

## Promoting High Value, Patient-Centric Care with Alternative & Complimentary Devices

Brian Taylor  
Turtle Beach / Hypersound

### Who is Brian Taylor?

- **20 years of clinical and business experience**
- **Employee of Turtle Beach**
- **Consultant for Fuel Medical**
- **Adjunct Professor, A.T. Still**
- **Editor, Audiology Practices**
- **Editor, Hearing News Section, HHTM Blog**

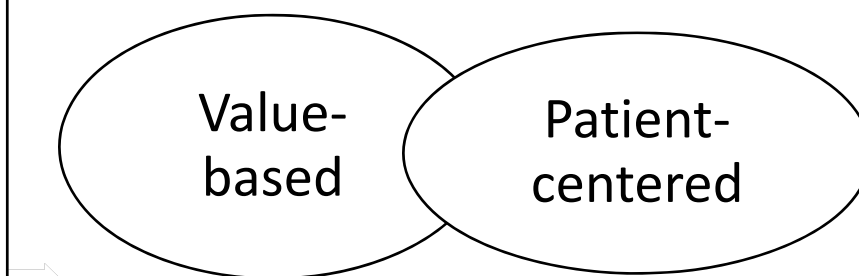


## Agenda

- Industry Challenges/Opportunities
- Why Hypersound?
- How Hypersound fits into your clinical practice?
- How Hypersound works?

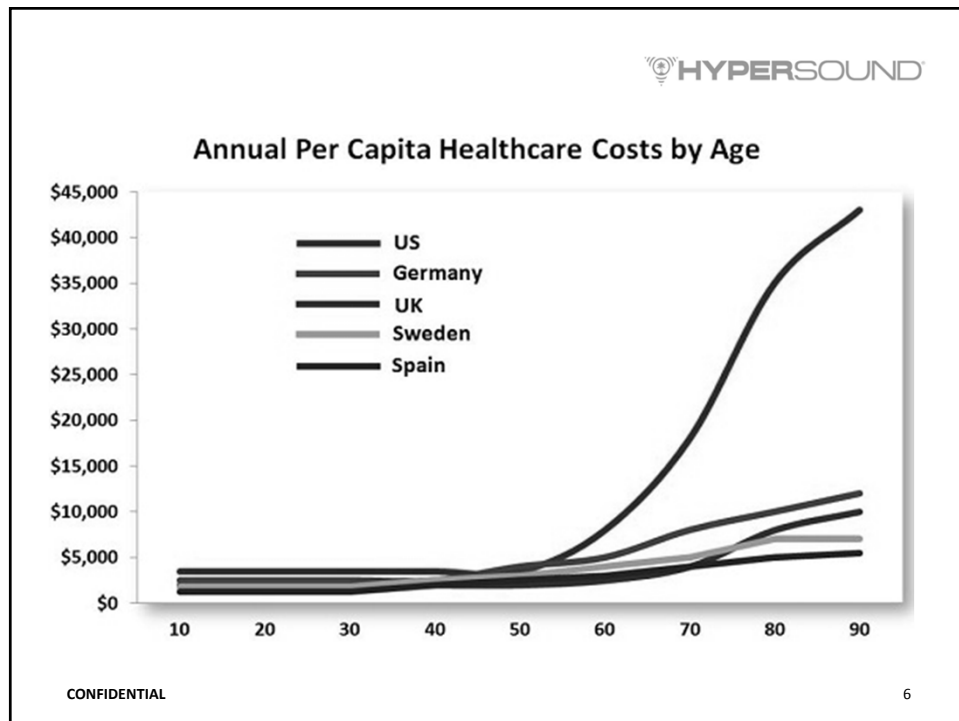
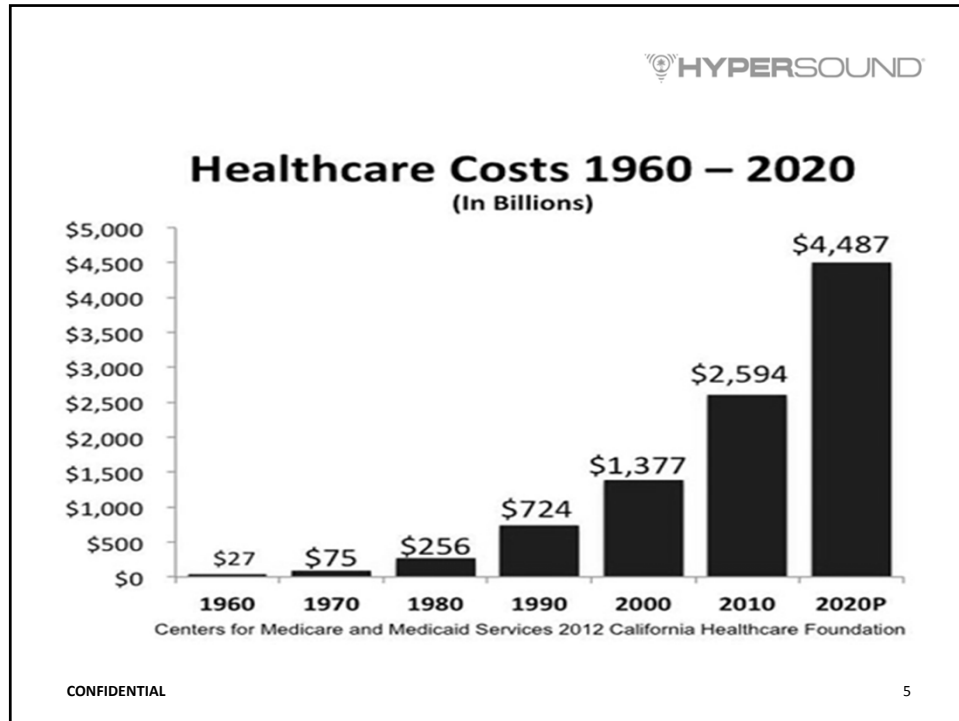
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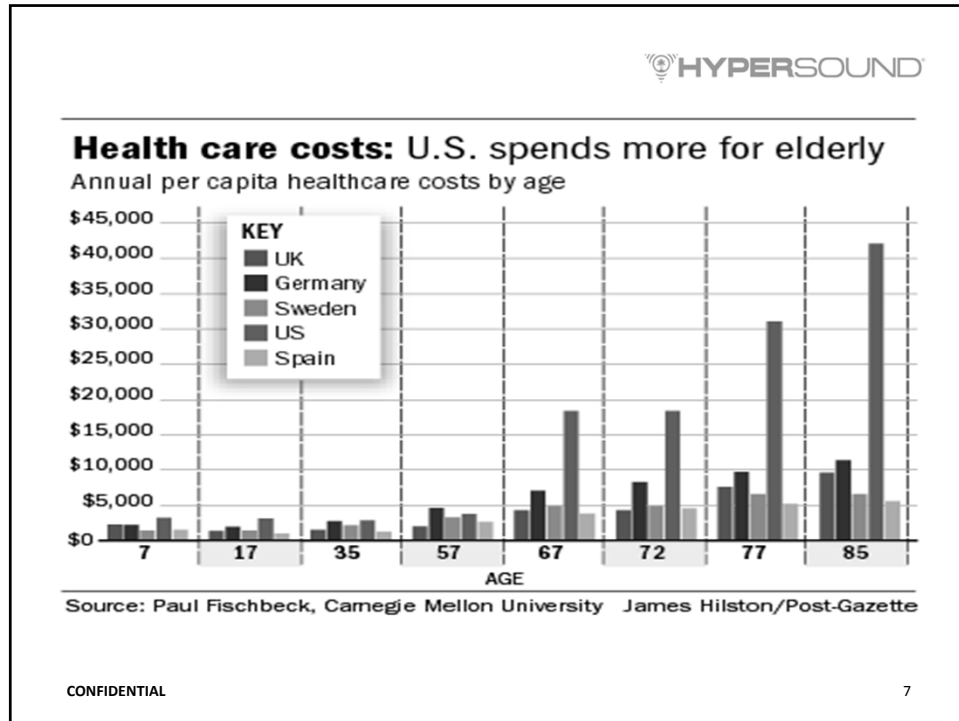
### Healthcare Trends



