starting-point for providing usable data for Clinical Research in an EHR system. We believe this is a stepping stone for protocol-specific data requirements (both safety and those that vary by trial and typically relate to the effectiveness of the product) that will be part of "Essential Future" (Tiers 1-3) described below. The CDASH "highly recommended" data elements have been listed in this profile's conformance criteria; CDASH modeling has not been required and is listed as a reference.
- Following is a representation of the progression from "Essential Now" functions (Tier 0) through the "Essential Future" functions (Tiers 1-3). The "Essential Future" functions will be further refined in release 2 of this functional profile.
- The use of the data after it leaves the EHR and is moved into research is not part of this profile. While we are aware that in some cases there is integration with research EDC system, this profile does not imply that this is an expected or sought-after scenario.