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Academia
CLAYTON FISHER
M.Cl.Sc., Audiologist

The benefits of data-transfer and computer-based audiological equipment

Thursday, June 1st, 2023

12:00PM EST

inventis
Audiology & Balance

About Me

I have worked with various hearing clinics to help clinicians do their job better/more easily

- Optimizing equipment to make clinician's lives easier, streamline clinical workflow
- I have helped transition one chain of clinics from paper to paperless, using existing and new gear
    - Helped another chain of clinics go from using manual entry to automatic data-transfer, *using existing equipment*

- What I find challenging and fun, other clinicians find annoying and uncomfortable.

About Me

I have a YouTube channel dedicated to audiology best-practice instruction and education

- https://www.youtube.com/@hearinghealthawareness8328
- Most of the content thus far has focused on the treatment side with hearing aids (REM)
- Finally, I'm talking about assessment!
  - Check out my PC-based audiometry video:

https://www.youtube.com/watch?v=8hQX_vNoRm0

Don’t we do a good job at testing?

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Most people can do an accurate hearing test… this talk relates more to workflow (but also, significantly, to the patient experience)

- Who cares if clinicians are doing things the hard way? It’s their loss, right?
- But sometimes improvements in workflow mean improvements in accuracy too…
- Equipment improvements often means a better patient experience

Interesting quote from the past

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"As intimidating as it might seem to transition to PC-based audiometry, the technological benefits are quickly outweighing clinicians' hesitations."

- Hearing Review, **2010**

13 years on… is this true?!

- Mikolai T, Mroz AC. Maximizing the patient counseling experience with PC-based audiometry. *Hearing Review*. 2010;17(11):18-23.

Why are we here today?

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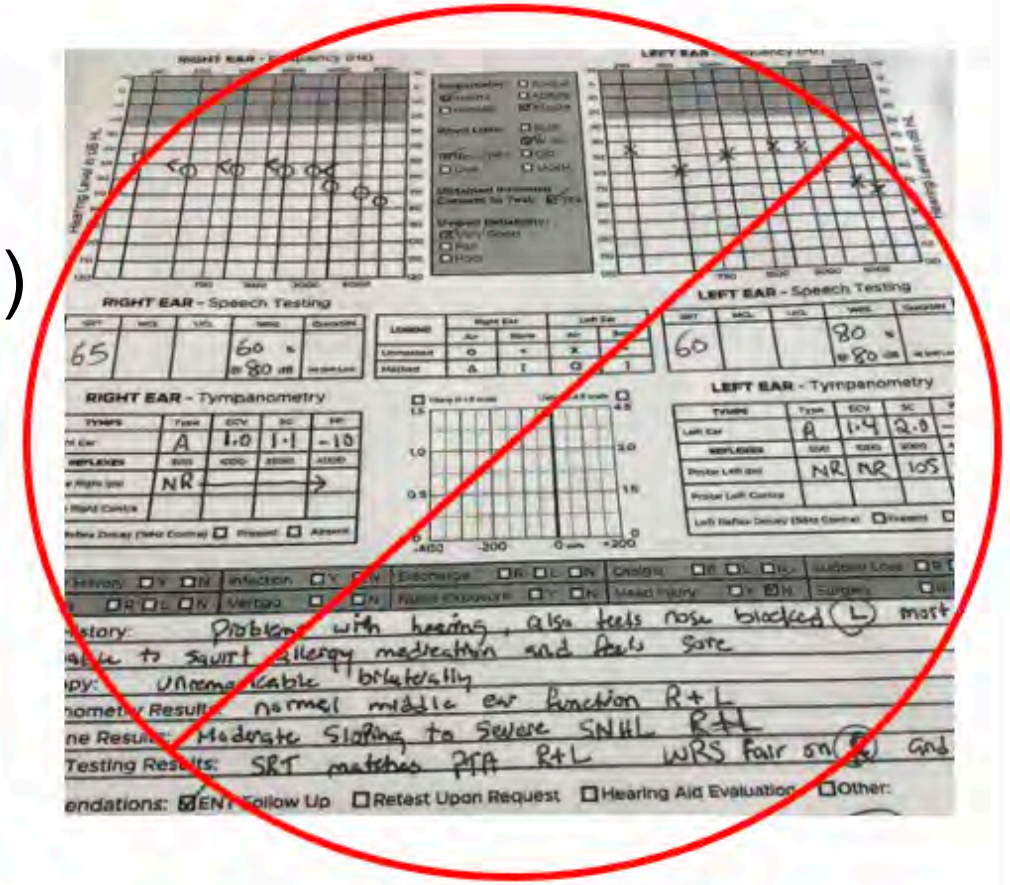
While many have embraced connected audiology, many still have not

1) There are a lot of people still doing paper audiograms (perhaps you are one of them!)

2) Many people do not optimize their gear; I will show you why you should

3) Change is often unwelcome, but with change comes opportunity!



- hopefully this talk encourages you to get started!