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# 48.1

8

4 in 10  
60-69

9

5 in 10  
70-79

10

8 in 10  
>80

11

### ***Value-based Care***



- ***Best outcomes at the lowest costs***
- ***Safe, appropriate, and effective care with enduring results, at reasonable cost.***
- ***Use evidence-based decision making and proven treatments and techniques that take into account the patients' wishes and preferences.***

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### ***Leaders of Patient Centered Care Movement***

- ***Laya Poost-Foroosh, St. Michael's Hospital, Toronto***
- ***Jill Preminger, U of Louisville***
- ***Caitlin Grenness, University of Melbourne, Australia***

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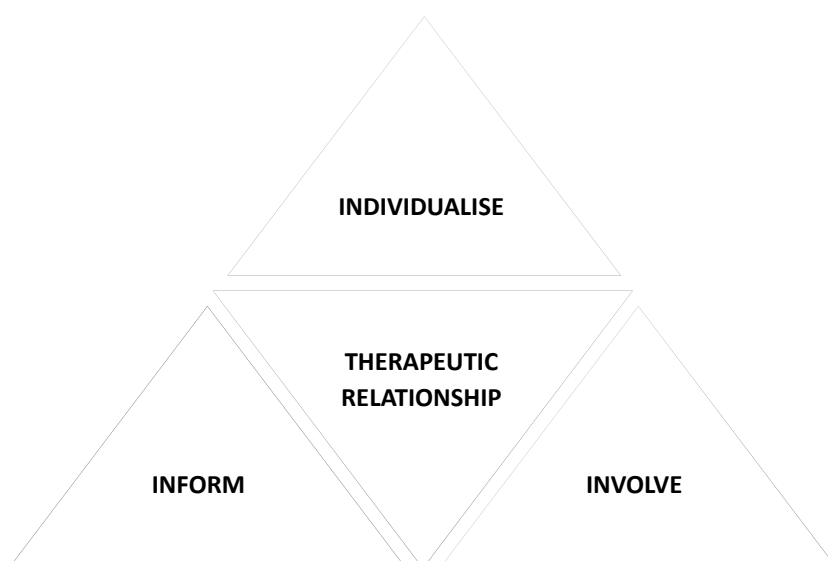
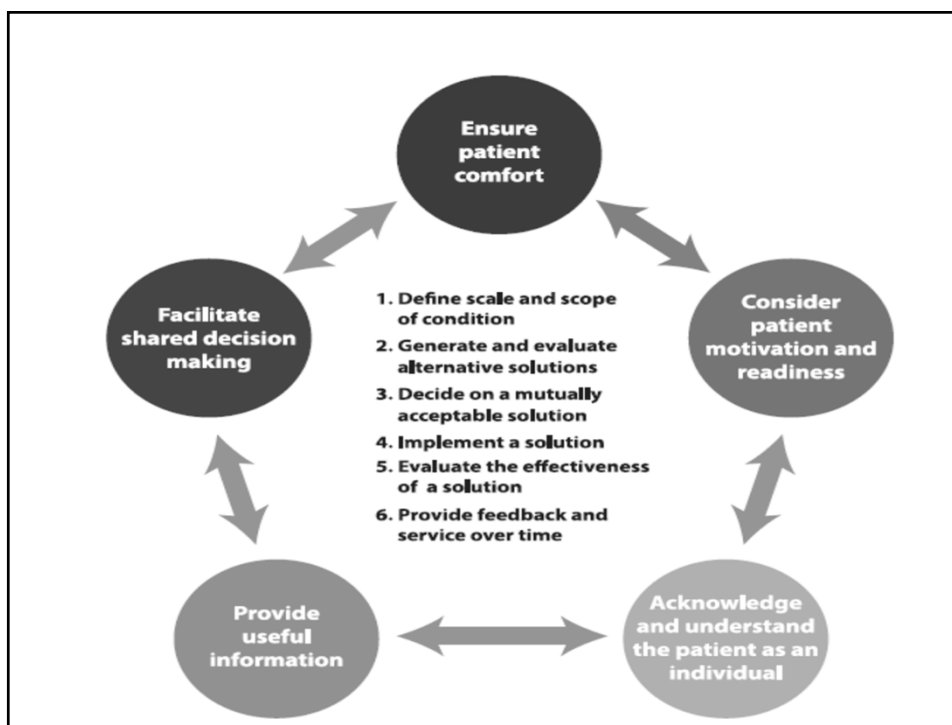
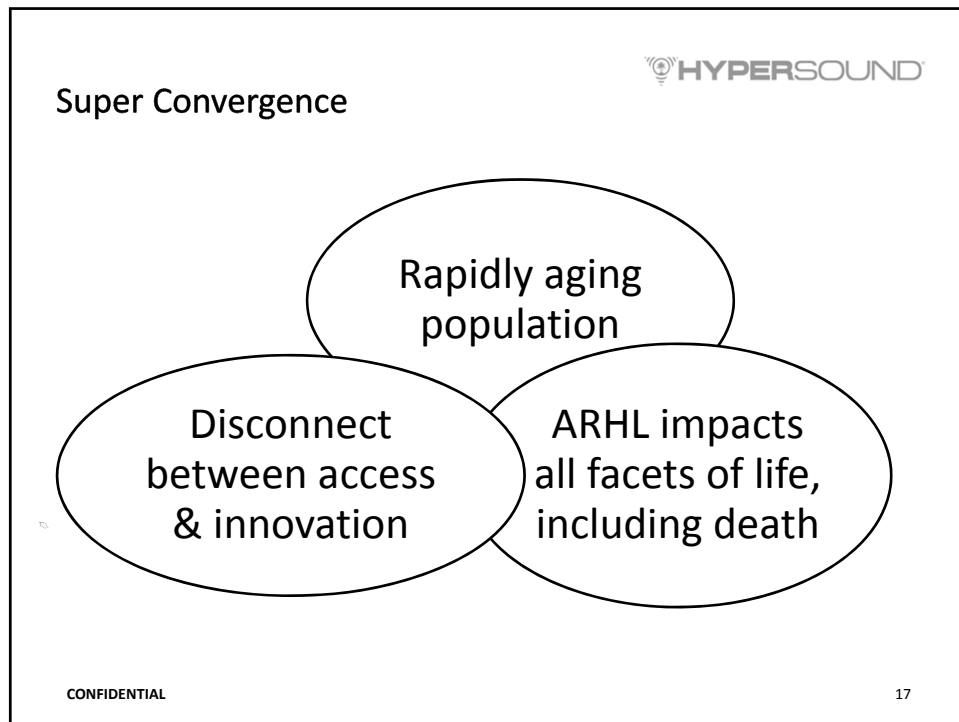


Figure 1. Operationalized Model of Patient-centered Audiologic Rehabilitation (Grenness et al (2014a))

