

Maryland Department of Health and Mental Hygiene

Project Narrative

MD EHDI Online Data Management

CDC Early Hearing Detection and Intervention (EHDI) Tracking, Surveillance and
Integration: CDC-RFA-DD09-903

Contents

Background and Need.....	3
Needs Assessment.....	5
Work Plan	7
Collaborative efforts	12
Program capacity	14
Staffing and Management Plan.....	15
Evaluation Plan	17
Evaluation Design.....	17
Purpose:.....	17
Uses.....	17
Question	17
Methods.....	18
Logistic Framework	20
Conclusion	21

Background and Need

Since July, 2000, the Office for Genetics and Children with Special Health Care Needs (OGCSHCN)/Infant Hearing Program in the Maryland Department of Health and Mental Hygiene (DHMH) has administered the Maryland Universal Newborn Hearing Screening Program (UNHS) mandated by State law (SB 624). Legislation requires that all birthing hospitals in Maryland provide physiologic hearing screening for all newborns prior to discharge. Results of the initial screening are reported to the Maryland Infant Hearing Program via eSP™, the online newborn hearing screening database. Individual patient demographic and exam results entered by hospital personnel are available to the Infant Hearing Program in real time. Hospital users enter data into eSP™ on the medical home provider before discharge and make any necessary appointments in the system for follow up screening. Audiologists performing diagnostic exams enter their assessment results directly into eSP™. The Infant Hearing Program follow up coordinators use the information entered by users to ensure that follow up care is initiated and completed for each child that was either missed or did not pass their hearing screen. The eSP™ online system was fully implemented in all 36 birth hospitals in Maryland in August 2008.

The current system has helped improve follow-up for infants in Maryland. In 2007, 96.5% of the babies born in Maryland received a hearing screening, and 4.5% of that population was lost to follow up. The preliminary data from August-December 2008 indicates that 97.2% of eligible babies (excludes deceased and refused status) were screened and only 3.06% of patients in the system appear as possibly lost to follow up. It should be noted that 2.37% of the records are still in process which indicates that they do not yet have a final outcome. Some of these records

may be designated as lost to follow up in the future if providers are unable to complete the care process. Nevertheless, these figures represent a significant improvement in follow up outcomes from the previous year's data.

However, while we are making improvements in our loss to follow up we have yet to reach our goal of 100% of the population receiving hearing screening by one month of age, and appropriate diagnostic testing for all those infants that do not pass their screening by three months of age. To address some of the issues that may be impeding follow up, enhancements to eSP™ are needed, including incorporating a module for early intervention tracking, reporting enhancements at the State and hospital level, protocol improvements to the risk monitoring care path, and the development of a de-duplication tool.

Currently both hospital level and State users have the ability to generate reports (custom and standard) on patient data including birth, outpatient, and audiologic outcomes as well as aging reports on these outcomes. Additionally, OZ Systems (system vendor) provides a monthly compliance report to the State of Maryland detailing data from each birth hospital on a panel of metrics determined by Infant Hearing Program staff.

The Infant Hearing Program has established collaborative relationships with the Maryland Department of Education, the Maryland School for the Deaf, the Hearing and Speech Agency, Parents Place, and the Maryland Infant Toddler Program to develop professional and family training, consumer information products, and interagency data sharing (see Appendix B-organizational chart). Through grants from the Department of Health and Mental Hygiene, workshops for families and early interventionists and other related professionals have been provided at least annually. Additional grants have funded the Maryland Keys to Communication

notebooks for families of deaf and hard of hearing infants, as well as other consumer and professional brochures used for communication between providers and families. Each year the Infant Hearing Program hosts a stakeholder meeting for all involved in infant hearing including hospital providers, physicians, nurses, early interventionists, families, and audiologists. The stakeholders meeting is an opportunity for inter-agency communication, collaboration, and learning.

After struggling for years to share data between the Maryland Department of Health and Mental Hygiene Infant Hearing Program and the Maryland State Department of Education so that comprehensive outcome assessment can be completed and that assurance can be made that all infants identified with hearing loss are receiving appropriate intervention, a Memorandum of Understanding is in the works between the two agencies but has not been finalized due to delays in the IDEA regulations. Preliminary processes have been designed to actually facilitate the sharing of data, but at this point they are only rudimentary and temporary. It is our intention to expand the online data system to include an early intervention module that would enable both agencies access to the appropriate data.

Needs Assessment

The introduction of the eSPTM online data system has allowed MDEHDI staff to have access to real time data (see Appendix E for Data Flow Chart) and address concerns with hospitals and other providers in a timelier manner. One of the indicators we would like to see improvement on would be to increase the number of children identified with hearing loss by 3 months of age. In 2007, only 50% of the babies were identified by 3 months of age, and by 6 months of age, 90% had been identified. In order to see improvements in this area, the program will need to

improve the lost to follow up rate, increase the number of hospitals importing exams, and encourage the input of diagnostic results., (See Appendix F for Work Plan details). Having a web based system has laid an important foundation for us to be able to more effectively follow up with babies in Maryland that need further care, however to reach our goal of a 100% screening rate we need to make adjustments in both our processes and system functionality (see Appendix G for current functionality).

It is important for our program to continue to improve the means by which we are able to identify children with late onset hearing loss. Risk monitoring has become an important part of the MDEHDI program. Before using eSPTM, program staff had limited knowledge of babies with risk factors. Although this component is present in our current system, it is not being fully utilized and needs a few improvements to make it more useable. It is our aim to improve functionality so that we can increase the number of appointments scheduled for children with risk factors.

The program also strives to decrease the negative impact of hearing loss on child language and social development. To effectively reach this goal, collaboration with the Maryland State Department of Education (MSDE) is essential. At the current time, DHMH and the MSDE are working to share data, but because of the lack of system integration between departments this process is laborious and not time efficient. OZ Systems (the vendor) has previously developed an online module for early intervention providers in Texas that can be customized for use in Maryland. This will enable both DHMH and MSDE access to child data including early intervention referral and enrollment date and current status. Integration on this level allows the State of Maryland to provide the most complete care in a timely, effective and efficient way.

The work plan on the following pages describes the goals of the programs and the means to achieve them.

Work Plan

The first goal of this project is to *improve the early identification (by 3 months of age) of children with hearing loss*. In order to achieve this goal, OZ Systems and MD EHDI program staff will work collaboratively to accomplish the following objectives:

- Decrease the lost to follow up rate of occurent births in Maryland by 10% by July 2011.
- Increase the submission of electronic exam results from hearing screening technologies into eSP™ by 25% by July 2011.
- Increase electronic submission by providers of diagnostic evaluations of Maryland babies that referred on the outpatient screen from 0 to 50%.
- Increase information sharing with vital statistics to increase the reliability of data in eSP™ by July 2011.
- Decrease the statistical reporting inaccuracy of referral by ½ of the babies who screen positive for hearing loss but are confirmed to have normal hearing.

The objectives outlined above will improve the validity of data collected and entered into eSP™.

Each objective listed above will only be accomplished through well planned and reasonable activities. The following section describes the planned activities used to meet set objectives.

Activities

Objective 1.1: To reduce the lost to follow up rate, OZ Systems will implement the following changes to eSP™. First, additional system notes will be added to the system to improve the

audit trail. These notes will be created when hearing exams are entered into the patient's records. The patient location functionality will also be modified allowing users to see individual patient location at multiple birth screen facilities simultaneously, allowing both state and hospital users to track the location of a patient within eSP™. The following data element will also be incorporated into the search and/or export options: state, city, phone number, and mother's date of birth. eSP™ will also capture new data elements (mother's race/ethnicity and mother's education level) to increase verifiable measures within the data. Likewise new functionality will be incorporated, allowing the Infant Hearing Program staff to merge patient records that have been identified to be duplicates. Online compliance reporting capability will also be implemented in eSP™ so that state and hospital users will have the ability to generate these reports on demand. Finally, OZ Systems will identify de-duplication solutions for MD EHDI including the use of Link Plus software (free from the CDC) and its possible linkage with eSP™.