Workshop Goals

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Learning Objectives:

1) Understand the benefits of establishing a connection with your equipment to a computer for clinical workflow and precision
2) Understand the benefits of establishing a connection with your equipment to a computer for the patient experience
3) Understand the different methods of achieving connectivity for assessment

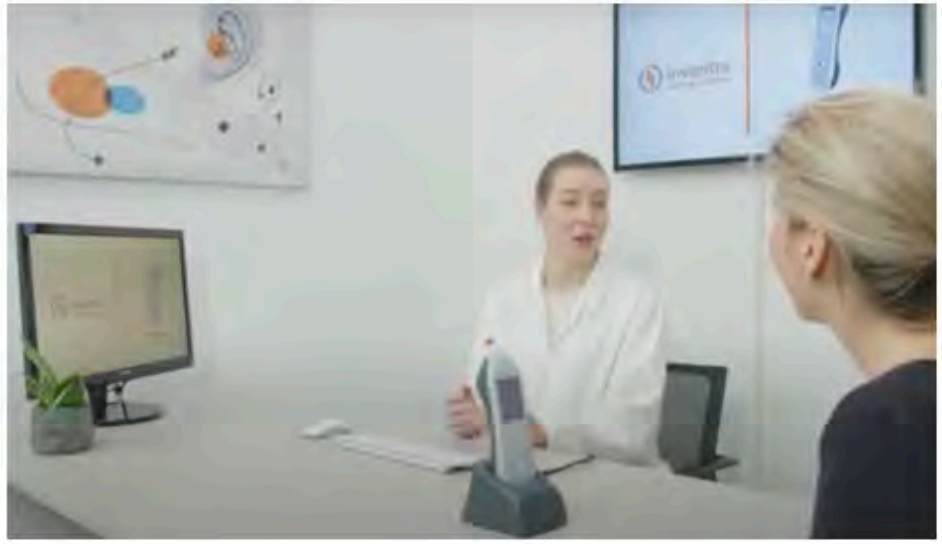
Workshop Outline

- **Part 1: Context and background**
- Terminology: what options are out there in terms of connectivity ?
- What are the benefits of connecting your gear to your PC?
- Some history on the topic and why there is reluctance from clinicians
- **Part 2: Compare and Contrast**
- Let’s walk through an assessment, the old way and the new way
- You decide which is superior both for you and your patient

My assumptions

If you're participating today, I assume that either:

- You are using traditional testing methods
- You may have the ability to do connected audiometry, but you're not using it
- You have a connected set-up, but are wondering if there are other ways you can optimize it

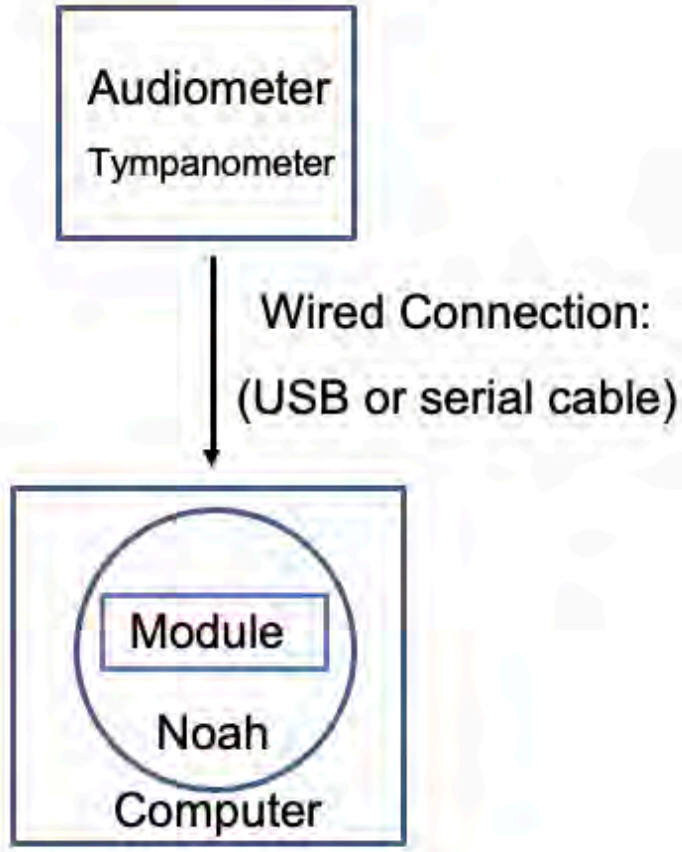


Context and Background

A Typical Set-up

Most people will use:

- **Noah as a database**
  - **Using the equipment manufacturer's software…**
    - **As a module from within Noah**
- Data is transferred to, or recorded in, the equipment manufacturer's Noah module
  - e.g. Maestro (Inventis), GSI-Suite, Otosuite (Natus/Otometrics), Interacoustics Suite etc.)
- When you save in the software, it saves to the Noah database



Note: Manual Data Entry to Noah

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Some clinics use a computer in the test room to enter data manually into Noah in real-time

- Noah 4 Audiogram module is a basic Noah module from HIMSA
- Rather than writing out a paper audiogram by hand, just manually input it directly into Noah
    - Tymp and speech data can be manually entered too
- Print to PDF, or paper