Dimension 1. Components (and subcomponents) of Trust
<b>Relational Competence</b> <ul style="list-style-type: none"> <li>• <b>Communication Style</b> "She talks serious business but she also jokes."</li> <li>• <b>Empathy</b> "They listened carefully at what I experienced and how I was."</li> <li>• <b>Instruction for Self-Management</b> "They're more interested in selling hearing aids and not the maintenance of hearing aids."</li> <li>• <b>Promotion of Shared Decision Making</b> "He was quite curt and abrupt....well there was nothing I could say, he was the one who decided everything."</li> </ul>
<b>Technical Competence</b> <ul style="list-style-type: none"> <li>• <b>Based on Services Received</b> "She didn't close the door completely. I could see her reflection on the glass so I knew when she was pushing buttons!"</li> <li>• <b>Based on Reputation or Education</b> "I suppose they're like opticians. They haven't got a proper medical degree or anything like that, but they are expert in their field."</li> </ul>
<b>Commercialized Approach</b> <ul style="list-style-type: none"> <li>• <b>Solicitation</b> "I notice they're offering free hearing tests. I rather imagine it is so they can flog them a very expensive hearing aid."</li> <li>• <b>Focus on Service versus Focus on Sales</b> "Some people in some professions ...they're just money-grabbing."</li> <li>• <b>Cost of Hearing Aid</b> "I trusted his advice, because he said 'No need to go for the gold. Just go for one the middle of the road.'"</li> <li>• <b>Public versus Private Healthcare System</b> "I never thought for a minute that National Health would be as good. I thought they'd be just basic hearing aids."</li> </ul>
<b>Clinical Environment</b> <ul style="list-style-type: none"> <li>• <b>Clinic Setting</b> "When I walked in I thought to myself, what have I gotten myself into? Because it was not very professional at all... He wasn't professional looking himself."</li> <li>• <b>Clinical Services</b> "Well they (hearing clinic) don't care whether you use them or not, once you have bought them there is no follow-up unless you go in and ask for it."</li> <li>• <b>Public versus Private Hearing Healthcare</b> "I think they (private hearing center) must have a bias towards a hearing aid or a firm who's supplying them, so I would have thought the other (public) would give you a wider range or a more independent view of them."</li> </ul>
Dimension 2. Assignment of Trust
<ul style="list-style-type: none"> <li>• Interpersonal Trust</li> <li>• Institutional Trust</li> </ul>
Dimension 3. Level of Trust
<ul style="list-style-type: none"> <li>• Varies from Low to High</li> </ul>
Dimension 4. Time Course of Trust
<ul style="list-style-type: none"> <li>• The Level of Trust prior to receiving Hearing Healthcare Services</li> <li>• The Level of Trust after receiving Hearing Healthcare Services</li> </ul>







# The Graying of America

(Stanford Center on Longevity)



**Take 100 individuals from our village of 10,000 people**



**12 individuals are 65 or older**



8 of these individuals has a hearing loss

In less than 20 years.....

(Hamdy, 2015)



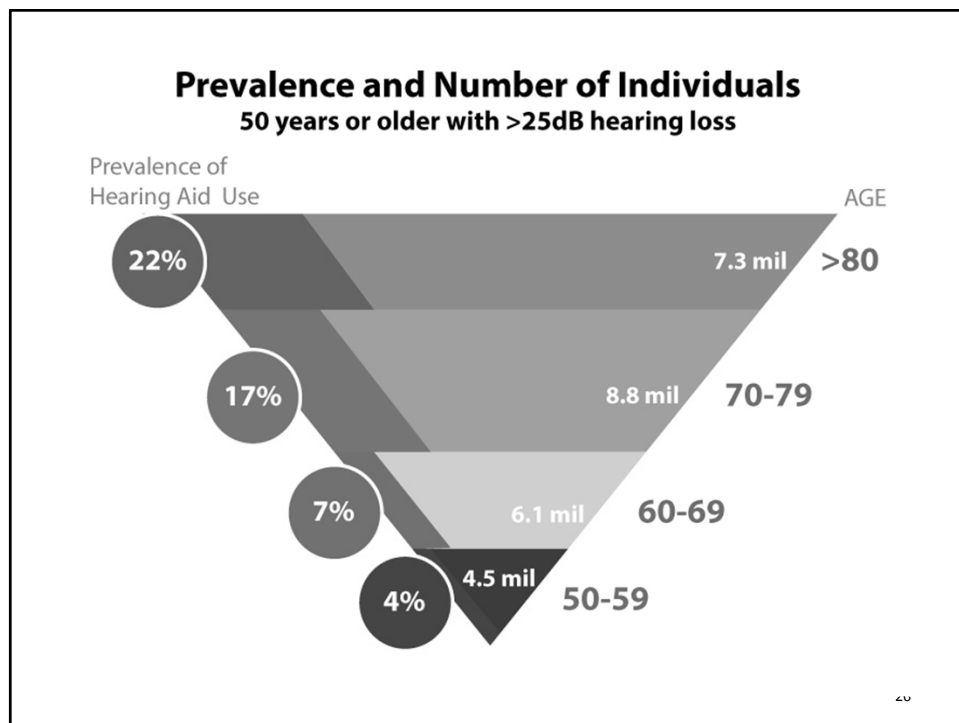
Take 100 individuals from our village of 10,000 people

