Children's EHR Format Enhancement: Final Recommendation Report

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Preface

The Agency for Healthcare Research and Quality (AHRQ) and the Centers for Medicare & Medicaid Services (CMS) funded a project in 2009 to develop the Children's EHR Format (the Format), an extensive set of software functional requirements that included 547 normative statements grouped in a hierarchy beneath 148 headers and function statements. Publicly released in 2013, the Format was well received by software developers identifying gaps in functionality, practitioners using EHRs in the care of children, and provider organizations purchasing and configuring EHRs.

Users of the Format also identified challenges. Hundreds of the function statements were not viewed as actionable by stakeholders, despite the organization into topic areas, the hierarchical grouping, and the use of SHALL, SHOULD, and MAY in the narrative statements themselves. Early feedback on the Format suggested that its impact could be greater if software developers and other stakeholders were provided additional guidance in using it.

This project produced the Children's EHR Format 2015 Priority List, and Recommended Uses for the Format, which are designed to provide this additional guidance. They are intended to enhance the use of the Format by providing a short list—47 items—for all stakeholders to focus on. These items have been edited or rewritten for clarity, and are supported by implementation notes that expand upon what is contained in the description of the requirement, to provide context. The 2015 Priority List and Recommended Uses of the Format are intended to spur dialogue among software developers, practitioners, provider organizations, professional organizations, and other stakeholders working to improve the care of children and the technologies supporting their care.

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Executive Summary

The Children's Electronic Health Records (EHR) Format (the Format) is important for the care of children because it identifies improvements in health IT to better support the safety and quality of care delivered to children. Required by the Children's Health Insurance Program Reauthorization Act of 2009 (CHIPRA), the Format was developed to improve the design of health IT to inform parents, caregivers, and other consumers about compliance with health care requirements associated with school or leisure activities as well as the extent to which the care children receive is clinically appropriate and of high quality. The Format also addressed and supported Federal and State privacy and security requirements and standards developed for EHRs.

This project convened a Multistakeholder Workgroup (MSWG) consisting of 19 experts to enhance the Format initially released in 2013. The MSWG developed a small set of high-priority requirements and recommended uses of the Format to promote its dissemination and use. The MSWG received several critical inputs to inform their work: the Evidence-based Practice Center (EPC) report on "Core Functionality in Pediatric Electronic Health Records,"[1] and lessons learned from two CHIPRA State grantees about their experiences using the Format. The MSWG reviewed the 2013 Format elements in detail. This work was motivated by early challenges in using the Format, such as those described in the EPC report: "While the [Format] included multiple desired functions, the large number of requirements as well as the lack of prioritization may have had a paralyzing effect on most vendors, who, confronted with Meaningful Use requirements, did not leverage the Format to improve their products." [1, p. 55]

The EPC report identified six core functional areas considered the most important for EHRs: (1) Vaccine Forecasting and Management, (2) Routine Health Care Maintenance, (3) Documentation and Billing, (4) Medications, (5) Management of Vulnerable Populations, and (6) Family Structures.[1, p. 55] The report also noted that while "many of these functionalities are not purely pediatric, their key role in the care of children in contrast to their minimal role for adults could mean they can get overlooked if an EHR is designed primarily for adult care."[1, p. 54]

CHIPRA grantee experience with the Format was gathered by conducting interviews in North Carolina and Pennsylvania with solo practitioners, small group practices, hospital-based practices, and software vendors. Overall, grantees reported the Format helped them identify ways to improve their use of EHRs, improve the design of EHRs, dialogue between EHR vendors and users, and address gaps in functionality. Grantees reported that the Format had too many items, included many ambiguous or duplicative requirements, had confusing jargon or vague language at times, and emphasized concepts such as SHALL, SHOULD, and MAY, that were not very helpful.

The MSWG created a set of 47 requirements drawn from the Format and a list of 16 recommended uses of those items, and of the Format in general. They used a modified-Delphi process to review and revise items in the Format, added Implementation Notes to provide detail they felt would be helpful to software developers and other stakeholders, and in vigorously discussed which items had the highest importance, clarity, and feasibility. A Federal Workgroup (FWG) of 19 members was convened to review the MSWG's work, provide feedback, and share the project activities with their respective agencies or centers.

The context for the 2015 Priority List, and Recommended Uses of the Format is important. The MSWG focused on the practical question: "What EHR functions will make a difference in

the routine care of the child by the practitioner who uses an EHR?" The 47 functional requirements they identified were not the only important considerations, and would certainly have changed if the MSWG's main goal was different, such as to develop certification criteria for EHRs or advance quality measurement, for example. While the 2015 Priority List responds to several earlier criticisms of the Format, it is not comprehensive enough to fully address the top priorities of every key stakeholder, as the first release of the Format set out to do. The 16 Recommended Uses identified by the MSWG included direct uses such as software development and improved use of an EHR by practitioners, and indirect uses such as policy changes, school information technology use, and quality measure development.

The AHRQ/CMS-sponsored work to develop the Children's EHR Format began in 2009 and culminated in the 2013 public release of the Format. This project, designed to address some of the limitations of the Format, identified parents and patients as important beneficiaries. It is hoped the adaptation of EHRs to meet the 2015 Priority List requirements will lead to safer medication use, better tracking and completion of childhood immunizations, improved communication and knowledge about growth and development, better screening and management of children with special health care needs, and a variety of other specific benefits. An explicit goal of this work is to draw vendor, provider, and stakeholder attention to the needs of children, which are often de-prioritized given a limited IT marketplace for pediatric products and a large number of meaningful use EHR certification requirements that consume vendor and practice resources. It is also important to consider what the State grantees reported and others confirmed, that these requirements and recommended uses would be best used to spur dialogue among software users, developers, and other stakeholders.

In addition to presenting the 2015 Priority List and the Recommended Uses of the Format, this project makes two recommendations. The first is to expand use and awareness of the 2015 Priority List so that software developers, practitioners, and others who are ready to make use of the requirements, can do so. The second is to encourage stakeholder collaboration to improve the Format, since collaboration across disciplines is the most effective way to improve the design and use of EHRs and build awareness.

Early initial feedback from American Academy of Pediatrics (AAP) leadership who were not involved in the development of the 2015 Priority List and Recommended Uses documents has identified both strengths and opportunities to improve this work. The implementation notes are envisioned to evolve over time, providing an opportunity for generating ideas, sharing, and learning about functional requirements for a child's EHR.

It is expected that the current list of high-priority requirements from the Format will evolve over time as EHR product capabilities improve, users demand new functionalities, health care business drivers shift, and broader societal changes occur, such as a shift toward greater information sharing with patients. The 2015 Priority List and Recommended Uses documents offer system developers, practitioners, provider organizations, patients, and other key stakeholders important ways to improve EHRs used in the care of children, and will have the greatest impact if they can be used and disseminated broadly.

Introduction

The Children's Electronic Health Record (EHR) Format Enhancement project was funded by the Centers for Medicare & Medicaid Services (CMS) and contracted to RTI International by the Agency for Healthcare Research and Quality (AHRQ) to identify a core set of Children's EHR Format (the Format) requirements and recommended uses of the Format. For those unfamiliar with the Format, it is a list of written functional requirements, often beginning with "The system shall…", that describes how software should behave to meet the needs of a user. An example of a functional requirement is: "The system shall capture the administration, completion, and interpretation of screening tools." The Children's EHR Format released publicly in 2013 served as a starting point for this project.

The enhancement work for this project consisted of environmental scan activities, workgroups, and a final project report. In the environmental scan we explored Format implementation experiences from two Children's Health Insurance Program Reauthorization Act (CHIPRA) State demonstration projects with grantees in North Carolina and Pennsylvania, and an Evidence-based Practice Center (EPC) report on "Core Functionality in Pediatric Electronic Health Records." After the environmental scan, a Multistakeholder Workgroup (MSWG) met for 6 months to develop specific recommendations, and a Federal Workgroup (FWG) reviewed the work and provided feedback. This final project report was developed to summarize the project work and findings.

During the site visits in North Carolina and Pennsylvania we conducted semistructured interviews with multiple stakeholders involved in caring for children enrolled in Medicaid and/or CHIP to explore their perceptions and experiences using the Children's EHR Format. RTI and its partner, Vanderbilt University, met with a diverse set of participants, including clinical and administrative leaders, clinical staff and EHR users, IT staff, and software vendors, all of which worked directly with the Format. Data from the interviews were analyzed and summarized in an Implementation Experiences Report provided to the MSWG and FWG members as they developed the 2015 Priority List and Recommended Uses of the Format.

The MSWG, a diverse set of 19 experts, included representation from practicing pediatricians, informaticists, vendors, health care system leadership, and representatives from the Medicaid/CHIP agencies in Oregon, Ohio, Massachusetts, and Vermont. As a group, they participated in a consensus process developed by RTI and its partners—researchers from Vanderbilt University, representatives from the American Academy of Pediatrics (AAP), and facilitation experts from c3 consulting. In six monthly meetings between January and June 2015, the MSWG reviewed and discussed requirements from the Format. They identified 47 high-priority requirements and 16 recommended uses describing how the individual requirements from the 2015 Priority List or the (more extensive) Format can be used to improve the care of children.

A Federal Workgroup (FWG) consisting of 19 members from multiple Federal agencies was convened to inform key Federal agencies about the work being done, and ensure that the work did not duplicate or contradict other work being conducted by the Federal Government. The FWG met for 6 monthly meetings from January to June 2015 and provided valuable feedback to the MSWG.

This final report presents the Children's EHR Format 2015 Priority List and the Recommended Uses of the Format, describes the methodology used to develop them, and summarizes key findings from the project.

Background

Development of the Children's EHR Format

A number of legislative actions set the stage for the development of the Children's Electronic Health Record (EHR) Format, a list of written functional requirements describing how a software system should behave to enable a health IT user to care for children. The Children's Health Insurance Program Reauthorization Act (CHIPRA) was signed into law on February 4, 2009, as an amendment to Title XXI of the Social Security Act, to improve the quality of care provided for children. Later that month, on February 17, the Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted, allowing the Department of Health and Human Services (HHS) to establish programs to promote health IT, including electronic health records (EHRs).[2]

CHIPRA specifically provided States with significant new funding, new programmatic options, and new incentives for covering children through Medicaid and the Children's Health Insurance Program (CHIP). Title IV, specifically Section 401, of this legislation pertains to child health quality measures and describes particular tasks that the Secretary of Health and Human Services must perform to strengthen quality of care for children enrolled in Medicaid or CHIP.

Included among these activities was the "Development of Model Electronic Health Record Format for Children Enrolled in Medicaid or CHIP." Among other characteristics, this work was required to be "structured in a manner that permits parents and caregivers to view and understand the extent to which the care their children receive is clinically appropriate and of high quality."[3]

With this structure in mind, the Center for Medicaid and CHIP Services (CMCS) and the Agency for Healthcare Research and Quality (AHRQ) collaborated to develop the Children's EHR Format (the Format).[4] An early version of the Format was sent to two CHIPRA Demonstration Grantees (North Carolina and Pennsylvania) in May 2012. These grantees agreed to evaluate the impact of the Format on health care quality, including costs, for children enrolled in Medicaid or CHIP.[5] The Format was then released to the public in February 2013, and was migrated to the AHRQ United States Health Information Knowledgebase (USHIK) in December 2013. Legislation and activities leading up to this project—the enhancement of the Format—are summarized in Table 1.

Table 1. Activities related to the Children's Electronic Health Record Format

Year	Activity
2009	Children's Health Insurance Reauthorization Act (CHIPRA) Health Information Technology for Economic and Clinical Health (HITECH) Act
2010-2013	Initial development of the Children's EHR Format by Westat under AHRQ contract with CMS funding
2012-2015	Evaluation of Children's EHR Format by CHIPRA Quality Grantees, Category D, in North Carolina and Pennsylvania
2013	Initial public release (February) and interactive release via the United States Health Information Knowledgebase (USHIK) Web site
2014-2015	Enhancement of the Children's EHR Format by RTI under AHRQ contract with CMS funding (this project)

Reason for This Project

RTI International, in collaboration with Vanderbilt University Medical Center (VUMC), the American Academy of Pediatrics (AAP), and c3 Consulting, was contracted to enhance the Children's EHR Format. The aim of the project was to promote greater use of the Format by developing recommendations to: (1) the Office of the National Coordinator for Health Information Technology (ONC) for core requirements related to child health that could be considered for EHR certification; and (2) CMCS for suggested "uses" of the Format to advance child health, such as through interoperable immunization data for health systems, schools, and public health agencies. The recommendations build on Multistakeholder and Federal Workgroup deliberations supported by the study of CHIPRA grantees, an Evidence-based Practice Center (EPC) technical report prepared under a separate AHRQ contract to characterize the scientific evidence supporting core functionality of pediatric EHRs, and the original work developing the Format, which included an environmental scan and gap analysis, interaction with standards organizations, and engagement of diverse stakeholders. The recommendations in this report are intended to advance the use of EHRs in the care of children by providing a focused set of requirements to system developers, practitioners, and other stakeholders.

EPC Technical Brief Findings

In 2014, AHRQ contracted the Vanderbilt University EPC to develop a Technical Brief to objectively describe the state of practice for pediatric EHRs, called "Core Functionality in Pediatric Electronic Health Records." Through a literature review, key informant interviews with clinicians, policy experts, and researchers, and an online search, the EPC conducted an environmental scan and review of the literature on pediatric EHR functionalities and how this has affected the implementation of pediatric EHRs.

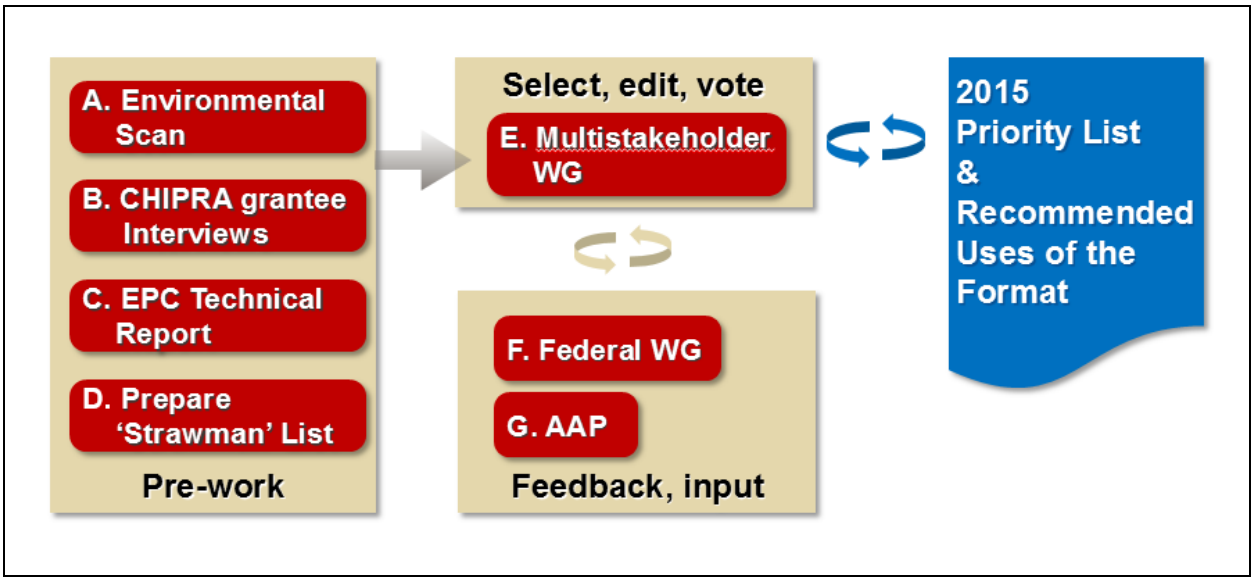
The EPC concluded there is a consensus that in order for child health care providers to deliver high-quality care for their patients, EHRs used specifically in the care of the children must have particular functionalities. The report stated that a child's evolving physiology, as well as conditions associated with changing maturity levels, are the main reason for these required functionalities. The report also noted the key informants' opinions that the proper implementation of these functionalities would better support care not only for children, but for all patients. The findings from this report, specifically the functionalities deemed necessary by the research and analysis performed by the EPC, provided input to the MSWG discussions about the high-priority requirements being developed under the contract with RTI and its partners.

Project Approach

Overview

Project key activities are summarized in **Figure 1**. To prepare for the Multistakeholder Workgroup (MSWG) meetings that began several months into the project, "pre-work" activities were conducted. The first was document collection as part of an environmental scan (Figure 1, A) to identify reports that examined the design and use of electronic health records (EHRs) in the care of children. Second, a study was planned and carried out to understand the implementation experiences from two Children's Health Insurance Program Reauthorization Act (CHIPRA) State demonstration projects in North Carolina and Pennsylvania to use the Format as a guide for improving the design and use of EHRs (Figure 1, B). Project artifacts from North Carolina and Pennsylvania programs were collected and analyzed, along with interviews with providers, vendors, practice managers, information technology (IT) staff, and CHIPRA program leaders to learn how they used the Format to improve the use of EHRs in the care of children, and to gather feedback on the Format. Third, we reviewed a technical report produced by the Vanderbilt Evidence-based Practice Center, as described earlier (Figure 1, C).

Figure 1. Key activities in developing the 2015 Priority List and Recommended Uses of the Format



Notes: A. Review of published and gray literature; B. North Carolina and Pennsylvania CHIPRA grantees and stakeholders; C. AHRQ Technical Brief, "Core Functionality in Pediatric Electronic Health Records"; D. 18 members; E. 15 members; F. 5 members of the American Academy of Pediatrics

Finally, as members of the MSWG and Federal Workgroup (FWG) were recruited, analysis of the Format began to identify a starter set of items, known as the "strawman" (Figure 1, D). The requirement selection process evolved over time and was designed around four components: (1) MSWG discussion of items on the strawman list, (2) MSWG voting, (3) MSWG small group work to review all Format items, and (4) creation of implementation notes for high-priority requirements (Figure 1, E). The MSWG used inclusion and exclusion criteria to guide their decisions, identified and resolved duplicate or near-duplicate items, clarified vague language, considered the feasibility of implementation of each requirement, and discussed each

requirement's importance to reach consensus. Process planning also began for developing recommended uses for high-priority requirements during the pre-work activities.

The MSWG was convened in December 2014 for orientation to the project, and included six working meetings (January through June 2015) to develop the list of high-priority requirements and recommended uses. A small honorarium was offered to MSWG members. After the April MSWG meeting, a draft list of high-priority items was complete. After the June MSWG meeting, a draft list of recommended uses was complete. Refinements were made to the priority list and recommended uses over the next several months in response to feedback from council leaders of the American Academy of Pediatrics (AAP) invited (Figure 1, G) to review the preliminary project work.

The FWG (Figure 1, F) met six times (January through June 2015), reviewed the deliberations of the MSWG, and provided feedback on their work. The FWG was assembled to allow representatives from an array of Federal agencies and programs with an interest in the Format to receive regular updates on the work of the project. Following the workgroup meetings and feedback, the project team developed the final report and presentation.

Implementation Experiences Report

RTI studied the experiences with the Format among Children's Health Insurance Program Reauthorization Act (CHIPRA) grantees in two States, North Carolina and Pennsylvania, by interviewing participants. The purpose of meeting with grantees was to help the MSWG identify possible enhancements to the Format, uses of the Format, barriers and facilitators for its use, and requirements perceived as having a greater impact on helping providers deliver high-quality care to children.

The RTI team worked with CHIPRA program staff in North Carolina and Pennsylvania to identify a diverse set of participants from whom to learn about experiences with the Format. Program staff also provided insight into the approach used in each State to implement the Format and offered a broad perspective about implementation across each State. Subsequently, the team conducted semistructured interviews with CHIPRA grantees in the two States, including practicing clinicians, vendors, information technology (IT) staff at the implementing sites, organizational leaders, clinical leaders, and practice administrators. A description of each of the roles is provided in the full report of implementation experiences in **Appendix A**.

A semistructured interview guide was developed and tailored for each role to elicit experiences using the Format, including the most or least important functional areas, challenges encountered in working with the Format, suggestions for improving the Format, and functional areas that would bring the highest value and impact. The project team traveled to sites in North Carolina and Pennsylvania to conduct semistructured interviews individually or in small groups. Interview transcripts and notes were transcribed and coded for qualitative analysis to identify emergent themes, including general feedback about the Format and suggestions for improvement.

Overall perceptions of the Format among grantees were positive. Interviewees indicated that the Format provided a helpful framework for conversations about pediatric needs for EHRs, both among members of a practice, and between practitioners and vendors. Using the Format, they sometimes better understood their EHR's capabilities or about what to ask their vendors. They also noted challenges using the Format, such as difficulty interpreting requirements and

prioritizing them. In some cases they were unable to adapt the use of their EHRs or noticed missing requirements in the Format.

Interviewees identified a number of the items in the Format as priority areas. These included automatically calculating percentiles for blood pressure, body mass index (BMI), and growth, and accommodating specialized calculations tailored for a child's condition such as Down syndrome. Another priority area was integration of existing screening tools and educational resources into decision support and practitioner workflows. Also, while many of the items in the Format addressed EHR and user needs within an institution, they often did not accommodate care needs across institutions, highlighting the need for information exchange. Integrated reporting and decision support to manage patient panels as well as support the care of individual patients was another priority. Since practitioners often care for siblings, family linkage was also cited as a need.

Participants reported difficulty interpreting certain requirements for several reasons, including the use of technical language, ambiguous examples, lack of useful examples, vague language, and differing interpretations of language by different stakeholders when discussing a requirement. To mitigate these problems, participants suggested glossaries, examples, use-cases, and test-cases that could facilitate interpretation.

Participants prioritized requirements differently depending on their role, clinical setting, and personal perspective. The very large number of requirements in the Format made it difficult for participants to determine which items to focus on. A number of participants noted that their EHR was initially designed for and targeted toward adult care, which explained why basic components essential to caring for children were not addressed. They felt that it would be valuable to start with these essential components before focusing on other requirements.

Although there were a large number of requirements covering multiple areas, participants identified a few topics they felt were gaps that the Format should address more fully. These included social factors such as socioeconomic status, and religious and cultural considerations. Other topics identified were food insecurity, conditions in the home, women, infants and children (WIC) assessments, and language considerations. Not all participants cited these as needs, but those who deal with populations for which these factors are relevant would find them useful in their care of children.

Participants indicated that the Format was a valuable tool for dialogue about EHRs and caring for children among clinical staff, IT staff, and vendors who may not otherwise have met to discuss how best to align EHR functionality with the needs of practitioners caring for children. However, the large number of items in the Format, the vagueness of many of the items, and the lack of supporting materials such as clinical examples led to communication and prioritization challenges. Participants suggested having fewer items and making sure they were as clear as possible, to improve the overall value of the Format.

Development of the Strawman

The MSWG was convened to create a list of high-priority requirements using the Format as a starting point. Members of the MSWG had varying degrees of familiarity (ranging from none to a lot) with the Children's EHR Format. The project team tested various processes for filtering the full list of 695 requirements in the Format to help the group begin their work.

Format items were filtered to include only normative statements since the other items were higher-level groups (called headings or function statements) for the normative statements.

Although each requirement included a type of requirement such as SHALL, SHOULD, or MAY, these categories were ignored during the pre-work and subsequent MSWG analysis based on feedback from the CHIPRA grantees and the project team. Another field in the Format, Core Yes/No, was also ignored, since the project team felt that it reflected a process that was not completed before the Format was released.

Four members of the project team, including the two MSWG co-chairs from Vanderbilt University and two RTI team members, reviewed the full list of 547 normative statements contained in the Format, identified items they believed might be of interest to the MSWG, and proposed inclusion and exclusion heuristics for the group to consider. The prework produced a list that included 166 items. After these items were reviewed to identify and remove duplicates and reconcile overlapping items, 99 items remained. This list was known as the "strawman," and was provided to the MSWG for their initial review before the first meeting. The MSWG discussed the strawman list, the heuristics and process for developing it, and how they wanted to move forward.

Through development of the strawman and subsequent discussions by the MSWG, a number of inclusion and exclusion criteria were formulated:

1. Exclude EHR features already very common in EHRs and/or covered under current certification criteria for meaningful use (MU) Stage 2 compliant systems.
2. Exclude EHR features that could be satisfied through the use of documentation templates.
3. Exclude EHR features that were too vaguely stated to be implemented.
4. Exclude EHR features that were very specific, and could be better addressed in a more general way.
5. Include EHR features relevant specifically to the provision of health care to children.
6. Include EHR features that had special importance to children (even if needed by both children and adults)

During the review and selection process, members of the MSWG encouraged changes to items to improve their clarity, to provide a reasonable level of detail, and in some cases, to help reach consensus. Subgroups were formed to examine specific groups of items within topics, such as items related to the topic *immunizations*. Each subgroup was asked to consider whether any items *not* included in the strawman list should be added to the strawman and reviewed by the entire group. All requirement text was considered draft, and subgroup members (or any member) could suggest changes to the title, description, or other details of a requirement to improve it. The MSWG decided to eliminate the distinction between statements using SHALL, SHOULD, or MAY, which appeared in the Format and are often useful in the context of a specific software product release, but were not felt to be useful for the work of this project. Instead, the MSWG used the lower case "shall" consistently, in each requirement that was adopted.

There was no specific target for the number of items to include on the strawman list or the final list. The goal for MSWG members was simply to develop a priority list that would serve as a manageable starting point for software developers, practitioners, purchasers, and other users of the requirements on the list.

Multistakeholder Workgroup Processes

The work of the MSWG was conducted using a modified-Delphi method, focusing on an iterative voting process and shared evaluation criteria. In all, the MSWG members were asked to

participate in three formal rounds of voting, which occurred primarily between meetings. Members were invited to review individual requirements from the strawman (based on the Format), and vote each item "In," "Out," or "Discuss." The workgroup members also shared discussion points to support their voting decisions in each round. The project team and workgroup agreed that each requirement that reached a supermajority of 80 percent "In" would be included in the Priority List. In addition, members were given supporting materials such as the AHRQ EPC report and the Report on Implementation Experiences as background. (**Appendix B** provides a list of workgroup members and meeting schedules.)

Members were asked to provide their initial votes on the strawman list between the orientation meeting and the first full workgroup meeting. During MSWG meeting #1, items receiving more than 80 percent "In" votes were reviewed in order to approve items that seemed to have the highest amount of consensus. Comments from those who had voted differently were discussed and largely found to be minor clarifications or considerations.

To perform prework before meeting #2, small subgroups were formed for each topic area found in the Format. Subgroups were asked to review strawman requirements in their topic areas and to put forward a consensus vote of "In" or "Out" for the full workgroup to consider. Subgroups were asked to provide comments, suggestions, or revisions to each item that would help the MSWG reach a supermajority vote. Members were also asked to review items in the topic areas that had not made the strawman list and consider whether any should be added to the strawman for consensus approval.

Before meeting #2, members submitted their round 2 votes, along with comments. During meeting #2, discussions focused on the context for voting something "in": clarity, feasibility, and importance. As defined by the workgroup, *clarity* refers to how understandable the language of the requirement is to various stakeholders. *Feasibility* refers to the ease with which a requirement can be implemented by EHR vendors and practitioners in a practical way, considering the technologies, policies, and staffing typically encountered. Overall value or *importance* refers to the relative likelihood that the item would improve the health of children if it was included in EHR functionality. MSWG members agreed to review items they voted as "In" during round 2, and rate each of the three dimensions (clarity, feasibility, value) as high, medium, or low.

The MSWG also decided to allow implementation notes to be associated with a requirement. These notes could be added by the MSWG without being tied to a vote on the requirement itself, since they were intended to offer guidance to improve its usability by stakeholders.

In meeting #3, the MSWG reviewed subgroup recommendations and voted on additional items. A third round of voting on remaining items was performed after meeting #3, and reviewed during meeting #4. Items receiving a supermajority "In" were added to the priority list, those with a supermajority of "Out" were retired, and remaining items were discussed during the meeting to achieve resolution.

After subgroup discussions about the 8 "additional work" items following meeting #4, 7 requirements with improved language were recommended to be "In," and 1 item was recommended to be "Out." In total, MSWG members voted to include 49 items on the priority list. Two items were subsequently removed from the list because they were almost identical to other list items, reducing the final list to 47 items. The final list is provided in **Appendix D**, including the implementation notes developed for each item. A summary (**Table 2**) of the requirement count by topic in the Format, in the project team prework, in the strawman, and in the 2015 Priority List shows the identification of a high-priority list of requirements (right column) refined from the broad list (left column) in the Format. The original Format highlighted

the breadth and depth of gaps in pediatric EHRs, but its hundreds of requirements and sometimes challenging use of language highlighted the need for a more focused and manageable list to provide a more feasible starting point for vendors, providers, and other stakeholders. The items included in the 2015 Priority List do not represent each and every functionality that may be useful in a pediatric-specific EHR system, but they do identify high-priority functions that will make an immediate impact on the care of children. Stakeholders interested in topic areas and functional requirements that are not addressed on the 2015 Priority list should review the Format for relevant items.

Patients and families, caregivers, and consumers are key beneficiaries of improvements in EHR design and workflow supported by the Format and the 2015 Priority List. The 2015 Priority List includes some specific items under the topic "Patient Portals – PHR", as shown in Table 2, such as differential access to health information for the teen and the parent/guardian, compliance with the Children's Online Privacy Protection Act, and transferrable patient portal access when a child reaches the age of maturity. Additional patient portal and health IT functionality directly used by consumers was not included in the 2015 Priority List to avoid duplication with EHR certification criteria under the meaningful use program.

