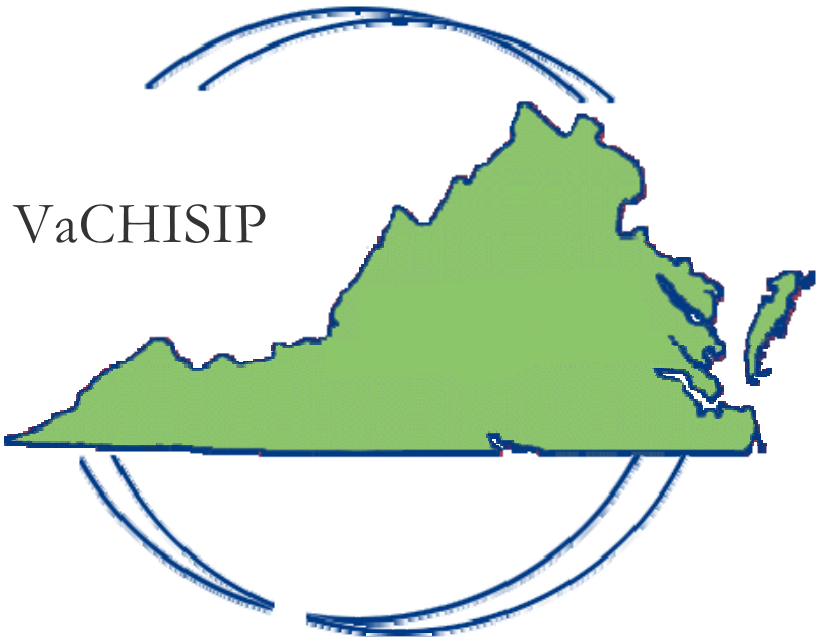
Virginia Department of Health
Division of Child and Adolescent Health

VIRGINIA CHILD HEALTH INFORMATION SYSTEM INTEGRATION PROJECT:

Manuscript on Redesigning the Virginia Infant Screening and Infant Tracking System



April 15, 2010

Section 1. Overview

Introduction. This manuscript provides a description of the processes that were used to produce and implement a redesigned Virginia Infant Screening and Infant Tracking System (VISITS II), which is a Web-based integrated database system that tracks and supports several child health programs.

VaCHISIP. The redesign of VISITS was done under the auspices of the Virginia Child Health Information Systems Integration Project (VaCHISIP) within the Virginia Department of Health (VDH), Office of Family Health Services (OFHS), Division of Child and Adolescent Health (DCAH), Genetics and Newborn Screening (then Pediatric Screening and Genetic Services). Genetics and Newborn Screening includes the Virginia Early Hearing and Intervention Program (VEHDIP) and the Virginia Congenital Anomalies Reporting and Education System (VaCARES), which is Virginia's birth defects registry. VaCHISIP was funded by a 3-year cooperative agreement between VDH and the Centers for Disease Control and Prevention (CDC), Early Hearing Detection and Intervention Tracking, Surveillance and Integration, under Program Announcement No. 05028, for budget period starting July 1, 2005, and ending June 30, 2008. During the final year of the budget period, CDC awarded VDH a no cost extension through June 30, 2009.

VEHDIP and VaCARES. VEHDIP was established by the Code of Virginia "for the purpose of identifying and monitoring infants with hearing impairment to ensure that such infants receive appropriate early intervention through treatment, therapy, training, and education." VaCARES was established by the Code of Virginia "in order to collect data to evaluate the possible causes of birth defects, improve the diagnosis and treatment of birth defects and establish a mechanism for informing the parents of children identified as having birth defects and their physicians about the health resources available to aid such children."

Purpose of VISITS I and VISITS II. The purpose of VISITS software (VISITS I and II) is to create a single record for infants and children reported to VEHDIP and VaCARES so that VDH can provide these children and their families with necessary follow-up services and enhanced care coordination. In addition, child health workers and policy makers can use VISITS to extract aggregate, non-identifiable data for conducting needs assessments, planning services for children with special health care needs, targeting prevention efforts, providing surveillance

and evaluation, responding to constituent questions, and satisfying state and federal funding requirements. VISITS indirectly supports the Virginia Newborn Screening Program (then Virginia Newborn Screening Services) because data from that program's database, STARLIMS (the state laboratory's information management system for newborn bloodspot tests), are uploaded into VISITS II for associated VaCARES parent contact activities.

