Audiology – Meningitis Protocol Inpatient – Outpatient 3.9.22

ORG A

Inpatient Specific Questions:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult?
This varies, depending on child's health. We see the child when the doctor thinks the child is healthy enough to have the testing. Almost always, we are contacted by the infectious disease department while the child is inpatient.

Is this an automated process?
No. The infectious disease physician places an order in our electronic record keeping system (EPIC) and one of the audiologists will go see the child inpatient.

What Audiology testing is done and within what timeline?
We try to see the child within a day of being contacted by the physician. We do a screening ABR if the child is under 6 months of age, followed up by an unsedated diagnostic ABR in one month if the baby passes the screen. If the baby does not pass the screen, we follow-up with an unsedated diagnostic ABR as soon possible. We can do this inpatient or outpatient.

For children older than 6 months of age we would likely screen using OEA and a perform a hearing test using Visual Reinforcement Audiometry/Conditioned Play Audiometry/Standard Audiometry as soon as child is well enough to test inpatient or able to come to our clinic (if very young). If child cannot be tested behaviorally due to illness or age, we would schedule a sedated ABR. We can sometimes do the ABR when a child is being sedated for a different procedure.

Do you have concerns/issues with anesthesia and completion of the ABR?
We have our sedation team make these decisions.

Is Radiologic testing completed during the inpatient admission to assess early ossification?
The physicians make these decisions. If we obtain abnormal test results, we refer to a neuro-otologist who also does cochlear implants as soon as possible.

At what point, is ENT consulted?
2 ways: As soon hearing loss is determined by audiology. The infectious disease control doctors can also refer to ENT

Outpatient:

What is the pathway and timeline for outpatient follow-up and intervention?
We try to test at one month, unless inpatient results are abnormal while inpatient, then we try to see the patient as soon as they are healthy enough to be seen. If we obtain normal results at that one month visit, we repeat testing every 6 months. If we obtain abnormal results, we refer to ENT and manage the hearing loss according to our standard practice, fitting hearing aids in 3 weeks if appropriate.

Do you have a cochlear implant program? If no, does this impact your protocol? Please describe.

No, we refer out as soon as possible.

Who "case manages" these patients to assure that the follow-up is completed and that expected timelines are met?
We schedule the next appointment each time we complete a round of testing.

Do you have a written policy/procedure/pathway that you can share?
I have outlined our policy above.

ORG B

Inpatient Specific Questions:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult? Is this an automated process?
Ideally, the diagnostic hearing testing should be ordered as soon as the meningitis diagnosis is made, but sometimes the diagnostic is often ordered near the end of the antibiotic course.

The consult (Audiology Diagnostic Evaluation) is initiated/ordered in epic by the in-patient medical team. It is not an automated ordering process. ENT will help expedite hearing test as needed.

What Audiology testing is done and within what timeline? Do you have concerns/issues with anesthesia and completion of the ABR?
Dependent upon the child's age and cognitive/developmental status, the test would be either a diagnostic audiologic evaluation or an ABR (Automated *Brainstem Response). The BA requires only a 45 minute time slot, and it is usually less difficult to schedule the time for the patient to come to the clinic.*
If an ABR is needed, sedation may or may not be required to enable the ABR to be completed.
Patients under the age of six months corrected age are tested in a natural sleep state at the patient's bedside.
Patients greater than six months of corrected age require sedation. The level of sedation is triaged and determined by the audiology nursing staff in collaboration with the in-patient medical team. If the patient requires sedation, and is in an ICU, the medical team in the ICU orders the sedative to be given by the bedside nurse. Monitoring is done by the bedside nurse.
If the patient is on an acute unit, the sedation must be done by an anesthesia team in the OR, PACU procedure room, or in the GIPS. This need for anesthesia is often the biggest hurdle to completing the ABR in the timeliest way. Always, an attempt is made to coordinate the ABR with any other planned anesthesia event.

Otoacoustic emissions and tympanometry are also performed.