Objective 1.2: In order to increase the submission of electronic exam results from hearing screening technologies, OZ Systems will work closely with both MD EHDI and the individual birth screen facilities. The first step will be to establish a new compliance metric within the monthly report to assess how many exams have been added by electronic submission for each facility. This will be reported as both number and percentage. OZ Systems will also work with each facility to identify the different hearing screening technologies used. They will then follow-up with the necessary vendors to create a complete and up-to-date contact information list. OZ Systems will also work with the each of the facilities to conduct any necessary training on matching exam results to individual records in eSP™.

Objective 1.3: As a means of increasing the electronic submission of diagnostic evaluations by providers, OZ Systems will work with the Infant Hearing Program to analyze and enhance this

process. Infant Hearing Program staff will tabulate the number of hard copy results received on diagnostics as compared to electronic entry from audiologists at each contributing facility. OZ Systems will create access to an on-demand standardized report from eSP™ on both type and severity of hearing loss. This will look at the number of patients with records imported and sort based on types and/or severity of hearing loss.

Objective 1.4: Increasing information sharing with vital statistics to increase reliability of data in eSP™. To complete this, the Infant Hearing Program will provide an exported list to Vital Statistics on all babies in eSP™ on a monthly basis. In return, Vital Statistics will provide information on deceased status from vital records. It is also hoped that this file sharing will allow for cross matching to identify any babies missing from eSP

Objective 1.5: In order to decrease the statistical reporting inaccuracy of referral by ½ of the babies who screen positive for hearing loss but are confirmed to have normal hearing, OZ Systems will update the current logic in eSP™. Currently, in eSP™ the patient outcome is calculated based on the last exam result entered without consideration for the technology used in conducting the screening. The logic will be changed in the current version of the MD EHDI application care path to allow an AABR result to override an OAE result regardless of the chronological order in which the tests were administered.

The second goal of this project is to *decrease the negative impact of hearing loss on child language and social development*. Again to achieve this goal, OZ Systems and MD EHDI program staff will work collaboratively to accomplish the following objectives:

- Establish an early intervention (EI) module to track and monitor referral enrollment status of children with hearing loss for use by the MSDE and DHMH.

- Increase availability of EI enrollment and referral status in the form of two new on-demand aggregate reports available to users.

The objectives outlined above will improve the access to care for children diagnosed as deaf or hard-of-hearing. Each objective listed above will only be accomplished through well planned and reasonable activities. The following section describes the planned activities used to meet set objectives.

Activities

Objective 2.1: OZ Systems will work with MD EHDI, the Maryland State Department of Education (MSDE), and the Maryland Department of Health and Mental Hygiene (DHMH) to configure the current EI module of eSP™ in order to track and monitor referral and enrollment status of children with hearing loss in the state of Maryland. After reviewing the current module, OZ Systems will collaborate with the DHMH Infant Hearing Program to develop the change requirements in order to establish a system that functions in conjunction with Maryland's process. Once the module has been established OZ Systems will train representatives from the education and health departments to track and label records appropriately to ensure the systems effectiveness.

Objective 2.2: In order to increase the availability of EI enrollment and referral status, OZ Systems will add an aggregate reporting feature to the EI module to be available to users. The first report to be added will be an annual report allowing users to see how many referrals and enrollments are present and/or needed. The second report to be added is an aging report to provide analysis of the age at which referrals and enrollments were provided to children in Maryland.

The third goal of this project is to *increase identification of late onset hearing loss in children in Maryland*. To achieve this goal, OZ Systems and MD EHDI program staff will work collaboratively to accomplish the following objectives:

- Increase the number of risk monitoring appointments scheduled for triggered cases by 15% by July 2011.
- Increase timely communication through eSP™ letters to parents of risk factors associated with hearing loss by creating on-demand letters for a cohort of babies in need as identified by program staff.

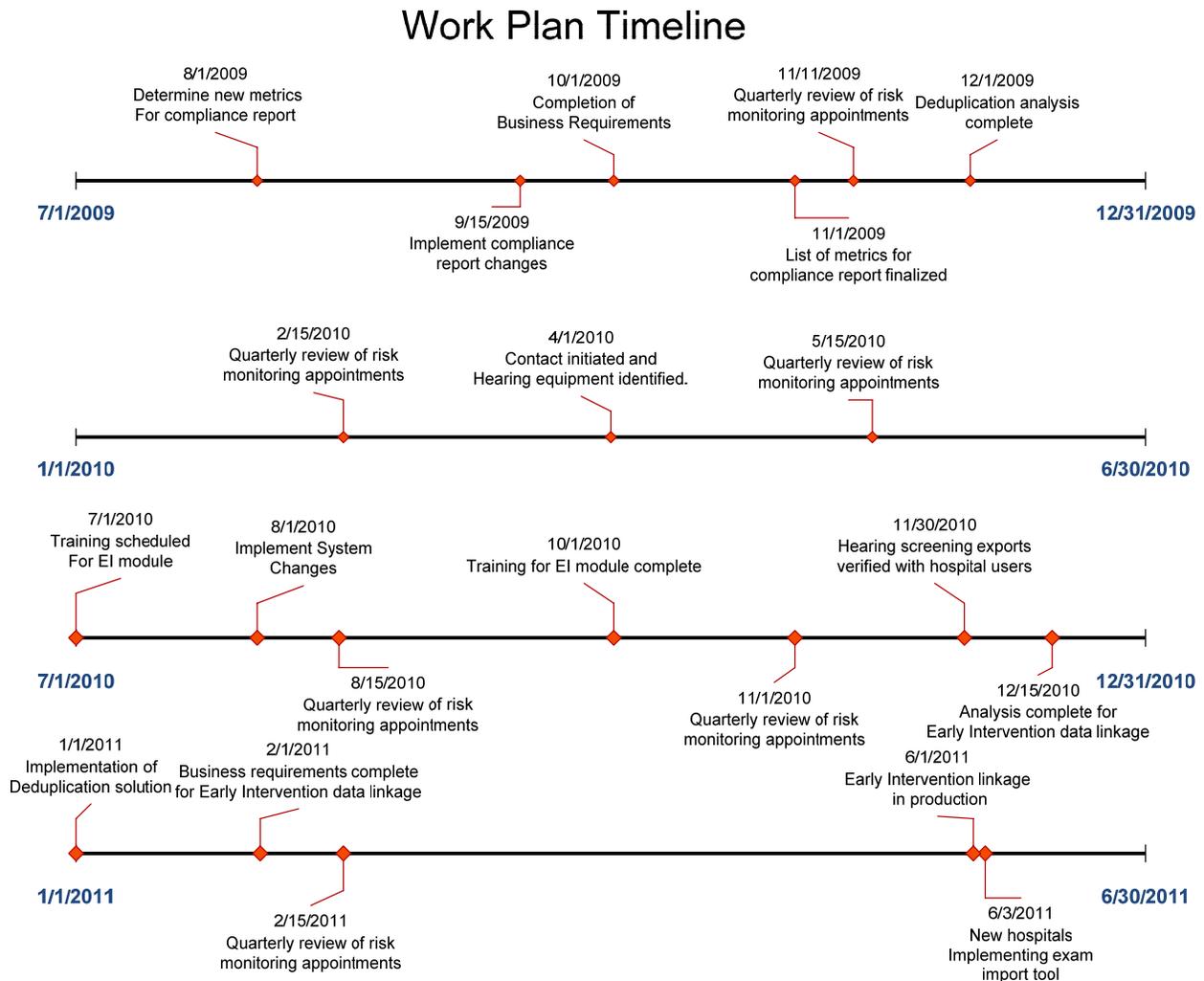
The objectives outlined above will improve the risk monitoring process and parental awareness for children at risk for hearing loss. Each objective listed above will only be accomplished through well planned and reasonable activities. The following section describes the planned activities used to meet set objectives.