Table 2. Number of requirements by topic in the Format, prework, strawman, and 2015 Priority List

Topic	The Format	Prework	Strawman	2015 Priority List (Final)
All Topics	547	166	99	47
Well Child/Preventive Care	131	45	25	12
Security and Confidentiality	24	7	5	7
Medication Management	38	14	8	6
Primary Care Management	47	14	6	5
Child Welfare	24	8	4	4
Growth Data	60	35	11	4
Newborn Screening	16	5	5	4
Parents, Guardians & Family Relationship Data	27	5	1	4
Immunizations	16	4	4	3
Patient Portals - PHR	13	1	1	3
Birth Information	66	11	7	2
Children with Special Health Care Needs	25	8	3	2
Registry Linkages	18	3	3	2
Child Abuse Reporting	29	1	1	1
EPSDT	14	5	5	1
Genetic Information	4	1	1	1
Patient Identifier	9	3	2	1
Prenatal Screening	17	5	3	1
School-Based Linkages	4	2	1	1
Specialized Scales/Scoring	39	9	1	1
Activity Clearance	8	1	1	0
Adolescent Obstetrics	5	2	0	0
Community Health	4	1	1	0
Quality Measures	5	2	1	0
Records Management	17	4	0	0
Special Terminology and Information	10	1	1	0

MSWG meetings #5 and #6 were devoted primarily to the development of recommended uses of the Format and the 2015 Priority List among various stakeholder groups. The project team identified an initial set of potential uses by reviewing extensive notes that were captured during the first four MSWG meetings and the Implementation Experiences report. Six stakeholder groups emerged from this review including: (1) providers that use/select EHRs, (2) groups that support services/education/improvements in the care of children, (3) software developers, (4) policymakers at both the State and Federal level, (5) policy implementers (Medicaid and Children's Health Insurance programs), and (6) groups focused on quality reporting and improvement. During meeting #5, MSWG members were asked to provide feedback on the list of users and to draft one or more uses envisioned for a particular stakeholder group. During meeting #6 (the final MSWG meeting), members reviewed the draft list of recommended uses and provided feedback to improve the final list.

As the list of recommended uses was being finalized, two types of use were identified—a "direct" use of the priority list items (such as adding a new feature to the EHR to capture needed patient data), and an "indirect" use that relied on the downstream effect of a priority list item (such as the data captured subsequent to implementation of a new EHR function). Both direct and indirect uses of the 2015 Priority List are important and are included in the final Recommended Uses document.

Federal Workgroup Input

An FWG consisting of 19 members from multiple Federal agencies was convened to inform key Federal agencies about the work being done, ensure the work did not duplicate or contradict other work being conducted by the Federal Government, and provide feedback to the MSWG. The FWG met for six monthly meetings from January to June 2015 and provided valuable feedback to the MSWG.

The FWG brought together representatives from AHRQ, CMS, ONC, Health Research and Services Administration (HRSA), Indian Health Service (IHS), National Institutes of Health (NIH), Administration for Children and Families (ACF), Substance Abuse and Mental Health Services Administration (SAMHSA), Department of Defense (DoD), and the Centers for Disease Control and Prevention (CDC). Each representative was chosen to represent activities in their respective agencies and programs that could be impacted as a result of the 2015 Priority List.

The FWG met monthly, shortly after each MSWG session. In each meeting, project staff provided a status update of the project work and facilitated a discussion regarding the direction and broader implications of the work for the agencies and programs represented. These discussions provided additional context and suggested directions for the products developed by the MSWG. Specifically, FWG members provided additional references and resources produced by the work of their respective agencies that were included in implementation notes and provided to members of the MSWG as they deliberated on the content of both the 2015 Priority List and the Recommended Uses. Overall, the FWG affirmed that the MSWG work would be valuable, and added specific suggestions about some proposed requirements and recommended uses.

Priority List Content Discussions

The 47 requirements in the 2015 Priority List were consistently rated by all members of the MSWG as "highly important," but their clarity and feasibility were not as consistently rated by members of the MSWG, the FWG, and others who provided feedback. Members of the MSWG

worked to edit each item to make it as clear and as feasible as possible to vendors, practitioners, and other stakeholders.

Some requirements deemed important by some members of the workgroup were excluded from the list due to a lack of consensus around importance, clarity, and/or feasibility, such as quality measurement and requirements that required additional infrastructure supporting the EHR. These items are discussed in more detail in the future work section. Other items were included by consensus agreement of the workgroup, despite acknowledged difficulties to implementation in the current environment. Significant discussions on a small handful of topics resulted in agreement that a specific statement was required as part of the recommended list that would make these core issues a priority moving forward, including:

Bright Futures. MSWG members strongly supported the incorporation of Bright Futures[6], an AAP-endorsed common framework for well-child care from birth to age 21, into the design of pediatric EHRs. However, the Bright Futures periodicity schedule for well-child visits was not the only schedule recognized by State, local, and national organizations. In some cases, State early and periodic screening, diagnosis, and treatment (EPSDT) programs contained components different from those in Bright Futures. Therefore, the MSWG agreed that systems must include the ability for both periodicity schedule and content to be modified by end-users to meet State, local, or practice-specific needs. Similar concerns were shared about immunization forecasting—which had very strong support during workgroup discussions, but equally strong agreement that the "rules" for vendors to follow would be complex to implement.

Interoperability. MSWG members agreed strongly that EHR capture of data such as birth information, newborn screening, and immunizations would strengthen quality improvement and monitoring activities and help to ensure children received essential services. But they also recognized that a single EHR system capturing the data was not enough, since often the data captured in one EHR must be accessible using a different EHR, such as at the child's first ambulatory encounter following discharge from a birth facility. Given the limited influence system developers and practitioners have on the design and use of third-party systems such as health information exchanges that enable interoperability, MSWG members recognized that a requirement placed on the priority list could have higher or lower feasibility or clarity, depending on the specific systems surrounding an EHR. Discussions regarding the maturity of existing interfaces with Immunization Information Systems (ISS) were similar. Though many ISSs are not currently capable of exchanging information electronically with EHR systems, the MSWG members felt that pediatric-specific EHR systems should be prepared to take advantage of advancements in ISS functionality that would support information exchange.

PHR/patient portal access for minors. Offering personal health record (PHR)/patient portal access and data segmentation for minors, teens, and parents is a complex topic requiring an understanding of the interplay among Federal laws, varying State laws, and organizational policies, creating uncertainties for software developers wishing to fully support these requirements. Nevertheless, most workgroup members felt strongly that this functionality was especially important in a pediatric EHR and must be included. The implementation notes for requirements in this area offer resources and suggestions for implementing these software requirements.

The 2015 Priority List Versus the Format

Each requirement on the 2015 Priority List is based on an item (or items) that appeared in the Children's EHR Format. The MSWG determined that each item met inclusion criteria, avoided exclusion criteria, had high value to EHR users and software developers, and would be clear and feasible enough to be included in the 2015 Priority List.

Whereas 547 requirements in 26 topic areas are covered in the Format, there are just 47 (8.6 percent) in 20 topic areas in the 2015 Priority List (**Table 3**). The Priority List includes only functional requirements without hierarchical elements such as Headers and Function Statements, found in the Format.

Fields. Requirements on both lists include the ID, Topic, Title, and Description fields. The contents of any particular field may vary across the two lists. For example, Table 3 shows corresponding fields for requirement Req-1070 (2013 Format) and Req-2023 (2015 Priority List). The 2013 Format also includes fields such as "Shall, Should, or May" and "Core: Yes or No" and "Provenance." The distinction of "Shall, Should, or May" was removed during priority list development, since all items on the list were designated as highly important, and because the priority list was not intended to describe a specific software release. The same applies to the use of the "Core" field. Finally, the concept of "Provenance", for example a requirement that is linked to HL7 content, was preserved from the initial list where applicable. The MSWG determined whether to keep or edit the contents of any field. For example, Req-2023 (see Table 3) had changes to the Title and Description but not the Topic, compared with its predecessor, Req-1070.

Table 3. Comparison of a requirement from the 2013 Format and the 2015 Priority List

Field	Format, Initial Release	2015 Priority List
ID	Req-1070	Req-2023
Related ID	Req-2023 (from 2015 Priority List)	Req-1070 (from 2013 Format)
Topic	Well child/Preventive care	Well child/Preventive care
Title	Age/gender-specific previsit history/screening/prevention forms	Support previsit history/screening/prevention forms
Description	The system SHALL support patient/parent completion of previsit history forms selected by specific age and gender-relevant screening/preventive care questions (e.g., ASQ or PEDS).	The system shall record values for pediatric specific previsit parent/patient reported data in a manner that enables retrieval and reporting
Implementation Notes	{this field does not exist}	Interest in patient-provided data through forms completed previsit and available for use during the visit has been growing and exceeds simple registration information prior to the first visit…(truncated to save space)

ASQ = Ages and Stages Questionnaire; PEDS = Parent Evaluation of Developmental Status

Feedback and Finalization of the 2015 Priority List

The project team coordinated with the AAP to invite feedback on the 2015 Priority List by the leadership of four AAP subgroups (Council on Clinical Information Technology, Council on Quality Improvement and Patient Safety, Section on Administration and Practice Management, and Council on School Health) as well as several immunization experts. Discussions with the

four AAP leaders and experts helped the project team to understand how it would be viewed by those outside the project team and workgroups. There were several notable findings which included the desire for EHR vendors to understand the importance users place on ensuring the product is capable of creating population health reports and problem lists. For example, the user should be able to view a report of: "all patients below age 10 who missed a vaccination and are scheduled to be seen in the next 6 months." These reports serve as an essential tool in helping pediatricians to manage their patient population and assure quality care.

Another notable finding was a discussion of immunization forecasting and the strong interest by pediatricians in making sure that the 2015 Priority List and implementation notes reflected this critical capability. While the workgroup decided against a separate requirement due to the lack of consensus among its members, placing immunization forecasting instead into the implementation notes, several AAP experts suggested this functionality belonged on the priority list, since it is essential for any product used by pediatricians.

Recommendations

In addition to presenting the 2015 Priority List and the Recommended Uses of the Format, this project makes two recommendations. First, there is value to be gained from expanding use and awareness of the 2015 Priority List for software developers, practitioners, and other stakeholders ready to take action. Second, engaging the community of stakeholders who can collaborate to update and make effective use of the Format is important for improving EHRs used in the care of children.

Recommendation 1: Expand Use and Awareness of the 2015 Priority List

The 2015 Priority List requirements listed by topic in **Table 4** and provided in detail in **Appendix D** are intended to provide a strong foundation for using electronic health records (EHRs) in the care of children. Items on the Priority List, including the implementation notes, were intended for immediate use by software developers, providers, provider organizations, and other stakeholders, as described in the recommended uses. The items on the list were selected as "high priority" because without them, it is challenging to use EHRs effectively in the care of children. Having a specific set of requirements across many stakeholders is advantageous because it can lead to more rapid and consistent improvements in EHR functionality and accelerate learning in key areas important to a number of stakeholders.

Although some awareness of the Children's EHR Format exists through professional societies such as the American Academy of Pediatrics (AAP), the United States Health Information Knowledgebase (USHIK) Web site, and CHIPRA grants, many software developers, practitioners, and provider organizations also want to improve their use of EHRs in the care of children, but are not aware of the Format as a resource for doing so. The 47 items on the 2015 Priority List, and the 20 topics they address, should be widely shared.

The MSWG felt that developing a focused list of high-priority requirements, and raising awareness about this work, would improve the care of children. Specifically, the CHIP Reauthorization Act of 2009 noted that the Format should help strengthen the quality of care for children enrolled in Medicaid or CHIP to be "structured in a manner that permits parents and caregivers to view and understand the extent to which the care their children receive is clinically appropriate and of high quality."[3] The 2015 Priority List and Recommended Uses is responsive to this legislation by supporting software development efforts through consensus functional requirements developed by domain experts in pediatrics that address typical activities and workflows that matter when caring for children. The 2015 Priority List and Recommended Uses of the Format offer information for State Medicaid and CHIP programs for setting policies and guiding providers in improving their use of EHRs when caring for children. Raising awareness of the 2015 Priority List and Recommended Uses is likely to help, based on the experiences of CHIPRA grantees.

Table 4. Children's EHR format 2015 Priority List items,‡ grouped by Topic

Topic Name	2015 Priority List Requirement ID
Birth Information	2001, 2009
Child Abuse Reporting	2006
Child Welfare	2031, 2032, 2033, 2034
Children with Special Health Care Needs	2014, 2022
EPSDT	2020
Genetic Information	2009
Growth Data	2002, 2003, 2019, 2042
Immunizations	2011, 2027, 2028
Medication Management	2005, 2010, 2012, 2035, 2036, 2037
Newborn Screening	2015, 2016, 2017, 2018
Parents and Guardians and Patient Relationship Data	2006, 2008, 2021, 2038
Patient Identifier	2021
Patient Portals—PHR	2007, 2026, 2032
Prenatal Screening	2009
Primary Care Management	2006, 2013, 2029, 2044, 2045
Registry Linkages	2011, 2028
School-Based Linkages	2026
Security and Confidentiality	2008, 2026, 2030, 2038, 2039, 2040, 2041
Specialized Scales/Scoring	2043
Well Child/Preventive Care	2004, 2013, 2019, 2020, 2023, 2024, 2025, 2027, 2044, 2045, 2046, 2047

‡Some requirements are associated with more than one topic.

PHR = personal health record.

In addition to the 2015 Priority List, the Recommended Uses list was created to provide suggestions about how key stakeholders could use the priority list. "Direct" uses include the design of EHR software, use when procuring an EHR, or use to help configure or optimize EHR implementation. "Indirect" uses leverage downstream effects subsequent to improvements in EHRs, and can support public health programs, quality measurement initiatives, and improved communication and coordination with patients/families. **Table 5** summarizes the final set of recommended uses, and **Appendix E** presents their full detail.

Brief information about this project was presented at two conferences in 2015, The Agency for Healthcare Research and Quality (AHRQ) Research Conference on October 4-6 and the AAP Council on Clinical Information Technology Education Program during the AAP National Conference and Exhibition on October 25. Information bulletins were developed and made available to the Centers for Medicare & Medicaid Services (CMS) for distributing to CMS, State Medicaid, the Children's Health Insurance Program (CHIP), and health plan stakeholders. The bulletins can be used to inform stakeholders about the 2015 Priority List and Recommended Uses of the Format, and can potentially promote the use of these resources in future projects or opportunities such as demonstration and health IT strategy projects.

AHRQ's Web site for public sharing of the Format, the USHIK, should be adapted to provide public access to the 2015 Priority List and Recommended Uses of the Format. The USHIK Web site already manages HL7 licensing before providing complete access to all Format items, and can similarly be used to protect HL7-dervied 2015 Priority List items.

Table 5. Summary of Recommended Uses of the Format

Stakeholders	Direct Uses
Providers and associated staff who use and select EHRs	1. Inform RFP/RFI development to ensure needed EHR functionality for the care of children 2. Support more productive vendor/provider discussions and expectation setting 3. Support ongoing improvements in the use of the EHR by providers and practice staff
Software developers	4. Improve the design and product road map for an EHR used in the care of children 5. Support better interoperability and integration within and between systems
Stakeholders	**Indirect Uses**
User advocacy groups, EHR system evaluators, and end users	6. Surface opportunities to improve workflow and other aspects of EHR use
School district providers and medical administrators	7. Share information with school districts
CMS, State Medicaid, and CHIP, and private payers and policymakers	8. Improve the alignment of EHR functionality with emerging financial policy
SDO, certification bodies, and professional associations	9. Support standards development 10. Identify functionalities for certifying health IT product functionality
State or county health and human services agencies	11. Establish expectations for electronic data capture and retrieval 12. Coordination of care, specifically children with special health care needs
Public health agencies	13. Support the public health functions of population health assessment, public health policy development, and assurance of public health policy compliance
Administrators, care coordinators, and health plans	14. Improve reporting around population health management
Quality reporting measure developers	15. Support for eMeasure development and specification
Pharmacists, pharmacy staff, and pharmacy management system vendors	16. Increase communication with pharmacists to support safer medication use

CHIP = Children's Health Insurance Program; EHR = electronic health records; IT = information technology; MS = Centers for Medicare & Medicaid Services; RFP/RFI = request for proposal/request for information; SDO = standards development organization.

While there is little data concerning users of the USHIK Web site, the anticipated new user scenario involves orienting the user to the goals of the site, showing what is available on the site, and offering various ways to access information on the site. The three main goals of the site appear to be to *inform* the user about the Format, to support the user in *exploring* the Format and the 2015 Priority List, and to *support downloads* from the site. A new user is more likely to engage in all three activities, whereas a returning user may return to any activity, but is less likely to use all three unless the site has changed or their needs have changed.

A number of functional requirements are being developed to guide changes to the USHIK Web site. The initial requirements include the following:

1. The site should support downloads of the Format–abridged, the Format–unabridged, the 2015 Priority List, and the Recommended Uses of the Format.
2. The site should provide background information about the Format, the Priority List, Recommended Uses, and links to related resources.
3. The Glossary and User Guide should be updated to address the Priority List and Recommended Uses.

4. Filtering should be supported for long lists such as the 2013 Format, and for items in the 2015 Priority List. When filtering is offered, it should support matching to user-specified criteria in multiple data fields using both AND and OR operators.
5. Tree view is not relevant for the Priority List and Recommended Uses information, but remains relevant for the Format items in the initial release.
6. The site should support links from an item in the 2015 Priority List to any related item in the 2013 Format.
7. The site should support links from an item in the Format (2013 Release) to any related item in the 2015 Priority List.
8. The site should support ease of use by a new user or by a repeat user.
9. HL7 licensing applies to 100 items in the 2013 Format, including items 110, 582, 607, 611, 646, 659, 1212, and 1238, which were the basis for modified items in the 2015 Priority List. We believe that the HL7 license requires that "Description" information be redacted for the following items in the 2015 Priority List if no documentation of a valid HL7 license is available: 2002, 2009, 2010, 2011, 2012, 2013, 2030, and 2036.
10. The Web site should allow the user to know, and to change their HL7 license status easily.

Recommendation 2: Encourage Stakeholder Collaboration to Improve the Format

Many diverse individuals and groups joined together to develop the first release of the Format in 2013, and during its development, a different set of individuals and groups (CHIPRA grantees) in two States worked to improve the design and use of their EHRs using the Format. The participants in this (current) project included pediatricians, family practitioners, pediatric specialists, software developers, Federal agency representatives, professional organizations, policy experts, academicians, and others, who worked closely together to produce a short, high-priority list of requirements for all stakeholders to use.

Collaboration across disciplines and stakeholders proved essential whether groups worked to develop the Format, apply it, or enhance it. It was critical for several reasons. First, multiple user perspectives help to assure a broad set of requirements are included in the Format. For example, software developers bring the engineering perspective needed to design and implement system features that support high quality care and efficient workflows. Practitioners from diverse medical settings including pediatrics, primary care, family practice, obstetrics/gynecology, and many others, bring a medical practice and policy perspective from delivering front-line care. Informatics professionals bring expertise in the capture, use, analysis, storage, and codification of data that can help users and systems improve their performance.

Second, using the Format to tackle different kinds of challenges, such as improving health IT design, streamlining practitioner workflow, or satisfying patients and families, requires a multidisciplinary understanding of the problem and proposed solution.

Third, like any tool, the Format items, and the 2015 Priority List items, can improve over time as they are used, especially if lessons learned during the implementation of requirements are captured and recorded. Implementation notes are designed to record such details for each requirement as learning takes place in new contexts, with changed workflows, as medical science advances, and as new technologies are adopted. Convening stakeholders for joint learning and collaboration will help to ensure that 2015 Priority List and Format items have the greatest impact on the care of children.

Discussion

The 2015 Priority List presents 47 functional requirements that reached supermajority (greater than or equal to 80 percent) agreement from the MSWG, which reviewed the extensive list of requirements from the Children's EHR Format, discussed many items in great detail, and developed heuristics for selecting high priority items. The 47 items do not "represent" the Format in its entirety, but rather, serves as a "starting point" for stakeholders as they work to improve the design and use of EHRs in the care of children.

The Recommended Uses of the Format offers guidance to stakeholders about how the 2015 Priority List, and the Format itself, may be used to support the aim of improving care of children.

Standards and Certification Crosswalk

Three documents address EHR functional areas that may overlap with the 2015 Priority List. The first, a standards document called the HL7 EHR Child Health Functional Profile, Release 1, was referenced in the initial development of the Format. The next two were developed as part of the EHR Incentive Progam.[7] The 2014 Edition Release 2 EHR Certification Criteria was being developed during the Format's development, and the 2015 Edition Health IT Certification Criteria was prepared after the Format's release. Details and links to the three documents are shown in **Table 6**.

Since each document was intended to impact and improve the design of EHRs used in the care of all patients, we wanted to understand the degree of overlap with the 2015 Priority List, which is focused specifically on improving the care of children. Each item on the 2015 Priority List was checked against information in the target documents to understand its alignment with them. Summary findings from the crosswalk analysis are shown in Table 6, and details are available in **Appendix C**.

Table 6. Documents reviewed in the crosswalk analysis

Short Name	Document Title	Status and Date Released	Link
HL7—Child Health Functional Profile	HL7 EHR Child Health Functional Profile, Release 1 Reaffirmation of ANSI/HL7 EHR CHFP, R1-2008	Version 1.0 standard originally released in 2008 and rereleased on 4/11/2014, unchanged	http://www.hl7.org/implement/standards/product_brief.cfm?product_id=15
2014 Edition EHR Certification Criteria	2014 Edition Release 2 EHR Certification Criteria and the ONC HIT Certification program; Regulatory Flexibilities, Improvements and Enhanced Health Information Exchange	Final Rule (Published in Federal Register 9/11/2014)	https://www.federalregister.gov/articles/2014/09/11/2014-21633/2014-edition-release-2-electronic-health-record-ehr-certification-criteria-and-the-onc-hit
2015 Edition Health IT Certification Criteria	2015 Edition HIT Certification Criteria, 2015 Edition base Electronic Health Record Definition and ONC HIT Certification Program Modifications	NPRM (Published in Federal Register 3/30/2015)	https://www.federalregister.gov/articles/2015/03/30/2015-06612/2015-edition-health-information-technology-health-it-certification-criteria-2015-edition-base

ANSI/HL7 =American National Standards Institute/Health Level 7; CHFP = Child Health Functional Profile; EHR = electronic health record; HIT = health information technology; ONC = Office of the National Coordinator for Health IT; NPRM = Notice of proposed rulemaking.

Higher overlap was anticipated with the HL7 CHFP because this document served as an input into the development of the original Children's EHR Format. Less overlap was anticipated with the 2014 Edition Criteria and Proposed 2015 Edition Criteria because the MSWG aimed to exclude Format items addressed under meaningful use, and because they were focused primarily on addressing gaps identified by practicing clinicians rather than regulators. Since 2015 Edition criteria potentially expanded upon those for the 2014 Edition, we anticipated there might be greater overlap between the priority list and 2015 Edition criteria.

As each item from the 2015 Priority List was compared with information in each document, it was assigned to one of the following groups:

1) Close Match: The 2015 Priority List requirement matched specific information found in the reference document.
2) (2) Concept Addressed: The 2015 Priority List requirement did not specifically match information found in the reference document, but the general principle or concept was addressed. Additional work would be required to specifically address the 2015 Priority List item.
3) (3) Not Addressed: The 2015 Priority List requirement did not match information found in the reference document.

The full details for each 2015 Priority List requirement are found in **Appendix D**. In general, requirements in the 2015 Priority List had greater detail than items in the three documents with which they were compared. 2015 Priority List items were more likely to have a "close match" with items in the HL7 CHFP (45 percent), and less likely with the other documents (4 percent). They were also more likely to be conceptually matched with the HL7 document then the others (26 percent vs. 17 percent). Most items from the 2015 Priority List were not addressed in either the 2014 Edition or Proposed 2015 Edition Criteria (79 percent) (see **Table 7**).

These findings show that the 2015 Priority List items are important because they address functional areas that are largely unaddressed in meaningful use regulations to date. Future efforts to develop mandatory or voluntary certification criteria should examine the 2015 Priority List items. If they were to be adapted for future EHR certification criteria, they would likely require additional work to ensure they were well suited to testing.

Table 7. Comparison of the 2015 Priority List items with reference documents

	2015 Priority List items compared with…		
Status	HL7 Child Health Functional Profile Release 1	2014 Edition Certification Criteria	2015 Edition Certification Criteria
Close Match	21 (45%)	2 (4%)	2 (4%)
Concept Addressed	12 (26%)	8 (17%)	8 (17%)
Not Addressed	14 (30%)	37 (79%)	37 (79%)
Total	47 (100%)	47 (100%)	47 (100%)

Limitations

The 2015 Priority List items reflect the interests and backgrounds of the MSWG members, time limitations, heuristics used to include or exclude items, feedback from the FWG and individual AAP members, the inputs of the project team, and other factors. In other words, the 2015 Priority List might easily have been different under different circumstances, such as less

focus on direct use by vendors and EHR users, and more focus on schools, public health agencies, quality organizations, policymakers, and parents/children themselves. Over time, as user needs and product capabilities shift, priorities will change. It is natural to expect that a future priority list will differ from the current one. In addition, noting the CHIPRA legislation that appropriated funds for development of the Format, the next phase of enhancement might include additional focus on health information available to parents and caregivers

The 2015 Priority List was not created by a software development team, which typically sets priorities in the context of specific technology choices, customer demands, dependencies on other software systems, and a portfolio of related products. Instead, the 2015 Priority List was produced by a diverse group of experts in health IT and the care of children, so it may overspecify or underspecify what would be needed for a specific software product. It is important to bear in mind that these requirements and recommended uses are best used to spur dialogue among software users, developers, and other stakeholders. The 2015 Priority List highlights many important gaps in EHR functionality, but it does not replace expertise in the care of children, informatics, or software design—all of which are critical factors in the design and implementation of EHRs used in the care of children.

Future Work

Software requirements, for developers, serve as instructions for the creation of functionality that can be designed, tested, and used in a specific way. Since medical knowledge and practice is often imprecise, based on a mixture of science and art, and continually evolve, it is natural for software requirements to change over time, as well. A number of areas were discussed by members of the MSWG but not included in the 2015 Priority List even though they were highly desirable, because they would be too ambiguous for developers to implement, or depend on other technologies that are themselves evolving or immature. As a result, they did not meet the MSWG's threshold for clarity or near-term feasibility.

The following areas were discussed by members of the MSWG or the FWG as issues of high importance where future work should be considered. In some cases, this work may uncover broader underlying needs (besides technology gaps) such as the development of evidence-driven rules or more accessible data to improve systematic capacity in that area.

Immunization forecasting. The 2015 Priority List does not include a specific requirement for immunization forecasting, although the MSWG discussed this topic and the EPC report identified this gap as well. Lack of this requirement illustrates a limitation of the 2015 Priority List: it does not include a number of important items due to its short length, the exclusions used by the MSWG, and judgments that differed among its members. Immunization forecasting has however in the past been used to identify EHRs with "pediatric functionality."

The majority of the workgroup members felt that discussion of immunization forecasting belonged in the implementation notes, since immunization guidelines and periodicity schedules were still too complex and varied among different States, making it difficult to develop a single requirement for developers that would meet both high clarity and high feasibility thresholds. While the workgroup members highlighted the implementation difficulty, several immunization experts highlighted that this work has been and can be done in many electronic health record systems. The MSWG acknowledged that immunization forecasting is a very high pediatric priority and suggested that continued work on the underlying policies, evidence, and requirements implementation be completed to support a consistent approach for pediatricians.

Specific Populations. A number of important areas such as food security, socioeconomic indicators of wellness, and maternal depression screening in the pediatric EHR were excluded because they applied in specific cases, not the general population. This prioritizing reflects the MSGW's overall approach: to include only items that would have the broadest impact. As mentioned earlier, the 2015 Priority List is a starting point for developers and practitioners, and future work to expand beyond its focus is important.

Quality measurement. While quality measurement was recognized as an important area by the project team and the MSWG, items included in the 2015 Priority List were not specifically focused on supporting quality measurement activities unless they also supported direct care, since the MSWG's primary aim was to improve the care of children by supporting important care activities routinely performed by providers. Clearly, system developers, practitioners, regulators, and others view this as a critical area that needs to be addressed in future work.

Health IT standards, data harmonization, and data exchange. Many times during MSWG and FWG discussions, the context surrounding the use and design of EHRs came into focus, highlighting the important role of health IT standards, work to harmonize data and semantic definitions, and data exchange in improving the capabilities and use of EHRs. While these broad areas were not the focus of the 2015 Priority List, continued work to improve the health IT infrastructure will help to advance the use of EHRs in the care of children.

Conclusions

The main purpose of this project was to enhance the Children's Electronic Health Record (EHR) Format by identifying and addressing barriers and limitations of the Format identified through the experiences of CHIPRA grantees in two States, North Carolina and Pennsylvania, EPC Technical Brief findings, "Core Functionalities in Pediatric Electronic Health Records," and activities of Multistakeholder and Federal Workgroups (MSWG and FWG) convened to review and improve items in the Format.

The 547 functional requirements in the Children's EHR Format were systematically examined by development of a strawman list, heuristics to guide the selection and improvement of high priority items, and an iterative voting and editing process to confirm requirements by supermajority of the MSWG. The end result was a list of 47 high-priority functional requirements (**Appendix D**) and 16 recommended uses for the requirements (**Appendix E**), called the 2015 Priority List and Recommended Uses document.

In addition to editing requirements to improve clarity and feasibility, implementation notes were added to provide additional guidance beyond what was available in the Format. The MSWG worked to reduce or eliminate ambiguous or duplicative requirements and unclear language found in the Format, such as an emphasis on distinctions between SHALL, SHOULD, and MAY statements, which convey criticality to developers when working on a specific software release, but were not helpful to the intended users of the 2015 Priority List. Since a number of requirements in the 2015 Priority List link to Format items derived from the HL7 Child Health Functional Profile, they fall under a free licensing agreement with HL7.

The main recommendations in this report are: (1) to use the 2015 Priority List to improve the design and use of EHRs and other health IT; (2) to make stakeholders aware that the 2015 Priority List and Recommended Uses is available; and (3) to promote mechanisms for continuing the work of enhancing the Children's EHR Format to improve the care of children. Through these activities, the overall aim to influence the design and use of EHRs to support better data capture, screening tools, quality metrics, data exchange, and other EHR requirements, can be achieved.