Terminology

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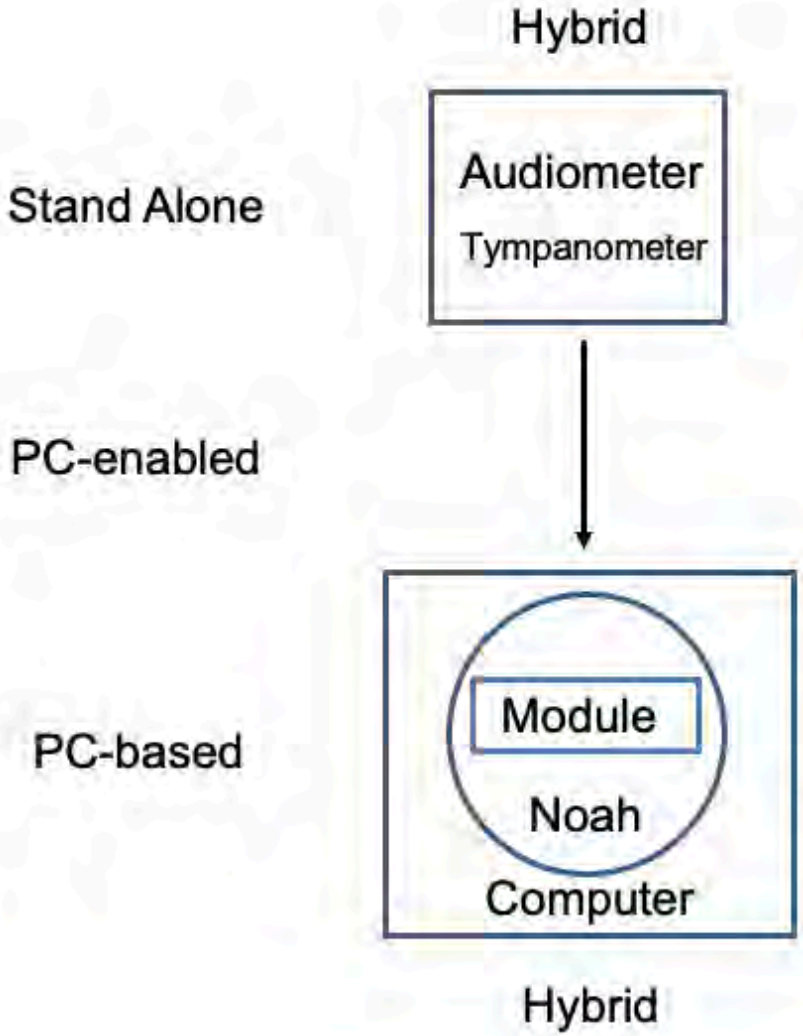
All audiometers and tympanometers fall into these categories

- **Stand-Alone** (no connection to PC)
- **PC-enabled**
  - data-transfer to PC (after saving on device)
- **PC-based**
  - computer triggers audiometric stimuli and stores results
- **Hybrid** (can be controlled by either computer or control panel)
- **Live view** (can use PC screen as a monitor)

Terminology Cont.



Hand-written Paper Audiogram

Manual Entry to Noah:

Printed audiogram

PDF audiogram

PDF Audiogram:

Generated from Software Suite

Generated from OMS

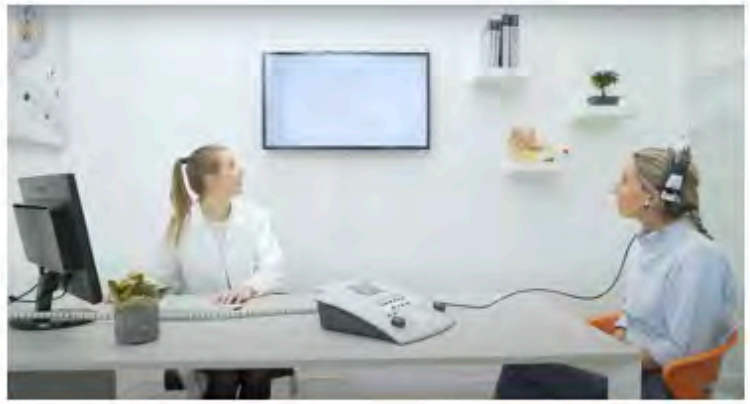
Examples of Gear Types

- **PC-enabled**
  - E.g. Inventis Piano/Harp or GSI Audiostar/Pello

- **PC-based**
  - E.g. Inventis Cello audiometer or Madsen Zodiac tympanometer

- **Hybrid**
  - E.g. Interacoustics AD629

- **Live view**
  - E.g. Inventis Flute/Clarinet tympanometers



Note on Hybrid Options

Certain PC-based audiometers offer a control-panel accessory option

- For those who recognize the benefits of a PC-based system, but want the old feeling of a classic device
- Longstanding example of this is the Madsen Astera

- **Inventis has recently released a control panel for the Cello**
  - Perhaps having the best of both worlds will allow clinicians thinking of making the jump feel more comfortable

Poll

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What is your current audiometry / audiogram set-up?

a. Paper audiogram with stand-alone audiometer

b. Digital audiogram with stand-alone audiometer

c. Digital audiogram with PC-enabled audiometer

d. Digital audiogram with PC-based audiometer

Why connect your gear?

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1) Benefits to clinical workflow

- **Efficiency**
  - It is faster to press “store” than it is to manually record a threshold (and it is *way* faster for tymp data!)
- **Accuracy**
  - There is *FAR* less opportunity for user/tester errors
- **Convenience**
  - Who wants to waist mental energy manually recording audiometric data?!

Why connect your gear?

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Benefits to clinical workflow cont.

- **Automatic calculations** in Noah or Manufacturer Module
  - Pure tone averages are automatically calculated
  - Audibility Index (AI) aka Speech Intelligibility Index (SII) automatically calculated
- **Compare data over time**
  - You can overlay historical audiogram to compare thresholds or to expedite testing

Why connect your gear?