Objective 3.1: As a means of increasing the number of risk monitoring appointments scheduled for triggered cases, OZ Systems will modify the functionality of this feature in eSP™. OZ Systems will establish functionality in eSP™ that will automatically add the NICU risk factor when a patient's nursery status is NICU for greater than 5 days (per JCIH 2007 guidelines). MD EHDI will then work with outpatient providers to raise awareness of the risk monitoring population and educate them on the protocol established in eSP™.

Objective 3.2: OZ Systems will collaborate with MD EHDI to increase the timely communication with parents regarding the risk factors associated with hearing loss through the creation of on demand letters. OZ Systems will develop a button to be housed on the search

results page that will allow users to print outstanding letters for the cohort of babies produced by the given search criteria.

Figure 1.1: Work Plan Timeline



Collaborative efforts

Currently, MD EHDI provides universal newborn hearing screening, tracking, and surveillance for more than 75,000 babies a year. Early hearing detection and identification could not be carried out without the assistance of our partners in MD EHDI. The Infant Hearing Program at

DHMH teams with a multidisciplinary advisory council, 36 birthing hospitals, 1 children's hospital, 2 pediatric rehabilitation hospitals, 100+ outpatient hearing screening and audiologist facilities, more than 3,000 pediatricians and family practitioners, the Maryland Infant and Toddler Program, and our data base vendor OZ Systems to fulfill the goals of early identification and intervention of deaf and hard of hearing infants.

By legislation, birthing facilities are required to perform hearing screenings and report the results to the Maryland Department of Health and Mental Hygiene (DHMH). The Infant Hearing Program staff at DHMH provide surveillance of all hearing screening in Maryland and follow up with families, physicians, and audiologists to ensure that all babies that are missed or do not pass their hearing screening receive timely and appropriate follow-up care. Additionally, Program staff makes referrals to early intervention services for all infants identified with hearing loss, and risk monitoring reminders to families via letter and phone contact with the families of infants identified with risk factors for hearing loss. (See Appendix E). Funding for this project will expand the relationship with the Maryland State Department of Education (MSDE) to extend the cascade of tracking and surveillance further into the intervention arena. MSDE has always supported the EHDI goals, (see Appendix A), and efforts are consistently made on both the informal and formal levels to work collaboratively with MD EHDI. By expanding the data sharing capabilities of eSP these partnerships will be strengthened and enhanced.

The Health Resources and Services Administration (HRSA) has provided primary funding for the Universal Newborn Hearing Screening Program since 2001. Additional funding is currently provided from portions of the MCHB Title V block grant and the Maryland Healthy Babies Initiative. Reporting relationships have long been established with these agencies as well as the Centers for Disease Control.

Reports are generated monthly to the birth hospitals to support their hearing screening activities and quality assurance monitoring. Reports are also sent on an as needed basis to our border states' EHDI Programs regarding births and screening status of babies born in Maryland but residing in Pennsylvania, Washington D.C., West Virginia, Virginia, or Delaware. The enhancements to eSP from this project will enhance reporting capabilities as well as tracking, surveillance, and follow up.

Program capacity

The Infant Hearing Program has been involved in universal newborn hearing screening by legislation since 2000, but for more than 10 years prior to that time, the Program was involved in newborn hearing screening via the high risk registry. Prior to eSPTM, the Program utilized a home grown Access data base. In its final version, the database was populated by a linkage from the Maryland Laboratory from data hand entered from the metabolic blood spot card. Problems with this data base included delayed reporting, relatively high risk for data entry error, significant data mining limitations, and a record capacity that had long been exceeded creating the real risk of an inevitable system crash. Gathering aggregate information regarding demographics, type and degree hearing loss, and age of screening and identification was severely hampered and required hours of essentially hand counting. Still, the Program was able to report to state and federal agencies on screening rates and relative prevalence rates of incidence of hearing loss. From the initiation of universal newborn hearing screening in 2000 to 2007 the rate of hearing screening improved from 80% to as high as 98%, and incidence rates averaged approximately 1 in 1,000 over the years.

OZ Systems staff has over 10 years experience providing data management and tracking solutions for EHDI programs in the US and abroad. OZ Systems program staff share knowledge, best practices and lessons learned from other States and use the information to inform systems development.

Staffing and Management Plan

OZ Systems Staff

The activities outlined in this proposal are important to program improvement and growth. Many of the activities will be initiated by OZ Systems, but all activities will be implemented and completed through a collaborative relationship between MDEHDI and OZ Systems.

The staff for OZ Systems involved in this project include a Program Coordinators who will assist in implementation, and the CEO who will provide guidance and oversight. OZ Systems program staff has expertise in both audiology and public health program implementation. All positions involved in this project are salaried and not subject to grant funding availability. The job descriptions are outlined in Appendix C. OZ Systems' experience extends beyond the eSP™ information system solution to include: former EHDI program staff with State administrative experience, staff with training (both train-the-trainer training and end-user training), support (first tier agency support and birthing facility support), data management, data hosting and data back-up experience. We employ staff with experience working with parents of children who are deaf and hard of hearing, and those with reporting, case management, monitoring birthing facility performance, compliance and certification expertise. In addition, we employ audiologists, including certified and licensed audiologists with extensive pediatric audiology experience.

The following professional staffs are available to concentrate on this program (resumes are attached, see Appendix D_:

- Terese Finitzo, PHD F-ASHA, FAAA, CEO
- Mary Catherine Hess, MSPH, Program Coordinator

MDEHDI/Maryland Infant Hearing Program Staff

The Maryland Infant Hearing Program has been fortunate enough to be fully staffed for the last two years. Current staff includes two audiologists, Linda Vaughan and Erin Filippone, two special program coordinators, Stephanie Hood and Theresa Thompson, and one administrative assistant, Hope Wharton. As indicated in the attached resumes (see Appendix D), the audiologists both have lengthy clinical and pediatric experience and have been a part of the team for 3+ years. The special program coordinators have several years of experience in public healthcare, care coordination, and patient follow up. Both coordinators have been a part of the team for several years and bring solid experience in early hearing detection and intervention.

Infant Hearing Program staff will work collaboratively with OZ systems to devise, implement and execute improvements and upgrades to the eSPTM online data management system. They will also assist with the training and support of key personnel from our partners at MSDE, Maryland birthing hospitals, and Maryland audiology providers.

Evaluation Plan

Evaluation Design

PURPOSE:

The purpose of this evaluation is to determine the impact of proposed system changes on the lost to follow up of infants in Maryland.

USES

The results of this evaluation will be used to inform and support program decisions on improvements to screening protocols and collaboration with screening and diagnostic providers. The results of this evaluation will be a valuable tool to engage hospital providers and audiologists to use the online data management tool to track and refer infants. To increase effectiveness of evaluation, input from stakeholders will be solicited to inform dissemination of results.

QUESTION

The research question addressed by this evaluation:

Do online data management improvements contribute to a decrease in the lost to follow up rate of infants receiving a necessary hearing care in Maryland?

METHODS

A time series model will be used to evaluate the online data management improvements effect on the lost to follow up rate for infants in Maryland EHDI program. Baseline data will be collected for evaluating the increase of successful identification of children with early hearing loss (by 3 months of age) and those with late onset hearing loss by looking (Objective 1) at data entered from August 2008, the initiation of the original system, to August 2009 when the first steps will be made towards updating the system. This time frame not only provides a full years worth of data from which to start, but also allows a clear stopping point prior to the implementation of any updates to the original system. As for the evaluation of the number of children enrolled in early intervention services by 6 months of age, the baseline values will assume the starting point of zero. Understanding that children are currently being enrolled in Early Intervention services, it is important to note that the question being evaluated in this case is the use of the online data management tool to determine age and number of enrollees and not just the enrollment of children in EI. As there is currently not an online data management system in place for early intervention tracking, the clear baseline is zero.