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Appendix A: Report on Implementation Experiences in North Carolina and Pennsylvania

Children's EHR Format Enhancement: Report on Implementation Experiences in North Carolina and Pennsylvania

Prepared for:
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Executive Summary

The Children's Electronic Health Record (EHR) Format Enhancement project was funded by the Centers for Medicare & Medicaid Services (CMS) and contracted to RTI International by the Agency for Healthcare Research and Quality (AHRQ) to identify a core set of Children's EHR Format requirements and recommended uses of the Format through three activities: learning from Format implementation experiences in North Carolina and Pennsylvania, Multistakeholder and Federal Workgroups, and a final project report. This report summarizes findings based on the early experience of EHR users, clinical and administrative leaders, software developers, and other stakeholders who have worked directly with the 2013 Children's EHR Format, a set of functional requirements developed to support the care of children.

The purpose of the report was to learn from the experience of stakeholders to help identify possible enhancements to the Format, uses of the Format and barriers to its use, and which requirements can make the greatest impact on helping providers to provide better quality care to children.

We sought to obtain a range of experiences with the Format among Children's Health Insurance Program Reauthorization Act (CHIPRA) grantees in two States. RTI worked with CHIPRA program leaders in North Carolina and Pennsylvania to identify a diverse set of participants, including clinical staff, IT staff, and software vendors. The RTI team and its partner, Vanderbilt University, conducted semi-structured interviews with CHIPRA State program staff and participants. Research notes were coded and analyzed to extract themes about participant experiences with the Format. Analysis of those interviews and discussion of the resultant themes form the basis of the report.

Qualitative analysis pointed to several themes: EHR functionality that is important or necessary, difficulty in interpreting the requirements, missing requirements, and the value of the Format overall. Specific EHR functionality participants found important included customized and integrated percentiles for blood pressure, body mass index (BMI) and growth, integration of existing screening tools and resources, information exchange, integrated reporting and decision support and family linkage. Interpretation was challenged by the language of the requirements and the need for additional resources. Areas for consideration in Format inclusion include social factors and defining medical relevance.

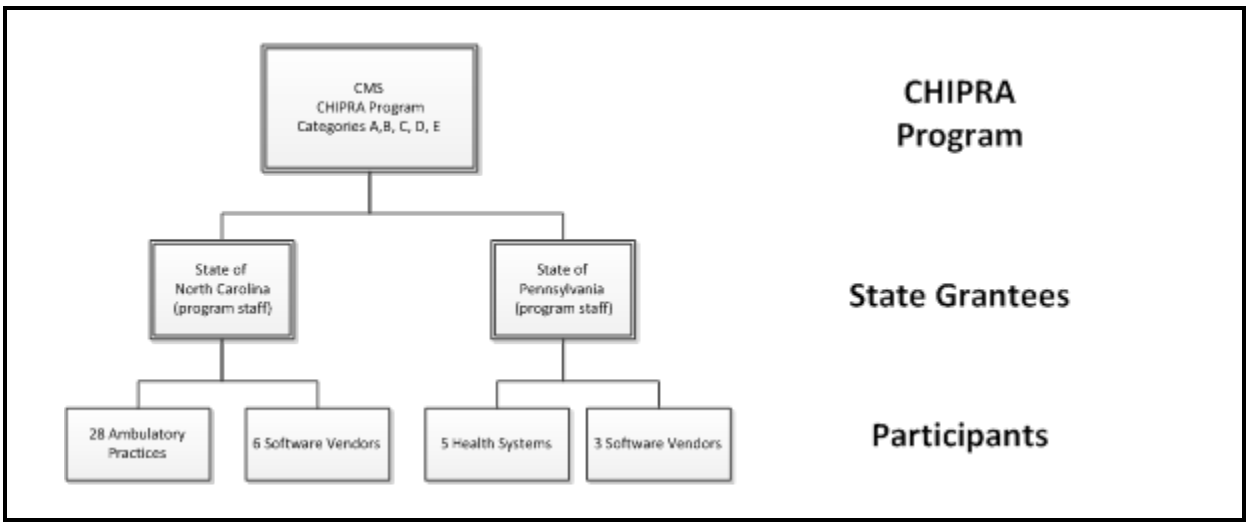
Introduction

Clinicians who care for children have specific needs for pediatric content and functionality in electronic health records (EHRs).[1] However, these needs are often not addressed adequately in EHR design and implementation for a variety of reasons. First, most EHRs were developed to serve patients in adult care settings, even though those EHRs are frequently *also* used in the care of children. Second, the configuration of an EHR for use with adults often creates barriers to its ease of use when the same EHR is used in the care of children. Third, as more quality measures rely on EHR data, capturing relevant pediatric information in the EHR as a byproduct of care activities is more important, and more problematic when not done effectively.[2] In 2010, in order to support improved care for children through improvements in the design and use of EHRs, the Centers for Medicare & Medicaid Services (CMS) collaborated with the Agency for Healthcare Research and Quality (AHRQ) to fund a 3-year project (2010–2013) to develop a set of software requirements called the Children's EHR Format (the Format). That project established the Format as a set of 695 requirement statements hierarchically organized into 25 topics relevant to the care of children. The requirements and topics are wide-ranging and are intended to serve all children including those enrolled in Medicaid or the Children's Health Insurance Program (CHIP).[2]

While the Format was under development, the Children's Health Insurance Program Reauthorization Act (CHIPRA) funded 10 quality demonstration grants across 18 States to support projects to enhance the care for children covered under Medicaid and CHIP.[3] As part of their grant objectives, grantees in North Carolina and Pennsylvania included learning how this large set of software requirements, the Format, could be used to improve the use of EHRs in the care of children.[3] Each grantee had State-level program staff who directed the work. They reached out to ambulatory practices, health systems, and software vendors ("participants") to assess the Format through surveys developed by, and interviews conducted by, State program staff. Through these activities, participants gained experience using the Format and provided feedback to State grantees. Depending on their role, participants reviewed the Format requirements in the context of designing, implementing, or using EHRs. Figure 1 outlines the relationship among CMS, State CHIPRA quality demonstration project program staff, and participants.

The overall goals of the CHIPRA quality demonstration projects were to identify gaps in EHR functionality, improve quality, and reduce costs.[3] North Carolina's CHIPRA program staff, working within the State's Community Care of North Carolina (CCNC)[4] network, recruited 28 practices and 4 vendors to provide feedback about the Format. During the fall of 2014, while our interviews were under way, North Carolina program staff continued to gather feedback from provider and vendor participants about their experiences with the Format. Participants in North Carolina were already focused on five quality improvement priority areas: asthma, developmental and behavioral health, early periodic screening and testing, obesity, and oral health. These priorities helped focus the North Carolina program's evaluation of the Format.

Figure 1. CHIPRA program structure



Pennsylvania's CHIPRA program staff, similarly charged with implementing the Format to assess its impact on the quality of care for children enrolled in Medicaid and CHIP, recruited five health care systems and three associated vendors to participate in grant-funded work that was ongoing during data collection for this report. Pennsylvania program staff fielded several surveys that presented individual requirements as survey items to solicit input about each requirement's relevance to the care of children and about the feasibility of meeting each requirement in the health system's current EHR.

Across the two States, a variety of participant organizations were represented, including vendor participants with pediatric-specific and general EHR products; provider organizations that varied in size from solo practitioners to integrated hospital systems; EHR users ranging from extensive experience with EHRs to new adopters; and provider settings ranging from urban to rural.

The context for this work is a larger project to make recommendations about high-priority requirements in the Children's EHR Format and recommended uses of the Format. The purpose of the report is to understand the experience of the CHIPRA grantees in North Carolina and Pennsylvania with the 2013 Children's EHR Format. Understanding how participants used the 2013 Format, assessed its potential value, and observed its impact on caring for children is anticipated to assist in developing the list of recommended requirements, as well as additional uses of the Format.

Methods

We sought to explore perceptions of the Format and its use across multiple stakeholders involved in caring for children enrolled in Medicaid and/or CHIP in two States. Site visits were arranged to conduct semi-structured interviews so that data could be gathered from multiple stakeholders in different roles. Perspectives on the value and use of the Format were anticipated to vary by role, since the overall impact of health IT generally reflects not only technology itself, but also the people using it, the tasks they perform, the organization supporting it, business processes, policies, and other factors as described in sociotechnical systems.

System functional requirements (such as those in the Format) serve a variety of purposes for different stakeholders, depending on the role of the individual. For example, software developers might use the requirements to drive technical specifications, to perform end-to-end testing of their product before its release, and to communicate product capabilities. System purchasers who select and pay for EHRs might use functional requirements to identify important business and user needs the EHR should address, and to distinguish competing products from one another. Providers and those who use the EHR in their daily work may find requirements statements to be informative, both as they initially learn the system's basic operations, and later as they explore more advanced system capabilities. Implementation staff who configure software systems and train others to use them may use functional requirements statements in a more detailed way based on the workflows they are trying to support.

Thus, the role of the stakeholder is anticipated to have a strong influence on their perspective about the Children's EHR Format.

Roles

Since the Format's value and uses were anticipated to vary by role, the RTI team worked with program staff in each State to identify key roles likely to have distinct views and experiences with the Format. Roles ranged from clinical to nonclinical staff, from leadership to front-line staff, and from software implementers to developers.

Seven roles were identified in this report: 1) CHIPRA program staff in each State (also known as "grantees"), 2) practicing clinicians, 3) vendors (also known as software developers), 4) IT staff, 5) organizational leaders, 6) clinical leaders, and 7) practice administrators. Roles 2-7 were also known as "participants" in the grant program—they were introduced to the RTI team via State program leaders. In-person or telephone-based interviews were conducted using a semistructured interview guide specific to each role.

The **CHIPRA program staff** in North Carolina and Pennsylvania were responsible for managing and executing the quality demonstration programs and also represented the State Medicaid/CHIP programs. Program staff worked closely with the participants—provider and vendor organizations—to obtain feedback on the Format. Program staff provided invaluable assistance to the RTI team in contacting participants and inviting them for interviews. Program staff were uniquely able to reflect on commonalities and differences among various participant perspectives on the Format.

Practicing clinicians included those who used the EHR in routine pediatric practice and could provide perspective on how well the Format aligned with pediatric care, as well as desired EHR functionality used in the care of children. This role is distinct because practicing clinicians

use the EHR to support daily clinical and administrative activities essential to the care of children.

Vendors included software designers and developers from EHR companies that could use the Format requirements to improve their product. Vendors could provide key insight on how the functionality of the requirements fit their products.

Organizational leaders were individuals who could address the potential value of the Format to the site or organization and provided perspective on how the Format fit into their site or organization's goals. This role is distinct because organizational leaders have a broad perspective of the Format and how it might support organizational goals.

Clinical leaders were individuals responsible for managing others and establishing practice policies and decisions. They could provide feedback on how the Format might impact everyday clinical practice. This role is distinct because clinical leaders can observe the use of the Format across clinical staff and in some cases, compare that to their own clinical experience.

Practice administrators could provide perspective on how use of the Format might impact workflows and practice policies across individuals and teams. This role is distinct because practice administrators can provide insight across the practice, both clinically and administratively.

IT staff were at clinical sites and were directly involved with EHR design and reviewing and integrating the Format. These staff discussed the technical feasibility of the requirements. This role is distinct because the IT staff supported vendor products and organizational IT needs within the facility.

Participants

The RTI team worked with each State's program staff to identify participants who had interacted most heavily with the Format, knew the requirements in detail, and matched the targeted roles. A total of 44 individuals were interviewed (see **Table 1**).

Table 1. Interviews by role

Role	Totals
CHIPRA program staff	9
Practicing clinician	8
Vendor	8
IT staff	9
Organizational leadership	1
Clinical leadership	5
Practice administrator	4

The 44 individuals reflected 14 different sites and six EHR vendors. Participant site affiliations and locations are shown in Tables 2 and 3. Interviews were conducted in person and via phone (when an in-person interview was not feasible).

Table 2. North Carolina participants, roles, and interview location

Site Name	Roles Interviewed	Interview Location
Community Care of North Carolina	CHIPRA program staff, clinical leadership, vendor	Raleigh, NC
Kids First	Practicing clinician	Raleigh, NC
Cary Pediatric Center	Practicing clinician, practice administrator	Cary, NC
North Raleigh Pediatrics	Practicing clinician, practice administrator	Raleigh, NC
Community Care Partners of Greater Mecklenburg	Clinical leadership, CHIPRA program staff	Charlotte, NC
Lakeshore Pediatrics	Practicing clinician	Denver, NC
Lumberton Children's Clinic	Organizational leadership	Phone
ABC Pediatrics	Practicing clinicians	Asheville, NC
Cornerstone Health	Clinical leadership, practice administrator	Winston-Salem, NC
Community Care of North Carolina (Northwest)	CHIPRA program staff, practicing clinician	Winston-Salem, NC
Allscripts	Vendor	Raleigh, NC
ReLi Med Solutions*	Vendor	Cary, NC
Physicians Computing Company (PCC)	Vendor	Phone
Office Practicum	Vendor	Phone

*ReLi Med Solutions was interviewed on site at Community Care of North Carolina.

Table 3. Pennsylvania participants, roles, and interview location

Site Name	Roles Interviewed	Interview Location
Pocono Medical Center	IT staff	Phone
GBS	Vendor	Phone
St. Christopher's Hospital for Children	CHIPRA program staff, clinical leadership, practicing clinician, practice administrator	Philadelphia, PA
Hershey Medical Center	IT staff	Phone
St. Christopher's Hospital for Children	CHIPRA program staff	Phone
NextGen	Vendor	Phone

Instrument Development

For each of the seven roles, a semistructured interview guide (see **Appendix A**) was developed. Questions in the guide were written to elicit experiences using the Format, including which functional areas were most or least important, what challenges were encountered while working with the Format, suggestions for improving the Format, and which functional areas would bring the highest value and impact.

The interview guides included general questions about the Format, specific questions tailored to each role, and suggested follow-up questions. Each interview guide asked for background from participants about their specific experiences with EHR implementation, their work with the Format, and their role.

Data Collection and Analysis

Interviews were conducted in person or by telephone with a three-member team: the RTI project director, a pediatric health IT consultant, and an RTI analyst serving as note-taker and logistics coordinator. Prior to the site visits, RTI received approval to conduct the evaluation from RTI's Institutional Review Board. Participants received a consent form prior to their interview to review and sign (**Appendix B),** and were also asked to provide verbal consent to be recorded during the interview for note-taking purposes.

Interviewees met individually or in small groups with the research team; each interview lasted approximately 1 hour and took place in private facility offices. The research team used the interview guide that was appropriate to the individual's role. The semistructured format allowed the use of probing questions to encourage richer discussion about topics of interest. Detailed notes were taken, along with an audio recording (with permission). The recording was used to obtain quotes or clarify points after the interview.

Data analysis and data collection occurred in an iterative cycle, which is typical of qualitative work. A preliminary set of codes was developed based on each interview guide. The codes were based on potential types of feedback about the requirements based on each question.

After each site visit, the notes taken during the interview were refined to remove grammatical errors and clarify meaning. These notes were imported into NVivo 10, a qualitative analysis software program. One of three researchers coded interviews after each site visit. Dr. Haque and the coding team met weekly during the coding process to review coding reports for consistency and completeness and make any necessary adjustments to the codebook.

Ten percent of interviews were coded by more than one team member to ensure consistency. Once coding was complete, an inter-rater reliability analysis was performed to determine consistency among the three raters and showed an average Kappa of 0.88, indicating substantial agreement.

The team then extracted themes from coded elements using NVivo 10. Data were grouped and analyzed to identify emergent themes, including general feedback on the Format, and suggestions to improve the Format. Lastly, team members reviewed common themes to systematically identify opportunities for refinement of the Format and its requirements.

Results

Role: CHIPRA Program Staff

After receiving CHIPRA funding, both North Carolina and Pennsylvania program staff recruited participants to provide feedback on the Format. Participants from provider organizations helped to identify gaps in EHR functionality and content. Program staff also successfully recruited some vendors to provide feedback on the Format items. Program staff from each State detailed their approaches to gathering feedback from vendor and provider participants to the RTI research team, as described below.

Approach Used by North Carolina Program Staff

To obtain feedback from providers and their EHR vendors, North Carolina program staff created a three-part survey using the hundreds of Format requirements; each format requirement was addressed through one survey question.

By October 2014, North Carolina program staff had deployed the first two surveys using SurveyMonkey and were preparing to deploy the third survey. Program staff used a naming convention to refer to the three surveys: Phase 1, Phase 2, and Phase 3. Program staff included requirement statements in each survey based on the topics below:

- Phase 1 topics: Obesity, Oral Health, Developmental and Behavioral Health, EPSDT, and Asthma
- Phase 2 topics: Autism Screening, Birth Information, Care Coordination, Children with Special Healthcare Needs, EPSDT, Growth Chart, Immunizations, Medical Home, Newborn Screening, Medication Management, Preventive Care Prompts, Referral Tracking, Weight-based dosing, and General
- Phase 3 topics (proposed): Maternal History, Foster Care, Health Information Exchange, Nursery, Patient Portal

Each survey item asked respondents about: a) the medical relevance of the item, b) their EHR's capability to satisfy the requirement, and c) their use of the EHR to address the requirement. Medical relevance was rated on a 1-5 scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree); EHR capability was rated as "Yes," "Partially," or "No,"; and their use of the EHR was rated as "Yes," "Partially," or "No." Comment fields were also available for respondents who wished to provide added detail.

In addition to administering surveys to participants, North Carolina's program staff hired four EHR coaches to visit and work with all practices and vendors that were asked to complete surveys. EHR coaches spoke with providers, staff, IT staff, and vendors about any requirements they were unsure about or had difficulty interpreting. Coaches documented feedback from EHR users, including any workarounds in their workflow. Coaches also identified vendor and provider survey responses where the vendor and practice disagreed, such as when the vendor indicated that a requirement was fully met, but the provider said it was partially met.

Approach Used by Pennsylvania Program Staff

Pennsylvania program staff recruited five health systems to participate in the CHIPRA D grant program that focused on testing of the Format. Participants from each health system

compared their current EHR functionality to the Format requirements. Areas within the EHR that did not meet requirements were then reviewed, and participants determined which requirements would provide the most clinical value to develop into their EHRs. All five health systems were encouraged to work with their EHR vendor to create a development plan for those requirements identified as providing the greatest clinical value, though not all participants did so.

Similar to the approach used in North Carolina, Pennsylvania program staff split the large number of Format requirements into three groups to make it more manageable, and developed a survey for each group of items. The three Pennsylvania surveys grouped items differently and asked slightly different questions than the North Carolina surveys. Each Pennsylvania survey asked about medical relevance, EHR capability, and actual use. Five response choices were used for medical relevance (similar to the North Carolina surveys): "Strongly Agree," "Agree," "Undecided," "Disagree," and "Strongly Disagree." Three responses for EHR capability were permitted: "EHR capable," "EHR partially capable," or "EHR not capable." Two responses about actual use were permitted: "Feature being utilized," or "Feature not being utilized."

Program Staff Common Themes

Both State grantee program staff identified the importance of strong support from participant leadership to ensure that the surveys and prioritization work were completed. They found that discussion with the vendor participants helped identify gaps in end-user knowledge of the EHR's functionality as well as product feature gaps.

Program staff provided feedback about their experience with many providers and vendors who used the Format. Two major themes emerged from their work:

- Participants found the volume of Format requirements to be overwhelming.
- Participants reported that ambiguous language made interpretation of the individual requirements difficult and time consuming.

Program staff frequently mentioned that participants found the volume of requirements to be high, the task of prioritization to be difficult and fatiguing, and completion of all the requirements in each survey to be difficult. Program staff also noted that participants reported repetition and duplication in the requirements. Attempting to reconcile subtle differences between duplicative requirements consumed a significant amount of time. From their experience with participants, program staff felt that reducing the number of requirements would be highly valuable.

Program staff and providers both reported difficulty interpreting the "shall, should, may" language of requirements. Program staff asked participants to focus mainly on medical importance rather than the shall/should/may status.

Role: Practicing Clinician

Practicing clinicians are primary end-users of EHR systems, and their comments in their feedback on the Format mainly focused on desired EHR functionality. Format-related themes from discussions with practicing clinicians included the following:

- Ambiguous language made requirements difficult to interpret.
- Prioritization of the list of requirements by medical relevance would be helpful.

- Requirements that served common needs across providers would have higher value than context- or subspecialty-specific requirements.
- Even though a requirement may be met, the workflow may not be supported.
- Additional functionality such as family linkages is needed.

North Carolina's practicing clinicians said the ambiguous language of the requirements was a barrier to completing the surveys. They reported disagreement among multiple providers in a practice on the meaning of many, if not the majority, of requirements. They said the lack of agreement resulted from the ambiguous language, differing interpretations, and language that was too technical. For them, spending a great deal of time analyzing what the requirements actually meant was frustrating. They did not understand the order of items in the survey, and said they ideally preferred to review requirements grouped by their medical relevance to general pediatrics.

> *"For development screenings … we have to order it and within that order, there is not a way to meaningfully put in the results of that screening. The number is meaningless because it is the sum of different components. There is not a way in the EHR to be able to report it in a meaningful manner."*

The most frequent EHR functionalities discussed by providers related to screening tools and growth charts. Comments were not associated with a particular vendor. Some were specific to an individual practice area, such as condition-specific growth charts for subspecialists. The most frequently mentioned functionalities included the following:

- EHRs should include existing, validated screening tools.
- EHRs should provide the ability to record condition-specific growth chart data for pediatric patients.
- EHRs should capture discrete data elements to aid in growth chart plotting and reporting.
- EHRs lack the functionality to do percentile calculations for BMI and developmental milestones.
- EHRs lack condition-specific growth charts.

Developmental screening tools were identified as key functionality for EHRs. Practicing clinicians would like validated screening tools to be integrated in their EHRs, but their use has been limited due to copyright laws and associated cost. Specific tools that were mentioned include M-CHAT for autism screening,[5] Ages and Stages for developmental screening,[6] and Bright Futures for psychological and behavioral screenings.[7] Some participants who do not have this functionality said they currently scan paper-based screening tools into their EHR, but this approach lacks structured data capture, a key functionality. Providers want to capture data in the provider notes, but also capture structured data elements to assist with reporting and health maintenance tracking of their patients. Clinicians mentioned lab reports, radiology reports, depression screenings, and maternal drug history as examples of data they would like to be structured.

Capturing relevant discrete data elements for growth charts, such as height, weight, and head circumference, was discussed as a key desired functionality, along with the ability to calculate and display the corresponding percentiles. Condition-specific growth charts specifically for premature babies and children with Down's syndrome were frequently mentioned. Clinicians said that typical growth charts in the EHR lacked functionality for additional customization.

Clinicians also pointed to the need to have family linkages. Because clinicians often care for siblings, they would like to reuse family history to save time and promote consistent

documentation and updates to family history. This functionality would also help document relevant findings from pregnancy or from the mother's history in the care of subsequent children.

Role: Vendor

A number of vendors were interviewed, including some with a pediatric-focused EHR and others with an adult-focused EHR also used in pediatric care. Themes that emerged through discussion with the vendors included:

- EHR products typically align with the Format.
- Ambiguous language of the Format requirements made interpreting the Format difficult.
- Prioritization of the requirements by medical relevance and according to their customers' needs would be ideal.

Overall, vendors did not perceive many gaps between their product and the requirements listed in the Format. Some noted that requirements marked by providers as EHR-not-capable were not possible by *any* vendor, not just their particular product. For example, vendors indicated that some of the confidentiality requirements, such as the ability to make parts of the EHR confidential, were a bit "futuristic." Vendors also reported that requirements related to school-based health clinics and those predicated on health information exchange were difficult for any vendor to implement. Vendors remarked that end-users were not necessarily well-trained in the use of the system, and often did not use the system as intended. This led to different interpretations among clinicians and vendors about whether a requirement was met. The gap analysis performed by program staff allowed vendors to identify opportunities for clinician training, and in some cases, led to additional training.

> *"Users don't use the system how we intend for them to use the system. We don't know a way around that for any vendor because there's way too much to learn upfront….We have done a lot more lunch-and-learn Webinars for end-users as a result of this project."*

Vendors felt that ambiguous wording of requirements was a limitation. Spending significant time trying to interpret the requirements reduced the time available for other software development work. Vendors stated that use-cases or scenarios would have been helpful to more fully understand the intent of each requirement and would be helpful in translating the technical requirements into their product. Because of the time spent meeting Federal meaningful use requirements, vendors had less time to spend addressing each Format item. Vendors would like items in the Format to be prioritized by medical relevance, customer demand, and/or administrative necessity. Prioritizing the Format by these factors would help vendors better evaluate and implement development opportunities according to demand and the amount of resources required.

Role: IT Staff

IT staff who participated in the Format assessment in provider practices and health systems were interviewed. Themes that emerged from these interviews included the following:

- Ambiguous language made interpretation and technical implementation of each requirement difficult.
- Requirements should be prioritized.

> *"If there are elements that aren't yet mature enough to be adopted in the model Format, adopt them in a future release. Focusing on foundational elements that are important to patient care would be better going forward."*

IT staff felt that the language of the requirements was too broad for technical use. Ambiguity and varied interpretations of the requirements led to inconsistent applications of the requirements in practice. As one participant said, "One problem with that—all the requirements have a normative statement and then there were subsequent requirements that mapped back to [the] parent requirement. When we just focused on shall, the parent requirement was lost and context was lost." Even after spending a lot of time meeting with various individuals to understand the requirements, IT staff still lacked clarity and wished that use-cases and clinical examples were made available. IT staff said they would strongly prefer a prioritized list of requirements to review rather than the full set of requirements. They felt that priorities should be based upon clinical relevance, impact on patient populations, and whether the item was foundational. Foundational elements included discrete data and functionality such as birth information, growth data, and immunizations.

Role: Organizational Leader

Organizational leaders primarily discussed the alignment of requirements with medical relevance for their practices and desired EHR functionality. Themes that emerged from interviews with organizational leaders were as follows:

- Requirements were clinically relevant.
- The requirements had ambiguous language.
- Condition-specific support is needed, such as growth charts for premature babies and children with Down's syndrome and specific EHR templates.

Requirements were confusing in terms of the target audience and relevant setting for whom the requirements were intended. As one participant indicated, "One of the questions we had related to interpretation was is this just general pediatrics? Is this only outpatient? Some were about newborn nursery and delivery." Organizational leaders stated that the Format requirements overall were clinically relevant and aligned well with pediatric care at their practices. Leaders indicated that the wording in some requirements caused confusion. Gaps such as the need for condition-specific growth charts for premature and Down's syndrome patients were mentioned. Leaders said this gap creates a cumbersome workflow where growth data are plotted on paper, analyzed by hand, and then scanned. Other examples of condition-specific support are integrated decision support and templates for behavioral health specialists caring for children with ADHD, with scoring tools for ADHD symptoms.

Role: Clinical Leader

Clinical leaders approached the Format and desired EHR functionality from a wide perspective. Themes that emerged from interviews with clinical leaders included the following:

- EHRs should facilitate care coordination.
- Integrated condition-specific functionality is needed.
- Population-based reporting should be provided.

- EHRs lack some basic pediatric functionality, such as pediatric dosing and percentile calculations.
- Integrated alerts are needed.

Clinical leaders, having both clinical and administrative duties, took a broad view of the functional requirements needed in the EHR. They want an EHR that facilitates care coordination, especially for children with special health care needs whose care spans multiple settings. They also want condition-specific EHR functionality (e.g., templates, care plans, and decision support), which is currently lacking. They would like EHR functionality to support management of patients with feeding tubes and other equipment. They mentioned one example of care management assistance from the EHR: when an asthma patient who has not been seen for asthma recently comes in for another reason, the EHR should prompt clinicians to review the patient's asthma status (desired functionality). Clinical leaders also wanted better population-based reporting to help with preventive care services, meaningful use, and identifying eligible patients for research.

> *"I want to see the EHR become a tool to help take care of patients. For example—if an asthma patient hasn't been seen for asthma in 8 months, even if he's here for sore throat, I want something to prompt me to review his asthma."*

Clinical leaders mentioned the need for age- and weight-based dosing integrated into the e-prescribing module, and automated notification if the patient's blood pressure and BMI are not in an acceptable percentile range.

Role: Practice Administrator

Practice administrators helped their clinicians and other participants provide feedback to program staff, and in some cases, helped to review the Format. Themes that emerged from interviews with practice administrators included:

- Ambiguous language made interpretation difficult.
- Pediatric content in the EHR often did not align with care practices for special populations.

Practice administrators reported that their clinicians and staff spent significant time trying to understand and interpret the requirements. They also noted that the Format did not appear to address the needs of special populations very well. For example, the ability to document patients who need social services or patients and families with food insecurity was not addressed in the Format. In addition, administrators mentioned the importance of documenting domestic and socioeconomic factors such as an unstable home situation or other social issues. These factors provide context when caring for children who regularly failed to keep appointments or did not keep up with vaccine schedules or care protocols because of these issues. Administrators mentioned the need for better integration of social work notes into EHR chart viewing tools.

Discussion

The results pointed to several cross-cutting themes related to the Format: EHR functionality deemed important or necessary, challenges interpreting requirements, methods for prioritizing requirements, missing requirements, and the value of the Format in general.

EHR Functionality Deemed Important/Necessary

Relatively few items were given a very low priority. However, some functional areas emerged as priorities, such as the need for automatically calculating percentiles, integration of existing tools and resources into the EHR, support for information exchange, the need for integrated reporting throughout the EHR, the value of decision support, and support for family linkages.

