LHC-Forms and Related Widgets for Capturing and Tuning Health Data

Ye Wang, MS¹, Paul Lynch, MS,¹ Ajay Kanduru, MS,¹ John Hook,² Lee Mericle, MS,¹ Christophe Ludet, MS,¹ Daniel J. Vreeman, PT, DPT, MSc², Clement J. McDonald, MD¹
¹National Library of Medicine, National Institutes of Health, Bethesda, Maryland, USA
²Regenstrief Institute, Indianapolis, Indiana, USA

Abstract: NLM’s Lister Hill National Center for Biomedical Communications (LHC) has developed four inter-related open source, web-based, JavaScript tools for gathering and processing clinical data: 1) **LHC-Forms** is a data capture widget designed in partnership with Regenstrief Institute to produce a browser executable form from a stored form description. LHC-Forms supports HL7 data types, repeating groups of questions, survey scoring, validation checks, answer lists, and default values that can be derived from answers given to preceding questions. LHC-Forms can execute any LOINC panel as a form, and generate an HL7 v2 message of the entered data. Try it: [https://lhc-forms.lhc.nlm.nih.gov](https://lhc-forms.lhc.nlm.nih.gov). 2) **Clinical Table Search Service** is an auto-completion tool that provides an autocomplete menu to fields that take answers from large tables. It is accessed via URLs whose parameters control what table to search, which fields to return to the choice menu grid, and which fields of the selected item to store as hidden content in the input fields. Our implementation provides preconfigured access to many clinical tables: LOINC, RxTerms, ICD-10-CM, many NCBI genomics tables, COSMIC and others. Try it: [https://clin-table-search.lhc.nlm.nih.gov](https://clin-table-search.lhc.nlm.nih.gov). 3) An **LHC-Form building tool**. Try it: [https://lhc-formbuilder.lhc.nlm.nih.gov](https://lhc-formbuilder.lhc.nlm.nih.gov). 4) A JavaScript **validator and converter for UCUM units of measure**. Try it: [https://ucum-validator.lhc.nlm.nih.gov](https://ucum-validator.lhc.nlm.nih.gov).

The four modules can be used together or separately in web applications.

System Description: **Purpose:** To provide a set of sophisticated but easy to use open source web modules that can be used within existing web applications and provide pre-configured support for standard clinical vocabularies (LOINC, RxNorm, UCUM, SNOMED CT) and genomic identifiers. Developers can also configure arbitrary external tables, such as local patient and doctor registries, to work with these widgets. LHC-Forms and its sister modules are designed to work together in LHC-Forms--or separately with other applications that follow its interface specifications. LHC-Forms can produce HL7 v2 messages, and will produce FHIR clinical reports in the future. The Clinical Table Search Service supports the HL7 coded-value types: coded with exceptions (CWE) and coded with no exceptions (CNE). Both the Clinical Table Search Service’s auto-completer and LHC-Forms can be downloaded as pre-built packages for integration in a web-application, so that forms and auto-completers can be rendered with just a few lines of code. **Current usage:** 1) We are using LHC-Forms and the Clinical Table Search Service to model the proposed HL7 v2 clinical genomics implementation guide which is up for HL7 ballot Sept 2016 (view full version at [https://lhc-forms.lhc.nlm.nih.gov](https://lhc-forms.lhc.nlm.nih.gov) by selecting the second example in the left column).

![Figure 1. Part of a structured genetics report form rendered in LHC-Forms to model the proposed HL7 v2 clinical genomics implementation guide which is up for HL7 ballot Sept 2016 (view full version at [https://lhc-forms.lhc.nlm.nih.gov](https://lhc-forms.lhc.nlm.nih.gov) by selecting the second example in the left column).](image-url)

This research and development effort was supported in part by the Intramural Research Program of the National Institutes of Health.