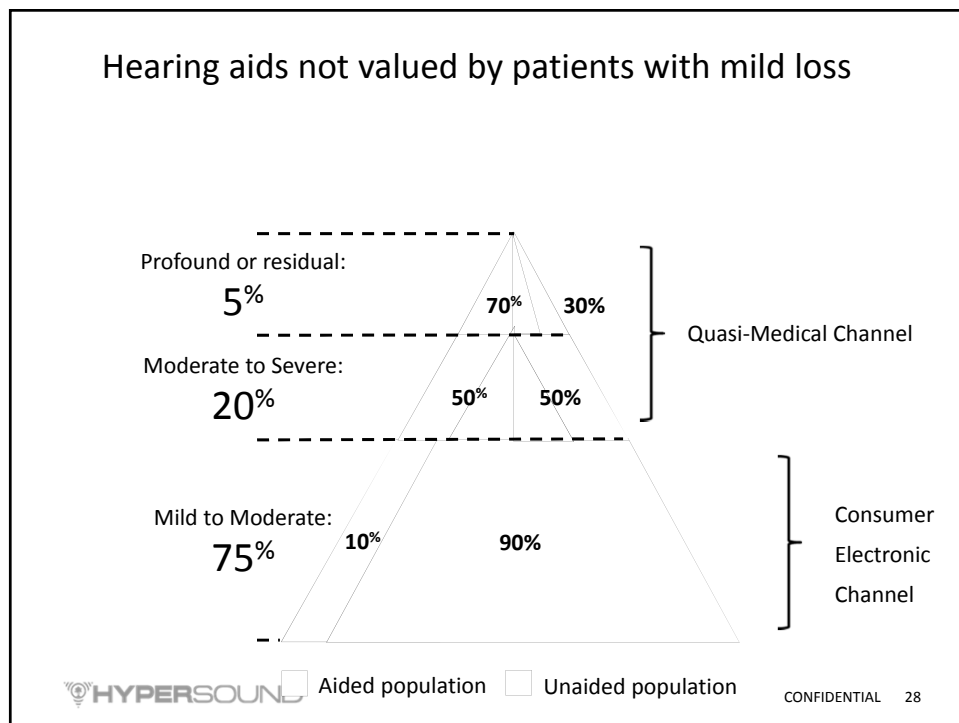
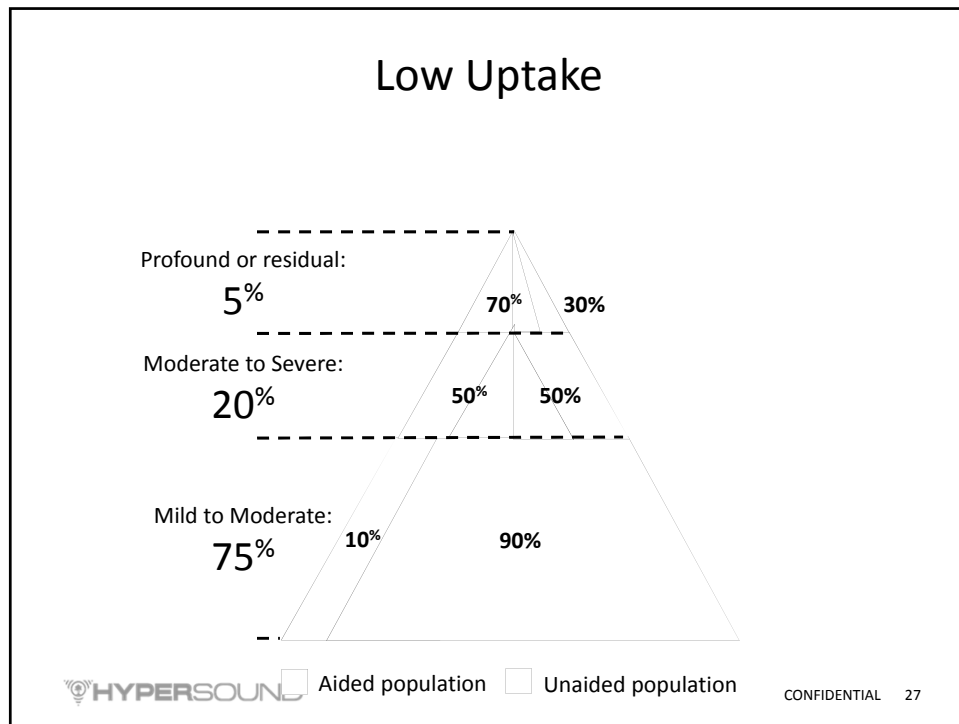


20 individuals are 65 or older



14 of these individuals has a hearing loss





### Hearables: Morphing of Two Different Technologies



### Mild Losses

- Many individuals with a slight hearing loss of up to 25dB HL experience activity limitations and participation restrictions (Bess et al 1991), yet 43% of patients with milder losses are given a “wait and re-test” approach (Kochkin, 2012)

## Hearing Difficulties (HD) and Normal Audiograms

- 12% of adults between 21 to 84 have HD and normal hearing test results. Overall prevalence is 3%. (Trembley, et al 2015)
- 51% of adults 49 years of age or older report HD, ½ of this group have normal audiograms (Chai, et al 2007)
- 60% of adults between 54 to 66 reported finding it difficult to follow conversations in noise (radio, TV, restaurants) (Hannula, et al 2011)
- Decline in speech recognition often begins between ages of 30-39 when audiogram is normal. (Fullgrabe, et al, 2015)



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## Options and Alternatives are Important

- ☐ Help seeking does not automatically imply patient is seeking hearing aids (Claesen & Pryce, 2012)
- ☐ When offered options 'more than half of patients' with hearing loss will choose an alternative to hearing aids. (Laplante- Levesque, et al 2012)



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### ***How does the typical adult spend their leisure time?***

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### **TV Watching in Popular**