The time series for Objective 1 will begin in August 2009 with the initiation of the grant and monthly data points will be collected for the variables of interest outlined below in the logistic framework through February 2011. This stopping point will allow ample time to compile data and compare with the baselines measurements, as well as the completion of the necessary improvements to the system. By collecting monthly data points a shift should be visible as different pieces of the project are implemented as well as the additive impact of the improvements as they are put into to production, due to the staggered process. The time series

for Objective 2 will begin in October 2010 after the completion of the training for the Early Intervention module and monthly data points will be collected for the variables of interest outlined below in the logistic framework through April 2011. This stopping point will allow ample time to compile data and compare with the baselines measurements. The logistic framework below displays both the activities and timeline for the proposed evaluation design.

Representatives from Maryland EHDI and OZ Systems will meet quarterly to discuss the evaluation plan and measures. These meetings will serve as a tool to make necessary adjustments to the timeline and evaluation activities.

LOGISTIC FRAMEWORK

Objective	Indicators	Methodology	When	Person Responsible
Increase the successful identification of children with hearing loss by 3 months of age and the successful identification of children with late onset hearing loss.	Number of patients with hearing exam data	Review of data in web-based system via developed audit trail	August 2009-February 2011	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
	Number of duplicate patient records found at the state level	Review of data in web-based system	August 2009-February 2011	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
	Number of hospitals electronically importing testing data	Review import queue in web-based system	August 2009-February 2011	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
	Number of diagnostic evaluations submitted electronically by providers	Tabulation of the number of paper reports received on diagnostics as compared to electronic data entry at each contributing facility	August 2009-February 2011	Infant Hearing staff
	Number of babies who refer on birth screen and then pass outpatient screen with AABR and OAE results	Tabulate the number of AABR results used to calculate patient outcome for both birth and outpatient screening	August 2009-February 2011	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
	Number of risk monitoring exams entered for babies with risk factors for late onset hearing loss	Review of data in web-based system	August 2009-February 2011	Infant Hearing staff & Mary Catherine Hess (OZ Systems)
	Number of babies in the NICU greater than 5 days with NICU indicated as a risk factor	Tabulate number of babies that have NICU indicated as a risk factor	August 2009-February 2011	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
	Number of parents receiving letters 6 months after the child's last screening appointment	Review of data in web-based system	August 2009-February 2011	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
Increase the number of children enrolled in early intervention programs by 6 months of age.	Number of children referred/enrolled in Early Intervention	Review of data in web-based system	October 2010-April 2011	Linda Vaughan (DHMH), MSDE, & Mary Catherine Hess (OZ Systems)
	Child's age at referral/enrollment to Early Intervention	Review of data in web-based system	October 2010-April 2011	Linda Vaughan (DHMH), MSDE, & Mary Catherine Hess (OZ Systems)

Conclusion

Data quality and integration is of utmost importance to program function and success. We feel that the most efficient and effective way to reduce lost to follow up with the implementation of improvements to the current system and the integration of early intervention.

