Table 3. Identified global syntactic standards

| **Standard** | **Name** | **Organization** | **Domain** | **Data Exchange** | **Analysis** | **Data Structure** | **Process Description** | **Goal** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **FHIR** | Fast Healthcare Interoperability Resources | Health Level 7 | Healthcare and research | x | x\* | x | - | Based on previous HL7 standards (HL7 Version 2 and 3, and CDA), and combines their advantages, authorization tools (OAuth), Representational State Transfer (REST) architecture, application programming interfaces (API), XML and JSON formats |
| **DICOM ®** | Digital Imaging and Communications in Medicine | Medical Imaging Technology Association (MITA) - a division of the National Electrical Manufacturers Association | Imaging | - | - | x | - | Exchanging and Managing images, images from different medical imaging devices such as CT or MRI can be used by different applications. DICOM® is recognized by ISO as the ISO 12052 standard. | |
| **OMOP CDM** | Observational Medical Outcomes Partnership common data model | Observational Health Data Sciences and Informatics (OHDSI) | Observational research | - | x | x | - | Allows for the systematic analysis of disparate observational databases, Once a database has been converted to the OMOP CDM, evidence can be generated using standardized analytics tools, currently developing Open Source tools for data quality and characterization | |
| **CDISC ODM** | Clinical Data Interchange Standards Consortium Operational Data Standard | Clinical Data Interchange Standards Consortium | Clinical Trials | x | - | x | - | Exchange of data within clinical trials, Standards to support acquisition, exchange, submission and archive of data for medical and biopharmaceutical product development | |
| **i2b2** | Informatics for Integrating Biology & the Bedside | i2b2 tranSMART Foundation | Research for cohort discovery | - | x | x | - | Open-source clinical data warehousing and analytics research platform, cohort discovery tool, meaning only patient counts can be retrieved. Individual patient-level data cannot be accessed through this tool, but it is possible to gather this information outside of i2b2 | |
| **OpenEHR** | - | OpenEHR Foundation | Healthcare and research | - | - | x | - | Common description of electronic health records (EHR),  offers open specifications, clinical models and software.  The clinical data models (archetypes) have been accepted as European standard in 2007 (CEN 13606 Part II) | |
| **IHE** | Integrating the Healthcare Enterprise | Integrating the Healthcare Enterprise | Healthcare | - | - | x | x | Promotes the coordinated use of established standards such as DICOM and HL7,  address specific clinical needs in support of optimal patient care | |
| **CDA** | Clinical Document Architecture | Health Level 7 | Healthcare | x | - | x | - | Information model to describe and exchange clinical documents | |
| **GA4GH AAI** | Authentication & Authorization Infrastructure | GA4GH | Healthcare and research | x | - | - | - | The standard specification leverages OpenID Connect (OIDC) Servers for use in authenticating the identity of researchers desiring to access clinical and genomic resources from data holders adhering to GA4GH standards, and to enable data holders to obtain security-related attributes of those researchers. | |
| **GA4GH Passports** | GA4GH Passport specification | GA4GH | Healthcare and research | x | - | - | - | The GA4GH Passport specification aims to support data access policies within current and evolving data access governance systems. This specification defines Passports and Passport Visas as the standard way of communicating the data access authorizations that a user has based on either their role (e.g. researcher), affiliation, or access status. | |
| **GA4GH DRS** | Data Repository Service (DRS) API | GA4GH | Healthcare and research | x | - | - | - | Standard for building data repositories and adapting access tools to work with those repositories, works with other approved APIs from the GA4GH Cloud Work Stream to allow researchers to discover algorithms across different cloud environments and send them to datasets they wish to analyze. The API allows data consumers to access datasets regardless of the repository in which they are stored or managed. | |
| **Beacon API** | Beacon API | GA4GH | Healthcare and research | x | - | - | - | The Beacon API can be implemented as a web-accessible service that users may query for information about a specific allele. A user of a Beacon can pose the query “Have you observed this nucleotide (e.g. C) at this genomic location (e.g. position 32,936,732 on chromosome 13)?” to which the Beacon responds with either “yes” or “no”. The new release of the Beacon API extends its functionality through support for additional types of genomic variants and improved metadata support. Additionally, the accompanying ELIXIR Beacon reference implementation demonstrates ELIXIR Authorization and Authentication Infrastructure (AAI), enabling data owners to light Beacons at different tiers of data access: public, registered, or controlled. | |
| **Data Connect API** | Data Connect API | GA4GH | Healthcare and research | x | - | x | - | A standard for the discovery and search of biomedical data, developed by the GA4GH Discovery Work Stream. The standard provides a mechanism for describing data and its underlying data model, as well as the ability to search the data with the given data model. | |
| **GA4GH TES** | Task Execution Service (TES) API | GA4GH | Healthcare and research | x | x | - | x | The standard defines a schema and API for describing batch execution tasks. A task defines a set of input files, a set of (Docker) containers and commands to run, a set of output files, and some other logging and metadata. The TES API supports greater genomic and health data sharing by providing greater flexibility in bringing computation to data and enabling execution of workflows spanning multiple institutions and infrastructures. | |
| **Machine Readable Consent Guidance** | GA4GH Machine Readable Consent Guidance | GA4GH | Healthcare and research | x | x | - | x | The standard provides instructions for researchers integrate standard data sharing language into consent forms in a way that is able to be translated to a computable language. Machine readable consent language is able to be attached to datasets and stored in their descriptive data using DUO terms. Researchers can then search for datasets that have been consented to for their research purposes. | |
| **MIABIS** | Minimum Information About BIobank data Sharing | BBMRI-ERIC | Biobanking | x | - | x | - | MIABIS aims to standardize data elements used to describe biobanks, research on samples and associated data. The MIABIS Community Standards work on several granularity levels, with the aim to support interoperability between biobanks sharing their data. | |

\*extent of analysis is dependent on FHIR Server