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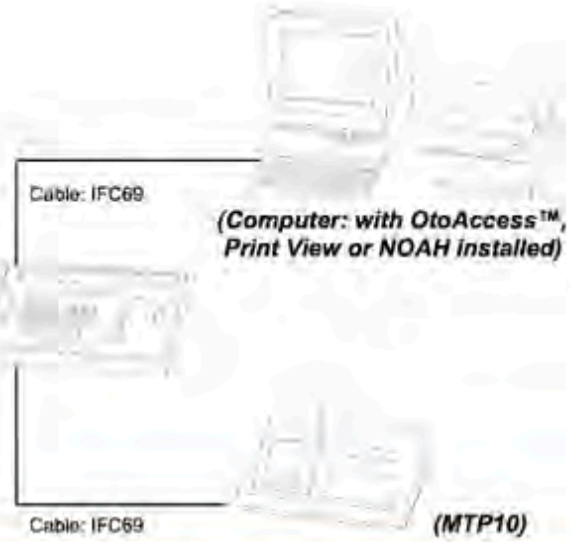
2) Benefits to the patient experience

- **Inclusion**
  - The patient can be included in every step of the assessment
- **Transparency**
  - They see what you see
- **Professionalism**
  - This is a more impressive approach that builds patient trust

This is not a new thing!

Equipment manufacturers have long understood that offering the ability to transfer data could offer many benefits to clinicians.

You may actually be surprised at what older equipment has the ability to do data transfer (e.g. Interacoutics AD**229** (circa 2007)



Connection to PC

The data from AD229E can be transferred to a PC by means of an Interacoustics UCA40 to USB adapter cable. The software needed for AD229E for transferring data to a PC is one of the following Windows compatible software:

- OtoAccess™ Database Program + diagnostics modules minimum version 1.25
- PrintView for PC monitoring and printing minimum version 1.15
- IA-NOAH-Aud Module interfacing to NOAH minimum version 1.23

Can a GSI-61 transfer data?

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?

Noah 4

Answer: Yes (Theoretically)

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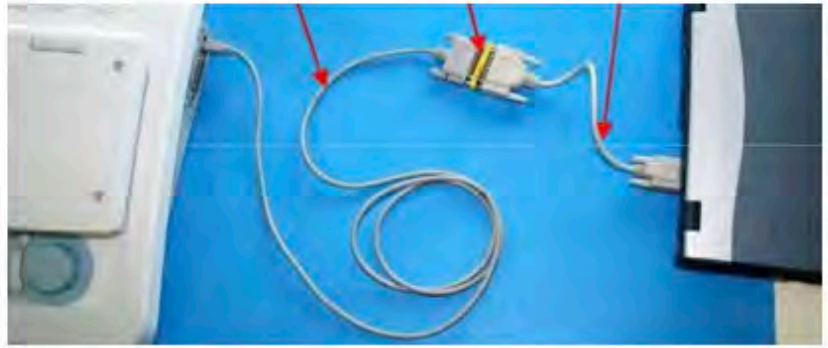
- **Ever older legacy audiometers could transfer data to NOAH**
  - But **no one** used this feature as it required uploading drivers and an understanding of:
    - Hardware/software handshakes,
    - dip switches, baud rates, parity, number of data bits/stop bits, etc.
  - Not to mention adapters!



Fun Fact #1

- **I participated in a lab-based student project in my Western audiology program Instrumentation class where my group decided to try and get legacy GSI gear transferring data to Noah**
  - There were three of us in the group
    - One was a computer engineer
    - One was an amateur audio engineer
    - The other was me, a gear enthusiast
  - We could not get either the GSI 61 nor the Tympstar to transfer data!!! It was deeply discouraging!

Luckily, a lot has changed

With newer devices, it is much easier now, as technology has developed significantly and the set-up is greatly simplified

- Now, easy USB connection to PC
    - Often no drivers needed
- No advanced computer knowledge needed

Can a GSI-Audiostar transfer data?

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?

Noah 4

Yes, of course, it *can*…

But how often is this feature used?!

- Less than you think!
- What is the number one listed FAQ on the Audiostar webpage?

> **Q. Does the GSI AudioStar Pro require a computer to operate?**
> **A.** No, the AudioStar Pro can operate as a fully functional, stand-alone audiometer without a computer.

  - It’s not until way down on the page where they first mention that it is PC-enabled

Example

I recently met a longstanding private clinic owner at a conference and asked him what audiometer his clinic uses… he told me he just replaced his legacy audiometer with a brand new GSI Audiostar!

When I asked him if he has it connected to Noah, he disclosed that he does not even have a computer in the test room!

My response?

"WTF ?!?!?!"

Why don’t more people do it?

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If this is so great, why doesn’t everyone do it?

- “If it ain’t broke, don’t fix it”
- Change is difficult; maintaining the status quo is far easier
- Many clinicians are not equipment-oriented
- It can be hard to find the time to learn to use your equipment to the fullest (lunch hour, patient cancellations, in the evenings!)
- With how hard it was in the past, I don’t blame anyone for being hesitant!

Are there any exceptions?