1. Appendices Attached

A. Letters of Support

B. Organizational Chart

C. Job Descriptions

D. CV or Resumes for Key Personnel

E. Data Flow Chart

F. Work Plan Table

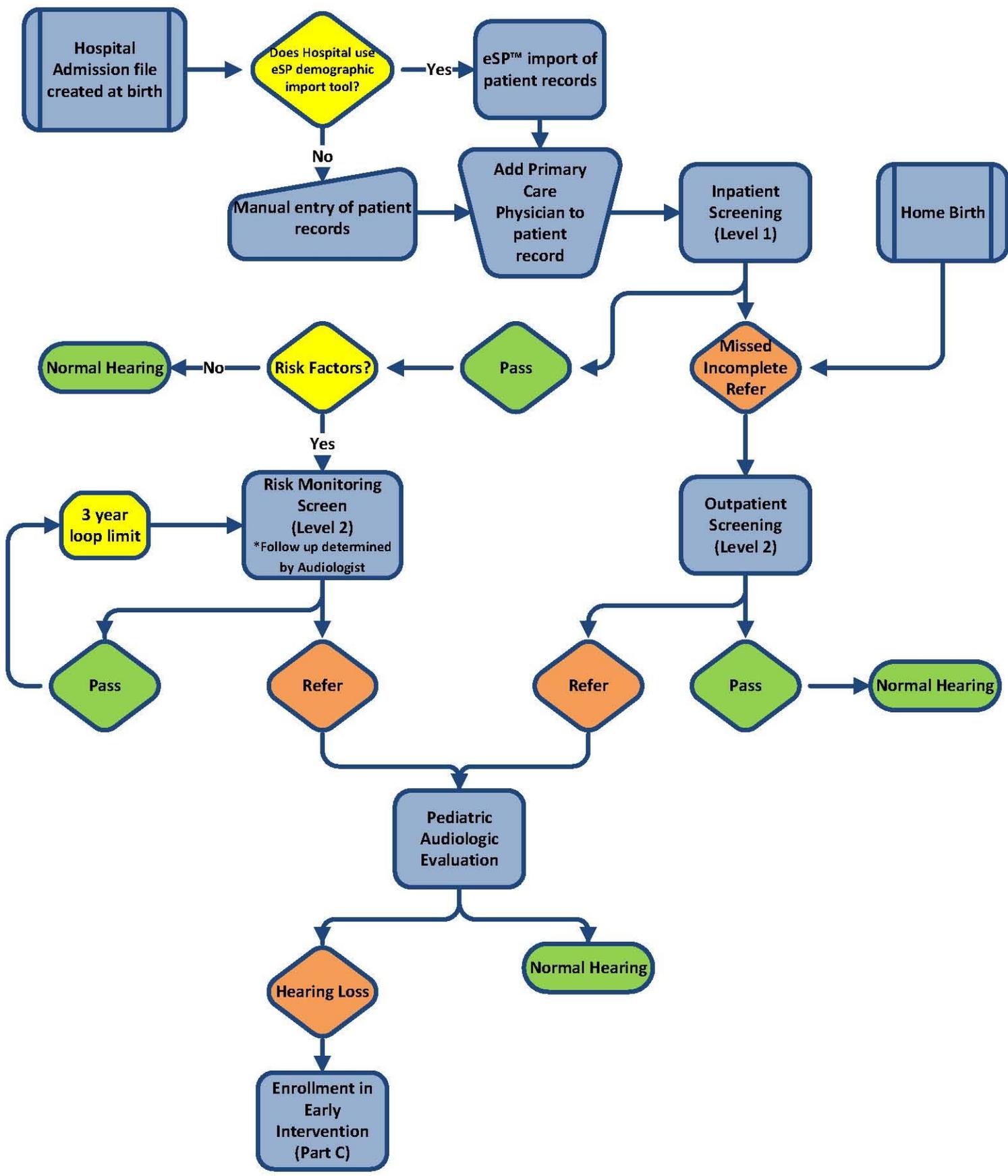
G. eSPTM Functionality

Maryland Department of Health and Mental Hygiene

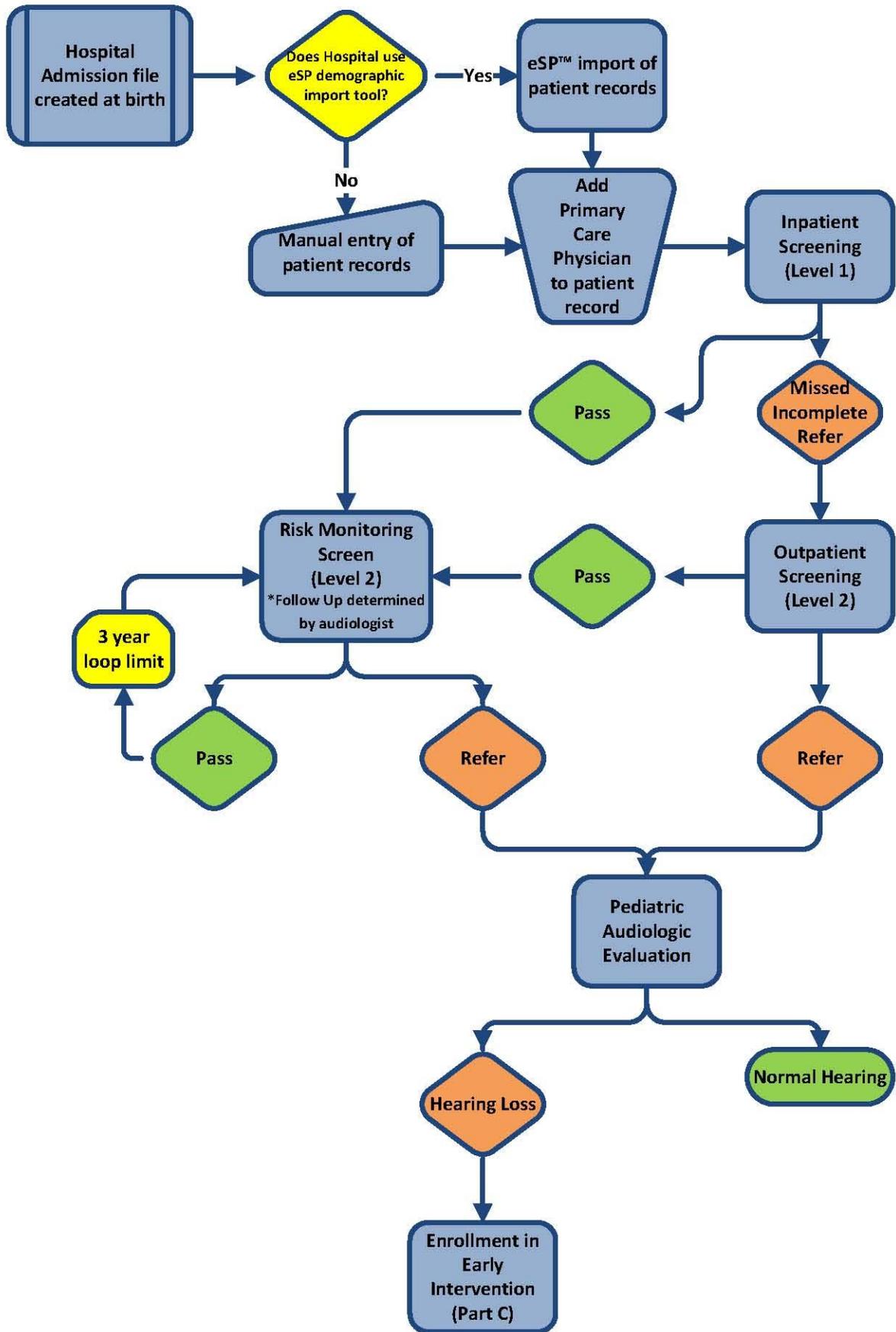
Appendix E: Data Flowchart

CDC Early Hearing Detection and Intervention (EHDI) Tracking, Surveillance and Integration:
CDC-RFA-DD09-903

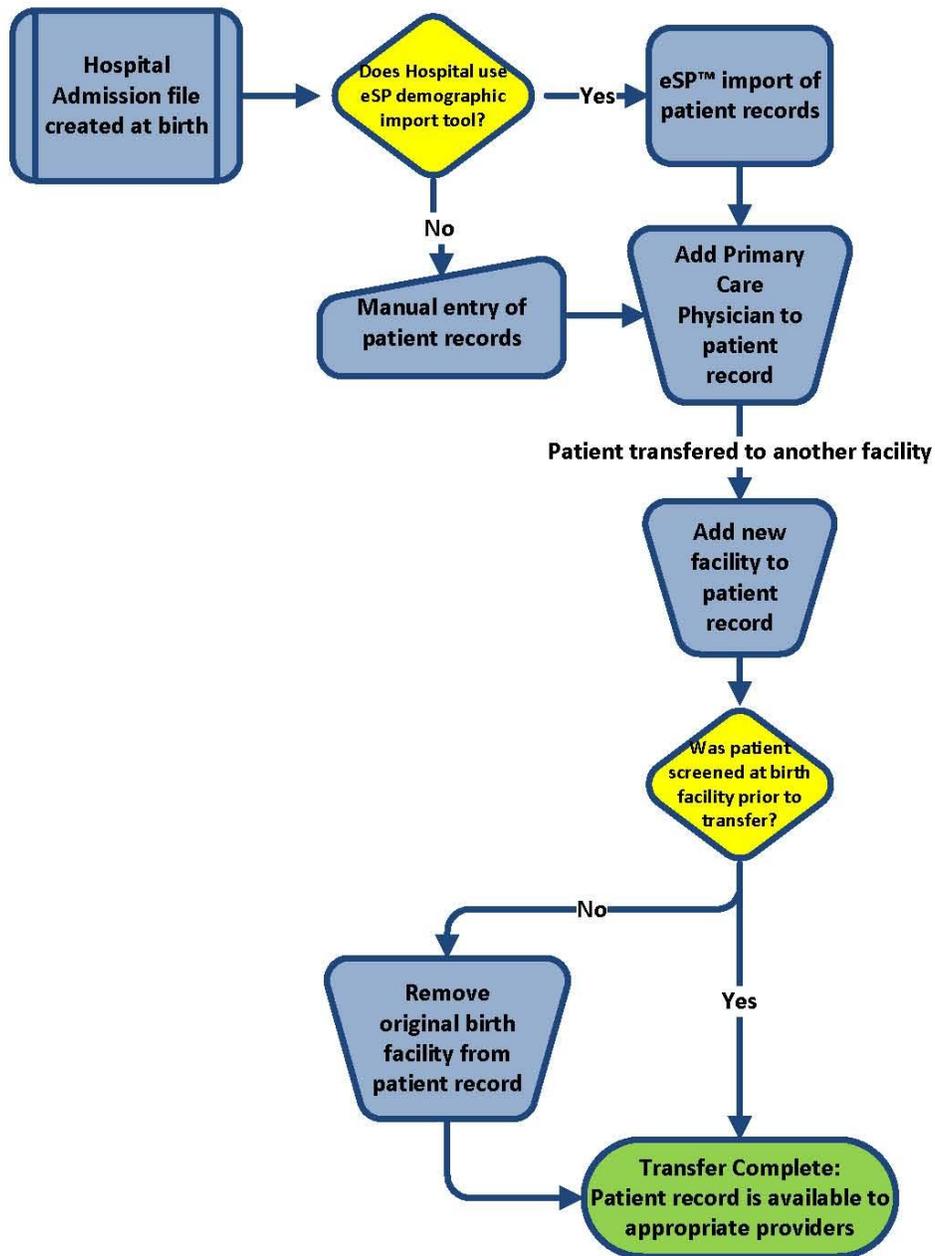
Well Baby Data Flow



NICU Data Flow



Transfer Data Flow



Maryland Department of Health and Mental Hygiene

Appendix F: Work Plan Table

CDC Early Hearing Detection and Intervention (EHDI) Tracking, Surveillance and Integration: CDC-RFA-DD09-903

Work Plan

Goal 1 <i>Increase the early (by 3 mo of age) identification of children with hearing loss in Maryland.</i>		Measures of Success <i>Successful identification of more children with hearing loss that receive appropriate follow up care.</i>		
Objectives	Activities/Steps	Data/Evaluation	Timeframe for Assessing Progress	Team Members Responsible
1.1. Decrease lost to follow up rate of occurent births in Maryland by 10% by July 2011.	Create a system note (audit trail) to track when hearing exams were entered for patient records.	Data: Number of patients with system notes for hearing exams.	Business requirement development complete by October 2009.	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
	Add the following data elements to search and/or export options in eSP™: state, city, phone and mother's date of birth.	Eval: Search by primary contact's city and/or State in eSP™. Eval: Search by mother's date of birth range in eSP™.		
	Capture new data elements to increase verifiable measures in data: Mother's race/ethnicity & Mother's education level by July 2011.	Eval: New fields are present and functional in eSP™.	Feature implementation by August 2010.	Mary Catherine Hess, OZ Systems
	Implement new functionality in eSP™ to allow State program staff to merge patient records that are identified to be duplicates.	Eval: Program staff have the ability to merge patient records from the same or different facility into one unique record while logged in at the State level.		
	Develop online compliance reporting capability.	Eval: state and hospital users have ability to generate compliance report on demand through eSP™.		
			Feature implementation by August 2010.	Linda Vaughan & Mary Catherine Hess
	Identify de-duplication solutions for MDEHDI including the use of Link Plus software (free from the CDC) and possible linkage with eSP™.	Eval: Decision of best tool to assist program de-duplication efforts.	Analysis and discussion of options complete by December 2009.	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
Implementation of de-duplication solution by January 2011.			Mary Catherine Hess (OZ Systems)	