Percentiles for Blood Pressure, BMI, Growth

Participants highlighted the importance of growth charts and collection of metrics that support the ability to automatically calculate percentiles, particularly for children with conditions that warrant special consideration, such as Down's syndrome. Percentiles and prompts that highlight if/when the percentile falls into an acceptable range, given the child's history, would improve the decision support offered to clinicians.

Integration of Existing Screening Tools and Existing Resources

Participants identified and strongly endorsed a number of screening tools, particularly the AAP's Bright Futures and State-specific tools. The importance of being able to integrate the tools within the EHR was mentioned several times. Participants articulated the need for tools to be integrated into their workflow, and the reporting from the tools and related actions (such as referrals) to be integrated as well, with results automatically uploaded as discrete data elements when possible. Recognizing that screening tools evolve and change over time, there was interest in being able to update the EHR easily as screening instruments advanced.

Information Exchange

Most items in the Format addressed EHR and user needs within a single institution, rather than information sharing between organizations. Participants identified the need for greater data exchange (including structured data exchange) between provider organizations to prevent re-entry of data and to facilitate care across providers. They thought the Format should address those areas, as well as discrete capture of lab results in specific data fields, with the ability to distinguish inpatients from outpatient labs, instead of the scanning of documents. Participants felt it was generally important to extract and capture specific data whenever possible, not the entire chart, from another EHR-based record.

Integrated Reporting and Decision Support

Participants would also like to be able to run aggregate reports across a patient population in addition to developing longitudinal reports on a single patient. Such features would allow providers to identify patients who are missing a dose in a vaccination series, patients with a chronic illness and gaps in follow-up, or patients who have not received a flu shot. Participants

reported that automated mechanisms for these kinds of reports were missing, and felt the EHR needed this important functionality.

Family Linkage

A number of providers highlighted the need for EHR functionality that supports sharing of family history among relatives such as siblings. Sharing relevant information could reduce inconsistencies in documentation between siblings that may occur when information is repeated for each patient's chart, and might also facilitate the identification/tracking of issues such as child abuse in the home. Offering a linkage between records or a method to capture shared history would provide value.

Linking the charts of family members could also help, if one child's chart was open, to identify other children or adults that might be affected by, for example, an infectious condition.

Another example of desired functionality is mother-child linkage. Having the ability to link a baby's chart to the mother's chart, even when those charts were not in the same EHR, would improve information access and flow during prenatal and postnatal time frames and help providers caring for infants in particular. This linkage could include information such as prenatal labs and maternal risk factors. Not all participants valued this functionality equally. Some felt it was more important in the inpatient setting than in the ambulatory setting.

Interpretation of Requirements

Participants reported they had difficulty interpreting the individual requirements for a number of different reasons that included: a) overuse of technical language, b) ambiguous examples, c) a lack of useful examples, d) language that was vague, and e) disagreements about meaning among participants working together.

As a result, a number of participants reported spending a great deal of time working to understand and interpret the requirements and parse what they meant. Because literally hundreds of items had to be reviewed, the task was arduous. Some participants reported hearing that language was intentionally left vague when requirements were drafted "to leave room for adaptation," but participants felt it was not helpful nor did it reduce the amount of confusion they experienced. The emphasis in the Format on using the qualifying terms "shall," "should," and "may" was another source of confusion and uncertainty.

Participants felt that having glossaries, examples, and use-cases would facilitate interpretation of the Format items, especially since the Format was intended for use by multiple audiences with varying levels of technical literacy, and should facilitate consistent understanding and interpretation among different stakeholders.

Prioritization of Requirements

All participants in both States were asked to rate the medical relevance of individual requirements they reviewed. In doing so, they found that requirement items ranged in medical relevance, sometimes differing based on the individual doing the rating. A number of participants would have preferred a shorter list of requirements preprioritized by medical relevance and core foundational elements. Participants did not really define what they meant by "core," but the examples given suggested that the capture of discrete data, for example, was more foundational than an EHR function that used already captured data. Participants would have

preferred to review a subset of requirements most relevant to their daily pediatric practice and patient population. This kind of prioritization may be difficult to achieve for all stakeholders since medical relevance varies across care settings, in different patient populations, and depends on other factors as well.

Because the "core" requirements in a model EHR can vary depending on stakeholder context and perspective, participants acknowledged that any particular list might "age" as technology, clinical needs, user workflow, and system context shifted over time. Some items in the Format having a lower priority could be critical in later versions of the Format or might be included in a second tier if a multitiered approach were used (that is, identification of a small "top" group, or Tier 1, and identification of other groups, such as Tier 2…n). A number of participants felt that having an EHR that was initially designed for and targeted toward adult care made it essential to identify basic core elements essential to EHR modules used in the care of children.

Missing Requirements

Participants would like the Format to address social factors and reflect the reality that the patient population is increasingly diverse across socioeconomic, religious, and cultural lines. The ability to document and flag relevant aspects of that diversity, such as dietary restrictions, would be useful.

Prioritizing Format items to address other aspects of social factors, such as food insecurity and WIC assessments, was variable. The ability to assess social factors and have the results automatically populate the EHR and shared with the relevant parties was cited as an important need by some but not all providers.

Some participants noted missing requirements, such as integrated functionality and reporting by condition, and discussed the importance of prompts, screening tools, and decision support for children with chronic illness or special needs.

Value of the Format

Participants endorsed the value of the Format, in concept and practice, as a tool for educating and aligning different stakeholders about needed EHR functionality in the care of children. The Format was also useful in promoting discussion between clinical staff and vendors. IT staff and vendors both indicated that the Format helped in understanding what future expectations might be and to consider collaborations and information exchange.

However, they found that the Format in its current state has too many items, is difficult to interpret, and has too few examples, use-cases, and terms defined. They felt the overall value of the Format would be greatly enhanced with fewer items and more clarity/reduced ambiguity for individual items.

Conclusions

This report yielded a number of findings that are relevant for the continued refinement and advancement of the Format.

Participants from both CHIPRA projects reported that many of the Format requirements addressed functional areas that were medically important and valuable in the care of children. Topics such as growth charts, immunization tracking, special scales and scoring, and age- and weight-based medication ordering were highlighted, and there was strong endorsement of other Format areas as well. State program staff reported challenges conducting their assessment on the Format, which were echoed by participants. The most consistent challenges were the high number of requirements and the ambiguous language of requirements in the Format.

North Carolina and Pennsylvania program staff took similar approaches to filtering the requirements they asked participants to review—they selected only the normative statements, and they divided the long list of requirements into three surveys. In North Carolina, requirements in the first (Phase 1) survey included the topics that matched the State's five key quality improvement areas, whereas Pennsylvania staff placed requirements in surveys roughly in the order found in the Format. There were no obvious State-to-State differences in survey items other than slight differences in survey item wording.

Using and assessing the Format proved challenging for participants due to the large number of items, the lack of clarity of many items, and the unclear organization of the items. Grantees focused exclusively on the 568 normative statements. Ambiguous requirements, redundant requirements, and requirements that lacked illustrative examples (sometimes with only subtle differences between similar items) made assessment of some items difficult. Organization of the requirements by topic helped make the Format easier to manage, but interviewees wanted fewer, clearer requirements to make the Format easier to follow and understand. It is also challenging to keep software requirements current since workflows, documentation requirements, and medical practice continue to evolve over time. Participants reported that the dialogue between providers and vendors—and in North Carolina, between providers and coaches—was one of the most valuable outcomes resulting from the CHIPRA program in their State.

Participants also indicated that there are still areas where additional requirements could be added. Having a few, concise, easy-to-understand requirements related to social factors, WIC, and family history would support the care of children more broadly. North Carolina and Pennsylvania participants also identified areas such as support for information exchange, family linkage, and integrated reporting and decision support.

Overall, findings yielded important insights into the value of the Format and its use through assessment of the Format among a broad group of providers, software developers, and other stakeholders with diverse interests and priorities.

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Appendix A: Data Collection Instruments

Children's EHR Format Site Visit Interview Guide
CHIPRA Program Staff

Note: This guide includes questions specific to the role of CHIPRA Program Staff.

Project Introduction and Consent

Introduce team, introduce project
Consent – Review highlights – make sure they sign and return
Start recording if they consent to being recorded

Introduction

- Before we start, what is your role in the [department or clinic]:
- How long have you been at the [department or clinic]?
- What is your title and role? How long have you been in this specific role?

Vision of Children's EHR Format

We will start by talking generally about EHR functionality necessary for caring for children and then move into how those can be operationalized into requirements. We would like to focus the discussion on EHR functionality and associated requirements that are specific to caring for children, as opposed to those items which might be relevant for adult patients as well.

- How was the Format used in your program?
- How did you assist the grantees in refining the Format?
- What impact has the Format had on quality and outcomes?
- What feedback did you receive from the grantees about the Format?
  - What were strengths/weaknesses?
  - Requirements that were missing?
- Please tell us how Grantees prioritized the specific set of Format requirements?
  - Do you still think these are the most important? Why or why not?
- What Format elements might be important, even if Grantees did not focus on them, or they do not align with existing quality improvement initiatives?

Wrap-up

- Ask if there is anything else you would like to share about the topics we have discussed?
- Thank them for taking the time to meet
- Provide business cards/contact information and invite them to follow up if they think of anything else they would like to share at a later point.

Children's EHR Format Site Visit Interview Guide
Organizational Leadership

Note: This guide includes questions specific to the Organizational Leader role.

1. Project Introduction and Consent

Introduce team, introduce project
Consent – Review highlights – make sure they sign and return
Start recording if they consent to being recorded

Introduction

- Before we start, what is your role in the [department or clinic or organization]:
- How long have you been at the [department or clinic]?
- What is your title and role? How long have you been in this specific role?

Vision of Children's EHR Format

We would like to focus the discussion on EHR functionality and associated requirements that are specific to caring for children, as opposed to those items which might be relevant for adult patients as well.

- What concerns do you hear about EHRs used in the care of children, from the physicians and staff?
- Do you think EHRs have the ability to improve quality and efficiency in the care of children in your organization? What is necessary to do that?
- What was the process for determining which Format elements were most beneficial for your organization?
  - Do you still think these are the most important? Why or why not?
- What Format elements were easiest to harmonize with other initiatives, and which were most difficult? Why?

Wrap-up

- Ask if there is anything else you would like to share about the topics we have discussed?
- Thank them for taking the time to meet
- Provide business cards/contact information and invite them to follow up if they think of anything else they would like to share at a later point.

Children's EHR Format Site Visit Interview Guide
Practice Administrators

Note: This guide includes questions specific to the Practice Administrator role.

2. Project Introduction and Consent

Introduce team, introduce project
Consent – Review highlights – make sure they sign and return
Start recording if they consent to being recorded

3. Introduction

- Before we start, what is your role in the [department or clinic]:
- How long have you been at the [department or clinic]?
- What is your title and role? How long have you been in this specific role?

4. Vision of Children's EHR Format

We will start by talking generally about EHR functionality necessary for caring for children and then move into how those can be operationalized into requirements. We would like to focus the discussion on EHR functionality and associated requirements that are specific to caring for children, as opposed to those items which might be relevant for adult patients as well.

- As a practice administrator, what concerns do you hear about EHRs used in the care of children from the physicians and staff?
  - Have any elements made it more difficult to care for patients?
- What improvements in EHRs are needed to improve the quality and efficiency in your practice for the benefit of children?
- Did any Format elements make aspects of your work easier or more difficult?
- What Format elements are important, even if you did not focus on them?
- What policies at your practice had to be developed or updated as you worked with the Format?

5. Wrap-up

- Ask if there is anything else you would like to share about the topics we have discussed?
- Thank them for taking the time to meet
- Provide business cards/contact information and invite them to follow up if they think of anything else they would like to share at a later point.

Children's EHR Format Site Visit Interview Guide
Clinical Leadership Role

Note: This guide includes questions specific to the role of clinician leader.

6. Project Introduction and Consent

Introduce team, introduce project
Consent – Review highlights – make sure they sign and return
Start recording if they consent to being recorded

7. Introduction

- Before we start, what is your role in the [department or clinic]:
- How long have you been at the [department or clinic]?
- What is your title and role? How long have you been in this specific role?

8. Vision of Children's EHR Format

We will start by talking generally about EHR functionality necessary for caring for children and then move into how those can be operationalized into requirements. We would like to focus the discussion on EHR functionality and associated requirements that are specific to caring for children, as opposed to those items which might be relevant for adult patients as well.

- In your role as a physician champion, what changes have you seen in the practice since some of the requirements from the Format have been built into the EHR?
- Were there any particular Format elements that were easier or more difficult to integrate into the workflows of the various clinicians in your practice or organization?
- What Format elements were easiest or most difficult to align with other quality initiatives underway?
- Did you have difficulty garnering support from various clinicians for any particular Format elements?
- Was there a common set of items that would provide the greatest value to various clinicians (physicians, physician extenders, nurses, etc.)? If so, what were they?

9. Wrap-up

- Ask about anything else they'd like to share before wrapping up.
- Thank them for taking the time to meet
- Provide business cards/contact information and invite them to follow up if they think of anything else they would like to share at a later point.

Children's EHR Format Site Visit Interview Guide
Practicing Clinician Role

Note: This guide includes questions specific to the role of practicing clinician.

10. Project Introduction and Consent

Introduce team, introduce project
Consent – Review highlights – make sure they sign and return
Start recording if they consent to being recorded

11. Introduction

- Before we start, what is your role in the [department or clinic]:
- How long have you been at the [department or clinic]?
- What is your title and role? How long have you been in this specific role?

12. Vision of Children's EHR Format

We will start by talking generally about EHR functionality necessary for caring for children and then move into how those can be operationalized into requirements. We would like to focus the discussion on EHR functionality and associated requirements that are specific to caring for children, as opposed to those items which might be relevant for adult patients as well.

- What are the most important capabilities you need in an EHR to help you care for children on a *daily* basis?
- How has the Format impacted your workflows?
  Has the way in which you receive and fill orders changed?
  Is decision support for vaccines supported?
  Has the Format made behavioral and developmental screening easier?
- What items would you add or take away from the EHR functionality to optimize it for your *daily* practice?
- What pieces of information are missing in your current EHR?
- What are things that would be nice to have in an EHR, but could wait until later?
- What elements would provide the greatest value to you for your daily practice?

13. Wrap-up

- Ask if there is anything else you would like to share about the topics we have discussed?
- Thank them for taking the time to meet
- Provide business cards/contact information and invite them to follow up if they think of anything else they would like to share at a later point.

Children's EHR Format Site Visit Interview Guide
IT Staff

Note: This guide includes questions specific to the role of IT Staff.

14. Project Introduction and Consent

Introduce team, introduce project
Consent – Review highlights – make sure they sign and return
Start recording if they consent to being recorded

15. Introduction

- Before we start, what is your role in the [department or clinic]:
- How long have you been at the [department or clinic]?
- What is your title and role? How long have you been in this specific role?

16. Vision of Children's EHR Format

We will start by talking generally about EHR functionality necessary for caring for children and then move into how those can be operationalized into requirements. We would like to focus the discussion on EHR functionality and associated requirements that are specific to caring for children, as opposed to those items which might be relevant for adult patients as well.

- From your perspective as an IT professional, what do you see as the most important ways in which the Format was used?
  How could it be used in practices you support? For example, is it a useful way to assess gaps or enhancement opportunities for current EHRs used in the care of children?
- Were there particular requirements that were easy or difficult to interpret and build into the EHR?
- Did you notice requirements that were similar, and could be simplified?
- Did the Format require any additional IT support to users?
  What kinds of support did users request?
- Were any hardware/software improvements needed prior to implementation of the Format?
  What other technological changes should be considered, beyond what is in the Format?
  What additional efforts were needed to promote interoperability related to the Format?
- How can the Format overall provide the greatest value to IT stakeholders?

17. Wrap-up

- Ask about anything else they'd like to share before wrapping up.
- Thank them for taking the time to meet
- Provide business cards/contact information and invite them to follow up if they think of anything else they would like to share at a later point.

Children's EHR Format Site Visit Interview Guide
Vendor

Note: This guide includes questions specific to the role of Vendor.

18. Project Introduction and Consent

Introduce team, introduce project
Consent – Review highlights – make sure they sign and return
Start recording if they consent to being recorded

19. Introduction

- Before we start, what is your role in the [department or clinic]:
- How long have you been at the [department or clinic]?
- What is your title and role? How long have you been in this specific role?

20. Vision of Children's EHR Format

We will start by talking generally about EHR functionality necessary for caring for children and then move into how those can be operationalized into requirements. We would like to focus the discussion on EHR functionality and associated requirements that are specific to caring for children, as opposed to those items which might be relevant for adult patients as well.

- To what extent did Format elements match a current product feature or an anticipated future feature?
- What would make the Format more useful in developing, designing and testing your product?
- What are the most important data standards needed to make the EHR more interoperable?
  Sharing with State or local health information exchange (HIE)?
  Sharing immunization data with registries?
  Sharing information with adult providers once patients age out of the pediatric practice?
  Sharing between inpatient and outpatient settings
  Others?
- How hard or easy was it to interpret specific requirements, and the requirements list overall, for your product?
- Which requirements were most difficult for users to execute in their daily workflows, and what would make it easier?
- How might the Format provide the greatest value to vendors?

21. Wrap-up

Ask if there is there anything else you would like to share about the topics we have discussed?
Thank them for taking the time to meet

Provide business cards/contact information and invite them to follow up if they think of anything else they would like to share at a later point.

Appendix B: Consent Form

Enhancement of Children's EHR Format
Consent to be Interviewed

The following information is provided to inform you about the research project and your participation in it. Please read this form carefully and feel free to ask any questions you may have about this study and the information given below. You will be given an opportunity to ask questions, and your questions will be answered. Also, you will be given a copy of this consent form.

Your participation in this research study is voluntary. You are also free to withdraw from this study at any time. In the event new information becomes available that may affect the risks or benefits associated with this research study or your willingness to participate in it, you will be notified so that you can make an informed decision whether or not to continue your participation in this study.

Purpose of the Study
This research is sponsored by Agency for Healthcare Research and Quality (AHRQ), an agency within the U.S. Department of Health and Human Services, and is being led by researchers from RTI International. This interview is part of a report that focuses on the Children's Electronic Health Record (EHR) Format (the Format) – a list of software requirements that EHRs used in the care of children.

The purpose of the report is to identify and prioritize Format requirements by understanding the experience of CHIPRA (Child Health Improvement Program Reauthorization Act) grant work in North Carolina and Pennsylvania. The report is anticipated to identify possible enhancements to the Format, uses of the Format and barriers to its use, and the requirements likely to have the greatest impact in helping clinicians to provide better quality care to children. You are being asked to participate in this research because you are a key staff member or stakeholder in implementation activities related to the Format, and your perspective is valuable for this project.

Study Size and Procedures
This study will include interviews from participants in two state CHIPRA grant programs (in North Carolina and Pennsylvania).

During the interview, the interviewer will ask questions about your experiences working with the Format, including technical considerations, workflow impacts and potential enhancements. The interview session should last up to 60 minutes and will be audio-recorded (but not transcribed) to supplement interviewer notes taken during the session, with your permission. Participants will be asked *not* to refer to themselves by full name and *not* to name the location where they work to minimize the information being recorded.

Expected Costs
There are no expected costs to you as a participant in this study, other than the time spent in discussion with the researcher.

Potential Risks or Discomforts
There is a small risk that the audio tapes of your interview could be lost or stolen. There is also a potential that signed documents might be lost or stolen. We are taking steps to minimize these risks by (a) requiring that participants agree not to discuss the interview's proceedings, (b) recording only first names of participants on the recordings, (c) temporarily storing written items and tapes in lockable briefcases and permanently storing them in lockable desks and file cabinets, and (d) assigning a random case and subject number to all audio and print materials.

We will destroy the tapes and documents at the earliest opportunity upon completion of our reporting. We will not contact participants after the completion of this session, except to review and optionally comment on the transcribed meeting summary produced from the session.

This study may cause some inconvenience to you, typically associated with the time involved in the study. There may also be discomfort associated with some of the questions asked.

The discomforts or risks are expected to be minimal-to-none, and are anticipated to be mostly psychological in nature. For example, anticipated discomforts may include potential feelings of inadequacy about your responses. You are not obligated to answer any particular questions asked and may withdraw from the study at any time.

Benefits of the Study
Benefits to science and humankind that might result from this study: This study will help the investigators better understand how to improve the Children's EHR Format, including requirements that may improve the Format for staff and practices.

Benefits you might get from being in this study: You may have a better understanding of how an EHR supports your clinic operations and the work of your team to provide care.

Compensation
Participants will be offered no compensation.

Circumstances to Withdraw
The principal investigator may withdraw you from this study if at any time it is deemed that continuing in the study would pose a risk to you or others.

What Happens if You Choose to Withdraw from the Study
Participation is entirely voluntary and will not have any effect on your work as a staff member or any other benefits to which are you are entitled. You are under no obligation to answer any particular questions posed during the interview.

You may withdraw from the study at any time. There is no penalty if you choose to withdraw from the study. If you decide to withdraw from the study, any audiotapes will be destroyed and not used in any way.

Confidentiality
All efforts, within reason and in accordance with applicable law, will be made to keep your personal information in your research record confidential but total confidentiality cannot be guaranteed. All records collected during this study, including this informed consent document, will be accessible only to key research personnel. All electronic information will be stored on password-protected computers. Additionally all print materials will be stored in a locked cabinet and de-identified using a random case and subject number. Finally, only aggregate data will be disseminated, so your data will never be presented singularly; it will be presented with all the others that participate in this study.

During the interview, please use your first name only. Recordings of the sessions are being kept for the purpose of ensuring accuracy. No one other than the research staff will hear the tapes. The tapes will be destroyed after the study's findings are released. By using only first names it becomes more difficult to identify any particular participant in the event a recording is lost or stolen.

Your responses will be kept confidential under Section 944(c) of the Public Health Service Act. 42 U.S.C. 299c-3(c). That law requires that information collected for research conducted or supported by AHRQ that identifies individuals or establishments be used only for the purpose for which it was supplied.

Additional information
For additional information about this study, please contact Dr. Jonathan Wald, the study director. He can be reached at 781-370-4019, or via email at jwald@rti.org.

For additional information about giving consent or your rights as a participant in this study, to discuss problems, concerns, and questions, or to offer input, please feel free to contact RTI International's Office of Research Protection at 866-214-2043.

Statement of understanding
By signing this document I am stating that I have read (or have had read to me) this informed consent statement and that it has been explained to me verbally. I am also stating that all of my questions have been answered. By signing this document I attest that I understand the contents of this document and freely and voluntarily agree to participate in this study.

Signature: _____ Date: _____

I agree that this interview may be audio recorded. _____
I do not consent for this interview to be audio recorded. _____

Appendix B: Workgroup Members and Meeting Schedules

Multistakeholder Workgroup (MSWG) Members

Chair:

Kevin Johnson, M.D., M.S.
Cornelius Vanderbilt Professor and Chair, Biomedical Informatics, Professor, Pediatrics, Vanderbilt University School of Medicine
Nashville, TN

Co-Chair:

Christoph U. Lehmann, M.D.
Professor, Pediatrics and Biomedical Informatics, Vanderbilt University
Nashville, TN

William G. Adams, M.D.
Associate Professor of Pediatrics
Boston Medical Center
Wayland, MA

Gregg Alexander, D.O.
CMO at Health Nuts Media, Pediatrician at Madison Pediatrics
London, OH

Mary Applegate, M.D.
Ohio Medicaid Department of Job and Family Services
Ohio Medicaid
Columbus, OH

Louise Bannister, R.N., J.D.
MA CHIPRA Quality Demonstration Project Director
University of Massachusetts Medical School
Worcester, MA

Bobbie Byrne, M.D., M.B.A., F.A.A.P.
Vice President for Health Information Technology at Edward Hospital
Edwards Health System
Naperville, Illinois

Ajit Dhavle, Dr.Ph.
Director of Clinical Quality
Surescripts
Alexandria, VA

Sheila Driver, R.N.
CHIPRA category D grantee
Ashe Pediatrics
West Jefferson, NC

Charles Anthony Gallia, Ph.D.
Senior Policy Advisor
State of Oregon Medicaid program
Oregon City, OR

Chip Hart
PCC—Physician's Computer Company
Winooski, VT

Beth Morrow, J.D.
Director, Health IT Initiatives
The Children's Partnership
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Multistakeholder Workgroup Meeting Schedule

Activity	Date
Orientation Meeting	December 16, 2014
Meeting 1	January 20, 2015
Meeting 2	February 24, 2015
Meeting 3	March 13, 2015
Meeting 4	March 31, 2015
Meeting 5	May 8, 2015
Meeting 6	June 12, 2015

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Federal Workgroup Meeting Schedule

Activity	Date
Meeting 1	January 22, 2015
Meeting 2	February 26, 2015
Meeting 3	March 26, 2015
Meeting 4	April 23, 2015
Meeting 5	May 28, 2015
Meeting 6	June 25, 2015

Appendix C: Crosswalk to HL7 Child Health Profile, 2014 Edition EHR Certification Criteria, and 2015 Edition Health IT Certification Criteria

Topic Name	2015 Priority List Requirement ID	Page Number
Birth Information	2001, 2009	C-2, C-5
Child Abuse Report	2006	C-4
Child Welfare	2031, 2032, 2033, 2034	C-13, C-13, C-13, C-13
Children with Special Healthcare Needs	2014, 2022	C-7, C-9
EPSDT	2020	C-9
Genetic information	2009	C-5
Growth Data	2002, 2003, 2019, 2042	C-3, C-4, C-9, C-15
Immunizations	2011, 2027, 2028	C-6, C-10, C-11
Medication Management	2005, 2010, 2012, 2035, 2036, 2037	C-4, C-5, C-6, C-13, C-14, C-14
Newborn Screening	2015, 2016, 2017, 2018	C-8, C-8, C-8, C-9
Parent and Guardian and Family Relationship Data	2006, 2008, 2021, 2038	C-4, C-5, C-9, C-14
Patient Identifier	2021	C-9
Patient Portals – PHR	2007, 2026, 2032	C-5, C-10, C-13
Prenatal Screening	2009	C-5
Primary Care Management	2006, 2013, 2029, 2044, 2045	C-4, C-7, C-13, C-16, C-16
Registry Linkages	2011, 2028	C-6, C-11
School-Based Linkages	2026	C-10
Security and Confidentiality	2008, 2026, 2030, 2038, 2039, 2040, 2041	C-5, C-10, C-13, C-14, C-14, C-14, C-15
Specialized Scales/Scoring	2043	C-15
Well Child/Preventive Care	2004, 2013, 2019, 2020, 2023, 2024, 2025, 2027, 2044, 2045, 2046, 2047	C-4, C-7, C-9, C-9, C-9, C-10, C-10, C-10, C-16, C-16, C-16, C-16

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2001 - Link maternal and birth data to child health record (birth information)	**Concept Addressed** "IN.5.3 – Enable standards-based application integration with other systems" p.88-9 "S.3.3.6 – Health Service Reports at the Conclusion of an Episode of Care" p. 112 These do not specifically mention importing birth and maternal information but information exchange and discharge summaries generally	**Concept addressed** "*Demographics.* (i) Enable a user to electronically record, change, and access patient demographic data including preferred language, sex, race, ethnicity, and date of birth." 170.314(a)(3)	**Not addressed** – additional detail for this requirement is not introduced in the Proposed 2015 Edition, beyond what is in the 2014 Edition

(continued)

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2002 - Record all vital signs and growth parameters precisely (Growth Data)	**Close Match** "DC.1.8.4 – Capture and manage patient clinical measures, such as vital signs, as discrete patient data" p. 32-34 Not at the same level of specificity to be a complete match	**Concept Addressed** "(i) Vital signs. Enable a user to electronically record, change, and access, at a minimum, a patient's height/length, weight, and blood pressure. Height/length, weight, and blood pressure must be recorded in numerical values only. (ii) Calculate body mass index. Automatically calculate and electronically display body mass index based on a patient's height and weight. (iii) Optional—Plot and display growth charts. Plot and electronically display, upon request, growth charts for patients." 174.314(a)(4)	**Concept Addressed – This is not a close match because this is optional and not required.** "Proposed "Optional" Pediatric Vital Signs We propose to offer optional certification for health IT to be able to electronically record, change, and access: Body mass index (BMI) [Percentile] per age and sex (with LOINC® code 59576-9) for youth 2-20 years of age; and Weight for length per age and sex (with LOINC® code to be established in a newer version of LOINC® prior to the publication of a subsequent final rule) and/or Head occipital-frontal circumference by tape measure (with LOINC® code 8287-5) for infants less than 3 years of age. We propose to require that a Health IT Module enable each optional vital sign to be recorded with an applicable unit of measure in accordance with UCUM Version 1.9. CDC recommends the collection of these anthropomorphic indices for youth 2-20 years of age and infants less than 3 years of age, respectively, as part of best care practices.[1] A Health IT Module certified to the "BMI percentile per age and sex," "weight for length per age and sex," or "head occipital-frontal circumference by tape measure" vital signs would also need to record metadata for the date and time or end time of vital sign measurement, the measuring- or authoring-type source of the vital sign measurement, the patient's date of birth, and the patient's sex in accordance with the standard we propose to adopt at § 170.207(n)(1). We believe offering optional certification to these three vital signs can provide value in settings where pediatric and adolescent patients are provided care. " 170.315(a)(6)

(continued)

[1] http://www.cdc.gov/growthcharts/clinical_charts.htm#Set1 and http://www.cdc.gov/growthcharts/clinical_charts.htm#Set2

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2003 - Provide unit conversions calculation and display during data entry and display (Growth Data)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2004 - The system shall capture the administration, completion, and interpretation of screening tools (Well child/preventive care)	**Concept addressed** DC.2.5.1 (p.51) addresses providing screenings but not the results of the screenings themselves	**Not Addressed**	**Not Addressed**
Req-2005 - Closest available standardized dose (Medication Management)	**Concept Addressed** "DC.1.7.1 Manage Medication Orders – #17- The system **SHOULD** provide the ability to create prescriptions in which the weight-specific dose is suggested." P. 25-27 Does not specifically mention standardized doses	**Not Addressed**	**Not Addressed**
Req-2006 - Ability to access family history, including all guardians and caregivers (Primary Care Management)	**Close Match** "DC.1.2 – Capture and maintain medical, procedural/surgical, social and family history including the capture of pertinent positive and negative histories, patient-reported or externally available patient clinical history" p.18	**Concept Addressed** in terms of recording family history as structured data but not adding family history automatically from other family member charts. "Enable a user to electronically record, change, and access a patient's family health history according to: (i) At a minimum, the version of the standard specified in § 170.207(a)(3); or (ii) The standard specified in § 170.207(j)." 170.314(a)(13)	**Not addressed** – additional detail for this requirement is not introduced in the Proposed 2015 Edition, beyond what is in the 2014 Edition

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Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2007 - Incorporate and adhere to local and national laws in regards to patient EHR access (Patient Portals – PHR)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2008 - Ability to document parental (guardian) notification or permission (Security and Confidentiality)	**Close Match** "DC.1.3.3 – Create, maintain and verify patient decisions such as informed consent for treatment and authorization/consent for disclosure when required" p. 20	**Not Addressed**	**Not Addressed**
Req-2009 - Allow unknown patient sex (Birth information, genetic information, prenatal screening)	**Close Match** "DC.1.1.2. - Capture and maintain demographic information. Where appropriate, the data should be clinically relevant and reportable. #11 - The system **SHALL** provide the ability to indicate that a patient's gender is unknown." P.14	**Not Addressed**	**Not Addressed**
Req-2010 - Order blood products in pediatric units (Medication Management)	**Close Match** "DC.1.7.2.3 – Communicate with appropriate sources or registries to manage orders blood products or other biologics #4 - The system SHALL allow ordering of blood products in units appropriate to pediatric care" p.28	**Not Addressed**	**Not Addressed**

(continued)

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2011 - Synchronize immunization histories with registry (Immunizations and Registry Linkage)	**Close Match** "DC.1.8.2 - Manage Immunization Administration #13 - The system SHOULD synchronize immunization histories with a public health immunization registry according to applicable laws and regulations, where they exist. " p 30-31	**Not addressed**	**Concept Addressed** "Provided the discussion above, we propose that, for certification to this criterion, a Health IT Module would need to enable a user to request, access, and display a patient's immunization history and forecast from an immunization registry in accordance with the HL7 Version 2.5.1: Implementation Guide for Immunization Messaging, Release 1.5. We welcome comment on this proposal. We also welcome comments on whether we should include an immunization history information reconciliation capability in this criterion and the factors we should consider regarding the reconciliation of immunization history information." 170.315(f)(1)
Req-2012 - Compute weight-based drug dosage (Medication Management)	**Close Match** "DC 1.7.1 – Create prescriptions or other medication orders with detail adequate for filling and administration. Provide information regarding compliance of medication orders with formularies #8 - The system **MAY** provide the ability for the ordering clinician to create prescription details as needed (e.g. body weight, dose per kilogram, instructions to the pharmacy to dispense medication in two labeled packages – one for home administration and one for administration during the day at school, child care or other care setting)." P. 25-7	**Not addressed** but mentioned in comments as a suggestion and the response was that it was not added.	**Not addressed** despite comments from 2014 Edition suggesting inclusion in the future. Weight is addressed through Optional Pediatric Vital Signs but weight-based dosing is not.

