

## Clinical Information Technology

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**UNANSWERED QUESTIONS ARISING DURING PRIMARY CARE VISITS.** Chuck Norlin, MD, FAAP,<sup>1</sup> Adam L Sharp,<sup>2</sup> Michael H Carpenter, MD,<sup>2</sup> Sean D Firth, PhD.<sup>1</sup> <sup>1</sup>Pediatrics, University of Utah Health Sciences Center, Salt Lake City, UT; <sup>2</sup>School of Medicine, University of Utah Health Sciences Center, Salt Lake City, UT.

**Purpose:** We aimed to identify the frequency, types, and importance of unanswered questions arising in pediatric primary care visits; characterize pediatricians' responses to them; and identify differences between questions arising in the care of children with special health care needs (CSHCN) and those without special needs (non-CSHCN).

**Methods:** Over 15 weeks, 890 patient visits to 35 general pediatricians were observed after parents completed a CSHCN screener. Physicians communicated questions that arose for which they did not know the answer, the importance of each, and their intent to pursue an answer. Questions related to patient information were excluded. Physicians were contacted 2 weeks later to determine if and how an answer was pursued.

**Results:** Of 890 visits, 170 (19.1%) prompted unanswered questions. Visits with CSHCN (n=167) comprised 18.8% of the total and their age distribution differed from the non-CSHCN (CSHCN mean/median ages= 7.61/7 years, non-CSHCN= 3.73/2 years; p<0.0001). Unanswered questions were more likely to arise during visits with CSHCN compared to those with non-CSHCN (28.7% v. 16.9% of visits; OR: 1.98, 95% CI: 1.32 to 2.97). This difference was even greater for "well visits" with CSHCN compared to those with non-CSHCN (34.6% v. 14.9%; OR: 3.24, 95% CI: 1.59 to 6.39). Physicians intended to pursue answers to 44% of the questions. Reasons for not planning to pursue an answer included doubt that an answer existed, time constraints, and not being sure where to look for an answer. Answers were pursued for 15.0% of questions. No relationship was found between perceived importance and pursuing an answer.

**Conclusion:** Clinical questions that cannot be readily answered arise routinely during pediatric primary care visits. Visits with CSHCN, particularly "well visits", generate more and different kinds of questions than visits with non-CSHCN. Pediatricians pursue answers to few of these questions. Reasons for not pursuing answers are primarily related to limited time and access to information resources.

The author has indicated *no* financial relationship or interest with any proprietary entity related to the content of this CME activity.

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**WEB-BASED INFORMATION FOR MEDICAL HOMES.** Chuck Norlin, MD, FAAP,<sup>1</sup> Dustin Whitney,<sup>2</sup> <sup>1</sup>Pediatrics, University of Utah Health Sciences Center, Salt Lake City, UT; <sup>2</sup>Spencer S. Eccles Health Sciences Library, University of Utah Health Sciences Center, Salt Lake City, UT.

**Purpose:** The Medical Home describes an approach to providing comprehensive primary care for children with special health care needs (CSHCN) in partnership with the family. About 13% of US children are CSHCN. Their diagnoses encompass hundreds of conditions, most of which are uncommon. Maintaining up-to-date knowledge of these is difficult. To provide a Medical Home for CSHCN, pediatricians have indicated the need for knowledge of practice guidelines and local resources. We are developing a web-based knowledge resource to provide ready access to reliable and useful information about chronic conditions in children and about community services. Our aim is to extend physicians' abilities to provide comprehensive care for CSHCN.

**Methods:** The MedHome Portal ([www.medhomeportal.org](http://www.medhomeportal.org)) is built in a Model-View-Controller architecture, separating data from code with MySQL and Cold Fusion respectively. Custom tags allow links, documents, citations, and content to be used in multiple locations within the site, and allowing for variations in display format (or view), without duplicating the data. Because each tag accesses a stored entry, only that entry must be updated to change all its references and views. Content is developed in a structured format, much of which lies within the hard-coded HTML. We are preparing to convert the site to a native XML environment, incorporating the structure and custom views into XML schemata and stylesheets. By defining data elements and indexing with Unified Medical Language System tools, we will greatly enhance useful searching of the site's content and enable linking from electronic medical records to relevant content via infobuttons.

**Results:** Though developed as a state resource, we are collaborating with several states on further development and sharing of content and infrastructure. Studying the site's impact on care processes and patient outcomes presents many challenges.

