



A Quality Improvement Project to Ensure Timely Cytomegalovirus Testing and Follow-up for Babies that do not Pass Newborn Hearing Screening at Mayo Clinic

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Introduction

- Twenty-six percent of babies diagnosed as deaf or hard of hearing show evidence of cytomegalovirus (CMV) infection¹.
- CMV is a virus that infects people of all ages; however, most show no symptoms of having been infected.
 - CMV can pose serious health problems to a baby if the mother is infected while pregnant.
 - Some of the consequences of congenital CMV may have long term health problems, including hearing loss.
- Minnesota, like most states, does not have established clinical practices to have CMV testing performed on babies who refer their initial newborn hearing screening (NHS).
- Mayo Clinic and Mayo Clinic Health System are developing practice guidelines to identify and monitor babies who have CMV in the well child population.
 - By 21 days of age, all babies will complete CMV testing by urine or saliva using polymerase chain reaction (PCR) testing if they refer on inpatient (in hospital) newborn hearing screen.
 - If a specimen cannot be collected before discharge, primary care will be notified to accomplish this.
- The aim of this project is to develop a prospective protocol including all babies who refer NHS and are CMV positive.
 - These babies will go on to audiometric diagnostic evaluation and referred to infectious disease specialists for further management.
 - All babies found to be CMV positive, regardless of their hearing status, will have regular audiometric follow up.
 - Limited guidance exists on the optimal audiometric follow up timelines and protocols².
- Development of electronic medical record standards and clinical practice guidelines aligned with these aims will promote clinical integration.
- Early identification and management of babies who are deaf or hard of hearing as a result of CMV infection will be enhanced by this project.

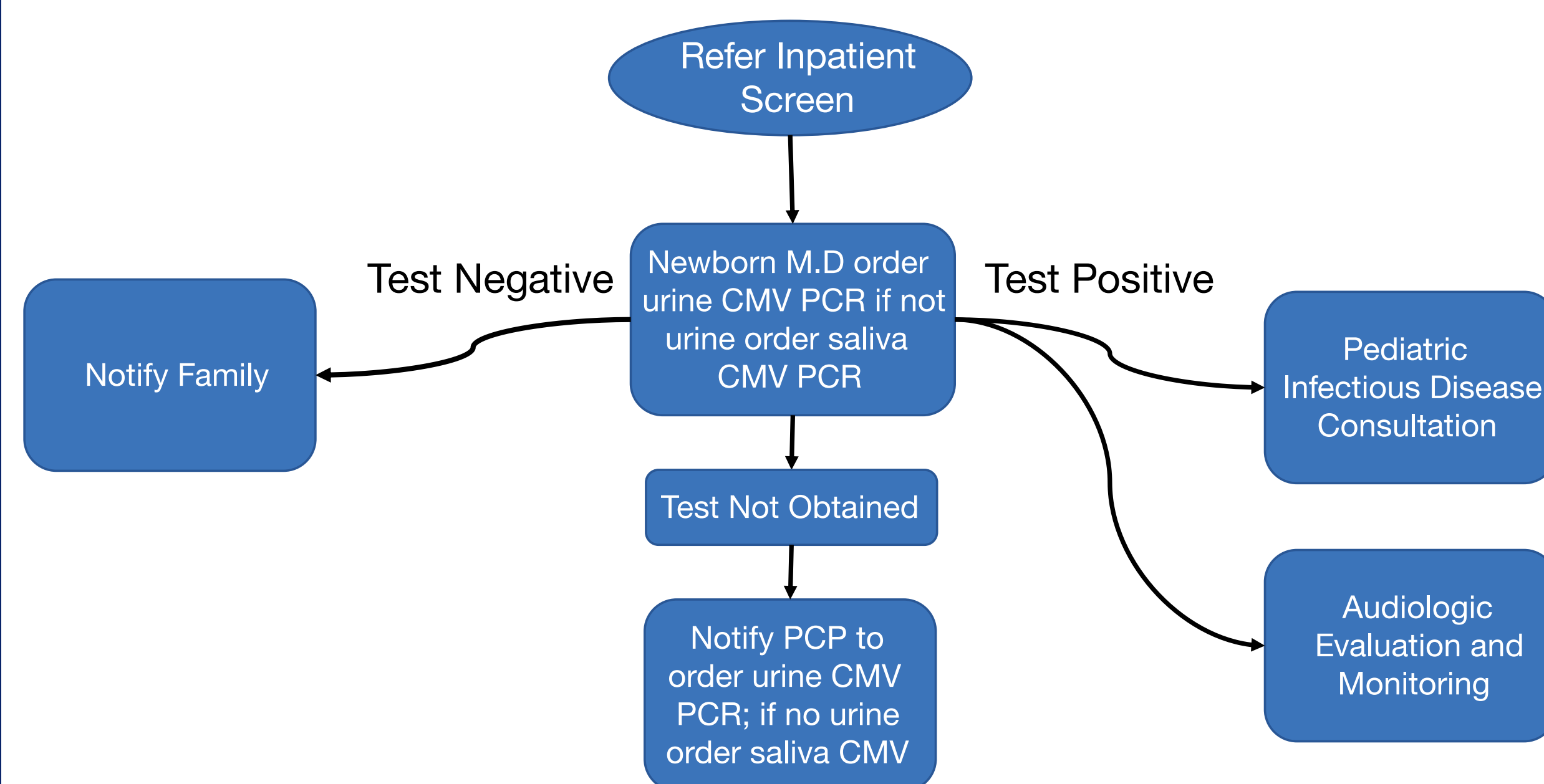
Objectives

- Objective 1:** To develop a quality improvement strategy where all babies who do not pass hearing screening get CMV testing by 21 days of age
- Objective 2:** To develop a follow up plan for all babies who test positive for CMV, keeping in mind that some may be found to have normal hearing
- Objective 3:** To create an electronic means of tracking these babies
- Objective 4:** To create a family centered educational tool