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Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2013 - Alert based on age-specific norms (Primary Care Management, Well child/preventive care)	**Close Match** "DC.2.4.3 Evaluate results and notify provider of results within the context of the patient's healthcare data #4 – the system SHALL present alerts for a result that is outside of age specific normal value ranges" p. 49	**Not addressed**	**Not addressed**
Req-2014 - Flag special healthcare needs (Children with Special Healthcare Needs)	**Close Match** "DC.1.4.3 – Create and maintain patient-specific problem list #6 – The system SHALL provide the ability to deactivate a problem #7 – the system MAY provide the ability to re-activate a previously de-activated problem #10 – the system MAY provide the ability to associate encounters, orders, medications, notes with one or more problems" p.22-23	**Not addressed**	**Not addressed**

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Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2015 - Newborn dried blood spot collection time and state (Newborn screening)	**Not addressed**	**Not addressed**	**Concept Addressed -** Reporting could occur through case reporting. "Toward this end, the S&I Structured Data Capture[2] (SDC) initiative is a multistakeholder group working on standards-based architecture so that a set of structured data can be accessed from health IT and stored for merger with comparable data for other relevant purposes. The SDC initiative is developing a set of standards that will enable health IT to capture and store structured data. These standards will build upon and incorporate existing standards, including the IHE Retrieve Form for Data Capture (RFD) profile. As part of this work, the SDC initiative has developed a surveillance case report form for public health reporting of notifiable diseases as part of the IHE Quality, Research, and Public Health Technical Framework Supplement, Structured Data Capture, Trial Implementation (September 5, 2014) standard.[3] The case report form can be further specified and used to electronically report vital statistics, vaccine adverse event reporting, school/camp/daycare physical, early hearing detection and intervention/newborn hearing screening, and cancer registry reporting, among other public health reporting data." 170.315(f)(5)
Req-2016 - Record parental notification of newborn screening diagnosis (Newborn screening)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2017 - Record diagnoses on patient problem summary list (Newborn screening)	**Close Match** "DC.1.4.3 – Create and maintain patient-specific problem lists" p 22-3	**Not Addressed**	**Not Addressed**

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[2] http://wiki.siframework.org/Structured+Data+Capture+Initiative
[3] http://www.ihe.net/uploadedFiles/Documents/QRPH/IHE_QRPH_Suppl_SDC.pdf

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2018 - Support appropriate newborn screening and follow-up (Newborn screening)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2019 - Record Gestational Age Assessment and Persist in the EHR (Growth Data, Well Child/Preventive Care)	Concept Addressed "DC.1.8.4 Capture and manage patient clinical measures, such as vital signs, as discrete patient data. #5 - The system **SHALL** provide normal ranges for numeric and normal values for non-numeric data (e.g. presence or absence of physical findings based on developmental stage) based on age and other parameters such as height, weight, ethnic background, gestational age when available. " p. 32-33 The recording is not specifically addressed but the item above implies capture and persistence	**Not Addressed**	**Not Addressed**
Req-2020 - Physical exam screening results (Well Child/Preventive Care)	**Close Match** "DC.1.5 – Create and maintain assessments #3 - The system **SHALL** provide the ability to document using standard assessments germane to the age, gender, developmental state, and health condition as appropriate to the EHR user's scope of practice." P. 23-24	**Not Addressed**	**Not Addressed**
Req-2021 - Associate mother's demographics with newborn (Patient Identifier)	**Concept Addressed** "DC.1.2 – Capture and maintain medical, procedural/surgical, social and family history including the capture of pertinent positive and negative histories, patient-reported or externally available patient clinical history" p. 18-19 OR "DC.1.1.2 – Capture and maintain demographic information." P. 14-15	**Not Addressed**	**Not Addressed**
Req-2022 – DME and nursing needs (Children with Special Healthcare Needs)	**Concept Addressed** "DC.2.4.2 - Display and request provider validation of information necessary for non-medication orders that make the order pertinent, relevant and resource-conservative at the time of provider order entry." P. 48	**Not Addressed**	**Not Addressed**

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Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2023 - Support pre-visit history/screening/prevention forms (Well Child/Preventive Care)	**Concept Addressed** "DC.1.1.3.2 - Capture and explicitly label patient originated data, link the data source with the data, and support provider authentication for inclusion in patient health record." P. 15-16	**Not Addressed**	**Not Addressed**
Req-2024 – Track incomplete preventive care opportunities (Well Child/Preventive Care)	**Close Match** "DC.2.5.2 - Between healthcare encounters, notify the patient and/or appropriate provider of those preventive services, tests, or behavioral actions that are due or overdue." P. 51 Does not specifically mention Bright Futures	**Not Addressed**	**Not Addressed**
Req-2025 – Age-specific decision support (Well child/Preventive Care)	**Close Match** "DC.2.5.1 - At the point of clinical decision making, identify patient specific suggestions/reminders, screening tests/exams, and other preventive services in support of routine preventive and wellness patient care standards. #1 - The system **SHALL** provide the ability to establish criteria for the identification of preventive care and wellness services based on patient demographics (e.g. age, gender). " p.51	**Concept Addressed –** Clinical Decision Support is addressed, but age-specific decision support is not. Age-specific decision support could be provided based on organizational decision-making and business rules.	**Concept Addressed –** Clinical Decision Support is addressed, but age-specific decision support is not. Age-specific decision support could be provided based on organizational decision-making and business rules.
Req-2026 – Transferrable access authority (Security and Confidentiality, School-Based Linkages, Patient Portals - PHR)	**Not Addressed**	**Not Addressed**	**Not Addressed**

(continued)

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2027 – Produce completed forms from EHR data (Immunizations, Well Child/Preventive Care)	**Close Match** "S.2.2.2 – Provide report generation features using tools internal or external to the system, for the generation of standard reports. #1 - The system **SHOULD** provide the ability to generate reports of structured clinical and administrative data using either internal or external reporting tools (e.g. predefined forms for school and sports physical examinations)." P. 102-103	**Close Match** **"*Data portability.*** Enable a user to electronically create a set of export summaries for all patients in EHR technology formatted according to the standard adopted at § 170.205(a)(3) that represents the most current clinical information about each patient and includes, at a minimum, the Common MU Data Set and the following data expressed, where applicable, according to the specified standard(s): **(i) *Encounter diagnoses.*** The standard specified in § 170.207(i) or, at a minimum, the version of the standard at § 170.207(a)(3); **(ii) *Immunizations.*** The standard specified in § 170.207(e)(2); **(iii)** Cognitive status; **(iv)** Functional status; and **(v) *Ambulatory setting only.*** The reason for referral; and referring or transitioning provider's name and office contact information. **(vi) *Inpatient setting only.*** Discharge instructions." 170.314(b)(7)	**Close Match** "(C) At a minimum, the version of the standard specified in § 170.207(e)(4) for administered vaccines. 170.102 - Definitions "Technology must enable a user to request, access, and display a patient's evaluated immunization history and the immunization forecast from an immunization registry in accordance with the standard at § 170.205(e)(4)." 170.315(C)(ii)

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Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2028 – Use established immunization messaging standards (Immunizations, Registry Linkages)	**Close Match** "IN. 5.1 - Support the ability to operate seamlessly with other systems, either internal or external, that adhere to recognized interchange standards. "Other systems" include other EHR Systems, applications within an EHR-S, or other authorized entities that interact with an EHR-S #5 - The system SHOULD provide the ability to exchange data using an explicit and formal information model and standard, coded terminology." p 84-85	**Close Match** ***"(1) Immunization information.*** Enable a user to electronically record, change, and access immunization information. **(2) *Transmission to immunization registries.*** EHR technology must be able to electronically create immunization information for electronic transmission in accordance with: **(i)** The standard and applicable implementation specifications specified in§ 170.205(e)(3); and **(ii)** At a minimum, the version of the standard specified in§ 170.207(e)(2). **(3) *Transmission to public health agencies—syndromic surveillance.*** EHR technology must be able to electronically create syndrome-based public health surveillance information for electronic transmission in accordance with: **(i) *Ambulatory setting only.*** **(A)** The standard specified in§ 170.205(d)(2). (B) *Optional.* The standard (and applicable implementation specifications) specified in § 170.205(d)(3). **(ii) *Inpatient setting only.*** The standard (and applicable implementation specifications) specified in § 170.205(d)(3)." 170.314(f)	**Close Match** "We propose to adopt a 2015 Edition "transmission to immunization registries" certification criterion that is revised in comparison to the 2014 Edition "transmission to immunization registries" criterion (§ 170.314(f)(2)). We propose to adopt an updated IG, require National Drug Codes (NDC) for recording administered vaccines, require CVX codes for historical vaccines, and require a Health IT Module presented for certification to this criterion to be able to display an immunization history and forecast from an immunization registry." 170.315(f)(1)

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Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2029 – Age-based educational cues (Primary Care Management)	**Concept Addressed** "DC.1.6.1 - Present organizational guidelines for patient care as appropriate to support planning of care, including order entry and clinical documentation. DC.1.8.3 - Present, annotate, and route current and historical test results to appropriate providers or patients for review. Provide the ability to filter and compare results. #14 - The system **SHOULD** trigger decision support algorithms from the results" p. 24-25 *Bright Futures not mentioned specifically	**Not Addressed**	**Not Addressed**
Req-2030 - Document decision-making authority of patient representative (Security and Confidentiality)	**Close Match** "S.3.5 - Document relationships between patients and others to facilitate appropriate access to their health record on this basis if appropriate" p.113 *does not specifically outline all requirements in 1212	**Not Addressed**	**Not Addressed**
Req-2031 - The system shall have the ability to record a child's adoption history (Child Welfare)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2032 - Authorized non-clinician viewers of EHR data (Child Welfare, Patient Portals)	**Close Match** "IN.1.2 - Manage the sets of access-control permissions granted to entities that use an EHR-S (EHR-S Users). Enable EHR-S security administrators to grant authorizations to users, for roles, and within contexts. A combination of these authorization categories may be applied to control access to EHR-S functions or data within an EHR-S, including at the application or the operating system level."	**Not Addressed**	**Not Addressed**
Req-2033 - Placement setting in out-of-home care (Child Welfare)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2034 - Alert for foster care without Medicaid (Child Welfare)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2035 - Rounding for administrable doses (Medication Management)	**Not Addressed**	**Not Addressed**	**Not Addressed**

(continued)

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2036 – Re-prescribe medications (Medication Management)	**Close Match** "DC.1.7.1 - Create prescriptions or other medication orders with detail adequate for correct filling and administration. Provide information regarding compliance of medication orders with formularies #14 - The system **MAY** provide the ability to re-prescribe medication by allowing a prior prescription to be reordered without re-entering previous data (e.g. administration schedule, quantity). #15 - The system **SHALL** provide the ability to re-prescribe a medication from a prior prescription using the same dosage but allow for editing of details adequate for correct filling and administration of medication (e.g. dose, frequency, body weight)." P.25-26	**Not Addressed**	**Not Addressed**
Req-2037 - Age- and weight-specific single dose range checking (Medication Management)	**Close Match** "DC.2.3.1 - Identify and present appropriate dose recommendations based on known patient- conditions and characteristics at the time of medication ordering. #8 - The system **SHALL** compute drug doses, based on appropriate dosage ranges, using the patient's body weight. #13 - The system **SHALL** provide the ability to automatically alert the provider to missing or invalid data required to compute a dose." p. 44-45	**Concept Addressed** Generally as part of clinical decision support, but would require additional work by vendors and the organizations	**Concept Addressed** Generally as part of clinical decision support and medication orders, but would require additional work by vendors and the organizations
Req-2038 - Separate consent, assent and permission (Security and Confidentiality)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2039 - Problem-specific age of consent (Security and Confidentiality)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2040 - Age of emancipation (Security and Confidentiality)	**Not Addressed**	**Not Addressed**	**Not Addressed**

(continued)

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2041 - Segmented access to information (Security and Confidentiality)	**Close Match** "IN.1.9 - Enable the enforcement of the applicable jurisdictional and organizational patient privacy rules as they apply to various parts of an EHR-S through the implementation of security mechanisms. #9 - The system **SHALL** provide the ability to mask parts of the electronic health record (e.g., medications, conditions, sensitive documents) from disclosure according to scope of practice, organizational policy or jurisdictional law (e.g., by age and clinical situation, adoption-related instances)." P. 71-72	**Not Addressed**	**Not Addressed**
Req-2042 – Support growth charts for children (Growth data)	**Concept Addressed** "DC.1.5 – Manage Assessments" p.23	**Concept Addressed** **"(4) *Vital signs, body mass index, and growth charts.*** **(i) *Vital signs.*** Enable a user to electronically record, change, and access, at a minimum, a patient's height/length, weight, and blood pressure. Height/length, weight, and blood pressure must be recorded in numerical values only. **(ii) *Calculate body mass index.*** Automatically calculate and electronically display body mass index based on a patient's height and weight. **(iii) *Optional—Plot and display growth charts.*** Plot and electronically display, upon request, growth charts for patients." 170.314(a)(4)	**Concept Addressed** generally in 170.315(a)(6)
Req-2043 - Scales and Scoring (Specialized Scales/Scoring)	**Concept Addressed**	**Concept Addressed**	**Concept Addressed**

(continued)

Requirement ID - Name (Topic)	HL7 Child Health Functional Profile, Release 1	2014 Edition 170.314 2014	Proposed 2015 Edition – 170.315 2015
Req-2044 - Use biometric-specific norms for growth curves (Primary Care Management)	**Concept Addressed** "DC.1.8.4 - Capture and manage patient clinical measures, such as vital signs, as discrete patient data. #6 - The system **SHALL** display growth charts. A growth chart: includes growth data (weight, length or height and head circumference) on a graph that includes normative data plotted against population-based normative curves (e.g. www.cdc.gov/growthcharts) by age ranges and gender of the respective normative data (e.g. females 0-36 months). #9 - The system **SHOULD** display growth curves as defined in Conformance Criteria 1.8.4.6 with other demographic characteristics (e.g. ethnicity) of the respective normative data. #11 - The system **SHOULD** allow display of clinical context for each data point on the growth chart (e.g. ventilated, receiving growth hormone, Tanner stage)." P. 32-34	**Concept Addressed.** Growth chart criteria not at this degree of specificity	**Concept Addressed** Growth chart criteria not at this degree of specificity
Req-2045 - Provide alerts for out-of-range biometric data (Primary Care Management)	**Not Addressed**	**Not Addressed**	**Not Addressed**
Req-2046 – Import data from pre-visit history/screening/prevention forms (Well Child/Preventive Care)	**Concept Addressed** "DC.1.1.3.2 - Capture and explicitly label patient originated data, link the data source with the data, and support provider authentication for inclusion in patient health record." P. 15-16	**Not Addressed**	**Not Addressed**
Req-2047 – Identify incomplete preventive care opportunities (Well Child/Preventive Care)	**Close Match** "DC.2.5.2 - Between healthcare encounters, notify the patient and/or appropriate provider of those preventive services, tests, or behavioral actions that are due or overdue." P.51 *not for a panel of patients and not Bright Futures specifically	**Concept Addressed** Could be addressed as part of clinical decision support but would require additional work by vendors and organizations.	**Concept Addressed** Could be addressed as part of clinical decision support but would require additional work by vendors and organizations.

Label Legend:

Close Match: Format requirement has a direct match in the reference document.

Concept Addressed: Format requirement is not directly addressed by the reference document but the general principle is addressed and would require some additional work by the organization, vendor or both to attain the specificity of the Format.

Not Addressed: The Format requirement is not addressed as certification criteria in the reference document

Appendix D: Children's EHR Format 2015 Priority List (Abridged)

Below are the 47 requirements included in the Children's EHR Format 2015 Priority List, listed in numerical order, each with their requirement ID, reference to related Children's EHR Format ID, topic area(s), title, description, and implementation notes. Table D-1 shows the items grouped by topic with their page numbers.

This "abridged" version of the 2015 Priority List hides "Description" information for 8 items that trace directly back to HL7 licensed material. Those items are: 2002, 2009-2013, 2030, and 2036. To view these items, please visit https://ushik.ahrq.gov under the "Child EHR Format" menu, and agree to the free HL7 License Agreement.

Table D-1. Children's EHR Format 2015 Priority List Items,* Grouped by Topic

Topic name	2015 Priority List Requirement ID	Page reference
Birth Information	2001, 2009	D-2, D-8
Child Abuse Reporting	2006	D-7
Child Welfare	2031, 2032, 2033, 2034	D-20, D-20, D-21, D-21
Children With Special Health Care Needs	2014, 2022	D-11, D-16
EPSDT	2020	D-16
Genetic Information	2009	D-8
Growth Data	2002, 2003, 2019, 2042	D-5, D-6, D-15, D-24
Immunizations	2011, 2027, 2028	D-9, D-18, D-19
Medication Management	2005, 2010, 2012, 2035, 2036, 2037	D-7, D-8, D-10, D-21, D-21, D-21
Newborn Screening	2015, 2016, 2017, 2018	D-12, D-13, D-14, D-15
Parents and Guardians and Family Relationship Data	2006, 2008, 2021, 2038	D-7, D-8, D-16, D-22
Patient Identifier	2021	D-16
Patient Portals—PHR	2007, 2026, 2032	D-7, D-18, D-20
Prenatal Screening	2009	D-8
Primary Care Management	2006, 2013, 2029, 2044, 2045	D-7, D-10, D-20, D-25, D-26
Registry Linkages	2011, 2028	D-9, D-19
School-Based Linkages	2026	D-18
Security and Confidentiality	2008, 2026, 2030, 2038, 2039, 2040, 2041	D-8, D-18, D-20, D-22, D-22, D-22, D-23
Specialized Scales/Scoring	2043	D-25
Well Child/Preventive Care	2004, 2013, 2019, 2020, 2023, 2024, 2025, 2027, 2044, 2045, 2046, 2047	D-6, D-10, D-15, D-16, D-17, D-17, D-17, D-18, D-25, D-26, D-26, D-26

*Some requirements are associated with more than one topic.

2015 PL ID	Req-2001	2013 Format Related ID	Req-95
Topic(s)	Birth Information		
Title	Link maternal and birth data to child health record		
Description	The system shall import birth information from an electronic newborn discharge summary as discrete data elements. All other requirements, such as gestation age, can be incorporated into a birth data elements list.		
Implementation Notes	Birth information is an essential and unique requirement of child's EHR and is a collection of data elements about the child at birth, many of which are taken from the mother's prenatal and delivery records. Birth information is static because it is obtained from external sources (the mother's records and the birth facility), refers to a specific point in time, and needs to be accessed at most well child visits during the first year of life and at other times as needed. It should be used at more than just the first newborn visit. In addition, the system should have the ability to edit the information at any time, if it is found to contain confirmed errors. LOINC codes that have been developed for newborn screening and for ACOG prenatal and delivery records should be used to define the data elements and the appropriate answer lists or formats. Any EHR that imports discrete data from HL7 Clinical Document Architecture (CDA) level 3 electronic documents such as the Continuity of Care Record (CCR or c-CCR) should be able to easily add functionality for importing future electronic newborn discharge summaries—providing that data elements in the CDA are identified by LOINC codes and can be mapped to data elements in the EHR, which are also identified by the same LOINC codes. Therefore, preserving LOINC codes is important to identify data elements inside an EHR and and not just in external messages, for data that are imported (such as data from the mother's EHR), and to re-export those same codes in future messages or documents. Importing birth data from electronic messages or documents is the preferred method for capturing birth data but is not required to meet this requirement for a child EHR. Neonatal physical exam, including symmetry (as symmetrical or nonsymmetrical growth retardation), was not included because it is narrative text and not discrete data. It will be available in a child's EHR as age-specific physical examination in the hospital or initial newborn visits and any significant findings should be included in the problems list (such as a heart murmur or hip click). Birth order for familial rank (not birth order for multiple births such as twins) was not included because it is better to use a family history pedigree, and birth order (oldest to youngest) will change over time in modern blended families. Maternal demographic data was not included and should be available as part of registration or family history data, but maternal age at time of birth is part of the core data elements list. *Birth Information Data Elements* There are several possible sources of a birth information data elements list. The initial list included below is based on requirements from the child EHR. Additional lists that should be consider include the ACOG prenatal, delivery, and initial newborn record as well as information required for ordering and reporting newborn screening results (available at NLM newborn screening codes Web site). *Core Birth Data Elements From Child EHR Requirements* • Precise birth date and time storage—to the minute if required by the scope of practice • Birth weight in kg—to 3 decimal places • Gestational age at birth in weeks and days • Basis for gestational age—last menstrual period (LMP), ultrasound, maternal report, Dubowitz scoring, Ballard Exam, or a future method • Singleton, twin, or multiple gestation • Birth order if not a singleton • Mechanism of delivery—Spontaneous Vaginal Delivery (SVD), Assisted Vaginal Delivery, Precipitous Vaginal Delivery, Emergent Cesarean section, Elective Cesarean section • Delivery assistance—No Assistance, Forceps, Mid Forceps, High Forceps, or Vacuum Extraction • 1 minute Apgar		

(continued)

2015 PL ID	Req-2001	2013 Format Related ID	Req-95
Implementation Notes (continued)	• 5 minute Apgar • 10 minute Apgar • Maternal age • Maternal GPAL—Gravida/Para/Abortus Status/Living Children • Maternal blood type • Maternal antibody status—Combs test • Maternal rubella status—Immune, Non-Immune, Pending, or Unknown • Maternal sickle cell status—HbSS, HbSC, HbS-Thal, Negative, Pending, or Unknown • Maternal hepatitis B status—Positive, Negative, Unknown, or Pending • Maternal VDRL status—Positive, Negative, Unknown, or Pending • Maternal HIV status—Positive, Negative, Unknown, or Pending • Maternal GBS status—Positive, Negative, Unknown, or Pending • Maternal gonorrhea status—Positive, Negative, Unknown, or Pending • Maternal chlamydia status—Positive, Negative, Unknown, or Pending • Prenatal care provider information—name and practice affiliation • Alcohol use during pregnancy—Positive, Negative, or Unknown • Average amount of alcohol used per day • Tobacco use during pregnancy—Positive, Negative, or Unknown • Average amount of tobacco used per day • THC use during pregnancy—Positive, Negative, or Unknown • Average amount of THC used per day • Cocaine use during pregnancy—Negative, or Unknown, as well as the average dollar amount of cocaine used per day • Narcotics use during pregnancy—Positive, Negative, or Unknown • Type of narcotics used • Average dollar amount of narcotics used per day • Amphetamine use during pregnancy—Positive, Negative, or Unknown • Average dollar amount of amphetamine used per day • Illicit drug use during pregnancy—Positive, Negative, or Unknown • Illicit drug use during pregnancy—name, dose, and frequency of use • Maternal drug screening results—drug tested and results Positive, Negative, Pending, or Unknown *Additional birth data elements not included because they are used in the inpatient setting to document management of special care infants (not core requirements)* • Betamethasone prior to delivery—date and time • Perinatal magnesium sulfate administration • Tocolytics administration • Perinatal antibiotic administration—type, date, time, and number of antibiotic doses administered before and during delivery • Additional prescription and nonprescription medications and supplements—name, dose, frequency, and route • Labor—spontaneous or induced • Labor onset—spontaneous or induced • Rupture of membranes details—spontaneous (SROM), artificial (AROM), premature (PROM), or preterm, premature (PPROM) • Record color of amniotic fluid—clear, cloudy, bloody, light meconium, moderate meconium, thick meconium, terminal meconium • 1-minute Apgar details—HR 0,1,2 | RR 0,1,2 | Tone 0,1,2 | Reflex 0,1,2 | Color 0,1,2 | • 5-minute Apgar details—HR 0,1,2 | RR 0,1,2 | Tone 0,1,2 | Reflex 0,1,2 | Color 0,1,2 | 10 minute Apgar • 10-minute Apgar details—HR 0,1,2 | RR 0,1,2 | Tone 0,1,2 | Reflex 0,1,2 | Color 0,1,2 | • Continuing Apgar scores—every 5 minutes after 10 minutes if the total score is less than 5 • Continuing Apgar scores details—HR 0,1,2 | RR 0,1,2 | Tone 0,1,2 | Reflex 0,1,2 | Color 0,1,2 | and Total 0-10 • Umbilical cord blood gas—umbilical cord blood gas results if available		

(continued)

2015 PL ID	Req-2001	2013 Format Related ID	Req-95
Implementation Notes (continued)	• Oxygen saturation in delivery room—percutaneous oxygen saturation measurements in the delivery room • Clinical staff at delivery—pediatrician(s), nurse(s), and respiratory therapist(s) present at delivery • Respiratory support in neonatal resuscitation—Blow-by O2, Nasal Cannula O2, Bag/Mask Ventilation, CPAP, or Endotracheal Intubation • FiO2 administration in neonatal resuscitation • Chest compression duration in neonatal resuscitation • Epinephrine in neonatal resuscitation—dose, route, and frequency of epinephrine used during resuscitation • Normal saline in neonatal resuscitation—dose, route, and frequency of normal saline solution used during resuscitation • Narcan in neonatal resuscitation—dose, route, and frequency of calcium chloride used during resuscitation • Na-bicarbonate in neonatal resuscitation—dose, route, and frequency of sodium bicarbonate used during resuscitation • Blood use in neonatal resuscitation—dose, route, and frequency of blood products used during resuscitation • Delivery room procedures • Surfactant administration in delivery room *Birth Data Fields Newborn Screening Panel LOINC 54089-8* 57717-1 Newborn screen card data panel 57716-3 State printed on filter paper card [Identifier] in NBS card 8339-4 Birthweight g 58229-6 Body weight Measured—when specimen taken g 57715-5 Time of birth 57722-1 Birth plurality of Pregnancy 57714-8 Obstetric estimation of gestational age wk 57713-0 Infant NICU factors that affect newborn screening interpretation 67703-9 Other infant NICU factors that affect newborn screening interpretation Narrative 67706-2 Maternal factors that affect newborn screening interpretation 67707-0 Other maternal factors that affect newborn screening interpretation Narrative 67704-7 Feeding types 67705-4 Other feeding types Narrative 62317-3 Date of last blood product transfusion 58232-0 Hearing loss risk indicators [Identifier] 57712-2 Mother's education 57723-9 Unique bar code number of Current sample 57711-4 Unique bar code number of Initial sample 62329-8 Birth hospital facility ID [Identifier] in Facility 62330-6 Birth hospital facility name 62331-4 Birth hospital facility address 62332-2 Birth hospital facility phone number in Facility		

2015 PL ID	Req-2002	2013 Format Related ID	Req-110
Topic(s)	Growth Data		
Title	Record all vital signs and growth parameters precisely		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	Some of these parameters are age-specific, such as head circumference that is typically measured to age 3 and recorded to at least 0.25 cm precision, but might be required on an older patient with a diagnosis of hydrocephalus. Precision refers to the smallest unit of measurement (such as height to the nearest millimeter or height measured to the nearest quarter inch) and not to the ability to replicate measurements (i.e., statistical precision), and also indicates how many decimal places to display after rounding. Parameters should be measured in only one unit and converted mathematically with an indication of which unit was the primary measure with appropriate rounding and conversion of precision. Weight in pounds and ounces if different from weight in pounds and fractions. For example, 7 pounds 12.5 ounces is 7.78 pounds and is represented as text "7–12.5" with a precision of 0.25 ounces. All five parameters are useful and can be recorded from a single measurement. The precision of pounds and ounces may include fractions of an ounce. An Adult EHR may use past values for height to compute BMI, but this practice has limited application to children. Date of information capture should be stored and available for display for each of the items in the vital signs list below. *Vital Signs Growth Parameter Data Elements* [LOINC codes should be made available and requested if not already available] • weight in kilograms • weight in pounds • weight in pounds/ounces pounds • weight in pounds/ounces ounces • weight in pounds/ounces text • weight precision • weight precision kilograms • weight precision pounds • weight precision ounces • calculated weight percentile • weight clothed/diapered • weight measured—kilograms, pounds, pounds/ounces, estimated, unknown • height in centimeters • height in inches • height precision centimeters • height precision inches • calculated height percentile • height or length • height measured—centimeters, inches, estimated, unknown • calculated BMI • head circumference in centimeters • head circumference in inches • calculated head circumference percentile • notes on special circumstance of measurement—free text such as dehydrated, with cast, held by parent • blood pressure systolic • blood pressure diastolic • blood pressure systolic/diastolic—calculated display text • blood pressure position—sitting, standing, supine, right arm, left arm, etc. • blood pressure precision • temperature • heart rate • respiratory rate		

(continued)

2015 PL ID	Req-2002	2013 Format Related ID	Req-110
Implementation Notes (continued)	• pulse oximetry • pulse oximetry location—finger, ear lobe, right hand, left hand, foot • severity of pain • pain scale used • bone age • waist circumference • hip circumference • calculated waist-to-hip ratio • mother's height • father's height • calculated mid-parent height		

2015 PL ID	Req-2003	2013 Format Related ID	Req-426
Topic(s)	Growth Data		
Title	Provide unit conversions calculation and display during data entry and display		
Description	The system shall provide unit conversions calculation and display during data entry and display (e.g., lb/kg) as well as appropriate level of precision (e.g., mm or quarter inch for length/height).		
Implementation Notes	The user should be able to tell which units of measure the EHR is using and know it can transpose between metric and English units, as appropriate. In addition, the ability for the user to configure as needed is also suggested. Precision refers to the smallest unit of measurement (such as height to the neared millimeter or height measured to the nearest quarter inch) and not to the ability to replicate measurements (i.e., statistical precision), and also indicates how many decimal places to display after rounding. Parameters should be measured in only one unit and converted mathematically with an indication of which unit was the primary measure with appropriate rounding and conversion of precision. Weight in pounds and ounces if different from weight in pounds and fractions. For example, 7 pounds 12.5 ounces is 7.78 pounds and is represented as text "7–12.5" with a precision of 0.25 ounces. All five parameters are useful and can be recorded from a single measurement. The precision of pounds and ounces may include fractions of an ounce.		