**Conclusion:** This poster is presented in the hopes of stimulating ideas, discussion, and collaborations to improve the implementation of the site and to study its impact on physicians, care, families, and CSHCN. The author has indicated *no* financial relationship or interest with any proprietary entity related to the content of this CME activity.

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**EXPERIENCE WITH CONSULTWIZ – THE SIMULTANEOUS ELECTRONIC NOTIFICATION, DOCUMENTATION, AND TRACKING OF INPATIENT CONSULT REQUESTS.**

**Stuart T Weinberg, MD, FAAP,<sup>1</sup> Kevin B Churchwell, MD, FAAP,<sup>2</sup> Lemuel R Waitman, PhD,<sup>1</sup> Ty Webb.<sup>1</sup>** <sup>1</sup>Department of Biomedical Informatics, Vanderbilt University, Nashville, TN; <sup>2</sup>Department of Pediatrics, Monroe Carrell Jr Children’s Hospital at Vanderbilt, Nashville, TN.

**Case Report:** ConsultWiz is a component of an electronic order-entry system that facilitates and documents requests for medical and surgical consult services in the adult and children’s hospitals. Piloted in the adult Dept of Medicine in Spring, 2005, ConsultWiz was expanded to all remaining adult services in July and all pediatric consult services in October. In six months from October thru April, 2300 pediatric consults were placed, averaging 12 per day. Background, details and issues in the development and implementation of ConsultWiz for pediatrics will be discussed.

**Methods:** Each consultant service was identified with a pager number to be available 24 hours a day and rolled over at all times to the appropriate person covering the service. The user is prompted to select the consult service, priority (Routine, Urgent, or Emergent) and data including reason for consult, call-back number, and other clinical information. Prefilled information includes the name of the person requesting the consult, his/her beeper number, and the name of the attending. Upon submission of the consult request order: 1) a text page is sent; 2) a consult request document containing all data entered in the request is placed in the patient’s electronic chart; and 3) the same consult request document is added to an online worklist for the respective consult service.

**Discussion:** The January 2006 CMS guidelines have resulted in policy changes to mandate the use of ConsultWiz for accurate documentation of inpatient consult requests. Preliminary feedback from users has been positive, but issues raised during implementation have included: 1) the accurate ‘rolling over’ of pagers to ensure the correct notification; 2) the education of providers and consultants that ConsultWiz is not replacing provider-consultant communication; and 3) the change of culture in defining a ‘curbside’ consult versus one to be documented by ConsultWiz. Additional studies will characterize and evaluate the use of ConsultWiz among departments and providers.

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**INFORMATION NEEDS IN PEDIATRIC EMERGENCY DEPARTMENT WORKFLOW.**

**Daniel Langsam,<sup>1</sup> David Kaufman, PhD,<sup>2</sup> Stephen B Johnson, PhD,<sup>2</sup> Peter S Dayan, MD,<sup>3</sup> Eneida A Mendonca, MD, PhD.<sup>2</sup>** <sup>1</sup>Department of Biostatistics, Columbia University School of Public Health, New York, NY; <sup>2</sup>Department of Biomedical Informatics, Columbia University College of Physicians & Surgeons, New York, NY; <sup>3</sup>Children’s Hospital of New York-Presbyterian, Columbia University College of Physicians & Surgeons, New York, NY.

**Purpose:** The availability of timely, accurate information is critical to clinical workflow and proper medical management. This is particularly true in the emergency department, where patient safety depends on time-sensitive decisions made on the basis of limited data. Previous studies have suggested that many clinical information needs go unmet. These studies have relied largely on physician self-reporting, have not sought to capture needs at the time they arise, and have not explored the context in which these needs occur. Our objective is to study information flow in a pediatric emergency department (PED), and to describe the pattern of information needs in the context of daily workflow.

**Methods:** An observational study in the PED of an urban, tertiary care pediatric hospital was conducted over a period of 6 months. The investigators used techniques of ethnographic observation and of shadowing to record clinicians’ information needs as well as narrative histories detailing the context in which the needs occurred. Each need was then categorized according to type, context, method used to address the need, and the degree to which the need was satisfied. A workflow analysis was performed and information needs were analyzed in relationship to the observed PED workflow.

**Results:** Physicians were observed over 11 sessions totaling 25 hours; 30 information needs were recorded. Most information needs were related to diagnosis or treatment. Physicians sought to address the majority of needs by approaching colleagues. Few attempts to access online information resources or perform electronic literature reviews were observed; this appeared to be due mainly to time limitations inherent to the PED environment. We are currently analyzing the context in which information needs occur in relation to PED workflow.