Is Radiologic testing completed during the inpatient admission to assess early ossification?
The radiological testing for ossification and the consultation with otolaryngology is initiated/monitored by the medical team for the meningitis patient. ENT will often order if not yet done when patient is diagnosed with hearing loss

At what point, is ENT consulted?

ENT consult is ordered by admitting physician if diagnosis of meningitis is already known. Otherwise, ENT consult is ordered by PHM or by critical care.

Outpatient:

What is the pathway and timeline for outpatient follow-up and intervention?. if abnormal, recommend repeat ABR or other otologic management as *indicated within 2 wks – 3 months depending on severity; start hearing aid fitting process asap if appropriate; IF normal, repeat audiologic testing in 3 mos until 1 year of age, then e. 6 months until age 3*

Do you have a cochlear implant program? If no, does this impact your protocol? Please describe. *yes, we have a ci program*

Who "case manages" these patients to assure that the follow-up is completed and that expected timelines are met? *The audiologist, or if they qualify for a CI, the CI coordinator*

Do you have a written policy/procedure/pathway that you can share? *Not that I'm aware of*

ORG C

Inpatient Specific Questions:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult? Is this an automated process?

- *This is decided by the inpatient medical team, usually Infectious Disease specifically. Not automated process, unsure if they have a specific timeline for when they place the inpatient consult order based on treatment plan.*
- *We recommend hearing evaluation be conducted immediately post dx of meningitis (regardless of pathogen), assuming patient is medically stable for testing*.

What Audiology testing is done and within what timeline? Do you have concerns/issues with anesthesia and completion of the ABR?

- *Generally Audiology is consulted when the acute illness has stabilized*
- *If behavioral testing or bedside ABR is unsuccessful we will recommend sedated ABR evaluation (assuming patient is cleared from a medical perspective – i.e. no longer febrile or with acute illness)*

Is Radiologic testing completed during the inpatient admission to assess early ossification?

- *We will recommend ENT consultation during hospitalization if ABR or behavioral testing is indicating hearing loss so that orders for imaging can be made.*

At what point, is ENT consulted?

- *If or when hearing loss is diagnosed (see above)*

Outpatient:

What is the pathway and timeline for outpatient follow-up and intervention?

- *Follow-up recommendations for children with normal hearing (20 dB HL or better) demonstrated on the initial evaluation: 3 months after initial evaluation then 6 months after initial evaluation. If initial eval and all subsequent are normal, patient will be d/c and re-evaluated as warranted/per concerns.*
- *Children with unilateral or bilateral hearing loss at initial evaluation (between 25 dBHL-70 dBHL) should be re-evaluated as follows:*
    - *2 week after initial evaluation – if results are stable then recommend every 3 months for 1st year post diagnosis, then every 6 months after first year until 3 years post-meningitis, annually thereafter as warranted or per parental concern*
    - *Children with fluctuating or worsening hearing loss should be referred back to ENT immediately*

Do you have a cochlear implant program? If no, does this impact your protocol? Please describe.
- *We are NOT a cochlear implant center*
- *Children with bilateral severe/profound hearing loss at initial evaluation are referred immediately to an ENT (ideally for imaging while admitted) and have a repeat evaluation 7 to 10 days after initial evaluation*
- *These children would be referred to a Cochlear Implant center upon discharge*

Who "case manages" these patients to assure that the follow-up is completed and that expected timelines are met?
- *Audiologist will make appropriate recommendations per our protocol and ensure follow-up is scheduled*
- *Nurse case managers may be involved in this as well on the inpatient side*

Do you have a written policy/procedure/pathway that you can share?
- *Currently in hospital approval process. We can share once it is approved.*

ORG D

Inpatient Specific Questions:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult? Is this an automated process?
Within 24 hours- not automated ENT/Audiology same time

What Audiology testing is done and within what timeline? Do you have concerns/issues with anesthesia and completion of the ABR?
If under 6 months: OAEs if UNHS was pass bilaterally, if abnormal Dx ABR. Sedated ABR if unable to complete in natural sleep state.
Is Radiologic testing completed during the inpatient admission to assess early ossification?
Not always completed, but ordered prior to discharge
At what point, is ENT consulted?
Initially at INPT diagnosis