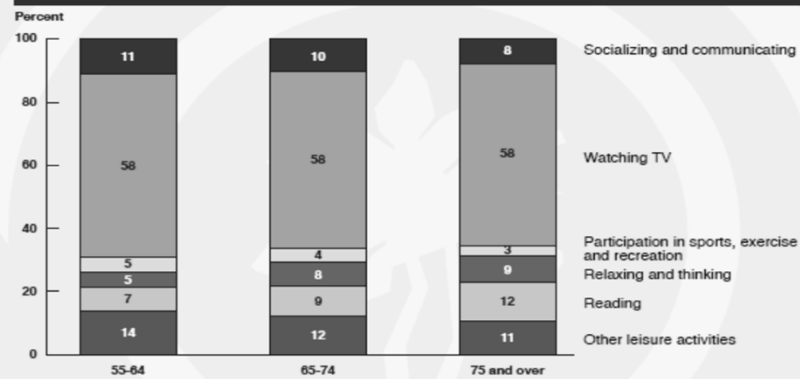
- American adults on average watch 34 hours of television per week + 3-6 hours watching taped (DVR) programs. Five hours per day. (NY Times, 2012)
- Both young and older subjects spend the same amount of time "listening to media at home" (Wu and Bentler, 2012)



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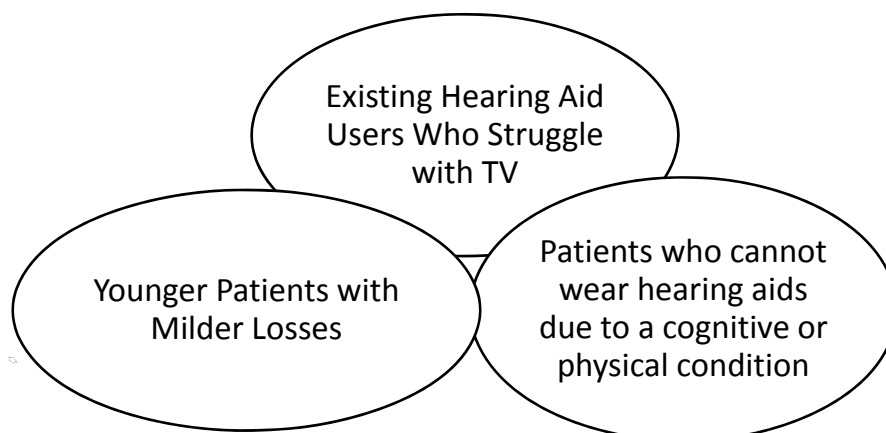
## Leisure Activities for Ages 55 and Over

Percent of total leisure time that people age 55 and over spend doing selected leisure activities on an average day, by age group, 2010



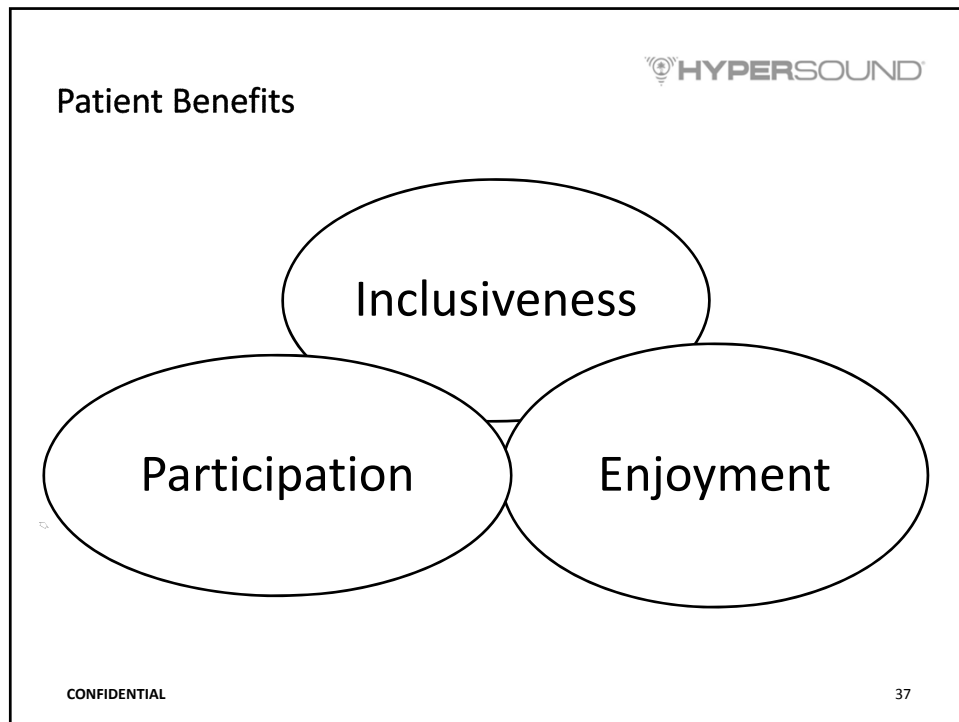
NOTE: "Other leisure activities" includes activities such as playing games, using the computer for leisure, arts and crafts as a hobby, arts and entertainment (other than sports) and related travel.  
 Reference population: These data refer to the civilian noninstitutionalized population  
 SOURCE: Bureau of Labor Statistics, American Time Use Survey


## Patient Categories



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***How to implement Hypersound in your clinic***

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## Market to Younger Adults



- *Baby boomers*
- *65 and younger*
- *People who struggle with dialogue on TV*

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## Identify the Need

### Reported Assessment of Communication Abilities

Name: MC (Male, 39 years)

Date: 06/06/14

Aided or Unaided (circle one)

How much difficulty do you have hearing in the following situations?