Work Plan

1.2. Increased submission of electronic exam results from hearing screening technologies into eSP™ by 25% by July 2011.	Establish a new compliance metric in monthly report to assess how many exams were added by electronic submission beginning in August 2009.	Data: Number and percentage of exams electronically imported into eSP™ grouped by facility location.	Determine appropriate metric for exam imports by August 1 2009.	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)	
			Implement metric in report when report runs on Sept 15 th , 2009.	Mary Catherine Hess (OZ Systems)	
			Communicate justification and rationale of new metric to hospital users.	Linda Vaughan (DHMH)	
	Identify hearing screening technologies used at all hospitals in Maryland.	Data: Document equipment used at each hospital.	Program manager contact initiated and equipment identified at all hospitals by April 2010.	Number of hospitals using exam import tool by July 2011.	Mary Catherine Hess
	Establish contact with vendors and create contact information list.	Data: Contact information for applicable equipment vendors.			
Conduct necessary training importing exams from hearing screening technologies.	Eval: Check import file queue to ensure successful import and matching of records.			OZ Systems & Linda Vaughan	
1.3 Increase electronic submission by providers of diagnostic evaluations of Maryland babies that referred on the outpatient screen from 0 to 50%.	Access to on demand standardized report from data system on type and severity of hearing loss.	Data: number patients with records exported and sorted based on type and/or severity of hearing loss.	Business requirement development complete by October 2009.	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)	
			Feature implementation by August 2010.	Mary Catherine Hess, OZ Systems	
	Tabulate number of faxes received on diagnostics from audiologists as compared to electronic entry at each contributing facility.	Data: Number of faxes received at DHMH for diagnostic evaluations.	Compare faxes and eSP™ records quarterly starting October 2009.		Erin Fillipone (DHMH)

Work Plan

1.4 Increase information sharing with vital statistics to increase reliability of data in eSP™ by July 2011.	Provide an exported list to vital statistics of all babies in eSP™ and receive information on deceased status.	Data: monthly list of babies indicated as deceased from vital records	Monthly submission of list to vital statistics starting August 2010.	Linda Vaughan
1.5 Decrease false positive rate of referral by 50% of babies in Maryland who screen positive for hearing loss but are confirmed to have normal hearing. (False positive is defined as any patient who has referred on one or both ears on the birth or outpatient screen because an OAE exam result of refer was entered after an AABR result of pass)	Add logic to current MDEHDI eSP™ care path to allow an AABR result to override OAE results regardless of when they were entered (current eSP™ protocol calculates patient outcome based on the last exam results entered regardless of technology used)	Data: AABR results are used to calculate patient outcome for birth and out patient screening.	Business requirement development complete by October 2009.	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
			Feature implementation by August 2010.	Mary Catherine Hess, OZ Systems

Goal 2 <i>Decrease negative impact of hearing loss on child language and social development.</i>		Measure of Success <i>Increase number of children enrolled in early intervention programs by 6 months of age.</i>		
Objectives	Activities/Steps	Data/Evaluation	Timeframe for Assessing Progress	Team Members Responsible
2.1 Increase continuity of care by ensuring that identified infants are enrolled in appropriate early intervention prior to 6 mo of age by August 2010.	Develop business requirements of EI module for eSP™.	Data: completed business requirements document.	Business requirement development complete by October 2009.	Linda Vaughan MSDE
	Establish and early intervention (EI) module to track and monitor referral and enrollment status of children with hearing loss for use by the Department of Education and the Department of Health and Mental Hygiene.		Feature implementation by August 2010.	Mary Catherine Hess
	Ensure addition of fields to track language competence at time of transition out of EI program.			

Work Plan

	Train representatives from the education and health department to track and label records appropriately in the new module.	Eval: Scheduled web based training with OZ Systems staff on EI module.	Training scheduled by July 2010. Training completed by October 2010.	Mary Catherine Hess
2.2 Increase availability of EI enrollment and referral status in the form of two new on demand aggregate reports available to users by August 2010.	Add EI report to the list of annual reports in eSP™, allowing users to see how many referrals and enrollments are present and/or needed.	Data: EI reports containing information on enrollment and referral status and aging criteria.	Business requirement development complete by October 2009.	Linda Vaughan , MSDE & Mary Catherine Hess
	Add EI report to the list of aging reports in eSP™ to provide an analysis of the age at which referrals and enrollments were provided to children in Maryland.		Feature implementation by August 2010.	Mary Catherine Hess
2.3 Increase information sharing with Department of Education to increase reliability of data in eSP™ data by July 2011.	Investigate possibilities of a data linkage between Department of Education and eSP™.	Finalize MOU between DHMH and Department of Education.	Investigation, analysis, and MOU completed by December 2010	Linda Vaughan, MSDE & Mary Catherine Hess,
		Eval: Produce documentation on options for integration with department of education database.		
		Business requirements for linkage.	Business requirements complete by February 2011.	Linda Vaughan, MSDE & Mary Catherine Hess
	Establish electronic data interchange between existing MSDE database and eSP™.	Data: number of records updated in eSP™ with information from vital statistics.	Linkage in production by June 2011.	MSDE & Mary Catherine Hess

Work Plan

Goal 3 <i>Increase identification of late onset hearing loss in children in Maryland.</i>		Measures of Success		
Objectives	Activities/Steps	Data/Evaluation	Timeframe for Assessing Progress	Team Members Responsible
3.1 Increase number of risk monitoring exams entered into eSP™ for babies identified with risk factors for late onset hearing loss by July 2011.	Establish functionality in eSP™ that automatically adds the NICU risk factor when a patients nursery status is NICU for greater than 5 days (as directed by JCIH 2007).	Data: Number of records in eSP™ that have NICU indicated as a risk factor.	Business requirement development complete by October 2009.	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
			Feature implementation by August 2010.	Mary Catherine Hess, OZ Systems
	Contact outpatient providers to raise awareness of risk monitoring population and educate on protocol.	Data: Number of appointments scheduled for risk monitoring.	Review number of appointments scheduled during each quarter.	Erin Fillipone
3.2 Increase timely communication through eSP™ letters to parents of risk factors associated with hearing loss by creating on demand letters for cohorts of babies in need as identified by program staff.	Develop a button for the search results page that allows users to print outstanding letters for the cohort of babies produced by search criteria.	Data: Number of parents receiving letters 6 months after last screening date.	Business requirement development complete by October 2009.	Linda Vaughan (DHMH) & Mary Catherine Hess (OZ Systems)
			Feature implementation by August 2010.	Mary Catherine Hess, OZ Systems

Maryland Department of Health

Appendix G: eSP™ System Functionality

CDC Early Hearing Detection and Intervention (EHDI) Tracking, Surveillance and
Integration: CDC-RFA-DD09-903

6/1/2009

eSP™ System Functionality

This document provides information on OZ Systems’ e-Screener Plus™ existing functionality. Many of the attributes described in this document meet or exceed CDC’s request for reporting and integration capability.

eSP™ Functionalities: Administrative Rights

The following access rights can be assigned to a user (screener, provider, etc.) by specifically authorized persons in eSP™ based on their role in the system.