2015 PL ID	Req-2004	2013 Format Related ID	Req-429
Topic(s)	Well Child/Preventive Care		
Title	Screening tool status		
Description	The system shall capture the administration, completion, and interpretation of screening tools.		
Implementation Notes	The system shall allow for the documentation that standardized screening tools to identify the particular conditions that have been administered, including the identity of the screening tool, the date it was completed, and the interpretation of the results of the screen. The preferred approach to adminster and share screening tools is described in Req-2043 Specialized Scales and Scoring and ideally should be accomplished using a standardized data-driven approach to defining scales and scoring that should be a high priority for standard development to assist adding this functionality with minimal need for custom development for each scale. A variety of screening tools exist to identify developmental delays or behavioral health care conditions. It is suggested that screening tools used should meet the sensitivity/specificity threshold established in NQF measure #1448 (see https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB4QFjAA&url=http://www.qualityforum.org/workarea/DownloadAsset.aspx?id%3D52734&ei=fVdsVZPmOoSusAXJtoPQCw&usg=AFQjCNHr0eVXLelOhJfJmAddyqYufxvmTQ&sig2=fRcvw8SSxstN3dV8DqAOPg). In addition, the American Academy of Pediatrics is in process of preparing a consensus statement on developmental screening tools at the time of this writing (June 2015) and should be considered when it becomes available. Consideration and review also should be given to the activities and direction provided by the Birth to 5: Watch Me Thrive! Initiative which has produced and published a Compendium of Screening Measures for Young Children. The initiative is a coordinated Federal effort to encourage healthy child development, universal developmental and behavioral screening for children, and support for the families and providers who care for them (see http://www.acf.hhs.gov/programs/ecd/child-health-development/watch-me-thrive).		

2015 PL ID	Req-2005	2013 Format Related ID	Req-451
Topic(s)	Medication Management		
Title	Closest available standardized dose		
Description	The system shall inform the ordering provider about the closest available standardized dose after calculating the dose based on patient age and weight and other factors.		
Implementation Notes	The EHR system should distinguish between different dosage forms such as capsules vs. suspensions. The EHR system should display all available commercial package sizes along with the corresponding metric quantities for prescribing purposes.		

2015 PL ID	Req-2006	2013 Format Related ID	Req-517, Req-1213
Topic(s)	Child Abuse Reporting, Primary Care Management, Parents and Guardians and Family Relationship Data		
Title	Ability to access family history, including all guardians and caregivers		
Description	The system shall provide the ability to record information about all guardians and caregivers (biological parents, foster parents, adoptive parents, guardians, surrogates, and custodians), siblings, and case workers; with contact information for each.		
Implementation Notes	Contact information could include current name, address, phone number, and preferred email address. The system should allow for addition of "other" to include various guardians and caregivers not part of a standard list. The system should allow multiple phone numbers and email addresses per person.		

2015 PL ID	Req-2007	2013 Format Related ID	Req-524
Topic(s)	Patient Portals - PHR		
Title	Incorporate and adhere to local and national laws in regards to patient EHR access		
Description	The system shall provide the ability to apply age-based triggers for Pediatric Patient Portal access to comply with varying Federal, State, and local laws. • As an example, it is expected that the system will comply with the Children's Online Privacy Protection Act. • The vendor shall identify the States and localities for which the system complies. • Recommended implementation of this requirement includes line item segmentation of conditions and treatments to allow separation of access between the patient and the parent/guardian.		
Implementation Notes	A system must be able to support end users in configuring access to a minor patient's personal health data through a patient portal in a manner that complies with Federal, State, and local laws. The system is not expected to be compliant with the variation of State/local laws across States but to provide the ability to configure the proposed functionality to adjust to local mandates. Age-based triggers should support the provider in that compliance. For instance, to support compliance with the Federal Children's Online Privacy Protection Act, the system should trigger a request for parent/guardian permission before collecting personal information from the minor patient online when a minor is younger than 13 years old. Systems should also support setting age-based triggers that reflect providers' own criteria around portal access. If a system supports the application of relevant State and local laws through age-based triggers, the vendor should identify which States and localities are supported. Importantly, to support the exposure of information through the portal in a manner that complies with relevant laws, the system should enable the selection of data or portions of the record for separation of access as between the minor patient and the parent/guardian based on localized legal requirements. See Requirement 2041 for further detail on data segmentation.		

2015 PL ID	Req-2008	2013 Format Related ID	Req-559
Topic(s)	Security and Confidentiality, Parents and Guardians and Family Relationship Data		
Title	Ability to document parental (guardian) notification or permission		
Description	The system shall provide the ability to document parental (guardian) notification or permission for consenting minors to receive some treatments as required by institutional policy or jurisdictional law.		
Implementation Notes	Under the HIPAA Privacy Rule, covered entities are permitted to share a patient's protected health information for purposes of treatment, payment, and health care operations (TPO). If the treatment provided does not require parental permission (as defined in 45 CFR 46.402) a notification may be generated for the parents that the child has consented to treatment through their own assent, under the parameters of institutional policy or jurisdictional law. The system shall allow for documentation of that notification, if allowable, including all required parameters such as date, consenting person, treatment consented to, discussed alternative treatments, and potential complications. Additionally, if the treatment requires parental permission (as defined in 45 CFR 46.402), the system shall document that the appropriate permission was requested and received on behalf of the guardian to treat the minor. Documentation of notification or permission should include date and time stamp.		

2015 PL ID	Req-2009	2013 Format Related ID	Req-582
Topic(s)	Prenatal Screening, Birth Information, Genetic information		
Title	Allow unknown patient sex		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	Sex is a biological characteristic and gender (known by HL7 as Administrative Sex) is a sociological and behavioral characteristic of the sex that a patient wishes to appear and be known as. In a child EHR, sex or the biological characteristic is essential and must include the option for unknown (usually a temporary situation at birth) and may need to be updated. Gender and administrative sex will continue to be the primary demographics by which a patient is known in the practice.		

2015 PL ID	Req-2010	2013 Format Related ID	Req-607
Topic(s)	Medication Management		
Title	Order blood products in pediatric units		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	NONE		

2015 PL ID	Req-2011	2013 Format Related ID	Req-611
Topic(s)	Registry Linkages, Immunizations		
Title	Synchronize immunization histories with registry		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	There are important differences between medication reconciliation and immunization reconciliation that vendors should consider when designing an EHR for children. • Medication reconciliation focuses on a single correct list of all current active medications, and immunization reconciliation focuses on the complete history of all immunizations that a child has received. • Medication reconciliation data usually comes from the original electronic prescription rather than manual transcription of data on forms or into the EHR; hence medication data are less prone to data entry errors. • EHR systems do not have permission to change data in an IIS that they receive by retrieving an immunization history, but they can submit new immunizations including ones present in the practice EHR data. With some IIS, an EHR can request changes in the IIS data, but there will be times when an EHR will want to maintain a different immunization history from the one in the IIS and use the EHR data for decision support if the provider believes that the IIS data are incorrect. • It is important to distinguish between a newly administered immunization, an immunization administered in the practice previously and on file in the EHR, data in the EHR obtained by transfer of records from another practice, data in the EHR obtained from another IIS, and data in the EHR obtained by history from the patient. Most IIS and EHR do not track the source and potential accuracy of their data. An EHR might be able to track new vaccines administrations that were sent to an IIS by keeping a log of data sent to the IIS using standard immunization messages. • Data in an EHR and in an IIS frequently are not identical due to small differences in dates because of manual transcription and difficulty reading handwritten forms. • There is a problem of counting invalid doses and it is necessary to record and display all doses but indicate whether some doses are not valid and should not be counted for numbering the doses given. An EHR that uses separate data fields for each dose of the same vaccine (e.g., DPT#1, DPT#2, etc.) is more error prone than one that records all vaccines as administered and computes dose numbers later based on all valid data. • Multiple data entry for combination vaccines may lead to errors and is it better to record the actual product administered (such as Pentacel) and map it to its components (DPT, HIB, and IPV) rather than make three entries (one for each component) which annotate the type of vaccine (Pentacel). • An EHR should request changes in the data in an IIS that do not match data in the EHR. • Discrepancies in the EHR data that do not match the IIS but that the practice believes need to be retained in the EHR without corrections or reconciliation should be annotated so that future providers in the practice will trust the data in the EHR. • The process begins by matching all entries in the IIS data and the EHR history. – Items in the EHR and missing in the IIS should be sent to the IIS as new administration messages. – Items in the IIS and missing in the EHR should be verified by the provider before adding to the EHR and may represent vaccine administered elsewhere. – Item that match exactly require no action. – Items that appear different should be reviewed for small errors in dates or in the vaccine product that was administered and corrections should be made to the EHR if appropriate. – Items that appear to be in error should be sent to the IIS with a request for changes and retained in the EHR with an annotation. • It is necessary to record vaccine contraindication and refusals in the EHR and the IIS to maintain an accurate and complete vaccine history. Some refusals and contraindication constitute compliance with recommendations and should not trigger alerts, and some may require continued alerts and efforts to complete the immunization process.		

(continued)

2015 PL ID	Req-2011	2013 Format Related ID	Req-611
Implementation Notes (continued)	• The use of vaccines that target multiple conditions can create confusion in the immunization reconciliation process and the CDC and FDA have provided tables that map FDA medication barcodes for vaccines to the correct CDC CVX and MVX vaccine codes and then map the CVX codes to vaccine groups that map alternative vaccine products and combination vaccines to one or more CVX codes for the vaccine targets. Use of these CDC-provided tables might help resolve differences in which vaccines can be considered equivalent. • Automated accurate capture of vaccine administration data in an EHR through the use of barcodes on the vaccine product (including miniature two-dimensional barcodes on prefilled single-dose syringes) may help capture the FDA NDC code that maps to CDC CVX and MVX code, lot numbers, expirations dates, and date of administration so that accurate data on new vaccine administration can be sent to an IIS using electronic messaging without any manual data entry in the EHR or the IIS. This should reduce the likelihood of problems with immunization reconciliation with IIS and EHR using these technologies and medication barcode scanners that can also identify the correct patient, if patients carry medical ID cards with barcodes, as wristbands are not used in typical ambulatory practice. The system should either provide its own immunization forecasting tool or should be able to integrate the recommendations from the forecasting tools provided by an immunization registry. Immunization forecasting, the determination of which immunizations are due for a patient based on established guidelines, as well as the determination of catch-up immunizations due, is particularly well-suited to the use of clinical decision support. The underlying rules can be complex, easily misinterpreted, and difficult to remember. There are multiple schedules that are easily confused. Information typically found in an EHR can be leveraged or captured directly from the patient or family. Whether implemented locally, via an immunization registry, or via internet-accessible web services, the use of clinical decision support systems (CDSS) for immunization forecasting serves an important need for providers, patients, and families engaged in direct care, and for public health programs.		

2015 PL ID	Req-2012	2013 Format Related ID	Req-646
Topic(s)	Medication Management		
Title	Compute weight-based drug dosage		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	Display of these vital statistics on the prescription should also include functionality to attach or include this information along with e-prescribing messages. Weight- or body-surface–based dosing is critical in small patients such as children and older adults. However, once a patient reaches a certain weight (usually 40–45 kg) adult dosing rules apply because a weight- or body-surface–based dose would overdose the patient. The system must be able to differentiate, based on the child's weight or body surface area, which dosing rule is applicable.		

2015 PL ID	Req-2013	2013 Format Related ID	Req-659
Topic(s)	Primary Care Management, Well Child/Preventive Care		
Title	Alert based on age-specific norms		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	The system shall provide the ability to create alerts for any growth parameter—weight, height/length, head circumference, and body mass index/BMI (where applicable)—that falls outside of 2 standard deviations, either higher or lower, of age-specific norms based upon either CDC or WHO Standard Growth Charts. Patient age shall be rounded to the nearest value for which CDC or WHO data for comparison are available. [Example: A child who is 50 days old will be rounded to 2 months] The system shall permit the modification of the growth parameter should it have been erroneous.		

2015 PL ID	Req-2014	2013 Format Related ID	Req-730
Topic(s)	Children with Special Healthcare Needs		
Title	Flag special healthcare needs		
Description	The system shall support the ability for providers to flag or unflag individuals with special health care needs or complex conditions who may benefit from care management, decision support, and care planning; and shall support reporting.		
Implementation Notes	This requirement is meant to support a provider's ability to use the EHR to identify a child who could benefit from care coordination or care management. It does not require that the system use algorithms to identify such children, based on services delivered, or billing codes used, as that method would likely lead to over- or under-identification of children in need of such services. It instead provides functionality to allow practices to use the system to track the children for whom a care plan or a care coordination plan might be needed. And, as the identification of such children requires provider judgment, and as children move in and out of needing care coordination or care planning, sometimes based on medical status or psychosocial situation, this requirement allows for that judgment to be applied, by allowing providers to flag and unflag children with such needs. A component of this functionality should be the ability to extract the information through a query on a population of children who fit specific criteria such as a specific common diagnosis, laboratory tests or test results, screening tools or screening results (like ADHD screening), treatments, or demographic information and shall be able to display (in the form of dashboards or lists) the populations and export data like names, contact information, pending health maintenance tasks and other information for use in other applications requiring such data. As an example, the system should be able to identify all Type-I diabetic patients, display them in a dashboard, highlight those with pending health maintenance tasks (like submitting glucose readings) and are able to export the names and contact information to a word processor to send letters to those with overdue tasks. This data should also be available for export for individual patients in a manner that allows it to be shared with necessary parties, such as school-based health care workers and others who may be involved in the care coordination and care management team. Associated diagnoses should be included as a component of any reports that are run on children with the special health care needs flag, to allow for further sorting and categorization by the practice (advanced query functionality). Each provider working with specific groups of patients, such as children with special healthcare needs and other vulnerable or priority populations should have EHR functionality allowing them to query the system based on specific data elements of interest, and generate reports on a panel of patients of interest, based on specific diagnoses, screening status, test results, medication use, demographics, or other data fields that support a provider's ability to manage care for those patients. The need for reports that aggregate data across a panel of patients is high for *all* patients (adult and child), but certain pediatric conditions like ADHD, asthma, diabetes, immunization status, and genetic disorders make this functionality a high priority in the context of pediatric care. These reports, sometimes known as dashboard functionality, allow the provider to review, in one report, any patients that have been flaged as requiring care management for special or complex conditions, and to stratify or drill down based on diagnosis. The ability to review summary information on a panel of patients that require special planning and support is paramount to providing better quality of care within a pediatric patient population.		

2015 PL ID	Req-2015	2013 Format Related ID	Req-800
Topic(s)	Newborn Screening		
Title	Newborn dried blood spot collection time and state		
Description	The system where the blood spot test was performed shall record the State and collection date and time with precision to no less than the nearest clock hour for when each newborn screening dried blood spot was collected. Multiple samples at multiple times may be collected, such as in States that require repeat testing or on prematurely born neonates.		
Implementation Notes	The newborn screen is often carried out in the ambulatory setting for out-of-hospital births, or in States that require a second specimen at 1–2 weeks of age, for premature infants or those who received transfusions, or when there is need to repeat the test due to improper collection of the first sample or borderline results. The data required to complete a blood spot request form (usually part of the filter paper card) include the State where the testing will be performed (the State of birth and not the State of residence or where care is received) and the infant's age in hours when the sample was collected. Multiple tests may be required and the reason for each test may be part of the request form or the test report. Some States are beginning to use electronic ordering of newborn screening using HL7 messages and it is not required that vendors are capable of submitting these order messages, but the information necessary to complete a manual order on the filter paper card should be available in the EHR. Most States implement the Recommended Uniform Newborn Screening Panel (RUSP) that changes under guidance from the Secretary's Advisory Committee on Heritable Disorders in Newborns and Children (SACHDNC) and many States implement screening for additional conditions or participate in pilot studies for new tests. Newborn screening is normally carried out in the State where the infant was born, which may not be the same as the State of residence or the State where the infant receives primary care. Newborn screening should always be completed in the State where it was begun. This means that an ambulatory practice may need to send specimens to different States for different patients, accept results from multiple newborn screening laboratories, and communicate with multiple State newborn screening programs that may be based in different parts of the health departments in different States. There are three phases to newborn screening that should be supported by a child EHR. First, it is essential to assure that all newborns are screened, including performing screening, in the ambulatory setting if it was not done at the birth facility. Second, short-term followup involves confirmatory testing or specialty referral for all out-of-range tests and may include second-specimen testing in some States and special protocols for premature infants or infants who received transfusions. The unit of the State public health department responsible for short-term followup varies from State to State and is not always the newborn screening laboratory. The third phase is long-term followup and initiation of treatment for all conditions identified by newborn screening that were not ruled out by short-term followup. For some conditions, short-term followup can take as long as 1 year or more and some conditions may represent carrier states or late onset conditions that will require attention and sharing of information when the child is older. Because newborn screening deals with rare, serious, and time-critical conditions, it is very important that any screening tests that were not done, any out-of-range tests that require further evaluation, and any conditions detected by newborn screening be included on the problem lists so that all providers who see the infant are aware of these care requirements. Preferably, alerts should be generated for any of these three types of concerns.		

(continued)

2015 PL ID	Req-2015	2013 Format Related ID	Req-800
Implementation Notes (continued)	The National Library of Medicine maintains a Web site (http://newbornscreeningcodes.nlm.nih.gov) that contains important information to support newborn screening in an EHR, including LOINC codes for all tests and results used by all States and SNOMED CT and ICD10CM codes for all conditions detected by newborn screening. This reference is important because newborn screening deals with rare conditions that sometimes have variant diagnoses. It is important to code these conditions precisely and correctly. Newborn screening conditions also must be reported correctly to public health and to birth defects registries. In the past, it was not always possible to correctly code or describe newborn screening conditions using ICD9CM or local medical vocabularies. The CDC developed a special version of ICD9 with three decimal places to handle these conditions for birth defects tracking. Many EHRs might lump these conditions under nonspecific diagnostic categories including Not Otherwise Specified (NOS), but this is no longer appropriate and all newborn screening conditions do have appropriate and specific codes in SNOMED CT and ICD10CM, which are preferred terminologies for problem lists. Because newborn screening deals with rare conditions that a practitioner may see only once in a lifetime of practice, special ACTion (ACT) Sheets were developed the American College of Medical Genetics (ACMG) and promulgated by AAP and AAFP. These ACT sheets describe essential actions to be taken and important information to share with parents and are available from the ACMG Web site: http://www.acmg.net/ Many States modify the ACT sheets to include local resources, and because only conditions on the RUSP are included in the ACT sheets, States need to provide guidance on management of conditions they screen for that are not currently on the RUSP. Some States distribute ACT sheets with abnormal newborn screening results and a child EHR should include a national ACT sheet for any out-of-range newborn screening test or any confirmed newborn screening diagnosis. Unfortunately, the ACT sheets are human readable and not yet suitable for incorporation into clinical decision support and alerting systems using data provided by ACMG. Any provider seeing an infant during short-term followup or long-term followup should be aware of the condition, which should appear on the problem list and the problem list entry should be linked to the display of the appropriate ACT sheet. An additional source of information about genetic conditions that are the target of newborn screening is the Genetic Home Reference maintained by the National Library of Medicine at http://www.ghr.nlm.nih.gov. This is a reliable resource for providers and includes cross-references to many other sources of information, testing, support groups, and referrals. Providers should also be linked to On Line Mendelian Inheritance in Man (OMIM) (http://www.omim.org or http://www.ncbi.nlm.nih.gov) for in-depth background and classic literature on genetic conditions with linkage to chromosome and molecular data. The NLM newborn screening codes include references to OMIM numbers for appropriate monographs and curated bibliographies on newborn screening conditions.		

2015 PL ID	Req-2016	2013 Format Related ID	Req-813
Topic(s)	Newborn Screening		
Title	Record parental notification of newborn screening diagnosis		
Description	The system shall be able to track that the child's legal guardians were notified of any newborn screening-related diagnosis.		
Implementation Notes	Because newborn screening results are important and may have important implications for the future of the infant's health and the health of others in the family, it is important to have data fields to alert providers whether families are aware of important findings and potential genetic diagnoses. Results of newborn screening may be delivered from many sources such as the health department, a specialist, or the primary care physician and may be shared via phone, mail, or in-person visits. It is important to document in the EHR who informed the parents and what they were told. The use of free text would suffice. The goal is to prevent a provider who has not seen the family before from omitting to share important information which has not yet been disclosed to the parents, from missing an opportunity to reinforce an important diagnosis or to provide followup for treatment and additional testing, or from failing to present conflicting information from what parents have already been told about their child.		

2015 PL ID	Req-2017	2013 Format Related ID	Req-815
Topic(s)	Newborn Screening		
Title	Record diagnoses on patient problem summary list		
Description	The system shall be able to record all diagnoses resulting from newborn screening other than 'Normal' and all outstanding newborn screening tasks that have not been performed on a patient problem summary list.		
Implementation Notes	Newborn screening is a process and not a single test. It is performed on all newborns in the United States in accordance with Recommended Uniform Screening Panel (RUSP) issued by the Secretary of Health and Human Services (HHS) under specific State mandates that may add or subtract from the RUSP. Newborn screening is performed in the State of birth and the process will be completed with the appropriate public health agency in the birth State regardless of where the infant lives or receives medical care. Because if may be difficult to obtain detailed newborn screening results in a form other than paper, and because newborn screening identifies conditions and diagnoses of great importance as well as tasks that need to be performed, it is necessary for an EHR that is used to care for children to record all diagnoses that result from newborn screening AND all incomplete tasks or tests not performed previously on the patient problem summary so that it is brought to the attention of all providers who care for the infant. Failure to complete newborn screening or having possible or probable diagnoses that have not been confirmed may require an alternative method of alerting all providers at all visits when to problem list is unable to include these items as problems with a special status. They are indeed clinical problems that should be brought to the attention of all providers until they are resolved and can be removed from the problem list. EHRs must have the functionality to query for and display a cohort of patients based on missing and abnormal newborn screening results. The results of these queries must be exportable to other aplllications that may require these data. Some results of newborn screening are known to the health department and some results (including followup testing which is done in a clinical laboratory and not by repeating the dried blood spot) are not known to the health department and it is the responsibility of the primary care physician to keep the newborn screening program informed of additional data that are available. The newborn screening program may not be aware of infants that have not been screened, particularly those born outside of a hospital, and the problem list is a good method for reminding all providers when newborn screening has not been performed. Most newborn screening is performed in the birth hospital, but all of the results are not always available at the time of newborn discharge. Some States require a second specimen at 1–2 weeks of age and followup testing of infants who received transfusions or had extended NICU stays. Newborn screening that was done in the hospital will be part of a newborn discharge summary, but results that are not available at discharge need to be identified in the ambulatory EHR so that they will be reviewed when available or repeated if necessary. Vendors can address this requirement through an input dialog that is invoked when newborn discharge summary birth data or newborn screening results or specialist consults are received in paper, PDF document, or electronic message form. The practice will be prompted to examine the documents and extract and enter on the problem list any tests not performed (such as no newborn hearing screening), any conditions that have been diagnosed, and any followup testing required (including repeat second specimen blood spots to be performed at 1–2 weeks of age in States that require them). The problem list, rather than the scanned documents or PDFs, becomes the communication tool for alerting all providers about incomplete tasks or important conditions that have been identified.		

2015 PL ID	Req-2018	2013 Format Related ID	Req-818
Topic(s)	Newborn Screening		
Title	Support appropriate newborn screening and follow-up		
Description	The system shall incorporate clinical decision support to assure newborn screening has been accomplished and that results have been followed up.		
Implementation Notes	Newborn screening deals with rare conditions that may be encountered only once in a lifetime of primary care practice hence primary care physicians need decision support and guidance to complete the workup and initiate appropriate treatment and referrals. The best source of guidance are the American College of Medical Genetics (ACMG) ACT Sheets that are also available from AAP and AAFP with clear step-by-step instructions on immediate tasks and actions as well as clear algorithms for evaluation. These are distributed as downloadable PDF documents and they are not computable decision support that must be implemented by EHR vendors. The documents are often distributed by the State newborn screening laboratory with the results of the newborn screening and they may have local modifications with local contact information or information about conditions that are not on the Federal RUSP. It is important for EHR users and vendors to remember that newborn screening is a screening process and a diagnosis is not confirmed until all of the steps on the ACT sheet are completed along with any additional requests from the State newborn screening program.		

2015 PL ID	Req-2019	2013 Format Related ID	Req-848
Topic(s)	Well Child/Preventive Care, Growth Data		
Title	Record Gestational Age Assessment and Persist in the EHR		
Description	The system shall capture and display assigned gestational age as well as the diagnosis of SGA=Small for Gestational Age or LGA=Large for Gestational Age when appropriate.		
Implementation Notes	Gestational age is part of the birth data. The measure is reported as a number of weeks, and is based on the assessment of the infant at birth. The reported value is compared with normative growth parameters to assess the overall growth development of the child. This assessment is classified as small for gestational age (SGA), Appropriate for Gestational Age (AGA), or large for gestational age (LGA), and has lifelong diagnostic, developmental, and predictive implications. (Being born SGA increases the risk for adult hypertension, diabetes, and coronary heart disease.) The assessment should be entered on the problem list and carried forward in time, particularly if it is SGA or LGA. Methods for assessing gestational age include maternal dates, prenatal ultrasound examinations, examination of the newborn, and use of specialized scales and scoring such as the Dubowitz Score. Ideally, the method for assessing gestational age and the source of the data when obtained from external sources should be documented in the EHR. Vital signs may have multiple measurements by multiple providers at multiple points in time. Gestational age also may be measured multiple times—as part of a newborn physical examination, a Dubowitz Score administration, or data imported from the mother's prenatal or delivery records; however, a single assigned gestational age should be selectable and used for the birth data. In infants born prematurely (before they reach 37 weeks gestational age), it is important that the system calculate and display the Gestation Adjusted Age (also known as "Corrected Age" or "Corrected Gestational Age") until the child reaches an adjusted age of 24 months old. The Gestation Adjusted Age should be displayed for these infants in all locations where age is displayed. The adjusted gestational age is calculated by this formula: [Gestation Adjusted Age] = [Current Age] - 40 + [Gestational Age at birth]. For example, a 16-week-old child, born at a gestational age of 30 weeks old, has an adjusted age of 16 - (40 - 30) = 6 weeks old. The adjusted gestational age should be displayed in weeks until it reaches 12 weeks old and thereafter in months. The adjusted gestational age is important to interpret developmental milestone and laboratory test results, and is critical to provide appropriate anticipatory guidance.		