	No difficulty	Slight difficulty	Moderate difficulty	Quite a lot of difficulty	Very much difficulty	Not relevant
One to one conversation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conversation in small groups	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conversation in large groups	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outdoors	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Concert/movie	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Place of worship/lectures	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Watching TV	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In a car	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workplace	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Telephone - Landline	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobile	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Restaurant/café	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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**TV Device or Hearing Aids?**  
An Interactive Decision Aid

If you like a statement, check ☒ the box  
If you dislike a statement place an ☒ in the box

<p>Check all statements that apply to you</p> <p>My hearing problem causes arguments with family members. The TV is too loud!</p> <p>I have difficulty understanding dialog, especially fast talkers, female talkers or foreign accents.</p> <p>My difficulty with the TV is affecting my personal and social life. My spouse or other family members can't be in the same room.</p> <p>I have difficulty when the TV is at normal volume. I can hear it, but cannot understand what is being said.</p> <p>The speech is too soft but the music is too loud. I can't find the right volume.</p> <p>The more items you checked, the more likely it is that you need help listening to TV.</p> <p>If you feel ready to address the difficulties, your Audiologist can help you to decide on the next step.</p>	<p>A TV device is less costly than hearing aids <input type="checkbox"/></p> <p>No long clinic appointments needed <input type="checkbox"/></p> <p>A TV device is easy to install, use and maintain <input type="checkbox"/></p> <p>Device only works for TV; other listening situations may still be difficult; indoor use only <input type="checkbox"/></p> <p>Device overcomes distance and background noise to isolate the TV signal and improve viewing experience <input type="checkbox"/></p> <p>Device does not disturb others; family members can view TV normally <input type="checkbox"/></p>	<p>Hearing aids are expensive, but they can be used in all situations <input type="checkbox"/></p> <p>Usually, 3-4 clinic visits are needed, to fit, fine-tune and troubleshoot hearing aids <input type="checkbox"/></p> <p>I will have to learn how to use hearing aids; regular cleaning and care are needed <input type="checkbox"/></p> <p>Hearing aids are designed to enhance speech understanding; they can be used in all situations <input type="checkbox"/></p> <p>Hearing aids may not solve my TV problem; I might need to buy extra devices that connect hearing aids to the TV <input type="checkbox"/></p> <p>Hearing aids do not disturb others; family members can view TV normally <input type="checkbox"/></p>
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**TV Device**

Total ☒

Total ☒

**Hearing Aids**

Total ☒

Total ☒

Do your responses appear to favor one over the other?  
With your audiologist, explore your preferences and dislikes.  
Discuss them together to aid your decision.

What is it?	Hearing Aids	Hearing Management Group	Directed Audio	Hearing Assistive Technology	Cochlear Implant	No Treatment
<p>What is involved?</p> <p>Pros/Cons</p>	<ul style="list-style-type: none"> <li>Buying hearing aids.</li> <li>Professional adjustment of the hearing aids.</li> <li>Wearing hearing aids to help with my hearing problems.</li> <li>Wear in all listening situations</li> </ul>	<ul style="list-style-type: none"> <li>Meeting with a group of people.</li> <li>Learning ways to cope with my hearing problems.</li> <li>Using the information to help me in daily life.</li> <li>Using a DVD for training at home.</li> </ul>	<ul style="list-style-type: none"> <li>Improving my ability to understand the television with or without hearing aids</li> <li>Allows family to participate in TV viewing without compromise</li> <li>TV viewing only – no other ear worn devices needed</li> </ul>	<ul style="list-style-type: none"> <li>Buying 1 or more items that can help me hear better in certain situations.</li> <li>Using those items in my daily life.</li> <li>May be needed to supplement use of hearing aids</li> </ul>	<ul style="list-style-type: none"> <li>Being evaluated to see if an implant might help me.</li> <li>Undergoing surgery.</li> <li>Professional adjustment of the implant.</li> <li>Wearing the cochlear implant to help with my hearing problems.</li> </ul>	<p>Continue my daily life without making any changes.</p>
Options I want to know more about	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Demonstrate it in fitting room



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### ***Patient Preference Study***

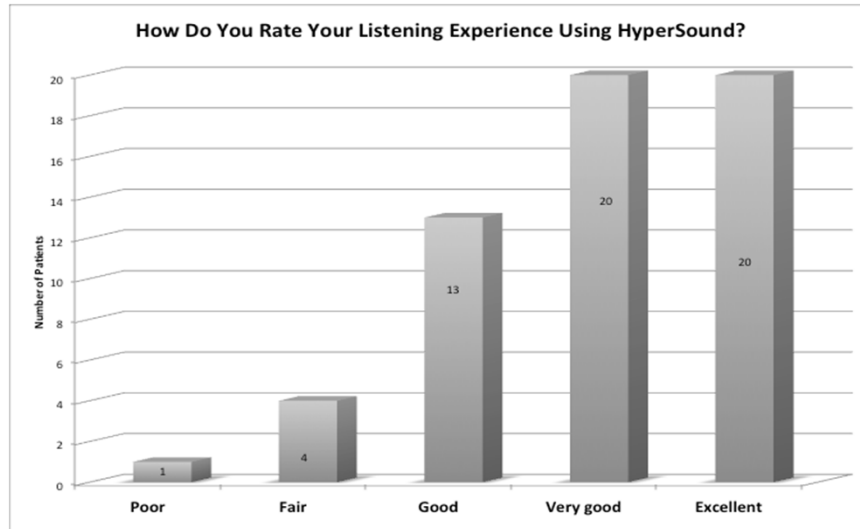
 **HYPER SOUND**

- 2 independent practices
- 58 participants with hearing loss
- Listened to 2 minutes – variety of audio clips (unaided)
- Written comments were gathered, then coded on 5 point Likert scale by blinded investigator