Tab	SubMenu	Access Right Assigned
Patients	Add a Patient	Create Patients
	Current Patient	Patient Access
	New Search	Patient Access
	Current Search	Patient Access
	Current Search Results	Patient Access
	Import New Patient Files	Import Patients
	Imported Patient Files	Import Patients
	Merge Patients	Merge Patients
	Manage General Notes	Read Patient Notes
Hearing	Hearing Journey	Patient Access
	Import Test Results	Patient Access
	Imported Files	Patient Access
	Manage Hearing Notes	View Hearing Notes
	Professional Contacts	Contact Search
Add a Contact (Person)		Manage Service Providers
Add a Contact (Place)		Manage Service Providers
Letters	Assign Letters	Manage Notifications
	Generate Letters	Send Notifications
	View Letters	Manage Notifications
	Library	Manage Notifications
Reports	Annual Report Set-up	View Reports
	Aging Report Set-Up	View Reports
Admin	Manage Screeners	Designate Agents
	Manage Risk Factors	Risk Factors
	Add User	Designate Agents
	Edit Facility Info	Edit Facility Information
	Services Offered	Edit Facility Information

*Note: All access rights allow the user to view the Home Page and Edit User Profile.

eSP™ Functionalities: Adding Patient Demographic Data

Import New File can be found under the tools tab and allows a user to import multiple patients' demographic data at one time. This data is generally exported from the birth facilities electronic medical record. It is important that the user evaluate his/her file before importing to determine what fields are included and what kind of file it is. Text (comma, tab, and character delimited) and XML files are compatible for importing. The user can choose from more than 70 fields when importing data, and also has the option to save the configuration settings to use again for the next import.

The screenshot shows a dialog box titled "Build Import Fields List". It is divided into several sections:

- available import fields:** A list of fields including "Patient's First Name", "Patient's Last Name", "Patient's Current Location (ward)", "Patient's Medical Record Number", "Patient's Blood Spot Card No", "Patient's Gender (Male, Female)", "Patient's GA (in weeks)", and "Patient's Date of Birth". There are up and down arrow buttons next to the list, and a "select all" button below it.
- fields to include in imported file:** An empty text area for selecting fields to import. It has "up", "down", "edit", and "remove all" buttons below it.
- Additional Import Information:**
 - file type:** A dropdown menu currently showing "select a format".
 - first row contains column names:** A checked checkbox.
 - update existing patient information:** A checked checkbox.
 - File to import:** A text input field with a "Browse..." button to its right.
- Custom Import Configurations:**
 - saved configurations:** An empty text area with "load" and "delete" buttons below it.
 - save configuration:** A checkbox labeled "yes, save import configuration as" followed by a text input field with "(description)" as a placeholder.

At the bottom of the dialog are "import file" and "cancel" buttons.

Add New Patient can be found under the patient tab and allows a user to manually enter the demographic data for a patient.

eSP™ Functionalities: Adding Patient Testing Data

Import Test Results can be found under the patient tab and allows the user to import hearing data previously exported from various screening equipment. The user will be prompted to verify the location, select certain criteria regarding the testing location and equipment used, the type of test (birth screen, outpatient screen, risk monitoring, or a combination) and the screener. Once the required information has been selected he/she can browse for the file (only OZ 7 files will be compatible) and then start the import.

Imported Files can also be found under the patient tab and allows the user to view previously imported hearing data files. When the import process above is complete it will automatically take the user to the imported file to be viewed. The application defaults to show files imported on the current date, but the user also has the option to filter within a selected date range. A sample of the filter results can be seen below. If a file shows as complete then each of the results in the file have been processed and assigned to a baby. If the file shows incomplete then test results still need to be processed and assigned to a baby. The user can open the file and search for the patient record, if one cannot be found then the user has the option to create a record for the patient to which the test result will automatically assign itself.

	File Name	Date	User	Status
Open	Test.oz	Timestamp from import	Screener, Sample	Complete

Enter Manual Screening Results can be found under the hearing tab of the patient’s record, and allows the user to manually enter testing results for birth screening, outpatient screening, or risk monitoring. The user will be prompted to select certain criteria regarding the testing location and equipment used, the test result (technical fail, note done, pass, refer) for each ear, the test type (birth screen, outpatient screen, risk monitoring) and the screener. The date will automatically default to the current date and time but the user has the option to change both date and time if the screening was completed earlier.

eSP™ Functionalities: Searches vs. Reports

Searches provide patient specific data, typically either looking for a specific patient to update his/her record or a group of patients who meet a certain set of parameters for analysis.

Example of Initial Search Output:

Name	Unique ID Number*	Medical Record Number	Date of Birth	Nursery
Sample, Baby	N1231464	13154643	3/5/2009	Well Baby

* Unique ID Number can be Medicaid Number, Bloodspot Card Number, etc.

From this point a specific patient can be viewed, the list as is represented above can be printed, or data from an established field list of over 100 variables can be exported to a text file for further analysis.

Reports provide aggregate program data via an Excel spreadsheet.

- **Annual Reports** provide data points by month, quarter, and year to analyze two types of program data-birth admissions screening and follow-up
 - **Birth Admission Screening:** compares data for the total number of births to those who need screening sub-grouping by “in process,” “done,” “pass both,” “refer,” “missed,” and “need follow-up.”
 - **Follow-Up:** compares data for those who need follow-up to those for whom follow-up is available sub-grouping by “in process,” “receiving follow-up: Birth Admission Fail,” “receiving follow-up: Birth Admission Missed,” “pass both,” “lost to follow up,” and “diagnosis needed.”
- **Aging Reports** provide data points by editable age intervals (hours, days, weeks, months, or years) for three different events- Birth Admission Screening, Follow-Up Screening, and Audiologic Assessment. Each report compares number, percentages, cumulative, and cumulative percentages by age interval. It also evaluates means, medians, standard deviations, minimums, maximums, and 90th, 95th, and 99th percentiles.

eSP™ Functionalities: Search and Report Configuration

Reports and Searches have the ability to be configured utilizing a variety of different fields outlined below. These configurations can be saved to use again as needed.

Patient Options	Professional Contact Options	Demographic Options	Patient Status Options	Test Result Options	Hearing Risk Options
<ul style="list-style-type: none"> - Last Name - First Name - Unique ID No. - Medical Record No. - Date of Birth - Location - Birth Admission Status - Nursery - Confidential ID No. 	<ul style="list-style-type: none"> - Provider- with or without services - Facility with or without services Configurable List of Services: <ul style="list-style-type: none"> - Birthscreen Provider - Audiologist - Case Management - ENT - Financial - Geneticist - Habilitation - OP Screening - Ophthalmologist - Parent Group - PCP/Medical Home - Social Services - Speech & Language Pathologist 	<ul style="list-style-type: none"> - Gender - Birth weight - Pt Contacts <ul style="list-style-type: none"> - Last Name - First Name - Zip Code - County - Race - Ethnicity 	<ul style="list-style-type: none"> - Birth Screen Outcomes - Outpatient Screen Outcomes - Risk Monitoring Outcomes - Audiologic Assessment Outcomes - ENT Outcomes - EI Outcomes - HAB Outcomes - Contact Information Status - Patient Outcomes - Appointments (range) 	<ul style="list-style-type: none"> - Pass - Refer - Technical Fail - Not Tested - Not Required - Not Appropriate - DPOAE - TOAE - AABR - Right Ear - Left Ear - Only One Ear - One or Both Ears - Both Ears - Screening Dates (range) 	<ul style="list-style-type: none"> - NICU > 5 days - Bacterial meningitis - Congenital infection - Apgar 0-4 at 1 minute - Cranio-facial anomalies - Birth weight < 1500g - Exchange transfusion for elevated biliruben - Ototoxic medications administered - PPHN associated with mechanical ventilation - Head Injury - Neurodegenerative Disorder - Apgar 0-6 at 5 minutes - Parental concern regarding hearing status - Otitis media > 3 months (middle ear infection) - Syndrome - Other Postnatal Infection - Up to 10 additional configurable local risk factors - Actual number of risk factors present (range 0-17)

eSP™ Functionalities: Managing Patient Notes

Case Notes (user notes) are created by a user to document information on a patient that can be seen by other users with that access right. It is a means of communicating with other parties who will be participating in the child's care.