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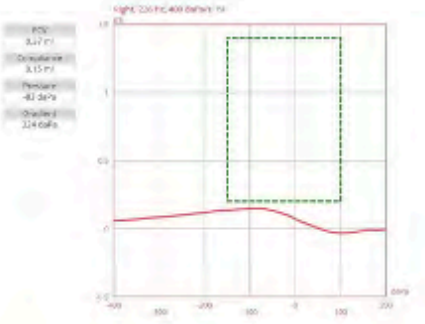
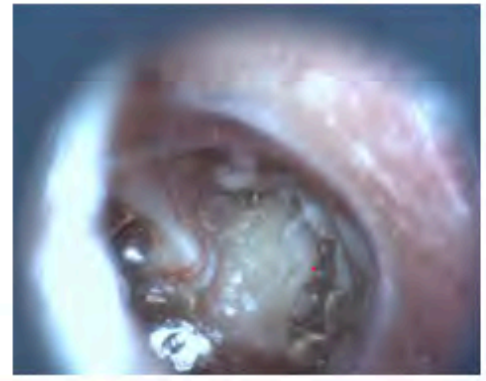
Arguably, the only time it *could* make sense to do a paper audiogram is for ENT testing

- Depending on the reporting method, it is likely a little faster to just scribble the report out and hand it to the ENT
  - However, the report would look way better if it was a digital PDF
    - With tymp **curves**, not just data and Type!
  - **Consider the enormous lost opportunity for creating a searchable database for the ENT tests!**
    - Imagine the research possibilities if you could look at and compare that audiogram data by hearing loss type, degree, configuration, test date, etc.
      - Also, video otoscopy over time over time is very useful





Fun Fact # 2

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- **While working in the context of a large hospital organization I suggested that we should enter audiograms into Noah in real time instead of a digital version of a paper audiogram in EMR**
  - My supervisor asked me “Why would we want to do that?”
  - Why? The possibilities are endless… but there are zero possibilities with paper (or digital version of paper)
    - When a paper audiogram (or its digital equivalent) is filed away in the patient’s chart, the audiometric threshold data is lost forever; but when it is entered into the Noah database…
      - Huge opportunity clinically, and for research, etc.

Do I have to replace my gear?

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- **If you have older equipment and really don't want to buy new gear, you need to determine if your device can transfer data**
  - And the feasibility of it (it likely doesn't make sense for true legacy devices… but it is worth looking into!)
  - It is the "in-between" devices were the opportunity lies
    - These are the devices that are PC-enabled, but that most people use as stand alone

Mix and Match

It doesn't have to be all or none!

- You may have a tympanometer that can easily do data transfer but maybe your audiometer cannot

This is fine! You can use a combined approach until you can or want to replace your audiometer

- Use Tymp manufacturer's module to receive data from tymp
  - Close out and open Noah 4 Audiogram module for manual input of thresholds and speech

Example from my clinical experience

I worked for years using this Madsen Itera II audiometer strictly as a stand-alone device, manually entering thresholds into Noah's audiogram module

- Yet, on the very first page of the user-manual, it outlines that the device is meant to be used and is best used connected to a PC
- I should also mention that we also had an Otocam300 that was (almost) never used, unless something had to be documented

Transferring data to and from a pc

The test results are stored in the device - even when it is switched off. The results can be transferred to a PC and displayed in OTOsuite (see Managing Data and Results ► 85).

You can download new firmware to MADSEN Itera II, and if this involves no change to the transducers, MADSEN Itera II does not need to be recalibrated.

1.1 **The Audiometry Module**

OTOsuite

OTOsuite is a software tool that integrates a suite of audiological tests with result review and reporting capabilities into a single powerful PC application.

The OTOsuite Audiometry Module is designed to operate with MADSEN Itera II as the test device.

The OTOsuite Audiometry Module

The OTOsuite Audiometry Module provides you with comprehensive control and overview of the current stimulus and masking choices both numerically and graphically in the displayed audiogram when you test with a connected Otometrics audiometer.

Example from my clinical experience

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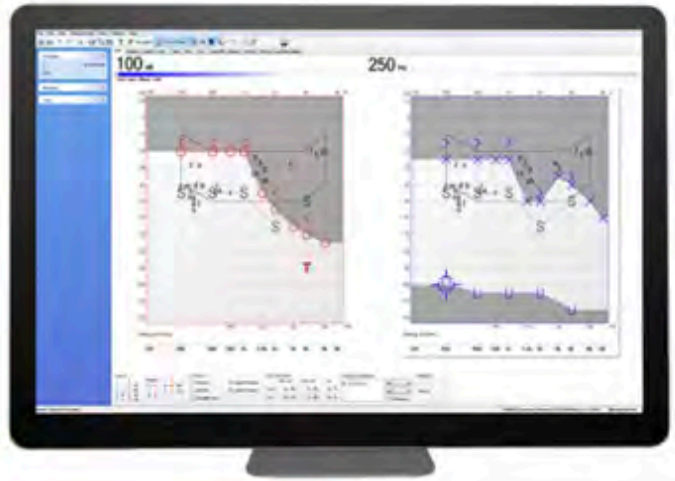
Most of the 12 locations in the family-run chain were using these device

- I went around to each clinic, found the serial cable that came with it, connected to the PCs that were already in the test rooms, made sure Otosuite uploaded as a Noah module, loaded the drivers and showed each clinician why how it was better
- It gave everyone a live audiogram monitor, as they are testing, and when they stored on the device, it would save the threshold in Noah/Otosuite



What about Tympanometry?