2015 PL ID	Req-2020	2013 Format Related ID	Req-978
Topic(s)	Well Child/Preventive Care, EPSDT		
Title	Physical exam screening results		
Description	The system shall allow documentation of the presence or absence of pediatric age- and sex-specific physical exam findings.		
Implementation Notes	NONE		

2015 PL ID	Req-2021	2013 Format Related ID	Req-992, Req-1222
Topic(s)	Patient Identifier, Parents and Guardians and Family Relationship Data		
Title	Associate mother's demographics with newborn		
Description	The system shall provide the ability to associate multiple identifying parent or guardian demographic information, such as relationship to child, street address, telephone number, and/or email address for each individual child.		
Implementation Notes	NONE		

2015 PL ID	Req-2022	2013 Format Related ID	Req-1062
Topic(s)	Children with Special Healthcare Needs		
Title	DME and nursing needs		
Description	The system shall capture Durable Medical Equipment (DME) and nursing needs for the child with identification of age-appropriate resources and orderables.		
Implementation Notes	Understanding the complete picture of a child's needs and care plan includes their nursing needs and any durable goods used, especially for children with chronic health issues. For those with special health care needs, this becomes especially important as their resource usage and needs can be quite complex. Without such information, the full picture of their health and health care cannot be fully understood, conveyed, or managed. This requirement is meant to establish the ability for an EHR to contain a care plan for a child. It is intended to call for an EHR to be able to produce a report for a child that lists the services that have been ordered for a child, starting with DME and nursing services. Other age-appropriate resources and orderables, such as Early Intervention services, specialty care, ancillary services, and special schooling needs can be added at a later date, once the basic functionality of establishing a basic care plan has been provided. EHRs must have the functionality to display a cohort of patients with special health care needs. Because of the complexity associated with managing children with equipment and special nursing care, it would be helpful to be able to query and identify patients also on services and durable goods needed for their care. The results of these queries must be exportable to other aplications that may require these data.		

2015 PL ID	Req-2023	2013 Format Related ID	Req-1070
Topic(s)	Well Child/Preventive Care		
Title	Support pre-visit history/screening/prevention forms		
Description	The system shall record values for pediatric specific pre-visit parent/patient reported data in a manner that enables retrieval and reporting.		
Implementation Notes	Interest in patient provided data through forms completed previsit and available for use during the visit has been growing and exceeds simple registration information prior to the first visit. Meaningful use regulations call for implementation of the Continuity of Care Document (CCD) as a means of capturing a wide range of patient information (demographics, insurance, problems, medications, allergies, immunizations, and vital signs) prior to the first visit or following a referral, emergency department visit, or inpatient admission. Vendors should store and display these data elements and encourage practices to use them with their patients. Additional forms, both paper and electronic, are used to gather information from patients about specific problems. Standards-based methods for providing these forms will enable vendors to do it once and enable practices to select forms from online libraries and to develop their own reusable forms that use data-driven approaches. These standards are evolving and are also discussed under Req-2043 Specialized Scales and Scoring. In the absence of standards, vendors can capture and display these previsit forms by any method that enables the display of these forms at the time of the visit.		

2015 PL ID	Req-2024	2013 Format Related ID	Req-1082
Topic(s)	Well Child/Preventive Care		
Title	Track incomplete preventive care opportunities		
Description	The system shall generate a list on demand for any children who have missed recommended health supervision visits (e.g., preventive opportunities), according to the periodicity of visits recommended in Bright Futures.		
Implementation Notes	Studies demonstrate the importance of adherence with periodic visits to the primary care provider. This requirement allows practices to generate reports across their population of children who are behind in periodic visits. It is not designed to assess the overall compliance with screening and preventive care, and could, depending on the format of the report, suffice to cover Req-2047. Because of the changes in recommendation that occur over time for the care of children, the ability to create new, customizable reports based on user defined criteria to identfy a new health maintenace tasks is important. For this report to be most useful, it would include at minimum the child's current age, contact information, and the date/purpose of the last visit to the practice.		

2015 PL ID	Req-2025	2013 Format Related ID	Req-1090
Topic(s)	Well Child/Preventive Care		
Title	Age-specific decision support		
Description	The system shall report on age-specific Bright Futures-based screening and preventive care opportunities for an individual patient in the practice.		
Implementation Notes	Studies of decision support demonstrate that primary care providers and children benefit from alerts and reminders about a variety of recommendations. This requirement extends alerts and reminders into screening (e.g., hemaglobin test) and preventive care (e.g., injury prevention discussion) domains, which are important for child health. Many of these recommendations are found in Bright Futures. EHRs that use rule-based alerting and that have data-driven forms for preventive care should be able to comply with this recommendation by allowing the content of forms to trigger recommendations based on the age of the patient and the age at which the preventive care normally would have been conducted. To reduce alert fatigue, these alerts and recommendations might be summarized by one rule, such as, "Some age-appropriate Bright Futures-recommended screening and preventive care recommendations have not been addressed to date. Click here for details."		

2015 PL ID	Req-2026	2013 Format Related ID	Req-1095
Topic(s)	School-Based Linkages, Security and Confidentiality, Patient Portals - PHR		
Title	Transferrable access authority		
Description	The system shall provide a mechanism to enable access control that allows a transferrable access authority, e.g., to address change in guardian, child reaching age of maturity, etc..		
Implementation Notes	This requirement could potentially be added as a flag to the guardian/relative requirement above "Access to chart."		

2015 PL ID	Req-2027	2013 Format Related ID	Req-1122
Topic(s)	Well Child/Preventive Care, Immunizations		
Title	Produce completed forms from EHR data		
Description	The system shall produce reports (e.g., for camp, school, or child care) of a child's immunization history, including the following elements: child's name, date of birth and sex, date the report was produced, antigen administered, date administered, route of administration (when available), and an indication of whether a vaccine was refused or contraindicated.		
Implementation Notes	Background: Schools and camps generally require at a minimum documentation of immunizations and a general assessment of health status and clinician determination of ability to participate in sports activities. Many also require inclusion of anthropometric measurements, medications, and problems. Although there is no standard template approved by all schools, the "School/Camp Form" is a core document for pediatric primary care. The ability to print the form during and between visits has been shown to reduce administrative burden and improve communication. A second type of form includes more detailed information about immunizations delivered. Typically called a "Vaccine Administration Record," this report is limited to immunization data but includes all available information (e.g., site, lot number, manufacturer, etc.) for immunizations given to patients. Vaccine Administration Record Specifications: The system shall be able to produce a detailed listing of immunization data sorted either by date of administration or by vaccine series that include child's name; date of birth and sex; date the report was produced; and all available information for each immunization, including antigen administered, date administered, route of administration, site of administration, manufacturer, lot number, expiration data, Visualization (VIS) publication data, contraindications, and immunities. The system also should be capable of capturing and including in the report an indication of refusal or contraindication in order to support a physician's choice to include this information as needed and clinically relevant. The data field for contraindication should include the ability to state why the immunization was not administered. School/Camp Form Specifications: The system shall be able to produce a report for use by Schools and Camps that includes (1) the child's name, date of birth and sex, and date the report was produced; (2) an immunization summary in tabular format that includes immunization dates of administration by series, sorted from earliest to latest; (3) anthropomorphic data (most recent Hgt, Wgt, BMI, BMI %ile, and Blood Pressure with date[s] obtained); and (4) clinician assessment of general state of health and any special considerations related to participation in sports and/or other physical activities. Additional information that may be included in the report includes (1) list of active problems, (2) list of active medications with dosing, and (3) detailed physical examination. This additional information is especially pertinent for patients that have been flagged in the system as having special or complex health care needs. This requirement was modified to limit the required forms to an immunization history that can be attached to existing forms that require immunizations. Typical use in ambulatory practice is to label the section "See attached." The intent of this requirement is to not limit vendors to printing the immunization history in a custom format that fit on the original form, and it is acceptable to use the same printed immunization history for all forms used by a practice.		

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2015 PL ID	Req-2027	2013 Format Related ID	Req-1122
Implementation Notes (continued)	In the future, EHR vendors are encouraged to pursue new technologies that allow mapping of data fields from the EHR onto to specific locations on a PDF form. There is a best practices guide called “PDF for Healthcare” that illustrates how a widely used proprietary forms generation and completion software package can map information extracted through database queries into previously developed PDF forms with custom layout and graphics developed by the creator of the form, such as a local school system or camp. The use of the HL7 Clinical Document Architecture (CDA) also holds promise for development of nationally standard school or camp forms that could exploit the technology that EHRs are already using to complete Continuity of Care Documents (CCD) for patient summaries. Automated templates for CDA documents that could be implemented automatically by EHRs are clearly desirable. This allows EHR vendors to implement the tool once and re-use it for many CDAs populated from data in the EHR. However, adoption of CDA templates and documents are limited outside of the Meaningful Use effort.		

2015 PL ID	Req-2028	2013 Format Related ID	Req-1139
Topic(s)	Registry Linkages, Immunizations		
Title	Use established immunization messaging standards		
Description	A) The system shall use the messaging standards established through Meaningful Use requirements to send data to Immunization Information Systems (IISs) or other Health Information Exchanges (HIEs). B) The system shall use the messaging standards established through Meaningful Use requirements to receive data from Immunization Information Systems (IISs) or other Health Information Exchanges (HIEs).		
Implementation Notes	There are very few IIS that can exchange immnunization information presently. Vendors may not have a pediatric volume in those uncovered geographic locations worth developing. However, this situation has changed rapidly in response to problems encountered during phase 1 of Meaningful Use that led to funding, assistance, and monitoring of state readiness for immunization messaging use standards. Established immunization messaging standards are very mature because of the long history of using them for immunization registries, and they are based on HL7 version 2 and their use is part of Meaningful Use requirements. Meaningful Use incentive programs will end soon and it is better to link details of this requirement to the HIT Standards Committee and even better to link to CDC standards for IIS and immunizations coding (CVX vaccine type and MVX vaccine manufacturer). It is also important to consider the standards used for communication with other EHRs when patients change medical home or location of care. This is usually done using electronic patient summaries that are HL7 CCD and that should always include immunizations for children. If an EHR generates a document for the parents at each visit, it can always provide an immunization history. This requirement is dependent upon the need for an EHR to enter all of the data required for transmission that should include refusals and contraindications. The correct coding of the vaccine needed for standards compliance can be assured by having the EHR read the barcodes that will be printed on all vaccine products per FDA regulations. There is also a need to connect this requirement to reporting of adverse reactions and to reporting for the vaccines for children program. All interoperability functionality has three parts: the message or document content and format, the coding, and the transmission protocols. This only requires vendors to address the ability to produce or use appropriate messages or documents with required coding and terminology. Security and transmission protocols will always need to comply with requirement of the local IIS or HIE and thus any EHR cannot assure users that they can actually send or receive the messages or documents that the EHR is capable of producing. It will be helpful to users of EHR if the vendor can disclose which State or local systems they have successfully implemented in the past.		

2015 PL ID	Req-2029	2013 Format Related ID	Req-1172
Topic(s)	Primary Care Management		
Title	Age-based educational cues		
Description	The system shall provide pediatric age-specific clinical decision support covering Bright Futures-based health supervision and anticipatory guidance.		
Implementation Notes	The clinical support provided should be a list of the services recommended, per the Bright Futures periodicity schedule at the visit for which the child is presenting. The 52 actionable items in the Bright Futures periodicity schedule are defined in: Finnel, SM; Stanton, JL; Downs SM. "Actionable recommendations in the Bright Futures child health supervision guidelines" Appl Clin Inform. 2014 Jul 23;5(3):651-9; and can be accessed online at http://www.ncbi.nlm.nih.gov/pubmed/25298806		

2015 PL ID	Req-2030	2013 Format Related ID	Req-1212
Topic(s)	Security and Confidentiality		
Title	Document decision-making authority of patient representative		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	By specifying the ability to store, retrieve, and display information, the system should explicitly provide the ability of the provider to access this information from the chart.		

2015 PL ID	Req-2031	2013 Format Related ID	Req-1217
Topic(s)	Child Welfare		
Title	Adoption history		
Description	The system shall have the ability to record a child's adoption history.		
Implementation Notes	The system should provide this functionality along with the ability to "hide" the information from printed materials shared with the patient and family and the EHR screen which may be viewed by the patient and family in the exam room, as the patient may not always be aware of his/her adoption status.		

2015 PL ID	Req-2032	2013 Format Related ID	Req-1218
Topic(s)	Child Welfare, Patient Portals - PHR		
Title	Authorized non-clinician viewers of EHR data		
Description	The system shall have the ability to identify members of the care team (including professional and nonprofessional members) and indicate their roles/relationships to the child.		
Implementation Notes	Pediatricians have long acted as "medical homes" for their patients. (The medical home concept has now become a part of "best practices" for all health care delivery.) Establishing a medical home requires building a complete and integrated care team, and such care teams require communication. Knowing who is a part of a child's care team—and being able to track, update, and facilitate the communications of that team—requires an integration sophistication only achievable through, and in direct association with, the child's EHR. For an EHR to adequately address the needs of children, the system should be able to record any and all members of a child's care team. Most preferred would be an automatic recording of an individual's care teams that would include: • health care providers, including ancillary services; • family members, including relatives, caretakers, and guardians; • friends and peer groups, as deemed important for the child's health care maintenance and support,including social, emotional, and medical support; • school system personnel, including school nurses, teachers, coaches, trainers, and team health care affiliates; • community health resource centers and providers, including local, regional, and those that may be at a distance (for children receiving specialized services from distant specialty care centers/providers); and • institutions and organizations affiliated with the child's care. HL7 currrently is completing work on a standarized list for care coordination in their "Coordination of Care Services Specification Project." This list would provide a quality reference for establishing the guidelines for EHR system implementation needs.		

2015 PL ID	Req-2033	2013 Format Related ID	Req-1221
Topic(s)	Child Welfare		
Title	Placement setting in out-of-home care		
Description	The system shall have the ability to record a child's history of and/or current placement in foster care, with relevant date(s) in care.		
Implementation Notes	NONE		

2015 PL ID	Req-2034	2013 Format Related ID	Req-1231
Topic(s)	Child Welfare		
Title	Alert for foster care without Medicaid		
Description	The system shall have the ability to provide an option to alert when a child in foster care is not enrolled in Medicaid.		
Implementation Notes	NONE		

2015 PL ID	Req-2035	2013 Format Related ID	Req-1236
Topic(s)	Medication Management		
Title	Rounding for administrable doses		
Description	The system shall enable calculated doses (e.g. weight-based) to be rounded to optimize administration convenience.		
Implementation Notes	EHR systems should allow their end users to round doses to convenient units of administration, such as readily available table sizes that do not need to be split or dropper/syringes that have commonly used calibrations.		

2015 PL ID	Req-2036	2013 Format Related ID	Req-1238
Topic(s)	Medication Management		
Title	Re-prescribe medications		
Description	****You are viewing the Abridged Children's EHR Format. To view the Full Children's EHR Format, you must first agree to the HL7 License Agreement.****		
Implementation Notes	Because children continue to grow and gain weight, it is necessary to recompute weight-based dosing every time a medication is refilled and to alert the provider when the weight-based dose has changed beyond the limits of convenience rounding of weight-based dosing. All medication refills should provide the opportunity for the provider to edit the prescription dose or instructions at the time of the refill.		

2015 PL ID	Req-2037	2013 Format Related ID	Req-1241
Topic(s)	Medication Management		
Title	Age- and weight-specific single dose range checking		
Description	The system shall provide medication dosing decision support that detects a drug dose that falls outside the minimum-maximum range based on the patient's age, weight, and maximum recommended adult dose (if known) or maximum recommended pediatric dose (if known), for a single dose of the medication.		
Implementation Notes	The system shall be able to alert the user if the maximum recommended adult (flat dose) or pediatric (based on weight or body surface area) dose for a single dose or for a total daily dose of the medication is exceeded. Implementers must be aware that minimum dose range alerts have been shown to have limited value to clinicians. (See Scharnweber C, Lau BD, Mollenkopf N, Thiemann DR, Veltri MA, Lehmann CU. Evaluation of medication dose alerts in pediatric inpatients. Int J Med Inform. 2013 Aug;82(8):676-83. doi: 10.1016/j.ijmedinf.2013.04.002. Epub 2013 Apr 30. PubMed PMID: 23643148.)		

2015 PL ID	Req-2038	2013 Format Related ID	Req-1246
Topic(s)	Security and Confidentiality, Parents and Guardians and Family Relationship Data		
Title	Separate consent, assent and permission		
Description	The system shall support the recording of consent, assent, and permission as separate artifacts.		
Implementation Notes	Consent is a term defined under the HIPAA Privacy Rule (45 CFR 164.501) which defines the ability for a HIPAA-covered entity to establish a process documenting patient approval for the use and disclosure of protected health information for purposes of treatment, payment, and healthcare operations (TPO). The term assent is applied specifically to children (as defined in 45 CFR 46.402) to provide affirmative agreement for the use of their data for purposes above and beyond TPO (such as research). Permission refers specifically to the agreement of the parent for the use of his/her child's data for purposes above and beyond TPO.		

2015 PL ID	Req-2039	2013 Format Related ID	Req-1249
Topic(s)	Security and Confidentiality		
Title	Problem-specific age of consent		
Description	The system shall provide the ability to access legal guidelines on consent requirements for reference, where available, and to record the age of consent for a specific treatment when these differ based on legal guidelines.		
Implementation Notes	Rules regarding age of consent vary across States and they also can vary depending on the service being provided or the minor patient's status. When a health provider is providing minor consent services, it is important for the system to support a provider's understanding around the relevant consent rules through available, up-to-date reference materials and to be able to record the age of or basis for consent within the record. This reference could be provded in the form of a look-up function, marked with the appropriate dates under which the information was referenced. The look-up could include the age of majority as defined in each State statute, along with any exceptions allowing for minor consent/assent prior to the age of majority for specific types of treatment. Several resources are available online that can support this functionality, including: State Minor Consent Laws: A Summary, from the Center for Adolescent Health & the Law (http://www.cahl.org/state-minor-consent-laws-a-summary-third-edition/) (for a fee); State Policies in Brief: An Overview of Minors' Consent Laws by Guttmacher Institute (updated yearly) (http://www.guttmacher.org/statecenter/spibs/spib_OMCL.pdf); as well as numerous State-specific resources, such as Understanding Confidentiality and Minor Consent in California: An Adolescent Provider Toolkit from the Adolescent Health Working Group (http://ahwg.net/uploads/3/2/5/9/3259766/2010mcmoduleblackwhite.pdf).		

2015 PL ID	Req-2040	2013 Format Related ID	Req-1250
Topic(s)	Security and Confidentiality		
Title	Age of emancipation		
Description	The system shall provide the ability to record the patient's emancipated minor status.		
Implementation Notes	NONE		

2015 PL ID	Req-2041	2013 Format Related ID	Req-1254
Topic(s)	Security and Confidentiality		
Title	Segmented access to information		
Description	The system shall provide users the ability to segment health care data in order to keep information about minor consent services private and distinct from other content of the record, such that it is not exposed to parents/guardians without the minor's authorization.		
Implementation Notes	Without the ability to segment information, providers are unable to provide adequate communications with affiliated persons and organizations. For instance, if confidential information cannot be extracted from a health report, providers may not be able to share any information with family members without risking breach of patient confidentiality. Further, appropriate billing for health care service provision is impeded when providers are unable to segment the information provided to payers, again risking patient confidentiality breach. (Providers may not be able to bill at all in such circumstances.) Communication regarding health care provision is especially complicated as it pertains to minors; being able to share as much information as possible without risking a breach of appropriate patient confidentiality is vital for both optimal patient care and for appropriate coding and billing of care services. Optimal care provision, communications, and reimbursements are only achievable if health care data can be segmented to allow patient confidentiality to be maintained appropriately.		

2015 PL ID	Req-2042	2013 Format Related ID	Req-111, Req-112, Req-116, Req-583, Req-630, Req-723, Req-839, Req-844, Req-846, Req-851, Req-852, Req-854, Req-856, Req-857, Req-858, Req-859, Req-860, Req-864, Req-865, Req-866, Req-867, Req-869, Req-870; Req-839; Req-878, Req-960, Req-961
Topic(s)	Growth Data		
Title	Support growth charts for children		
Description	The system shall support display of growth charts that plot selected growth parameters such as height, weight, head circumference, and BMI (entered with appropriate precision or computed as described in Req-2019) along with appropriate sets of norms provided by the CDC or in a compatible tabular format (typically based on Lambda-Mu-Sigma [LMS] curve fitting computational method).		
Implementation Notes	An EHR should do more than replicate paper processes using a computer; therefore, a growth chart should be more than a plot of height, weight, and other growth parameters superimposed on an image or PDF of a paper form that was used to plot growth data in a paper medical record. Data that are the basis for computing and displaying growth chart percentiles are provided by CDC at http://cdc.gov/growthcharts and is age- and sex-specific as well as expected to change over time as new population data becomes available. Vendors may provide a variety of usability enhancements such as offsets for gestation age, offsets for bone age, annotation of special circumstances of individual values, or precision of the measurement; but these user interface enhancements are not part of the core requirement. Magnification and printing should be provided as appropriate for other graphical data in the EHR and for sharing with patients or other providers. The primary growth parameter data on which the growth chart is based always should be available for display and should include computed values such as units conversion, BMI, and percentiles as described under the Req-2019 implementation note. If data are available, they should include annotation of the source of values that were not entered directly into the EHR at a visit on the date of the measurement. It may be desirable to display or print growth charts in different units such as metric for providers and pounds and inches for parents. When this is done, the guidelines in Req-2019 for measurements in only one unit and mathematical conversion of one set of primary data should be followed in accordance with the precision of measurement. The data currently provided by the CDC are limited to metric percentiles as that is the preferred unit of measurement. Mathematical conversion of the percentile data to pounds or inches should be performed, but should not be rounded to the precision of the actual patient measurements. Users may request growth charts for specialized populations such as Down Syndrome, Turner Syndrome, or certain ethnicities or medications; however, the vendor can provide such growth charts only when the necessary data for computing percentiles is available from the CDC or in equivalent format. A variety of approaches exist for computing ideal or target weight, and for predicting adult height based on mid-parent height or bone age and it is not possible to make these clinical decision-support and user-interface enhancement tools part of the core requirement. Vendors are encouraged to consider including these enhancements and links to obesity management information when feasible and appropriate.		

2015 PL ID	Req-2043	2013 Format Related ID	Req-457, Req-488, Req-1018, Req-1019, Req-1020, Req-1021, Req-1026, Req-1034, Req-1037, Req-1039, Req-1050, Req-1222
Topic(s)	Specialized Scales/Scoring		
Title	Scales and Scoring		
Description	The system shall allow the capture of data using an established instrument, the creation of reports and displays using the data, and data use in clinical decision support and in the EHR as necessary.		
Implementation Notes	Specialized scales and scoring occur in many contexts in a child EHR. Each scale requires a data entry form which may include images to illustrate the choices; a method to import patient-entered data from Web sites, electronic documents, or waiting room apps; a scoring method, a location to store the computed score; or guidelines to assist or provide the interpretation of the results. This information also should be made available in either hard copy or electronically to the patient or parent/guardian as part of the visit note if desired by the physician. The data captured should also be available for extraction through query functionality that allows the user to create reports on a panel of patients. For example, the system should provide the ability to identify all patients that have a particular cutoff score on a depression screening within a specific window of time, so that additional outreach and services are offered, and potential issues are not lost or overlooked.See implementation notes for Req-2004 for information about the sensitivity/specificity threshold established in NQF measure #1448 for screening tools (see https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB4QFjAA&url=http://www.qualityforum.org/workarea/DownloadAsset.aspx?id%3D52734&ei=fVdsVZPmOoSusAXJtoPQCw&usg=AFQjCNHr0eVXLelOhJfJmAddyqYufxvmTQ&sig2=fRcvw8SSxstN3dV8DqAOPg). At the present time, these is no single standard for distributing the wide variety of scales in a standard electronic format that would automatically generate a data entry form, a Web page, a waiting room app, and facilitate automated import of the data into and EHR with scoring, interpretation, and filing of the results in the EHR. In the absence of standards that would allow a vendor to implement this requirement once with tools that can be reused for any specialized scale and scoring, some of the most important forms for ambulatory use may require custom implementation or a simple workaround with use of a PDF form that can be scanned or imported with results entered manually into discrete data in the EHR. Standards that are under development and implementation for quality measure reporting hold great promise to help move this important feature toward generalized solutions.		

2015 PL ID	Req-2044	2013 Format Related ID	Req-643
Topic(s)	Primary Care Management, Well Child/Preventive Care		
Title	Use biometric-specific norms for growth curves		
Description	The system shall include the ability to use pediatric age-specific norms for weight, height/length, head circumference, and BMI to calculate and display growth percentiles and plot them over time on standardized CDC/WHO growth curves as appropriate.		
Implementation Notes	Age and gender-specific growth data for healthy children are available from CDC and WHO and are used to monitor the growth of children over time. Available growth data for the child are plotted on graphs that include reference data to allow the assessment of changes in growth velocity over time.		

2015 PL ID	Req-2045	2013 Format Related ID	Req-643
Topic(s)	Primary Care Management, Well Child/Preventive Care		
Title	Provide alerts for out-of-range biometric data		
Description	The system shall include the ability to provide alerts for weight, length/height, head circumference, and BMI data points that fall outside 2 standard deviations of CDC/WHO pediatric data.		
Implementation Notes	Alerts for abnormal growth values serve two important purposes. The first is prevention of data entry error and encouraging repeat measurements if current values are not consistent with previous measurements or significantly out of range. The second is to encourage intervention for abnormal growth measures that might suggest obesity, eating disorders, or growth failure. Typically abnormal values are considered 2 standard deviations from predicted values. There are no clear guidelines for alerting an abnormal measurement based on prior measurements; therefore, vendors may wish to explore a variety of user interface approaches to detect suspected measurement or data entry errors.		

2015 PL ID	Req-2046	2013 Format Related ID	Req-1070
Topic(s)	Well Child/Preventive Care		
Title	Import data from pre-visit history/screening/prevention forms		
Description	The system shall allow the asynchronous importation of parent-/patient-derived previsit data in a manner that enables retrieval and reporting.		
Implementation Notes	Subsequent to Req-2023, this requirement allows for the patient/caregiver to complete forms offline and route it to the EHR, where it is imported for clinician review and use.		

2015 PL ID	Req-2047	2013 Format Related ID	Req-637, Req-639, Req-1082
Topic(s)	Well Child/Preventive Care		
Title	Identify incomplete preventive care opportunities		
Description	The system shall track and report the completion of recommended health supervision visits delivered according to the recommended periodicity of visits included in Bright Futures for a panel of patients.		
Implementation Notes	Studies have demonstrated the value of maintaining a periodic visit schedule in responding to parent questions, providing immunizations, and assessing child development and behavior. This requirement refers to the ability to track adherence of a single patient to this recommended periodicity of visits, using the Bright Futures guidelines as a common standard. It differs from Req-2025 in that it focuses on the periodicity of visits and not on visit-specific content. It differs from Req-2024 in that it focuses on a single patient's overall compliance with the periodicity schedule. Ideally, an EHR developing this monitoring also should provide the capability to retroactively enter dates of previous visits in a way that seamlessly integrates with the practice schedule data from which this sort of report normally would be generated. This functionality would be important for a child transferring into a practice, or for a child with fragmented care and visits that occur at another location that cannot exchange such data electronically.		

Appendix E: Recommended Uses

This report accompanies the Children's EHR Format 2015 Priority List (2015 Priority List).

Introduction. The Children's Electronic Health Record (EHR) Format Enhancement project reviewed the broad list of over 500 functional requirements in the Children's EHR Format (the Format) (http://www.ahrq.gov/research/data/ushik), selected high priority items from the list, and developed recommended uses for those items. The project also included a review of the experiences of providers and software developers who had implemented the Format under two CHIPRA-funded State grants. A panel of experts representing providers, software developers, informatics experts, policymakers, and other stakeholders to form a multistakeholder work group (MSWG) that developed the 2015 Priority List and recommended uses, with review by a Federal work group and other stakeholders. This project was funded by the Centers for Medicare & Medicaid Services (CMS) and contracted to RTI International by the Agency for Healthcare Research and Quality (AHRQ).

2015 Priority List. The MSWG identified and updated 47 requirements they felt should receive immediate attention from care providers, software developers, and other stakeholders to improve EHRs used in the care of children. By creating a short, high priority list derived from the Format, they hoped to provide an initial and consistent starting point for discussions about essential pediatric-specific functionalities. Once consistently implemented in EHRs, the 2015 Priority List requirements will also impact the care of children by permitting better use of standards, data harmonization activities, interoperability, and EHRs for pediatric-specific quality reporting, population management, and communication with parents/children. Included with each requirement is a section called "implementation notes" intended to provide additional details or guidance to assist in understanding and using the requirement. **Table 1** provides a list of the topics and requirement identifiers (IDs) for each item included in the 2015 Priority List. The full list is detailed in ***The Children's EHR Format 2015 Priority List*** report.

Table 1. 2015 Priority List Requirement IDs by Topic

Topic Name	2015 Priority List Requirement ID*
Birth Information	2001, 2009
Child Abuse Reporting	2006
Child Welfare	2031, 2032, 2033, 2034
Children with Special Healthcare Needs	2014, 2022
EPSDT	2020
Genetic information	2009
Growth Data	2002, 2003, 2019, 2042
Immunizations	2011, 2027, 2028
Medication Management	2005, 2010, 2012, 2035, 2036, 2037
Newborn Screening	2015, 2016, 2017, 2018
Parents and Guardians and Patient Relationship Data	2006, 2008, 2021, 2038
Patient Identifier	2021
Patient Portal/PHR	2007, 2026, 2032
Prenatal Screening	2009
Primary Care Management	2006, 2013, 2029, 2044, 2045
Registry Linkages	2011, 2028
School-Based Linkages	2026
Security and Confidentiality	2008, 2026, 2030, 2038, 2039, 2040, 2041
Specialized Scales/Scoring	2043
Well Child/Preventive Care	2004, 2013, 2019, 2020, 2023, 2024, 2025, 2027, 2044, 2045, 2046, 2047

*Requirement IDs refer to individual requirements on the 2015 Priority List.