Sample Case Note:

Patient Name	Created By	Date and Time Created
Note Text		

Viewing Case Notes: Once notes are created on a patient's record, the most recent of these notes will be displayed under "Last Case Note:" on the Demographics tab. The "View/Add Case Notes" button will display the number of case notes present for that patient in parenthesis. Clicking on this button will pull up all of the case notes entered for this patient, with the ability to edit those present, as well as enter additional notes.

Last Case Note: Sample case note number 1	View/Add Case Notes (1)
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System Notes are created by eSP™ when action is taken on the patient record. This includes adding a patient, patient contact, professional contact, patient merge, changes to test results, etc.

Sample System Note:

Patient Name	System	Time Stamp when action occurred
Action taken. Who initiated the task (user) and on whose behalf the action was taken (either eSP or Facility).		

Searching System Notes: These notes can be viewed either through the "manage patient notes" selection under the patient tab or "View/Add Case Notes" on the patient's demographic tab. In either method "find notes by user type:" must be changed to All or System.

Patient Case Notes Search Criteria:	
search for:	<input type="text"/>
search in:	all my facilities <input type="button" value="v"/>
find notes by type:	All <input type="button" value="v"/>
find notes by category:	General <input type="button" value="v"/>
edited from:	05/20/2009 <input type="button" value="c"/> to <input type="text"/> <input type="button" value="c"/> <input type="button" value="Search Notes"/>

Audit Trails are created on every patient through a combination of system and case notes. For example, a case note may read patient transferred to Hospital B due to complications and the system note would read Professional Contact Hospital offering the service of Birth Screen Provider was added to patient's record. These notes are searchable by both contact and date ranges. For example, a baby misses his/her birth screen and a program manager searches that baby's name and the date range from date of birth to discharge date to see if any notes were entered as to why the baby was missed.

eSP™ Functionalities: The patient journey

Logic based care paths guide each patient through the process from screening to diagnosis to intervention producing reliably consistent care for every baby in the system. For each stage of the process, whenever data is entered; eSP™ analyzes the data entered in combination with data already present to determine the next step in the process so that each patient is able to move efficiently from screening to diagnosis to intervention. There are over 215 possible outcomes mapped in eSP™. Likewise, there are 10 searches pre-built into the patient journey outlined below.

Patient Journey Tab	Patients Searched
1. In Patient	All patients in a birth facility both Well Baby and NICU nurseries who have either not been screened or did not pass the screening and have not been discharged.
2. Well Baby	All patients in a birth facility in the Well Baby nursery who have either not been screened or did not pass the screening and have not been discharged.
3. NICU	All patients in a birth facility in the NICU nursery who have either not been screened or did not pass the screening and have not been discharged.
4. Out Patient	All patients associated with a birth facility who require Out Patient follow-up either Out Patient screening or Risk Monitoring and have an appointment scheduled.
5. OP Screening	All patients associated with a birth facility who require Out Patient screening and have an appointment scheduled.
6. Risk Monitoring	All patients associated with a birth facility who require Risk Monitoring and have an appointment scheduled.
7. Out Patient Screening	All patients associated with a birth facility who require Out Patient screening and do not have an appointment scheduled.
8. Risk Monitoring Screening	All patients associated with a birth facility who require Risk Monitoring and do not have an appointment scheduled.
9. Audiologic Assessment	All patients associated with a birth facility who require Audiologic Assessment and do not have an appointment scheduled.
10. Complete Care Process	All patients in a birth facility both Well Baby and NICU nurseries who require some step to complete the care process and have not been discharged.

eSP™ Functionalities: Letters Tab

Letter Library is where all of the letter templates are housed. There are two types of templates, enterprise and local. Local are used just at the facility level whereas enterprise are used at the state/national level. These templates are configurable to meet the needs of the program both in text and merge fields.

Assign Letters allows different letter templates to be assigned to different types recipients based on the different possible testing outcomes as seen in the table below. Letter templates can also be marked as required which will notify the user to generate the letter when the appropriate conditions are met. If the required box is not selected, these letters may still be generated but are not required as a part of the child's care path and notification will not be triggered automatically.

Contacts	Outcome
– Primary/Professional Contacts	– Birth Screening Outcomes
– Records	– Outpatient Outcomes
– Social Services	– Risk Monitoring Outcomes
– Audiologists	– Audiological Assessment Outcomes
– Ophthalmologists	– ENT Outcomes
– Speech & Language Pathologists	– EI (Early Intervention) Outcomes
– Early Childhood Advisor	– Habilitation Outcomes
– Geneticists	– Contact Information
– Parent Groups	
– Birth Screen Providers	
– PCP/Medical Home	
– ENT	
– Outpatient Screener	
– Habilitation	
– Case management	
– Other Services	

Generate Letters produces a list of outstanding letters (required and optional) that have not yet been printed for all of the patients within a facility, a sample of this list can be seen below. The user has the option to print letters for all patients on the list or to select certain patients and generate only certain letters. For example a user could select only letters for those patients who did not pass their birth screening. After the selection is made, eSP™ will generate a mail merged word document that can be opened, printed, and mailed to the appropriate person.

	Patient Name	Medicaid No.	Medical Record No.	Letter Topic	Recipient Type
<input type="checkbox"/>	Test, Baby	N1564848	1618618618	Birth Admit- Pass Neither	Contacts

View Letters allows the user to see letters that have already been generated. The user can select a date from which to start their search and eSP™ will generate a list of all letters generated from the selected date to the current date for all patients within a facility, a sample of this list can be seen below. Any of these letters can be re-generated by clicking on the word icon and resent.

	Status	Patients	Info	User	Submitted
	Complete	Test		User, Sample	Time Stamp originally generated

eSP™ Functionalities: Letters from the Patient Tab

In addition to managing the patient’s letters from the letters tab, the patient’s letters can also be accessed from the patient’s demographic tab under the tasks section.



If the patient does not meet the criteria to warrant a required letter or this letter has already been generated and printed his or her letters tab will look like the above example on the left. If the patient does meet the criteria to warrant a required letter and it has not yet been generated, it will look the above example on the right. Regardless of which tab is displayed, clicking on it will take the user to the “To Be Printed” screen. If there are no letters to be printed it will read “no outstanding letters to be printed.” If there are letters to be printed, the user can select, generate, and print the necessary letter(s). Once this has been done, the pink tab will convert to the gray tab seen above. After clicking on either tab, users will also have the option to navigate to either the “Available” or “History” screens outlined below.

- **“Available” screen** will list all of the available letters for the patient, this includes any optional letters for the patient, and any of these letters listed can be selected and reprinted
- **“History” screen** will produce a list of letters which have already been generated for the patient similar to that of the list generated under the View Letters tab. All of these letters can still be selected and re-printed just like those under the “View Letters” option under the letters tab. However, the “History” screen will only show those letters generated for this patient and it will show all letters generated for this patient since their creation in the system, as there is no date filter.

eSP™ Functionalities: Alerts

eSP™ utilizes a traffic-light style alerting system for the different tabs under the task section on the patient’s demographic page, so that it is clear to the user at a glance what actions must be taken to move the patient through the process.

Letters

Text	Color	Logic
No Letters to Produce	Gray	Currently no letters to produce
Letters to Produce	Pink	Required letter needs to be generated

Appointments

Text	Color	Logic
No Appointments Required	Gray	Patient does not need a follow-up appointment
Appointments Required	Pink	Patient needs to be scheduled for a follow-up appointment
Appointments Pending	Gray	Patient has been scheduled for a follow-up appointment-awaiting results

Contact Information

Text	Color	Logic
Contact Info Required and Present	Green	Patient’s primary contact information is entered including address and phone number
Contact Info Required but not Present	Pink	Patient’s primary contact information is either incomplete or missing altogether