VISITS I Development. VISITS I was a Web-based tracking and data management system. It was developed by VDH through a contractual agreement with Health Informatics at the Children's Hospital of The King's Daughters (later transferred to Welligent, Inc.) under the leadership of DCAH and in collaboration with the Virginia Department of Mental Health, Mental Retardation and Substance Abuse Services (now Virginia Department of Behavioral Health and Developmental Services).

VISITS I Release. VISITS I was released statewide in 2002, at which time hospitals began reporting VaCARES and VEHDIP data to VDH online. In addition, in-house staff uploaded Virginia Newborn Screening Program data from STARLIMS into VISITS I. In 2004, VDH piloted a VISITS I At Risk module that automatically and semi-automatically referred children at risk for developmental disorder to Part-C Early Intervention (Part-C EI). Security measures included firewall protection, 128-bit encryption, unique user names and passwords, assigned security rights, and HIPAA compliance.

VISITS I Funding. VISITS I funding sources were diverse and included (1) US Department of Health and Human Services (USHHS), Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB) Title V MCH Block Grant; (2) Virginia Department of Mental Health and Mental Retardation Substance Abuse Services – Infant and Toddler Connection of Virginia; (3) a 4-year grant awarded by USHHS, HRSA MCHB (Universal Newborn Health Screening Project); and (4) a 3-year Centers for Disease Control and Prevention (CDC) birth defects surveillance and prevention grant (Virginia Congenital Anomalies Tracking and Prevention Improvement Project).

VISITS II Development. Like VISITS I, VISITS II is a Web-based tracking and data management system. It was developed by VDH Office of Information Management (OIM) through a contractual agreement with DCAH. Unlike VISITS I, VISITS II has been integrated with the new Electronic Birth Certificate (EBC). Both VISITS II and EBC are modules of the

Virginia Vital Events and Screening Tracking System (VVESTS). Listed below are major accomplishments that occurred during the VISITS II development process.

- Integrated VISITS II with the new EBC.
- Completed data conversion of all VISITS I records into VISITS II.
- Completed programming changes in both VISITS II and the Care Connection for Children (CCC) database, Care Connection for Children System Users Network (CCC-SUN). These programming changes will allow for automatic referrals of children with certain birth defects to CCC, which is a statewide network of regional programs that provides care coordination and other support services for children with special health care needs and their families.
- Incorporated better quality control and quality assurance programming functions for improving data quality.
- Incorporated improved security, capability for database linkage/integration, change management processes, user interface, and reporting functionality.

VISITS II Release. Following the statewide phase-in implementation of the VVESTS EBC module, VISITS II was released statewide on April 12, 2010, at which time all reporting hospitals switched from entering VaCARES and VEHDIP data into VISITS I to VISITS II, and in-house staff switched from uploading Virginia Newborn Screening Program data into VISITS I to VISITS II.

VISITS II Funding. Major funding for VISITS II development was provided by the 3-year cooperative agreement between VDH and CDC that funded VaCHISIP.

VISITS II Future Supported Programs. Within the next year, VISITS II will support two other programs through linkage or data matching processes: (1) CCC, by supporting automatic referrals of children with certain birth defects to CCC via linkages between VISITS II and CCC-SUN databases, and (2) Part-C EI, by supporting referrals of children with hearing loss from VEHDIP to Part-C EI through a data exchange and data matching system between VISITS II database and the Part-C EI database, Infant and Toddler Online Tracking System (ITOTS).

VISITS II Changes and Delays. The target date for statewide implementation of VISITS II was originally scheduled for June 30, 2008. This date corresponded to the end of the 3-year cooperative agreement that funded VaCHISIP. The major project change, which caused the major project delay (i.e., VISITS II implementation), was the decision to integrate VISITS II with the new EBC. It was decided by the VaCHISIP Steering Committee and Project

Development Team that although the integration of both applications would result in delaying the implementation of VISITS II, the advantages of integrating VISITS II with the EBC—including a more robust VISITS II application that would minimize duplicate records—were greater than the disadvantages of a delayed start-up date. The new EBC began to be implemented statewide on a phase-in basis as follows: in-house implementation was executed during the weekend of May 31, 2009, and hospital implementation was executed from the first week of November 2009 through December 14, 2009. Statewide implementation of VISITS II occurred on April 12, 2010.