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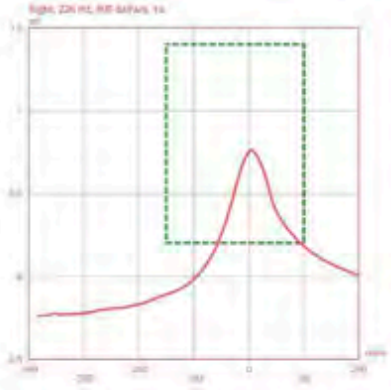
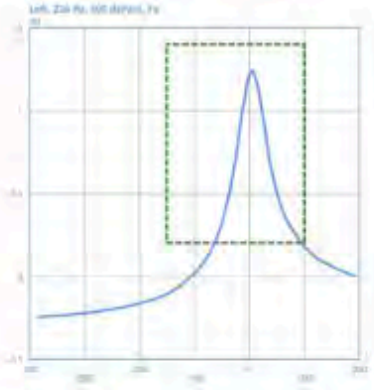
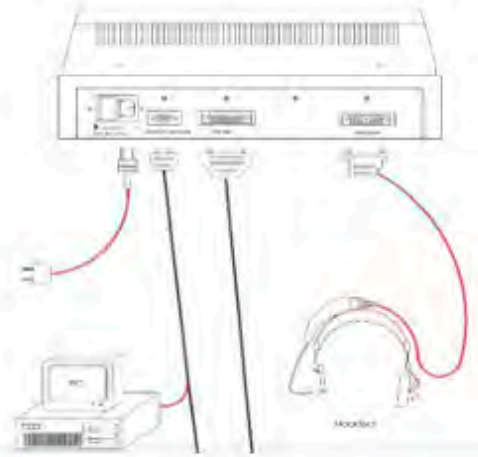
The only thing I hate more than manually inputting audiometric pure tone thresholds is inputting tympanometric data!







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Compare and Contrast

Let’s do a comparison

Clinic A uses a stand-alone audiometer and paper audiogram…

How many times do they need to enter the audiogram?

1) Onto the paper
2) Into Noah (for HA fitting)
3) Into OMS? (for patient file)
4) Into Verification system?

Let’s do a comparison

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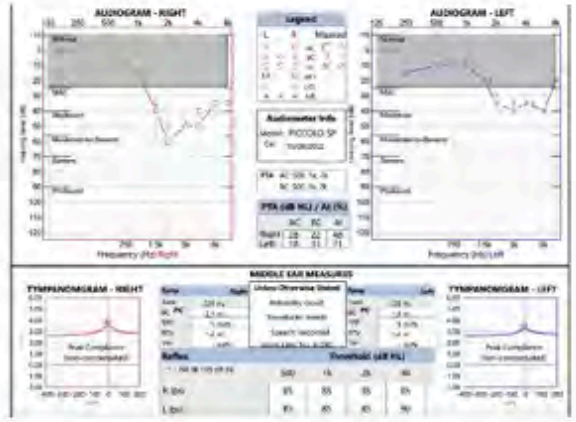
Clinic B uses a computer-based audiometer or PC-enabled for data-transfer

How many times do they need to enter the audiogram?

1) **Once:** On the audiometer (that’s it!)
   - This is either automatically in Noah (PC-based) or it’s transferred to Noah with the push of one button (PC-enabled)
   - Automatically in OMS with systems like Blueprint’s ”BPlink”
     - Synchronizes Noah data with OMS data
   - Automatically in computer-based verification system (e.g. Inventis Trumpet)



Clinical Comparison: The Old Way

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From a clinical perspective:

- **Traditional Otoscopy:** No documentation
- **Tympanometry/Acoustic Reflexes:** large opportunity for error during data input (ECV, SC, TPP); no curves
- **PT Audiometry:** do you have the correct ear, frequency, intensity?
- **Speech:** Often done live voice as lists are not readily available on device and require CD or MP3, which some people find to be a nuisance (it was with CDs, but it's not an issue with iPad/iPods)
- **Data comparison:** cumbersome and annoying

Clinical Comparison: The New Way

From a clinical perspective:

- **Otoscopy:** Documentation in Noah with video otoscopy
- **Tympanometry/Acoustic Reflexes:** no data entry required with data-transfer to computer; gorgeous curves
- **PT Audiometry:** There is far less chance for error, as you save the frequency and intensity that you are testing
- **Speech:** done with recorded speech lists that are embedded / pre-loaded on the device or in software
- **Data comparison:** we can easily compare changes over time

Typical Patient Experience: The Old Way

Here is what often happens in an audiology assessment in a traditional (old-school) clinic

- **Otoscopy:** patient is completely blind to this; little conversation around this as a result
- **Tympanometry:** patient is also blind to this; occurs on a tiny screen or printout
- **Audiometry:** explained on a piece of paper, often hand-written
- **Consultation:** often no demonstration of hearing aids (likely because audiogram is not in Noah)!!!

Typical Patient Experience: The New Way

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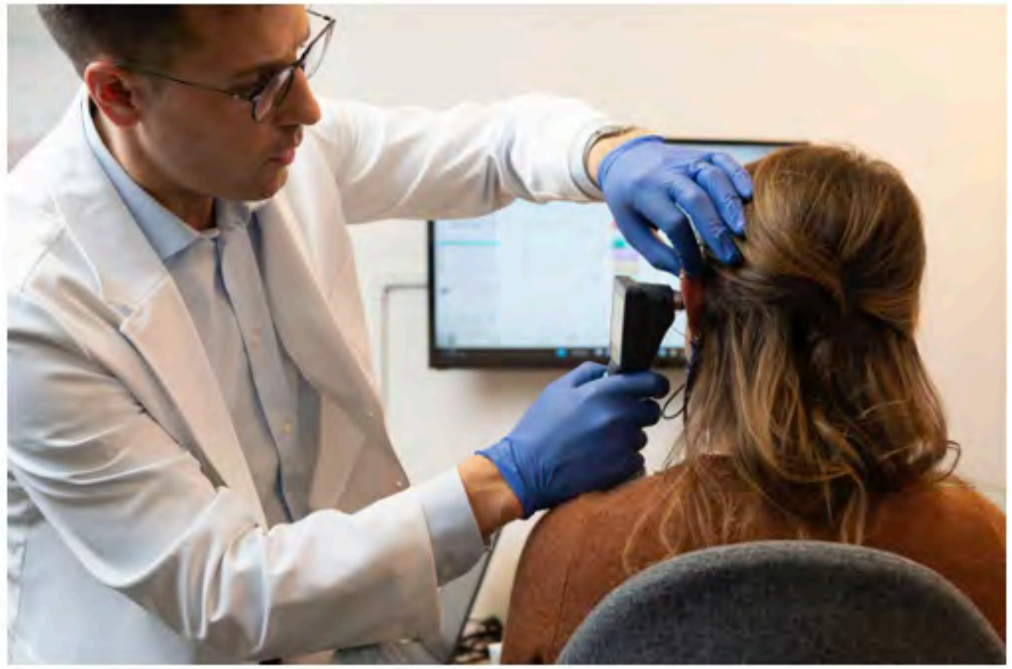
Here is what happens in an audiology assessment in a modern hearing clinic (with large monitor)