Recommended Uses

The MSWG prepared this document to accompany the 2015 Priority List to suggest how the software requirements might best be used by key stakeholders to improve the care of children. The most immediate, "direct" use of a 2015 Priority List software requirement is to change the way software is designed and used. Direct use in product planning and design activities usually involves users, domain experts, product planners, and software engineers. However, the MSWG recognized that additional stakeholders and downstream uses, after software changes were made, would be essential. Much work would be needed to leverage improved EHR data and tools to support public health, quality measurement, individual care, and communication among all who participate in the health and care of the child. The MSWG identified a number of "indirect" uses of the 2015 Priority List (beyond software development) by stakeholders focused on these downstream effects. Stakeholders may find it valuable to review and understand the 2015 Priority List as part of their planning activities, funding decisions, policy development, or community advocacy work. Each recommended use in this report is labelled as *direct* or *indirect* to reflect this distinction.

The list of recommended uses is shown below, organized by direct or indirect use, and by stakeholder.

Direct Uses of the 2015 Priority List

Stakeholder: Providers and associated staff who use and select EHRs

Recommended Use 1: Inform RFP/RFI development to ensure needed EHR functionality for the care of children

Recommend Use Details. Providers (both clinicians and information technology champions) are often asked the specific functionality that they envision to be important for care delivery during a vendor selection process. Commonly, a "wish list" of key functions and capabilities is shared with potential vendors, often in the form of an RFI (request for information) or RFP (request for proposal). The Priority List identifies a set of requirements that may be helpful in vendor selection.

Value. A readily available set of EHR requirements specific to child health offers providers a consistent starter set of basic pediatric EHR functionalities, or a comparison list for use with an existing set of requirements. A practice may wish to add requirements to the initial list based on functionality specifically important to areas of specialty or workflow. At the same time, not all the requirements on the list may be applicable to all clinical settings (e.g., functions that support early and periodic screening, diagnostic, and treatment (EPSDT) in primary care settings, such as Bright Futures) and practices may wish to remove those requirements. In addition, groups such as the AAP or AAFP could annotate this list with details that might be pertinent for an RFP or scripted product demonstration.

Limitations. A well-defined set of requirements is useful for both vendors and providers and may serve as a basis for discussions, clarifications, and negotiations. However, the 2015 Priority List should be considered an additional set of requirements to support children's health specifically, and does not seek to replace or duplicate requirements stipulated by other entities, such as the CMS EHR Incentive Program.

The Priority List represents items with the highest feasibility and value, and may not reflect every functionality that individual providers may desire, requiring further discussions between providers and/or vendors. The 2013 Children's EHR Format, found on the United States Health Information Knowledgebase (USHIK) Web site, provides many requirements that could be considered by those developing an RFP/RFI, as well as references to standards (such as Bright Futures or CDC charts) that should be specifically included in a pediatric-specific EHR product.

Relevant 2015 Priority List Requirements: All requirements are relevant.

Recommended Use 2: Support more productive vendor/provider discussions and expectation setting

Recommend Use Details. As providers engage with EHR developers and suppliers, whether third-party vendors or internal IT staff, they need resources that help them understand and communicate their needs more effectively. The 2015 Priority List, as well as the accompanying implementation notes, can be used by informed clinicians as a reference when interacting or working with those developers or designers to assure that the product is designed and configured to achieve the desired functionality.

The 2015 Priority List helps to educate providers about what to expect from a vendor, and helps software suppliers set expectations for users of their product, such as when a capability that is present, requires specialized data to function properly. One example, Req-2042, describes specialized growth charts where supporting data is available (as of June 2015, data for Downs Syndrome is not generally available to support specialized growth charts). The 2015 Priority List also can be used as a basis for training new providers on specific EHR capabilities.

Organizations that describe and compare EHR capabilities may use the 2015 Priority List to indicate which EHR products support, or do not support, individual requirements. Over time, as more requirements are satisfied by leading EHR products and they become more universally

available, they will more likely form the "base" of functionality, rather than "extras".

Value. The 2015 Priority List provides value to providers and to software suppliers who are trying to improve the functionality of electronic records, such as promoting information exchange, in support of child health. Using the 2015 Priority List as a reference for discussion between an EHR vendor and local IT staff improves communication between the end user customer and EHR developer. The 2015 Priority List may also serve as a blueprint for implementation during the build of the EHR, or as a reference during the optimization phase of an implementation project.

Encouraging staff input on EHR use often provides important insights into an EHR's functionality that supports improved use by the provider. Staff use of the 2015 Priority List to understand what might be expected from a vendor and/or an EHR is critical for driving a system's use and development.

Use of the 2015 Priority List makes it more likely that end users will have use of a system that meets their needs when caring for children.

Limitations. The 2015 Priority List items are intended to convey specific information to software developers, EHR users, and other stakeholders. Checklists and written requirements, by their nature, are subject to different interpretation by one reader even when a different reader believes there is high clarity and clear context. One way to improve the use of the items on this list is to make sure that the provider or system developer with less domain expertise understands the intention and context of each item on the list, and why that item might have been included. Non-experts not familiar with the details of a specific functionality may wish to partner with an informaticist or domain expert who can help to translate an EHR requirement into technical language that will be helpful to the system developer, or vice versa.

Not all EHR systems will be immediately ready for configuration as desired due to gaps in the product design or dependencies on other data or systems that cannot be satisfied; some proposed functionality will need to be addressed in later versions of the product. Also, some requirements are not yet easily addressed for reasons external to the EHR product. For example, immunization forecasting is a critical component of knowing that a child is receiving all of the care that they require, but it was not included in the 2015 Priority List because of concerns about feasibility in the current environment. Additional functionalities and coordination between relevant entities must occur before this can become a standard practice. Encouraging the EHR vendor to coordinate with user groups, and users to engage other stakeholders as needed, can help highlight that a particular functionality is vital to a broad set of clients or customers.

Some functionality may not be feasible because data in a suitable electronic format are not available, or materials are subject to copyright and licensure, limiting their implementation without additional cost and agreements. The 2015 Priority List requirements create a framework for improving these discussions, setting more realistic expectations, and highlighting the need for further development of electronically sharable materials that would support the effort to achieve common goals.

The implementation notes that accompany the 2015 Priority List are intended to offer additional details to the EHR vendor or systems developer, but in many cases will not substitute for work with the specific end users to interpret the scope and meaning of a requirement and implement it in a useful way.

Relevant 2015 Priority List Requirements: All requirements are relevant.

Recommended Use 3: Support ongoing improvements in the use of the EHR by providers and practice staff

Recommended Use Details. Providers can achieve practice improvement by examining the way EHRs are currently used, such as where there might be procedural or clinical gaps in capturing information, reviewing information, supporting decisions, or sharing information with family members, other health practitioners, or community organizations that interact with the children under the care of the provider. The 2015 Priority List will

assist providers in identifying and addressing areas for improvement.

Value. A provider or provider organization can examine existing processes in relation to their EHR use to identify inefficiencies or opportunities for improvements in data collection, workflow, and communication within and outside the practice, based on EHR capabilities identified on the list. Items on the list highlight the role of the EHR in the identification of children who are likely to benefit from care coordination such as children with special health care needs, children whose developmental or behavioral health screening identifies the need for specialty referrals, and those with exam findings outside of the normal ranges.

Limitations. Even a clear statement of EHR requirements does not eliminate differences in perspective and approach among providers, software vendors, and others facing operational challenges. Even differences in the terminology used to in define or understand an issue can be confusing, and the task ownership for addressing a concern can also be unclear. While a written requirement may be helpful by itself, it's important to engage in dialogue to get the most benefit from use of the 2015 Priority List.

Relevant 2015 Priority List Requirements: All requirements are potentially relevant. Of particular relevance, Children with Special Health Care Needs: 2014, 2022; Well Child/Preventive Care: 2004, 2013; Specialized Scales and Scoring: 2043; Primary Care Management: 2044.

Stakeholder: Software developers

Recommended Use 4: Improve the design and product road map for an EHR used in the care of children

Recommend Use Details. The 2015 Priority List for the Children's EHR Format suggests a number of ways to improve the design of the EHR, which can help software developers doing EHR product planning and road map development. In some cases, an EHR can be improved by addressing a specific requirement or set of requirements. In other cases, an EHR can be improved by taking a more flexible approach to implementing requirements, such as a service-oriented architecture (SOA) and software-as-a-service (SAAS) approach. For example, designing an EHR to incorporate third-party decision and documentation rules could shift the work of developing custom templates and tools away from individual vendors and toward a collective of pediatric and technical subject matter experts. This shift, which could accelerate adoption and use of content-rich requirements, such as Req-2043 (specialized scales and scoring), which calls for EHR support of many template-driven and scored instruments like the Apgar score, Glasgow coma scale, or Dubowitz score.

Value. One of the significant obstacles to the development of pediatric features is a lack of guidance and clinical content. Having a prioritized list of requirements for a children's EHR provides a much needed target.

Limitations. EHR functionality that serves the care of children competes for priority with other EHR functional requirements, slowing the pace of adoption and reducing the overall software maturity level. This makes standards less likely to be adopted, or in some cases, defined. Wide functional variations between currently available products and the lack of a certifying body focused on pediatric-specific EHR requirements continues to be a challenge.

Relevant 2015 Priority List Requirements: All requirements are relevant.

Recommended Use 5: Support better interoperability and integration within and between systems

Recommend Use Details. The 2015 Priority List includes several requirements that encourage vendors to extend their functionality for better system integration. Req-2028 calls for use of established immunization messaging standards and Req-2011 calls for immunization reconciliation with data in immunization registries that will require data sharing and requests to correct discrepant data. Req-2036 expands electronic prescribing to include re-checking weight-based dosing at the time of refills, and Req-2037 calls for age- and weight-specific dose checking for

medications before they are prescribed. Req-2001 calls for linking to and importing birth information found in the mother's record into the infant's record when possible to eliminate the need for manual entry in the hospital and ambulatory setting. Req-2021 facilitates this transfer of birth data by linking mother's demographics to the infant. Req-2017 calls for recording newborn screening diagnoses on the problem list so that they will transfer to other providers as part of a patient summary document. The comprehensive approach to pediatric vital signs and growth data in Req-2002 supports use of these data in a standard patient summary of care document shared with other practitioners, and in public health organizations to aggregate population data. Req-2043 calls for a wide range of pediatric specialized scales and scoring that Req-2004 and Req-2023 will use as screening tools for well child and preventive care by capturing this type of data completed by the parents prior to a visit or in the waiting room.

Value. Interoperability is important for a children's EHR since it enables a comprehensive longitudinal picture of care a child receives. It is essential to assess the current care a child has received with the benefit of information from critical periods in a child's history. For example, transfer of growth data between practices is essential for completing growth charts, transfer of birth data from the birth hospital to the medical home is essential for neonatal and infant care, and transfer of complete newborn screening and immunization data is essential to meet key public health objectives.

Limitations. There is not yet full agreement on screening periodicity schedules, and there are also gaps in the availability of fully computable electronic resources for existing or emerging standard schedules. Periodicity schedules in Medicaid are discussed here. Req-2020 for age-specific findings, and Req-2024 for access to age-specific guidelines for EPSDT and Bright Futures™, highlight these gaps. An important challenge to immunization information system (IIS) interoperability has been local variations in standards compliance concerning the transmission of standard messages and IT security.

Relevant 2015 Priority List Requirements: Birth Information: 2001; Growth Data: 2002, Well Child/Preventive Care: 2004, 2023; Immunizations/Registry Linkages: 2011, 2028, Newborn Screening: 2017; Patient Identifier: 2021; Medication Management: 2036, 2037; Specialized Scales/Scoring: 2043; Primary Care Management: 2044.

Indirect Uses of the 2015 Priority List

Stakeholder: User advocacy groups, EHR system evaluators, and end users

Recommended Use 6: Surface opportunities to improve workflow and other aspects of EHR use

Recommend Use Details. Work to configure and optimize use of an EHR extends well beyond the initial go-live activities. The 2015 Priority List, particularly the implementation notes and references to resources such as Bright Futures, may help users better leverage an EHR's capabilities. For example, are growth data collected before the encounter with the clinician, and in a way that provides critical information during that encounter? What training should be provided to practitioners given the complex workflow needed to execute some aspects of care? Thinking through these questions can be helpful in identifying opportunities for an improved practice workflow that better leverages the functionalities of the EHR.

Value. The 2015 Priority List provides value by surfacing goals and questions, based on a set of important requirements, that can help stakeholders better understand the challenges of EHR use in a busy pediatric or family practice.

Limitations. One challenge of this recommended use is that workflow is not the primary focus of the 2015 Priority List, and it may be difficult to identify workflow assumptions behind some requirement descriptions and implementation notes.

Relevant 2015 Priority List Requirements: Child Welfare: 2031, 2032, 2033, 2034; Children with Special Health Care Needs: 2014, 2022; Well Child/Preventive Care: 2004, 2013, 2019, 2023,

2024, 2025, 2027, 2046, 2047; Immunizations: 2011, 2027, 2028; Medication Management: 2005, 2010, 2012, 2035, 2036, 2037; Newborn Screening: 2015, 2016, 2017, 2018; Patient Portal/PHR: 2007, 2026, 2032; Primary Care Management: 2006, 2013, 2029, 2044, 2045; Security/ Confidentiality: 2008, 2026, 2030, 2038, 2039, 2040, 2041.

Stakeholder: School district providers and medical administrators

Recommended Use 7: Share information with school districts

Recommend Use Details. Practitioners frequently communicate with schools about their patients. For example, input from the teacher is important in making a diagnosis of attention-deficit hyperactivity disorder (ADHD). Schools also request information when a child's medical condition will impact their learning in school and they must make an accommodation. Improving the capacity for a provider to communicate with the school and share relevant information electronically supports the capture of relevant information in the school record, coordination of care for conditions such as asthma, and tracking of information such as school-based vision and hearing screening, which may reduce unnecessary testing.

Value. Schools may use the 2015 Priority List to better understand how EHRs are used to capture more relevant information about their patient, and communicate patient information to the school. Automated completion of school forms by any child EHR would be highly valuable, but challenging due to the wide variety of forms used and very limited use of electronic forms. The 2015 Priority List requirements support the completion of the immunization history portion of the school form.

Limitations. The challenges to this process are the privacy protections regulating health care organizations (health insurance portability and accountability act, or HIPAA) and privacy protections of outside agencies such as the school system requirements (family education rights and privacy act, FERPA). A national standard for school forms that is implemented in a conventional standard electronic document format such as CDA (clinical document architecture) would facilitate the implementation of desired automated and expedited communication with schools.

Relevant 2015 Priority List Requirements: All requirements related to Well Child Information are potentially relevant. Of particular relevance, Immunizations/Well Child-Preventative Care: 2027; Immunizations/Registry Linkages: 2028; Child Welfare Patient Portals/PHR: 2032; Primary Care Management: 2029.

Stakeholder: Centers for Medicare & Medicaid Services (CMS), State Medicaid and CHIP, and private payers and policymakers

Recommended Use 8: Improve the alignment of EHR functionality with emerging financial policy

Recommend Use Details. The use of value-based purchasing is increasing, and the 2015 Priority List supports a number of EHR functions that support the maintenance of health, avoidance of unnecessary medical utilization, and advances in self-management, which are becoming more important for providers receiving global payments in place of fee-for-service payments. Also, practices or health systems may use global payment funds to incentivize the shift of care to less expensive delivery channels (e.g., use of email or telephonic contacts in place of face to face visits, or the use of funds to support the delivery of care coordination services for patients). The 2015 Priority List includes items that support emerging care models.

Value. By improving the ability of EHRs to support the tracking and management of well-child care in accordance with evidence-based guidelines, children's adherence to recommended immunization schedules, and additional opportunities for preventive care, practices will be able to track and improve their delivery of preventive care services, and report their performance to payers.

Limitations. The 2015 Priority List includes functionality for several guideline-based care

domains such as preventive care and immunizations, but not all areas relevant to value-based care. The future identification of additional high priority requirements that support the implementation of value-based payment will be important.

Relevant 2015 Priority List Requirements: Registry Linkages: 2011; Well Child/Preventive Care: 2024, 2025, 2047

Stakeholder: Standards development organization (SDO), certification bodies, and professional associations

Recommended Use 9: Support standards development

Recommend Use Details. SDOs support the generation and production of communication, usability, and functional requirements standards for healthcare industry stakeholders. SDOs for healthcare that might find the 2015 Priority List useful include: HL7, ANSI and NIST. The list can serve as a guide when developing technical and workflow specifications as well as functional requirements such as prescribing rules, care guidelines, clinical workflow best practices, clinical content specifications, end user usability design and testing methods, among others. The scope of the standards may vary from terminology work to domain analysis models.

The 2015 Priority List for the Children's EHR Format may help to highlight important gaps in current standards and opportunities for standards development. Req-2001 calls for capture of birth data, since the standards for the child's EHR do not match those advocated by ACOG for maternal prenatal records. There is an urgent need for better standards for birth data for infants and electronic messages or documents to share this data between the birth hospital and ambulatory setting. Req-2002 lists a comprehensive set of pediatric vital signs and growth data that should be maintained with necessary LOINC codes to support entry and sharing of this data. Req-2042 calls for a range of growth charts and there is great demand but very limited availability for specialized growth charts for special populations and specific diseases. Standards that have been used for the CDC and WHO growth charts could be applied to development of new growth charts that could be disseminated to vendors and implemented using the same tools suggested for currently available growth charts. Immunization messaging standards used in Req-2011 are very mature but vendors indicate that they are incomplete when it comes to transmission and security protocols for sending or receiving the existing standard messages with local immunization information systems (IIS) or registries. Work is needed to help vendors make standard immunization messages that are included in their EHR functional in any location with minimal configuration or testing beyond practice identification codes. This will require considerable advancement in standards so that an EHR that can communicate in one State can be expected to communicate immunization data in another State or be able to interact with multiple State registries when required. Req-2043 calls for reconciliation of immunization data between the practice EHR and the local IIS. More work is needed on standards to manage requests for changes and how to prevent obtaining the same error messages every time an immunization history is requested. Req-2043 calls for including many specialized scales and scoring in a child's EHR and electronic standards are needed for distribution of this scales that can facilitate automated implementation in an EHR rather than custom programming. Req-639 calls for sharing of well-child preventive care guidelines from EPSDT (which can vary locally) and Bright Futures. Standards for sharing these guidelines in machine-readable form that can also be used to track compliance will require new standards development. Standards for sharing ACIP immunization guidelines have been developed and implemented at CDC but are too complex to implement in each EHR. This task is best delegated to an IIS or decision support server but standards are needed to share the recommendations of immunization forecasting and integrate this approach to remote clinical decision support for immunizations in child EHR.

Value. If the SDOs adopt standards that support elements of the 2015 Priority List, then the specific

child health requirements will be incorporated in the body of the standards or supported by the standards. When vendors of clinical systems follow the standards, then the end users will benefit from these functions. For example, if the 2015 Priority List describes the requirements for developmental screening for child health, SDOs such as HL7 can leverage this functionality and then develop a set of very granular functional requirements related to child health developmental screening that will complement the Children's EHR Format developed through AHRQ/CMS.

Limitations. SDOs usually promote standards by consensus methods. One of the barriers for encouraging SDOs to adopt elements of the 2015 Priority List is the limited participation of child health champions within the SDO. This can be overcome by 1) identifying existing SDOs with existing child health champions and promoting/sharing the 2015 Priority List, and 2) soliciting child health champions/stakeholders for relevant SDOs without pediatric champions. Child health stakeholders within the SDOs can then work within the SDO framework to develop relevant standards that support the 2015 Priority List.

Relevant 2015 Priority List Requirements: All requirements are relevant. Of particular relevance, Children with Special Healthcare Needs: 2014, 2022; Immunizations: 2011, 2027, 2028; Well Child/Preventive Care: 2020.

Recommended Use 10: Identify functionalities for certifying health IT product functionality

Recommend Use Details. The 2015 Priority List identifies functionalities that may serve as a basis for developing pediatric-specific health IT certification criteria, testing scripts, and technical specifications. For example, circa 2009, the Certification Commission for Health Information Technology (CCHIT) used functional requirements for pediatrics published by HL7 as the starting point for prioritizing pediatric specific functions to be certified.

In addition, professional associations such as the AAP could use the list to assess industry EHR products used in the care of children and provide some direction to their membership about which products met the high priority items contained in the 2015 list. Advancing support for the 2015 Priority List (and the 2013 Children's EHR Format as a whole) from organizations such as AAP, AAFP, AHRQ, CMS/Medicaid, and other child health stakeholders such as Children's Hospital Association can help to highlight the importance of the list to the care of children. Legislation such as CHIPRA or ARRA meaningful use may help to advance the impact of the 2015 Priority List on EHR design and use.

Value. Advancing the consistent inclusion of the 2015 Priority List items in EHR is desirable, since current products often lack these capabilities. Certification and/or product review may help spur other activities such as testing, configuration guides, and development standards, creating greater consistency among different EHR products.

Limitations. Certifying and product review organizations are selective about the software requirements they choose, and might view some of the 2015 Priority List items as having limited focus compared to other items affecting greater numbers of patients and providers.

Relevant 2015 Priority List Requirements: All requirements are relevant

Stakeholder: State or county health and human services agencies

Recommended Use 11: Establish expectations for electronic data capture and retrieval

Recommend Use Details. As public health agencies enhance their human services records systems, often with linkages to external health information sources, they will benefit from incorporating EHR data (as appropriate) into health records that form a part of the case record. For example, child welfare agencies are currently engaged in developing more robust health records for children/youth in foster care pursuant to the Federal Fostering Connections to Success Act, among others. The 2015 Priority List could help them anticipate information providers need, to

deliver effective care and to ensure it is captured in the agency's case record, using standards that enable electronic exchange of that information between systems and technologies..

Value. By facilitating the development of an EHR that follows a child through his/her experiences with various health and human services agencies (i.e., through foster care), these requirements will make it more likely that the health records available to pediatric providers for such children will be adequate to inform care and support appropriate health care decisionmaking during episodes of care, and afterward.

Limitations. A significant level of coordination must occur to achieve the vision outlined in this use. To speed up the development process, health and human services agencies should be preparing now to use and leverage pediatric-specific information described in the 2015 Priority List. This will allow gap that currently exists to close more rapidly as pediatric EHRs move toward compliance with the requirements suggested.

Relevant 2015 Priority List Requirements: All requirements are relevant. Of particular relevance, Child Welfare: 2031, 2032, 2033, 2034; Patient Portal/PHR: 2007, 2026; and Security and Confidentiality: 2030, 2040, 2041.

Recommended Use 12: Coordination of care, specifically children with special health care needs

Recommend Use Details. Care coordination that leverages EHR data, especially data collected for children with special health care needs, is especially important for priority populations. It can be particularly challenging since many service providers for these children do not use EHRs.

Value. Contained within the 2015 Priority List are critical EHR functions necessary to appropriately document and track childhood development, especially for children with special healthcare needs including:

1) well child visits
2) support for the analysis of growth charting
3) tracking childhood immunizations
4) immunization documentation
5) weight-based drug dosing
6) specialized scales and scoring

The 2015 Priority List requirements support improved care coordination through the use of EHRs that provide standardized, validated instruments to screen children. For example, and EHR might help the user to document a developmental delay, and suggest follow-up care.

Limitations. Incompleteness or gaps in EHR data, and lack of access to the data, create barriers to the use of pediatric EHRs for coordination of care for children with special health care needs and contribute to incomplete tracking of care coordination activities in the patient/clinical record. Continued adoption of standardized developmental screening tools will improve the documentation in EHRs, improving the coordination of care among practitioners.

Relevant 2015 Priority List Requirements: Growth Data: 2002, 2003, 2019, 2042; Immunizations: 2011, 2027, 2028; Medication Management: 2005, 2010, 2012, 2035, 2036, 2037; Well Child/Prevention Care: 2004, 2013, 2019, 2020, 2023, 2024, 2025, 2027, 2046, 2047

Stakeholder: Public health agencies

Recommended Use 13: Support the public health functions of population health assessment, public health policy development, and assurance of public health policy compliance

Recommend Use Details. Improvements to EHRs using the 2015 Priority List items can promote improved communication between ambulatory practices and public health agencies. There are three primary public health informatics functions that can leverage an EHR. First, patient data from the EHR in combination with survey data can generate a picture of population health status that highlights the need for intervention or screening. Second, public health policies and programs can be improved through the use of EHR data to monitor compliance with policies, and to track performance against guidelines for well-child care, immunizations, and disease management. Third, immunization data and other data important for public health can be captured and shared.

management. Third, immunization data and other data important for public health can be captured and shared.

For example, obesity metrics are a public health priority. Req-2002 calls for capture of appropriate obesity measures, Req-2044 calls for age-specific norms, and Req-2045 calls for reporting and alerting out of range data.

Req-2016 calls for recording parent notification of newborn screening results that will encourage EHR users to be sure that results were checked and completed. Req-2017 calls for recording newborn screening diagnosis and all outstanding newborn screening tasks on the problem list so that all providers will see them. Req-2018 calls for making decision support, such as the American College of Medical Genetics and Genomics (ACMG) ACT sheets, available to assist providers in management of rare conditions that might be seen only once in a lifetime of practice.

Req-2034, to alert for a child in foster care who is not also in Medicaid, is intended to help support an important public health intervention to improve child welfare.

Value. The 2015 Priority List strengthens the capture and communication of child information in the EHR that is also used to support important public health initiatives.

Limitations. The 2015 Priority List does not include every important requirement, such as immunization forecasting and immunization clinical decision support, which also serve public health objectives. These and other requirements deserve more attention in the future. At the time of this writing (August 2015) they were not included because the requirements are complex, subject to changing ACIP guidelines, and still require full validation using a large number of test cases available from CDC and AAP. Immunization forecasting is an appropriate role for public health and can be integrated into immunization information systems (IIS) or registries with the decision support recommendations displayed by the EHR.

Relevant 2015 Priority List Requirements: Growth Data: 2002; Primary Care Management: 2044, 2045; Newborn Screening: 2016, 2017, 2018; Child Welfare: 2034

Stakeholder: Administrators, care coordinators, and health plans

Recommended Use 14: Improve reporting around population health management

Recommend Use Details. The 2015 Priority List supports improved EHR data capture as part of the routine care of the child, which is anticipated to be useful in population health management.

Value. Many of the 2015 Priority List requirements are central to pediatric health and can be reported in aggregate and used in the comparison of practices, such as rates of performance of preventive care practices, newborn screening, and other guideline-driven activities. The goal of population health management is to improve population based outcomes while reducing cost by improving efficiency of care delivery, promoting cost effective strategies, and supporting early preventive interventions. Timely feedback to providers caring for a population of patients is essential to attain these benefits.

Challenges and Barriers. Adequate data quality and its consistent capture are prerequisites for use in population health management. Additional barriers relate to the joining of data from EHRs with other data sets for population health management. Establishing routines for the complete and accurate collection of data is essential for its downstream use in population health management.

Relevant 2015 Priority List Requirements: Primary Care Management: 2006; Child Welfare: 2013, 2032, 2033, 2034; Children with Special healthcare Needs: 2014, 2022; Genetic information: 2009; Growth Data: 2002, 2003, 2019, 2042; Immunizations: 2011, 2027, 2028; Medication Management: 2005, 2010, 2012, 2035, 2036, 2037; Newborn Screening: 2015, 2016, 2017, 2018; Patient Portal/PHR: 2007, 2026, 2032; Primary Care Management: 2013, 2029, 2044, 2045; Registry Linkages: 2011, 2028; Specialized Scales/Scoring: 2043; Well Child/Preventive Care: 2003, 2013, 2019, 2020, 2023, 2024, 2025, 2027, 2046, 2047

Stakeholder: Quality reporting measure developers

Recommended Use 15: Support for eMeasure development and specification

Recommend Use Details. The 2015 Priority List supports improved EHR data capture as part of the routine care of the child, which is anticipated to advance the use of EHR data in quality monitoring and reporting, supporting more uniform and standardized methods to assess performance across practices using a variety of EHRs.

Value. More consistent collection of more standardized EHR data about a child is anticipated to improve direct care, as well as secondary use of child data for measurement. eMeasures are essential tools for understanding progress toward important goals in child health. As standards are more precisely defined, and EHRs are more consistently designed to support those standards, eMeasures can be better used to track practice improvements.

Limitations. The 2015 Priority List does not include every data element that will be useful to measure developers, but it is a start. Over time, as the list of high-priority requirements shifts, it will be important to consider requirements that may be important for eMeasure development and use, as well as those having a high impact on the delivery of care to children.

Relevant 2015 Priority List Requirements: All requirements are relevant.

Stakeholder: Pharmacists, pharmacy staff, and pharmacy management system vendors

Recommended Use 16: Increase communication with pharmacists to support safer medication use

Recommend Use Details. Improvements in the completeness and accuracy of data in the patient record can potentially lead to improvements in the transfer of pediatric patient information to the pharmacy, which is critical for safe dispensing. Pharmacists serving in the role of care provider often do not have access to this valuable data. Receipt of this information will help them dispense accurate medications and thus result in better patient outcomes. Furthermore, this data will also help the pharmacy management system vendors configure their software so that their systems can consume and meaningfully display this information to the pharmacist end user.

Value. Access to the child's EHR medication data supports more accurate and safe medication dispensing through better integration of the pharmacist as part of the patient care team, and reduces redundancy and duplicated effort.

Limitations. Benefits require the exchange of medication information between EHRs and pharmacy systems, which may be slowed by competing priorities and/or lack of adoption by the EHR and Pharmacy technology system vendors.

Relevant 2015 Priority List Requirements: Patient Identifier: 2021; Birth Information: 2001, 2009; Immunizations: 2011, 2027, 2028