Planned Linkages Not Implemented. Two originally planned database linkages will not be implemented: (1) VISITS II - ITOTS and (2) VISITS II – LeadTrax. The planned linkage between VISITS II and ITOTS databases, for the purpose of automatically referring children who are at risk for developmental delay to Part-C EI, was deemed to be not feasible because VISITS II and ITOTS are not aligned as the two systems are on separate servers and operated by separate agencies. Instead of a referral linkage system, VDH will be able to notify Part-C EI of infants and young children diagnosed with hearing loss and VDH will receive notification from Part-C EI that the referred infants and young children were enrolled through a data exchange and data matching system. The current manual system for referring infants and young children diagnosed with hearing loss from VEHDIP to Part-C EI will continue until the VISITS II – ITOTS data exchange and data matching system is in place. The other planned database linkage, VISITS II – LeadTrax, will not be implemented because it was determined that it would not be beneficial; instead, project resources were directed to develop and implement the VISITS II and EBC integration.

Section 2. Process

Need for Redesign. VISITS I needed to be redesigned to (1) minimize the number of infants lost to follow up; (2) expand referrals of identified children with special health care needs to the appropriate source for intervention and/or care coordination; (3) improve the mechanism for identifying infants and children with late onset or progressive hearing loss; (4) modify the birth and death certificate linkages methodology for ensuring unduplicated individual identifiable data; (5) comply with requests for hearing screening and birth defects registry data; (6) expand

integration and linkages with other surveillance systems; (7) ensure high-quality data; and (8) improve efficiency, security, and cost effectiveness.

Organizational Structure. VISITS II development was a collaborative project between DCAH and OIM through an intra-agency contractual agreement. Internal and external users provided usage scenarios that drove the creation of acceptance tests. Expert consultation was provided by OFHS Maternal and Child Health Epidemiologist and the contract Geneticist (MD, MPH).

Communication Structure. A VISITS Redesign Network was established that included the following entities: (1) Project Steering Committee, which monitored the progress of VaCHISIP to ensure its success; (2) Project Development Team, which developed and implemented required VISITS II application solutions according to specifications and standards; and (3) Project User Groups, which reviewed prototypes, participated in VISITS record deduplication and conversion processes, conducted user tests, and participated in user trainings.

VISITS II Redesign Process. VISITS II redesign was an iterative process. Each VISITS II component went through multiple iterations before production release. The iterative process included the following components**:** (1) Fast Track Oracle Method, which involved using reusable system components (common logic that can be reused by multiple applications to standardize business processes, calculations, etc.); (2) User Group Meetings, which involved Project User Groups and Project Development Team; (3) Prototypes, which were representations of the User interfaces for the application (i.e., the programmers' interpretation of the users' requirements built to elicit user input); and (4) Visual Implementation, which involved demonstrating the product prototypes before actual implementation.

Activities. Key activities that were accomplished during planning and implementation processes are listed below according to VaCHISIP budget years.

Year 1: July 1, 2005 – June 30, 2006

1. Completed the Memorandum of Agreement between DCAH and OIM, which was renewed for each of the VaCHISIP budget periods, including the year-4 no cost extension.
2. Established the VaCHISIP Steering Committee, which was convened on a monthly basis throughout the project to monitor project activities and address issues as they arose.
3. Established the Project Development Team for the purpose of developing and implementing the required solutions according to specifications and standards, including:

- Quality assurance software elements.
- Quality control software elements.
- Agency information technology and non-technology security requirements.
- Routine tracking and surveillance reports.
- Ad hoc query capability.

  Note: The ability to extract up to 25 variables was incorporated into the VISITS II Requirements Document. In addition, data from EBC and VISITS II are now included in the OFHS Data Mart, which expands the availability of ad hoc reporting.
- Accurate tracking and surveillance of unduplicated individual identifiable VEHDIP and VaCARES data requirements.
- Electronic linkage with CCC-SUN.
- Electronic integration with EBC, which replaced the planned VISITS II - LeadTrax linkage.