- **Video Otoscopy:** patient sees what you see in real-time; obviously this spurs discussion!
- **Live Tympanometry:** patient see their tympanograms mapped in front of them (or displayed after curve has run)
- **Data-driven Audiometry:** explained on a large monitor in full colour with overlays and discussion of audibility statistics (AI/SII)
- **Consultation:** Hearing aids are programmed and demonstrated in a minute of two as audiogram is readily available

The New Way

Here's what I do, step by step, in my clinic

- Let's walk through an initial assessment
- We will not include case history and intake form
  - But this is a process that has changed a lot as well!
    - Done at home before visit or in person on iPad



Step 1: Otoscopy

People love to see their own eardrum

- …but they almost always never have
- This is a great way to objectively show someone that their hearing problem is not wax-related
- For everyday practice, and especially for ENT testing, it makes a lot of sense to document the state of the eardrum with an image in the patient file (or even on audiogram!)

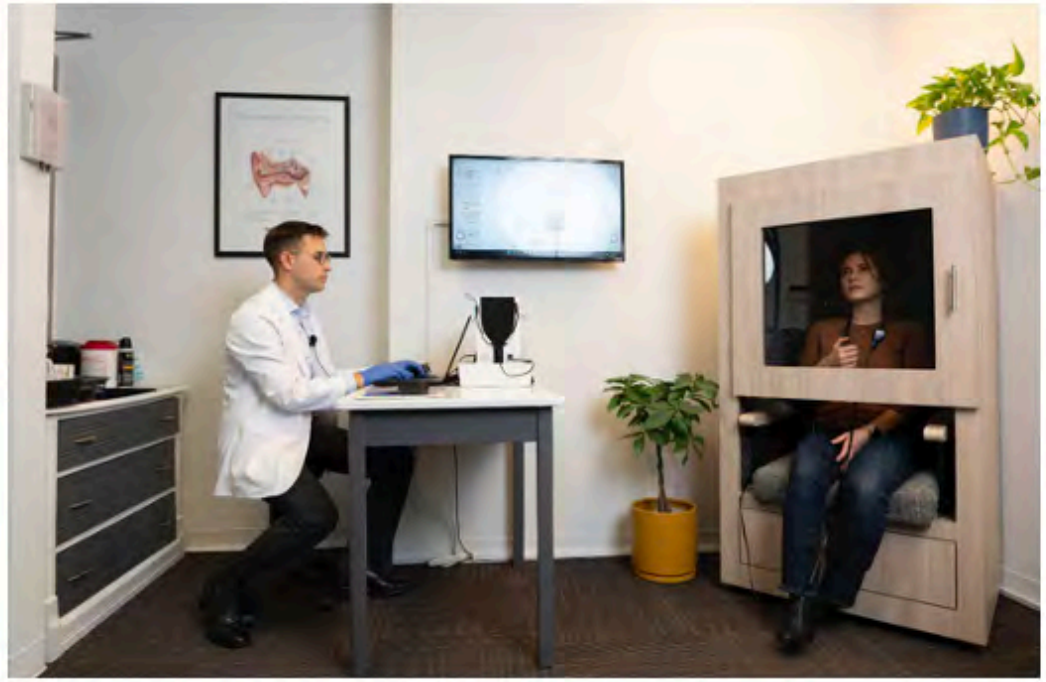
Step 2: Tympanometry

- **People also love to see their tymp curves!**
  - Ideally, in real time with PC-based tymp or live view
  - Or, statically up on monitor after data transfer
  - Not on some grainy old screen on tiny printout