Outpatient:

What is the pathway and timeline for outpatient follow-up and intervention?
If normal hearing- (under 6 months) behavioral testing ta 7-9 months of age, then annually.
If HL, standard follow up with management

Do you have a cochlear implant program? If no, does this impact your protocol? Please describe.
Yes, only if Hearing loss qualifying for CI. Typically fast-tracked to CI process, pending ENT recommendations, scans, parent choice

Who "case manages" these patients to assure that the follow-up is completed and that expected timelines are met?
We have a newly ID list that is monitored for those with HL. Those that are normal are sent to PCP with recommendations for future referrals/monitoring

Do you have a written policy/procedure/pathway that you can share?
We have testing guidelines for Audiology only.
ENT is a separate department

ORG E

Inpatient:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult? Is this an automated process?
As early in the hospital stay as possible, once the patient is out of the acute illness phase (typically 1-2 weeks after admission for bacterial cases, viral cases typically have a much shorter admission). Audiology consult is part of the meningitis admission power plan (providers have to opt out of the consult), otherwise the care team initiates the consult. The infectious disease department also emails audiology when there is a + culture for meningitis.

What Audiology testing is done and within what timeline? Do you have concerns/issues with anesthesia and completion of the ABR?
Diagnostic ABR, high-frequency otoacoustic emissions (1.5-12k Hz) and tympanometry on neonates. For children old enough for behavioral testing, transportation to outpatient sound booths is organized if feasible. If testing is inconclusive, or middle ear dysfunction is noted with absent OAEs, ABR under anesthesia is recommended to ENT and that testing typically takes place during the inpatient stay.

Is Radiologic testing completed during the inpatient admission to assess early ossification?
MRI and/OR CT testing is regularly completed during the inpatient admission for children whose testing indicates sensorineural hearing loss. If early signs of ossification are present, cochlear implant evaluation and surgery follow quickly thereafter. In our hospital, three children over the past two years have been identified with profound SNHL, had signs of ossification, and were subsequently implanted all during their inpatient admission.

At what point, is ENT consulted?
ENT is consulted if testing indicates middle ear dysfunction (and therefore the need for myringotomy and ABR in the OR) or sensorineural hearing loss.

Outpatient:

What is the pathway and timeline for outpatient follow-up and intervention?
The outpatient audiology follow-up is ordered and scheduled prior to inpatient discharge. If inpatient results were normal, we test children 3 months after discharge, then 3 months after that, then we discharge them (again, if all results are normal).

Do you have a cochlear implant program? If no, does this impact your protocol? Please describe.
Yes, almost all of our audiologists also work with cochlear implants.

Who “case manages” these patients to assure that the follow-up is completed and that expected timelines are met?
The inpatient audiologists and the department of health, when needed.

Do you have a written policy/procedure/pathway that you can share?
We do not have a written policy specific to meningitis. It is part of our risk factor protocol.

ORG F

Inpatient Specific Questions:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult? Is this an automated process?
Audiology is consulted anywhere from the time of diagnosis/inpatient stay to several days before the end of the treatment/inpatient stay; most often it is towards the end of the stay. I believe there is an order set that includes audiology that the attending physician initiates when appropriate.

What Audiology testing is done and within what timeline? Do you have concerns/issues with anesthesia and completion of the ABR?
Testing is completed based on the patient status and treatment, typically completed within a few days of discharge. We do have anesthesia availability when needed if ABR testing cannot be completed without sedation.

Is Radiologic testing completed during the inpatient admission to assess early ossification?
Radiology testing is typically ordered by ENT; unsure of timing.

At what point, is ENT consulted?
An ENT consult is typically placed during the inpatient admission.

Outpatient:
With our Audiology department being one entity which covers both inpatient and outpatient (including outside sites when the families live a distance from our main campus), we are able to manage the patient and have them coordinate with the cochlear implant team directly.

ORG G

We do not have a formal hospital protocol for this, but would like to create one. Reviewing other hospitals' protocols would be very helpful.