4. Completed the Project Charter, which was signed in year 2 (see Appendix 1. Project Charter).
5. Drafted the VISITS II Requirements Document, which was completed in year 2 (see Appendix 2. VISITS II Requirements Document).
6. Proposed legislation, which was passed by the 2006 Virginia General Assembly, that would authorize hospital users who enter VaCARES data into VISITS to view certain personally identifiable information in the system (see Appendix 3. Code of Virginia, underlined sentence).

   Note: Passage of this legislation allowed for VISITS II design changes to reduce duplicate records.
7. Initiated plans for the modification of VISITS II that would allow for the integration of VISITS II with the EBC.
8. Completed an evaluation of VaCARES, which was based on the standard guidelines for evaluation surveillance systems by the Centers for Disease Control and Prevention[1] (see Appendix 4. VaCARES Evaluation).

[1] Centers for Disease Control and Prevention. Updated Guidelines for Evaluating Public Health Surveillance Systems: recommendations from the guidelines working group. MMWR 2001; 50 (No. RR-13): [4-25].

- *Note:* VaCARES evaluation findings were incorporated into the VISITS II Requirements Document.

Year 2: July 1, 2006 – June 30, 2007

1. Completed the VISITS II Requirements Document.
2. Initiated the programming phase of VISITS II.
3. Completed the initial prototypes of VISITS II and initiated testing by in-house user groups.
   - *Note:* At least five formal meetings between the VISITS in-house user groups and OIM were convened, during which business processes were clarified and prototypes demonstrated. Hospital user groups were convened during year 5 for final testing.
4. Identified potential new database linkages from existing statewide child health databases.
   - *Note:* The OFHS Data Mart was created to facilitate linkages among various health department datasets. The Data Mart will enable VISITS II to expand its linkages to other databases and strengthen VEHDIP and VaCARES case ascertainment, follow-up, quality improvement, and surveillance and evaluation activities. Currently, the Data Mart has access to the following databases: Virginia Health Information, which includes all hospital discharge data; Virginia Death Certificates, which includes all death records; Virginia WIC Program, which includes all Virginia WIC records such as children's body mass index; and STARLIMS (snapshot), which contains newborn bloodspot diagnosed case records. Beginning July 2010, the Data Mart will include access to the Virginia Information Immunization System (snapshots), which contains immunization data of persons of all ages.
5. Established and convened the VISITS I Deduplication Team, which completed the deduplication plan.

Year 3: July 1, 2007 – June 30, 2008

1. Partially completed deduplication of VISITS I records.
2. Completed the major programming phase of VISITS II, including integration with the new EBC.
3. Completed plans for conversion of VISITS I records into the VISITS II database.
4. Completed plans for linking VISITS II with CCC-SUN.
5. Initiated VISITS II beta testing with in-house user groups and corrected identified defects.
6. Completed DCAH business rules for manual referrals to Part-C EI and for automatic referrals to Part-C EI via VISITS II – ITOTS linkages.

- *Note:* Manual referrals to Part-C EI of children who were less than or equal to 36 months of age and had certain hearing disorders continued, and manual referrals were planned to be replaced by automatic referrals after the VISITS II - ITOTS linkage was completed.
- *Note:* Manual referrals to Part-C EI of children who were less than or equal to under 36 months of age and at risk for development disorders (other than those with hearing disorders) were not being done; however, automatic referrals were planned to be implemented after the VISITS II - ITOTS linkage was completed.

7. Completed an evaluation of CCC-SUN to determine if it needed to be redesigned.
8. Received reply from the Attorney General Office that a change in the Code of Virginia was not needed to allow VDH to automatically refer children diagnosed with birth defects and identified through VaCARES to CCC.
9. Completed an evaluation of VEHDIP, which was based on the standard guidelines for evaluation surveillance systems by the Centers for Disease Control and Prevention (see Appendix 5. VEHDIP Evaluation).
    - *Note:* VEHDIP evaluation findings were incorporated into the Requirements Document.