**Conclusion:** Information needs arise continuously in the PED. The results suggest that information technology, if well-integrated with workflow, could contribute to substantial improvement in addressing information needs and may have a positive impact on bringing evidence into clinical practice. The author has indicated *no* financial relationship or interest with any proprietary entity related to the content of this CME activity.

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**ONLINE CALCULATOR FOR INTRAVENOUS FLUID AND ELECTROLYTE MANAGEMENT OF PEDIATRIC DEHYDRATION: A SIMPLE AND ACCURATE APPROACH TO REDUCE MEDICAL ERRORS.** Ravi Mishra, FAAP.<sup>1</sup> <sup>1</sup>Pediatrics, Midwest NeoPed Associates, Ltd, Chicago, IL.

**Purpose:** Severe dehydration from acute diarrhea accounts for more than two million pediatric deaths globally. In developed nations such as US, it accounts for more than 200,000 hospitalizations, and approximately 300 deaths/year (MMWR 2003). Intravenous rehydration, the mainstay therapy for severe dehydration, entails a high risk of errors in calculations leading to electrolyte imbalances and even death. Availability of an online reliable calculator in the public domain is a way to answer this problem globally.

**Methods:** Based on the recent guidelines on IV rehydration therapy, an online calculator was developed at: [http://www.pediatricsandneonatology.com/html/dehydration\\_calculator.html](http://www.pediatricsandneonatology.com/html/dehydration_calculator.html).

It provides stepwise detailed calculations for the rate and type of fluid for IV rehydration. Additional features include adjustments for age, weight, duration of illness, degree of dehydration, serum sodium, IV boluses, rapid hyponatremia correction, fever, SIADH, humidification and oral rehydration therapy calculations.

3 sample problems and answers from The Harriet Lane Book (17th Edition), covering isonatremic, hyponatremic and hypernatremic dehydration were selected as a control for calculations.

This was then compared to the only available another online calculator from <http://www.medcalc.com/pedifen.html>, for online implementation.

**Results:** No significant differences were obtained between our calculator and the answers from the book, except regarding choice of fluid in hyponatremic dehydration, as we have avoided hypotonic solution in hyponatremic dehydration correction (Moritz and Ayus 2003).

The MedCalc hypernatremia calculations was significantly different from the book as MedCalc corrects deficit in 24 hours, instead of 48 hours.

Additionally, our calculator has more features & ease of use than MedCalc.

No inter-user and intra-user variability seen.

**Conclusion:** Our calculator is fast and reliable for IV rehydration therapy. It provides a novel approach in health informatics to tackle a serious global problem.

The author has indicated *no* financial relationship or interest with any proprietary entity related to the content of this CME activity.

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**ADAPTING AN ENTERPRISE EMR TO THE NICU: USE OF A HELPER APPLICATION.**

William MacKendrick, MD, FAAP,<sup>1</sup> Matthew Derrick, MBBS.<sup>1</sup> <sup>1</sup>Pediatrics, Evanston Northwestern Healthcare, Evanston, IL.

**Purpose:** Enterprise-wide EMR products are beginning to be deployed in NICUs. These products are not usually designed to adequately address the unique informatics needs of the NICU environment. We report the use of an auxiliary database application that is used in conjunction with an enterprise EMR solution to provide the necessary informatics functionality in the NICU.

**Methods:** In 1997, our neonatology division began using an in-house Microsoft Access database application to capture and track clinical data in real time. In 2003, our institution deployed a comprehensive EMR system. When the EMR was deployed, we determined that it did not provide needed informatics functionality for neonatal patients. Workflow analysis demonstrated that the missing functionality could be supplied by running our legacy Access database application in tandem with the EMR on the same hardware

device. Simple means of bidirectional data transfer were devised using the copy/paste functionality of the Windows clipboard object.

**Results:** The key informatics elements supplied by the Access database application include: capture and analysis of nutritional information; display of growth charts; capture of respiratory support information and key lab values for trend analysis; and capture of professional billing codes with automatic code checking using business rules. A software algorithm synthesizes a progress note from user-entered data and text and copies the note to the Windows clipboard, allowing it to be pasted into the EMR. Data is abstracted from the EMR using a text template that is copied to the Windows clipboard and analyzed by a software algorithm that parses out the data into fields in the Access database. Since mid-2003, over 36,000 records containing data on over 1400 patients have been written to the Access database.

**Conclusion:** Enterprise-level EMR systems may not adequately address the informatics needs of specialized environments such as the NICU. Our experience demonstrates that use of helper applications can augment EMR functionality without requiring construction of custom interfaces.

