

PDF for Healthcare and Child Health Data Forms

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Abstract

PDF-H is a new best practices standard that uses XFA forms and embedded JavaScript to combine PDF forms with XML data. Preliminary experience with AAP child health forms shows that the combination of PDF with XML is a more effective method to visualize familiar data on paper and the web than the traditional use of XML and XSLT. Both PDF-H and HL7 Clinical Document Architecture can co-exist using the same data for different display formats.

Introduction

Portable Document Format for Healthcare (PDF-H) is a recently introduced standard for best practices for displaying and sharing medical data.¹ We used a familiar PDF child health form to test and demonstrate use of PDF-H to display XML summaries of meds, allergies, problems, and immunizations.



Fig 1. Paper Child Health records provide a familiar model for building electronic forms

Fig 2. A paper immunization form has no method to transfer data to or from an EHR



References

1. AllIM Best Practices Implementation Guide for Portable Document Format for Healthcare 2008.
2. American Academy of Pediatrics Website <http://www.aap.org/advocacy/blankform.pdf> accessed March 14, 2008.
3. ASTM E-2369 Standard Specification for Continuity of Care Record (CCR). 2005.
4. Dolin RH, Alschuler L, Boyer S, Beebe C, Behlen FM, Biron PV, Shabo A. HL7 clinical document architecture, release 2. JAMIA 2006;13(1):30-39.

Methods

The American Academy of Pediatrics Emergency Information Forms (EIF)² was used as a test document to evaluate PDF-H. This form is available on the public website and parents are encouraged to complete these forms for their children with special needs to provide core data for emergency use.

The paper form was edited using Adobe Acrobat Professional to add an XML data source which was used to populate fields on the form using XML Forms Architecture (XFA).

PDF Healthcare also supports other features such as barcodes populated with XML data, buttons that trigger JavaScript, and digital signatures.



Fig 3. A continuity of care document is a CDA CCD that is visualized using an XSLT which translates formatting tags embedded in the narrative text for each section. The display information is packaged with the data and translated to HTML by the XSLT

There are three methods for generating human readable data from XML data. The CCD contains embedded human readable text in a narrative text tag for each section. The CCR uses an external XSLT to arrange the tagged data on a display. The third method, which we compared to the first two, is to map data fields onto a pre-existing or custom designed PDF form.

Fig 4. Acrobat LiveCycle forms designer allows the original paper PDF form to be imported into the center panel. A data source is created in the left panel from an xsd, a sample xml data file or a



data base connection. Widgets in the right panel, such as a text box, are dragged over the center form and data bindings are created to the xml data on the left with format options.

Results

Forms using the PDF Healthcare best practices were successfully created and able to display the sample XML content. The resulting forms were easy to read and use. There was no need to install an XSLT on the user's computer or modify the web browser

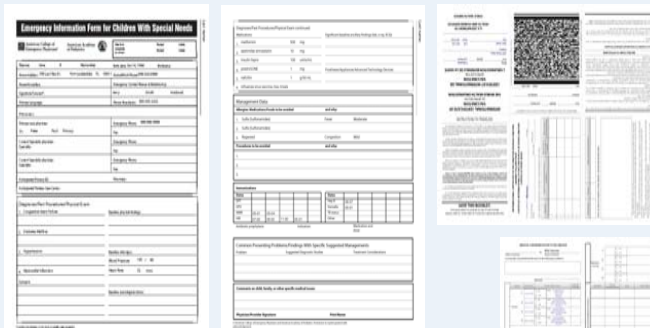


Fig 5. An AAP EIF form populated using data in a CCR XML record



Fig 6. An immunization tri-fold form populated from data in CCR that includes a 2-D barcode which also carries the human readable data



Fig 7. The same CCR summary data displayed using PDF Healthcare (above) and a conventional CCR XSLT (below). The PDF form has the advantage of working two way for data entry in a web browser while the XSLT generated form is read-alone and cannot modify the XML data record. Note that each data element on both forms has the source attribution that was part of the original record.

Discussion

The traditional method of creating a human readable display is to combine the XML data with an XSLT that generates an HTML web page. This approach is the basis for the HL7 Clinical Document Architecture (CDA) that uses a generic XSLT to render the narrative text sections of a structured XML document using HTML embedded in the text.⁴

Use of a PDF document offers advantages of fine grained and predictable format control as well as the ability to re-use familiar paper forms while adding dynamic user controlled option buttons. The resulting documents can be more appealing and efficient than HTML documents. This is part of the explanation for the growth of PDF formatted web pages over time replacing html because the PDF readers are almost universally available.

XML discrete data fields stored in a CDA documents can also work effectively with PDF Healthcare once the original data is extracted into an appropriate simple XML subset that can be more easily mapped to the form, or complex expressions can be written to extract the correct data required to populate each field on the form.

The PDF Healthcare Implementation Guide describes how XDF can be used to package both the XML data and the PDF form together using conventional web server applications that can generate XML.

Conclusions

The PDF Healthcare approach to visualizing data in an XML record is a powerful tool for populating familiar PDF forms for printing and web display. PDF Healthcare should be explored when XML data will be displayed to end users without the benefit of sophisticated user interfaces and applications. PDF for Healthcare specifies the methods for rendering documents, but does not introduce new standards for the document contents. PDF forms can carry critical medical data for children with special needs and children in foster care facilitating an electronic medical home that parents can carry at all times.