Year 4: July 1, 2008 – June 30, 2009 (No Cost Extension)

1. Continued multiple rounds of VISITS II beta testing with in-house user groups and continued to complete corrections to defects.
2. Completed programming for the automated CCC-SUN referrals between VISITS II and CCC-SUN with the release of VISITS II Beta 2.3, and finalized the DCAH business rules for manual referrals to CCC and automatic referrals to CCC via VISITS II – CCC-SUN linkage.
3. Conducted security testing of VISITS II User Roles and Privileges.
4. Initiated statewide implementation of the new EBC on a phase-in basis.
5. Initiated the process of VISITS I records deduplication for conversion into the VISITS II database according to data deduplication rules, which were developed by the VaCHISIP team (see Appendix 6. VISITS I Data Deduplication Rules).
6. Leveraged additional funds to support ongoing improvement of VISITS II.
    - *Note:* A 3-year CDC cooperative agreement was awarded to VDH to fund VaCHISIP II, which includes assessing the desire and need for audiologists and primary care providers to access VEHDIP data online.

Year 5 – July 1, 2009 – April 30, 2010 (Beyond No Cost Extension)

1. Initiated plans with the Virginia Department of Behavioral Health and Developmental Services to revise the data sharing agreement to meet VEHDIP and Part-C EI data sharing needs.
2. Completed matching of VISITS I records to birth certificate records (see Table 1. Matching Summary of VISITS I Records with Vital Records Data).
    - *Note:* Using linkage software from a VDH Co-Morbidity grant, about 85% of the VISITS I records were linked to birth certificates.

Table 1. Matching Summary of Visits I Records With Vital Records Data

Clients Category	Total Count	Percentage	OIM Comments
Total number of VISITS qualified clients.	192,463	100.00%	Clients with screenings and contacts and CID in seven digits.
Total number of clients MATCHED with Vital Records birth record.	178,532	92.76%	Child and/or or parent information are reused from VITAL RECORDS data.
Total number of clients NOT-MATCHED with Vital Records birth record.	13,931	7.24%	Converted a VISITS Child.

3. Completed the last rounds of VISITS II beta testing with in-house user groups and completed corrections to defects.
4. Completed deduplication and conversion testing.
    - *Note:* Extensive data cleaning and preparation was conducted on VISITS I data prior to conversion to improve data quality and reliability going forward in VISITS II. These data assessment and clean up exercises covered three broad areas: general data clean up and mapping, identification of duplicate records, and identification of birth certificate records matches. OIM and DCAH identified issues related to data quality such as missing data, illogical data related to dates, and conversion of free text into mapped fields. Approximately 467,000 data fields were modified to improve data quality. Duplicate records, a known issue in the system, were identified through a series of eight queries developed using different combinations of variables. Over 22,000 unique client records were reviewed as potential matches. Some identification of duplicates could be automated, while others required manual review. A total of 8,180 of these were found to be duplicates and merged into existing records. In addition, 795 client records were

deleted due to duplicative or missing information. The third major exercise involved matching VISITS I clients to Virginia Vital Records birth certificate records. A total of 178,532 out of 192,463 VISITS clients were linked to birth certificate records for a match rate of 93%.

5. Completed a survey of computers used by hospital users.
    - *Note:* The survey identified 20 hospital users who were either working out of their home office using a hospital computer or were using their own personal computer. Afterwards, the VDH security committee addressed this issue because a security certificate needed to be installed in all computers where VISITS II data would be entered.
6. Implemented statewide training on VISITS II for hospital users.
    - *Note:* Eight three-hour training sessions were convened throughout Virginia on four separate dates, with each date offering a morning and an afternoon session as follows: (1 and 2) February 15, 2010, Prince William Hospital (northern Virginia); (3 and 4) February 17, 2010, Office of Vital Records (central Virginia); (5 and 6) February 18, 2010, Sentara Virginia Beach General Hospital (eastern Virginia); and (7 and 8) February 24, 2010, Carilion Roanoke Memorial Hospital (western Virginia). Training was provided by OIM and DCAH staff and was targeted to anyone who enters data for either VEHDIP or VaCARES (see Appendix 7. VISITS II Power Point). A Take Home Training Packet was provided to each participant, which included the following items.
        (1) Welcome letter, which included the VISITS II URLhttps://vr-fhs.vdh.virginia.gov, explanation of the need to have a representative of their facility install a security certificate on the computer that will be used to enter data, explanation of the new security agreement and logon access forms that need to be signed by users and their supervisors, and information about transferring user ids and passwords to VVESTS once security documents are received by VDH.
        (2) User Training Exercises, which included exercises on resetting the user's password the first time the user enters the new application, registering a child entirely through VISITS II or searching for a child that was already registered as an EBC client, entering discharge summary data, entering initial hearing screening data, entering hearing re-screening data and viewing a summary page, running hospital hearing screening reports, entering VaCARES/Birth Defects data, running VaCARES hospital