Step 3: Audiogram

Using a PC-based or PC-enabled audiometer

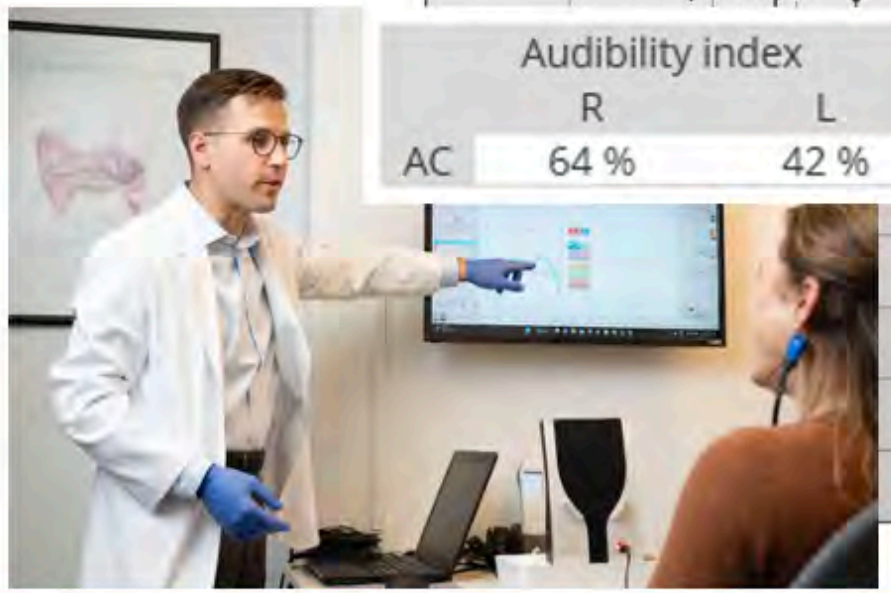
- **Store your thresholds**
  - Store on computer or on device, then transfer
    - (Turn off monitor screen!)
- **Store speech data**
  - Using embedded word lists
  - Store as WRS, SRT, MCL, UCL



Step 4: Explain Results

On monitor, using speech sound and severity overlays, discuss the person's hearing loss in terms of impact on audibility

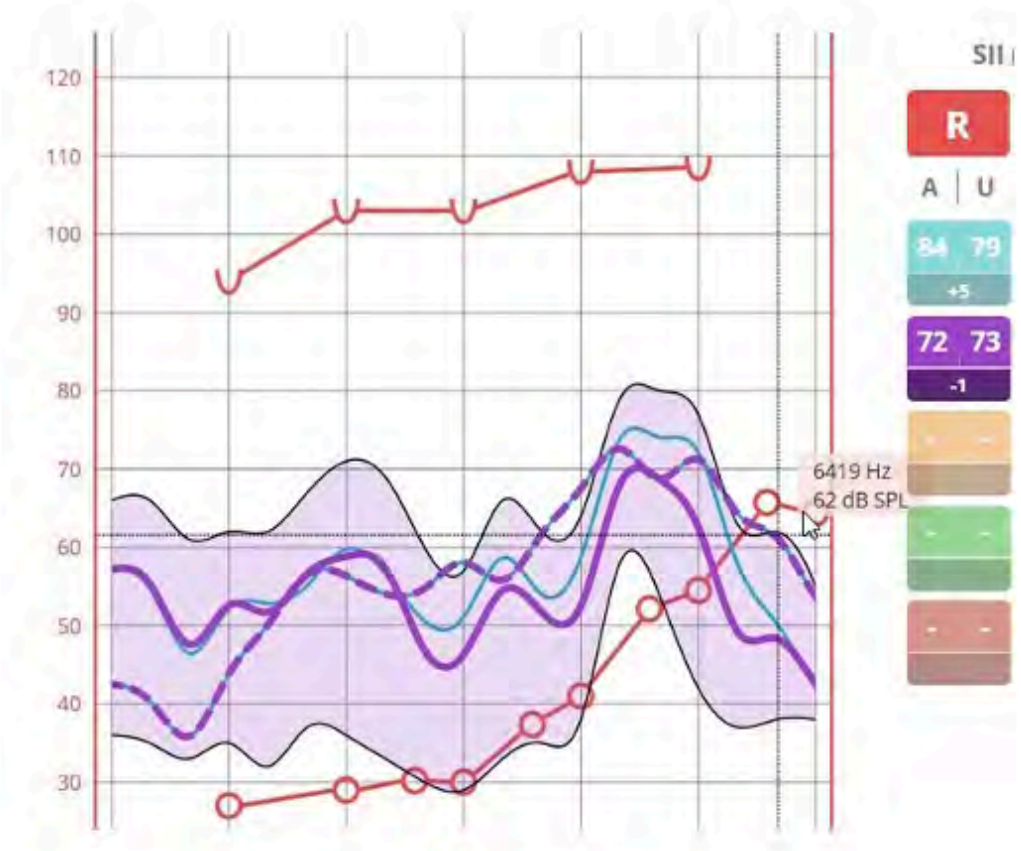
- Explain what the AI is and what the numbers mean
- Explain how hearing aids can help
- Ask if they have any questions



Step 5: Demonstrate

The next logical step is to demonstrate treatment options

- **This is easy, because**
  - Audiogram is already in Noah
- **Connectivity is now easy**
  - With 2.4 gHz here is nothing stopping you from demonstrating technology



New Clinic Advantage?

I have noticed that newer clinics (started in the last say 5 years are more likely to have connected gear)

- They had to purchase all new equipment and
  - New PC-based equipment is often slightly less expensive that more traditional set ups
  - It has a smaller footprint and a cleaner, more modern look

Established Clinic Disadvantage?

Older clinics have older gear that is less likely to be networked/connected

- This means that these clinics:
  - Spend more time on data input
    - And thus, less time with patient
  - Have a much less modern process
  - Are less efficient

And a (possibly) poorer patient experience!

Summary

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- Connected audiometric equipment improves clinical workflow, efficiency, accuracy and convenience
- It also significantly improves the patient experience by making it more inclusive, transparent and collaborative
- There are many equipment options/possibilities that facilitate this connected experience
    - Purchasing new equipment may not be necessary to achieve some version of this!

Thank you for your attention.

QUESTIONS?

Contact: info@treatyourhearing.ca

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