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**KIDSGROWTHTOOLKIT.COM: A NEW INTERACTIVE WEBSITE FOR HEALTHCARE PROFESSIONALS.** Harold S Starkman, MD, FAAP,<sup>1</sup> Daisy Chin, MD,<sup>1</sup> <sup>1</sup>Division of Pediatric Endocrinology, Goryeb Children's Hospital, Morristown, NJ.

**Purpose:** Short stature in childhood can be a variant of normal growth or a pathologic finding, requiring therapeutic intervention. Evaluation of children with short stature and/or growth disorders is often delayed due to long intervals between pediatric visits as well as difficulties in triaging and assessing these children. Recommendations for management of children with growth disorders have recently changed due to the development of newer diagnostic tools and changing indications for treatment.

Although growth patterns can be strong indicators of short stature causation, there are few dynamic tools for incorporating this information into a management algorithm. This is especially true for children with less common genetic syndromes where short stature may be a primary clinical finding. Although there are references on the evaluation and treatment of growth disorders, there is no comprehensive on-line guide focusing on individual case management.

**Methods:** Kidsgrowthtoolkit.com, is a new interactive website developed for pediatricians and other primary care providers to assist in the evaluation of growth. The site allows the provider to generate lists of differential diagnostic possibilities from common growth curves, with diagnostic and therapeutic recommendations provided for each diagnosis. A "Photo Gallery" section allows the clinician to view typical facial features of syndromes associated with short stature. Clicking on these photos gives additional information about these syndromes including work-up and treatment. A "Growth Calculator" section allows the clinician to predict adult height from bone age and mid-parental and target heights. Reference sections include information on normal and abnormal growth, diagnostic tools and therapy.

**Results:** Kidsgrowthtoolkit.com was posted in January 2006, and made available free of charge to interested providers. Feedback to date has been positive.

**Conclusion:** Kidsgrowthtoolkit.com is a new tool for the management of growth disorders. It may serve as a model for other web-based pediatric programs.

The author or immediate family member has a financial relationship or interest with a proprietary entity producing health care goods or services related to the content of this CME activity. The financial relationships are identified as follows: Novo Nordisk Pharmaceuticals; Unrestricted Educational Grant for Development of website Unrestricted Educational Grant

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**CREATING A WEB SITE FOR PEDIATRIC HEALTH CARE PROVIDERS AND FAMILIES: AN ITALIAN EXPERIENCE IN PEDIATRIC ONCOLOGY.** Paola Sabrina Buonuomo, MD,<sup>1</sup> Antonio Ruggiero, MD,<sup>1</sup> Giuseppe Barone, MD,<sup>1</sup> Emanuele Ausili, MD,<sup>1</sup> Riccardo Riccardi, Prof.<sup>1</sup> <sup>1</sup>Pediatric, Pediatric Oncology, Catholic University of Rome, Rome, Italy.

**Purpose:** Parents of children with cancer go online to search for information related to their child's disease, diagnostic and therapeutic methods, and to get emotional support. In addition, general paediatricians who take care of their oncologic patients sometimes need to have much more information. Today information on the Internet is poorly organized, rapidly growing, and of questionable authority.

Studies have shown that in its current form, it is difficult to use the Internet to obtain correct answers to questions.

**Methods:** In march 2006 we created a prototype of our web site ([www.neuroncologia.it](http://www.neuroncologia.it)) with the aim to bring order to the chaos of the Internet medical resources.

It provides current, authoritative, easily accessed pediatric information whenever and wherever physicians and families want. Contents are divided between information created for health care providers and for patients, curated into digital libraries by structured approaches. It is also possible to obtain information regarding the new trend in innovative research. Since in Italy is not present a general database for new drugs used as innovative therapy for rare disease, we created a special catalogue describing clinical trials using new drugs and protocols for pediatric age. Information is provided only in Italian language, but in the next future we have in mind to translate all contents in English, French and Spanish to offer the possibility of accessing information also to Immigrate population living in Italy.

**Results:** The preliminary data provided by family caregivers and oncology healthcare providers who are participating at this time in user testing support the feasibility and usability of prototype.

**Conclusion:** Ongoing development of our Web site will provide an innovative approach to assist family and physicians of children with cancer in meeting important information about rare conditions and innovative therapy, and will provide evidence in design and development of Internet medical web sites. The author has indicated *no* financial relationship or interest with any proprietary entity related to the content of this CME activity.