reports, creating a new client record, creating or associating a mother to a VISITS client, creating a primary contact for a VISITS client, creating a provider record for a VISITS client, viewing summary data for a VISITS client, and entering client transfer data.

(3) Information Systems Security Access Agreement Form, which describes terms that govern a users access to and use of the information and computer services of VDH. All system users are required to sign the form before they are allowed to use the application.

(4) VISITS Hospital User Logon Request Form, which designates the role(s) that will be assigned to hospital users: Basic Login Role, which is assigned to all hospital users of the application; Hospital Hearing Role, which is assigned to hospital VEHDIP application users; and Hospital VaCARES Role, which is assigned to hospital VaCARES application users. All system users are required to sign the form before they are allowed to use the application.

(5) Instructions to Logon to the VISITS Practice Web site, including logon screen shots.

(6) VISITS Hospital Training Evaluation Form.

(7) Hospital Training CD: "VISITS Application User Guide," which includes all of the training materials that were published online.

7. Published training materials online at http://vrfhs.vdh.virginia.gov/training.htm (see Appendix 8. VISITS II Training Materials). These materials include the following documents, which also highlight aspects of the application that are used by hospital users—both those who enter hearing screening data and those who enter VaCARES data.

- VISITS II Introduction: An introduction to the new VISITS application, main features of the new application, and how VISITS II is distinguished from VISITS I.
- Application Terminology: Terminology used in Web applications and description of the VISITS II application page layout.
- Login and Message Center: Login procedures, password rules, and how to use the message center.
- Child Registration (EBC): Registration of a child by querying an existing child from the EBC, including mother, father, contact, and provider information.

- Hearing Screenings: How to enter hearing screening information once the child has been registered.
- Hospital Hearing Reports: How to use parameter forms and generate hearing screening reports.
- Child Registration (VISITS): How to complete the child registration process in its entirety through VISITS II.
- VaCARES Data: How to enter VaCARES data once the child has been registered.
- Hospital VaCARES Reports: How to use parameter forms and generate VaCARES Reports.
- Child Transfers (In-State): How to enter information regarding child transfers to an in-state hospital.

8. Released VISITS II statewide on April 12, 2010.
9. Initiated plans for developing a survey to assess user satisfaction in 3-6 months.
10. Completed an informal survey of in-house users two days after VISITS II was implemented.
    - *Note:* Survey comments are listed in the paragraph labeled “Initial Impressions of VISITS II.”

VISITS I and VISITS II Comparisons. VISITS II application includes the following enhancements:

- Minimizes duplicates with the help of various validation at the time of data entry itself.
- Efficiently and effectively tracks every child born in a Virginia hospital, which was made possible with the integration of the EBC and VISITS II modules of the VVESTS application.
- Increases data quality.
- Decreases the need to continuously contact hospital users to "verify" hearing status results on each child.
- Provides adequate and timely services and referrals to families.

Table 2, which appears on the next page, presents a summary of the major differences between the VISITS I and VISITS II applications.