Newborn Hearing Screening (NHS)

- All babies born at Mayo Clinic in Rochester, MN undergo NHS according to Minnesota state guidelines².
 - Well Child Nursery: A two step method is used such that if otoacoustic emissions (OAEs) is not passed, then automated auditory brainstem response (AABR) screening is completed.
 - Intermediate Special Care Nursery (ISCN): hearing is screened by AABR
 - Neonatal Intensive Care Unit (NICU): hearing is screened by AABR
- NHS is completed primarily by audiology assistants who offer to screen in the mother's room whenever possible.
 - Timing of the screening is on the first full day of life in the well child population and is in the last week of the hospital stay for babies in the ISCN or NICU.
 - Results are given verbally and in writing at the time of the screening.
 - A brochure with a list of milestones for hearing and speech development is also provided.
 - No more than two attempts at screening are completed before scheduling outpatient rescreening.
- Inpatient refer result for one or both ears prompts scheduling as an outpatient and creation of a note in the electronic medical record outlining the results of the NHS.
 - It is at this point that CMV testing is initiated through care team communications between Audiology and the physician service managing the baby.
 - The physician service orders the CMV test and the nurse completes the urine collection for PCR.
 - Hearing screening, risk factor, and follow up data are tracked through an internally created (EHDI) database.

CMV Test Procedure for Newborns



Mayo Clinic Birth Cohort

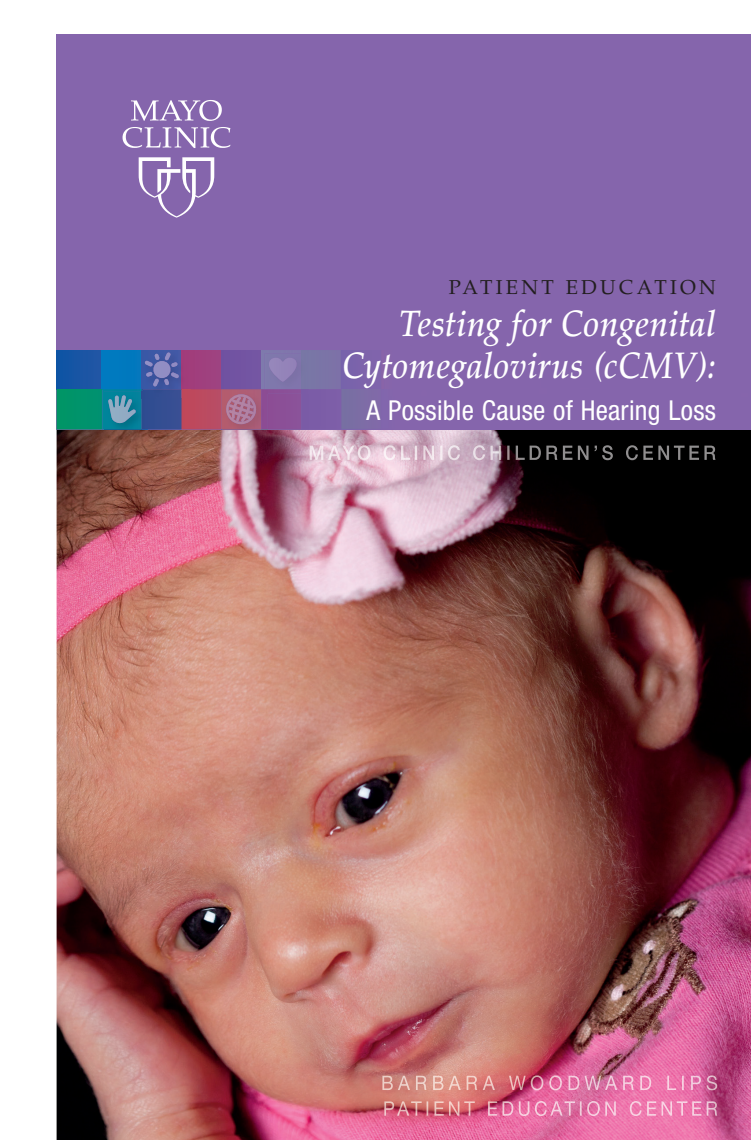
- Over the past three years of newborn hearing screening at Mayo Clinic, an average of 1880 babies were screened in the well child nursery annually.
 - Of those, about 4% had a refer result on their inpatient hearing screening and were scheduled for outpatient rescreening.
 - That is, approximately 79 babies per year will have a refer result on their screening and require CMV testing.

	2015	2016	2017	Average
Birth cohort	1899	1839	1902	1880
Fail/ Refer	49	65	125	79

- Based on previous work by Choi et al. (2009), it is anticipated that ~2.7% of the Mayo Clinic newborn hearing screening population will test positive for CMV³.
 - This serves as a predictor of the number of patients expected to require follow up. Of the 79 babies per year with a refer on inpatient NHS, 2-3 babies are expected to require follow up.
- Follow up will include consultation with an infectious disease specialist and regular monitoring of hearing status until 3 years of age⁴.

Patient Education Tool

- What is CMV?
- How does it cause illness?
- Relationship of CMV and hearing loss
- Testing for CMV
- Treatment for CMV
- CMV Prevention



Conclusions

- This project will enhance early identification and management of babies who are deaf or hard of hearing as a result of CMV infection.
- Based on past experience, it is expected that approximately 4% of patients per year will refer their inpatient hearing screening and 2.7% of those will require follow up with Audiology and Infectious Disease.
- Development of family-centered educational materials combined with improvements in electronic medical record standards/tracking will promote clinical integration.

References

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