Currently, we receive an order from the in-patient doctor for babies with Meningitis. An audiologist will do either an ABR screen, diagnostic ABR, or just tymps and OAES depending on the age of the child and their wake state as soon as we can while they are hospitalized. If there are signs of hearing loss we do a diagnostic ABR ASAP. If there are no signs of hearing loss we bring them back out-patient in 1-3 months for monitoring and keep them on an every 3 month basis for at least one year after the diagnosis. I am unaware if radiology is consulted while they are inpatient. We recommended ENT as soon as their are signs of cochlear damage or hearing loss. That is our overall "protocol" for now.

ORG H

Inpatient:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult? Is this an automated process?
Ideally, once meningitis is diagnosed, the front-line ordering provider places a consult to audiology. Not automated.

What Audiology testing is done and within what timeline? Do you have concerns/issues with anesthesia and completion of the ABR?
Initial assessment includes otoacoustic emissions, immittance measures, and either ABR or behavioral assessment depending on the developmental age of the patient. Testing completed as soon as the patient is medically stable e.g., not during the active phase of meningitis.
Timeline of testing determined in consultation with the patient's medical team.
If audiologist recommends sedated ABR, the front-line ordering places consult to the sedation team to determine the type of sedation needed

Is Radiologic testing completed during the inpatient admission to assess early ossification?
Yes.

At what point, is ENT consulted?
If ENT is not already a part of the patient's care team, ENT is consulted when a hearing loss is diagnosed.

Outpatient:

What is the pathway and timeline for outpatient follow-up and intervention?
The pathway and timeline are the same for inpatient and outpatient.

Do you have a cochlear implant program? If no, does this impact your protocol? Please describe.
Yes.

Who "case manages" these patients to assure that the follow-up is completed and that expected timelines are met?
Collaborate effort between the patient's managing audiologist, family, and the teams (as needed) involved in the care of the patient (e.g., inpatient audiology, outpatient audiology, ENT, Neurology, cochlear implant team)

Do you have a written policy/procedure/pathway that you can share?
https://www.chop.edu/clinical-pathway/meningitis-clinical-pathway

ORG I

Inpatient Specific Questions:

How early following the meningitis diagnosis is Audiology consulted and who initiates the consult? Is this an automated process?

Currently, this is not an automated process, and the referral is typically placed by the consulting infectious disease physician after the initial consultation.

What Audiology testing is done and within what timeline? Do you have concerns/issues with anesthesia and completion of the ABR?
Depending on the patient, developmentally appropriate testing is completed. Neonates will receive an ABR; older children will be tested through behavioral audiometry.
This is done as soon as possible after the audiology referral is received (our goal is within 24 hours).
We do not have concerns or issues with regard to anesthesia and the ABR.
If the patient is a neonate and a natural sleep ABR can be completed, we go that route; otherwise, we request anesthesia for an ABR.

Is Radiologic testing completed during the inpatient admission to assess early ossification?
Yes, imaging is completed if/when hearing loss is identified.

At what point, is ENT consulted?
ENT is consulted as soon as a hearing loss is identified.

Outpatient:

What is the pathway and timeline for outpatient follow-up and intervention?
Before the patient is discharged, the inpatient team will coordinate with the outpatient team to schedule follow-up care to ensure there is no loss to follow-up as much as possible. If appropriate, cochlear implantation occurs as soon after ABR, diagnosis, and scans as medically possible.

Do you have a cochlear implant program? If no, does this impact your protocol? Please describe.
We do have a cochlear implant program and CI ENT's on call. This ensures we are able to get the child diagnosed and intervention started very quickly. Our inpatient and outpatient audiology teams work very closely to ensure a seamless transition to outpatient audiology and speech therapy care following discharge.

Who "case manages" these patients to assure that the follow-up is completed and that expected timelines are met?
We have a cochlear implant coordinator who manages these patients from the beginning to ensure everything is completed.

Do you have a written policy/procedure/pathway that you can share?
We do have a written protocol for these patients.