Table 2. VISITS I and VISITS II Comparisons

VISITS I	VISITS II
• Search for existing child only includes persons from log on facility resulting in duplicates and confusion about transfers.	• Search for child includes all entries in Virginia Vital Records Electronic Birth Certificate System. • Due to changes in Code of Virginia, users can access basic demographics across all facilities. • Child and family identifying information and demographics only have to be entered one time for Vital Records, Newborn Hearing Screening, and VaCARES.
• Initial hearing screening and transfers hearing screenings can get confusing with multiple facilities.	• Initial hearing screening can only be entered one time, and once an infant is transferred, the record is locked except to the transfer hospital thereby reducing confusion among those who are responsible for next screening entry.
• Hearing hospital users may have to keep own tally to report statistics to VDH.	• Children with no known hearing screening status will automatically pop up so that hospitals will have clear information on which children still need to have their follow-up data or results entered.
• Many fields are free text such as transfer hospital.	• More fields have a list of values to choose from such as transfer hospital.
• VaCARES accepts all ICD codes.	• VaCARES accepts only mandated ICD codes and now accepts the same code for two different hospitalizations reducing confusion about data entry.
• Users have to scroll down to see case status information.	• Users will have summary of child at top of screen with current case status. • Important information such as child closed in system or deceased will be easy to see.
• Current system has no date validations and entries can be made for admit, screening, or discharge prior to DOB.	• Date validations will not allow wrong or illogical dates to be entered.
• Client summary is not in chronological order of events.	• Client summary will be in chronological order of events, which will help users easily understand history and next steps.
• Users have to search to see risk indicators and it is unknown which risk indicators are still valid.	• Risk indicators will be viewable on every screening and can be modified according to current circumstances.
• Risk indicator screen contains a lot of text.	• Risk indicator screen is reformatted for multiple check boxes and is easier to read. Risk indicator list is being modified according to most current Joint Committee on Infant Hearing standards.

Initial Impressions of VISITS II. While a formal survey of VISITS II users will not be done until 3-6 months after the VISITS II release date, a brief informal survey of internal users was conducted two days after VISITS II was released. The survey took the form of brief, informal face-to-face interviews in which the following two questions were asked by the Genetics and Newborn Screening Director: (1) What do you like about VISITS II, especially in comparison to VISITS I? and (2) What do you not like about VISITS II? The following DCAH staff participated in the interviews: VEHDIP Manager, VEHDIP Data Manager, VEHDIP Follow-up Analyst, VEHDIP Support Technician, VaCARES Support Technician, and DCAH Surveillance and Evaluation Coordinator. Below is a summary of participants' comments:

- All reported that, overall, VISITS II is much better than VISITS I.
- All reported that VISITS II was much faster than VISITS I; e.g., finding a child in the system.
- All reported pre-written reports functionalities, which allows in-house users to generate their own reports rather than having to rely on surveillance staff to generate reports (as was done in VISITS I), were user friendly and more efficient.
- Some reported that VISITS II screens were crisper than VISITS I screens; however, all reported some type of visual design issue(s) with VISITS II.
- Linking VISITS II data to EBC data improved the quality of VISITS II data in comparison to VISITS I data, which were not linked to the EBC. For example, VISITS II provides better parent data because some data that was usually missing in VISITS I is now pulled from the EBC into VISITS II.
- Search capability is much more flexible in VISITS II than it was in VISITS I.
- VISITS II requires hospitals to report hearing screening results on all children; whereas, children who passed their initial hearing screen were not entered into VISITS I.
- The VEHDIP Support Technician reported receiving about 30-40 unsolicited comments from hospital users. Most of their comments focused on the following issues:
    - Some users reported being confused over the difference between the VISITS Information Systems Security Access Agreement and the VISITS Hospital User Login Request Form.
    - Most users reported that once they got into the system and successfully entered a child's information, they liked VISITS II.

- Some users reported there was a long waiting time for the telephone helpline. Some of those who waited too long, hung up and called the VEHDIP Support Technician because they were used to getting help from that staff member under VISITS I.
    - *Note:* Under VISITS II, hospital users are supposed to call the agency helpline numbers for assistance with password and application questions. This issue will soon be addressed by changing to a call-in helpline triage system.
- The VaCARES Support Technician reported receiving the following unsolicited comment via email:

    "Boy, this new process works SO much nicer than the old one! But I have more questions: on the current provider information should I be adding CHKD as the current provider? The record I am currently in will not let me do that, but I did do it on another client (which had "unknown facility" in that data field. There was no MD listed in the one I changed so perhaps that is the difference, because I did not have to click on the add button for that one). Did I do the wrong thing? Should that field be left as is? What qualifies for changing or adding to it? I thought this would probably just add another provider to a list?"

Section 3. Future Enhancements and Evaluations

VISITS II Enhancements. Ongoing improvements are planned based on users' evaluation of the application. Within the next 3-6 months, a formal review and analysis of the VISITS Hospital Training Evaluation forms, which were completed by training participants, will be done to identify areas needing improvement. The training evaluation form included the following questions: (1) On a scale of 1-10, please rate the overall application. (2) Did you like the look of the screen? (3) Did the application flow well? (4) Was the application intuitive? (5) What was your least favorite thing about the application? (6) What was your favorite thing about the application? (7) Would you like to see anything added to the application? and (8) Rate your training experience on a scale from 1 – 10. Additionally, a formal survey of hospital users will be conducted to elicit additional feedback about VISITS II, with feedback from in-house users of the application. Based on such feedback, improvements to VISITS II will be planned and implemented using available funds. Major enhancements will be incorporated into VISITS III.

VISITS III. With major funding support from a CDC EHDI cooperative agreement, VDH is assessing the feasibility of developing VISITS III Audiologist and Birth Center Reporting Modules for audiologists and birth centers to report hearing screening data online. Additionally, VDH is assessing the feasibility of providing primary care providers with an online method of having direct access to child-specific hearing screening information, such as using the VDH Virginia Immunization Information System (VIIS) as a portal to VEHDIP data through a VISITS III – VIIS linkage.

VISITS II Measurement Criteria. The following measurement criteria, which were developed at the start of the project, need to be measured to more objectively determine the success of VISITS II. Likely, these criteria will be measured one year after VISITS II release.

- VISITS II birth and death certificate matching and deduplication processes result in 95% confidence intervals for birth defect, fatality, and mortality rates.
- VDH end users report that VISITS II performance attributes—which include simplicity, flexibility, data quality, acceptability, sensitivity, positive predictive value, representativeness, timeliness, and stability and availability—are improved.
- VISITS II hosting, security, and maintenance/update costs are decreased by at least 10%.
- Number of infants receiving follow-up testing before 3 months of age is increased.
- Number of infants and children receiving VEHDIP follow-up services is increased.
- Number of infants being tracked by VEHDIP and lost to follow up is decreased.
- Number of infants and children identified at risk of developmental delay and are referred to Part-C EI is increased.
- Number of infants and children identified with late onset or progressive hearing loss and reported to VDH is increased.
- Letters to parents of children with selected birth defects are reinstated by VaCARES and sent to parents within 3 months of the identification of birth defect.
- Data requests from the CDC, National Birth Defects Prevention Network, and March of Dimes for EHDI, birth defect, and neural tube defect data, respectively, are provided.
- All ad hoc data requests from customers are provided via VISITS II data queries.
- VEHDIP annual reports continue, and VaCARES annual reports are initiated.
- 100% of infants and children who have hearing loss are referred to Part-C EI.
- 100% of infants and children with selected birth defects are referred to CCC

Section 4. Conclusion

Improved Application. Compared with VISITS I, initial critiques of VISITS II by in-house and some hospital VISITS II users have indicated that it is a much better application than VISITS I. While the start-up date was delayed by 22 months due to changing the redesign to be integrated with the new EBC, the final product is a more robust application that minimizes duplicate records and enhances data quality. Other enhancements include improved security, search capabilities, report-generating functions, and speed. Additionally, VISITS II programming will allow for future data linkages with other child health databases.

4/22/2010 Correction: VISIT II implementation was not delayed due to the redesign with EBC but because there were implementation delays with EBC due to infrastructure solution problems. Northrop Grumman, which works for the Virginia Information Technologies Agency (VITA), Virginia's consolidated information technology organization, was charged with providing a secure infrastructure deployment of EBC and they proposed three different solutions that did not work causing a delay in the implementation of EBC not the design. OIM could not have deployed VISIT II without EBC being live since VISITS II records are now matched the child records with EBC. Therefore, OIM had to wait until the EBC implementation was complete to schedule the VISITS II roll-out.

Appendices

Appendix 1. Project Charter

Appendix 2. VISITS II Requirements Document

Appendix 3. Code of Virginia

Appendix 4. VaCARES Evaluation

Appendix 5. VEHDIP Evaluation

Appendix 6. VISITS I Data Deduplication Rules

Appendix 7. VISITS II Power Point

Appendix 8. VISITS II Training Materials