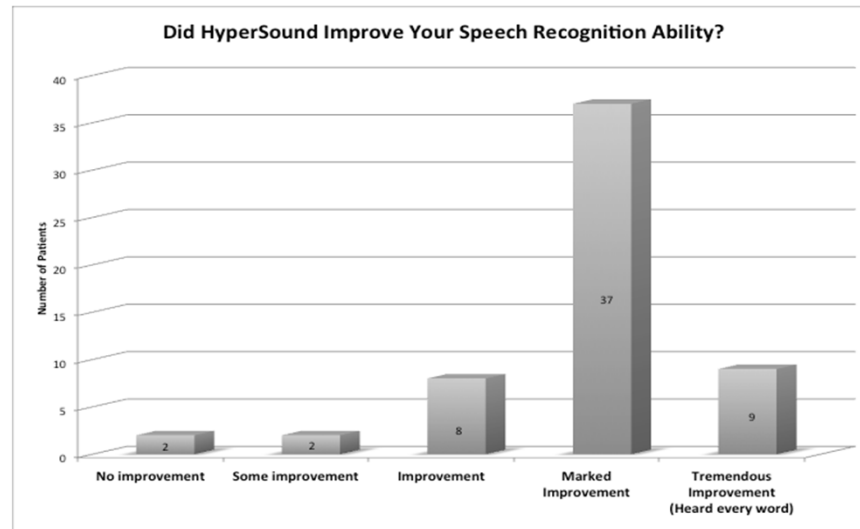
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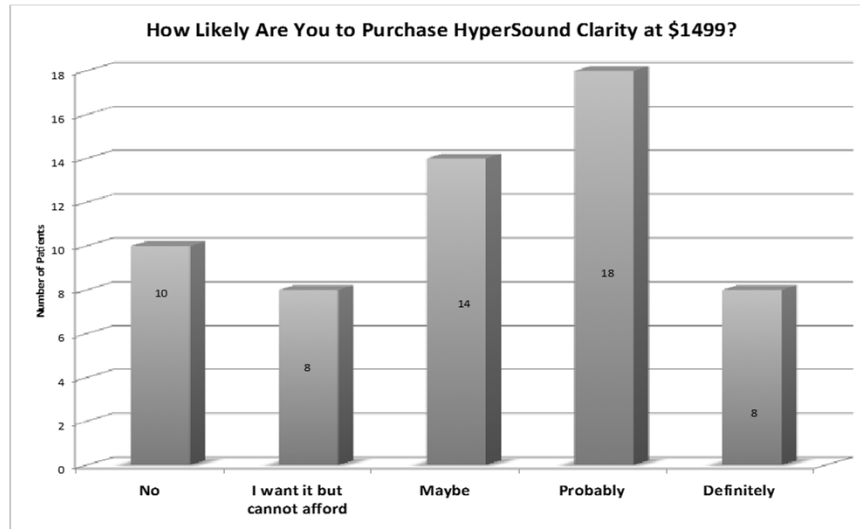
### ***Overall Listening Experience***



### ***Perceived intelligibility improvements***

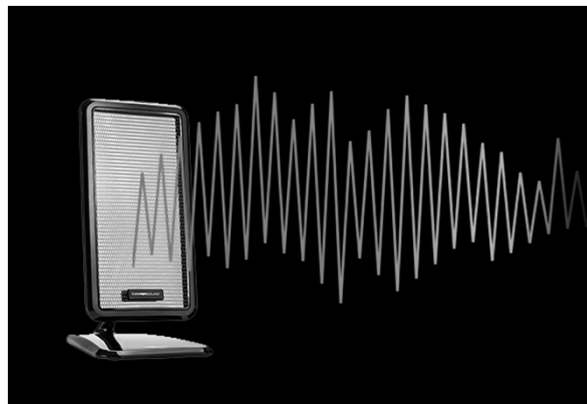


## PURCHASE INTENT



Average Rating = 3.1 out of 5

Send the patient home with the unit



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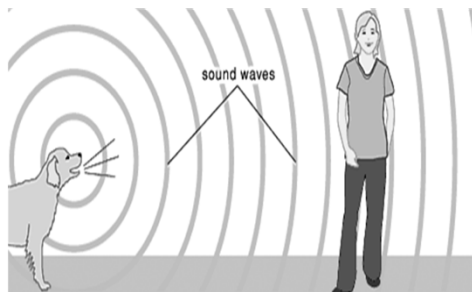
## ***How Hypersound Works***

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## ***How sound travels through the air conventionally***

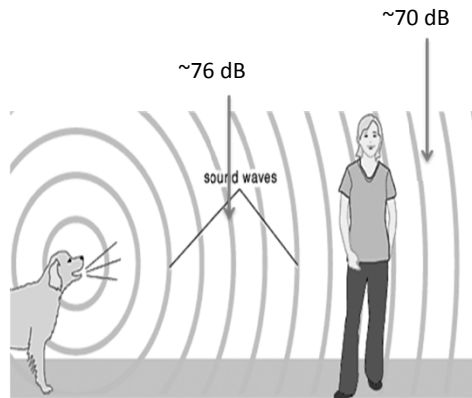


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### ***How sound travels through the air conventionally***

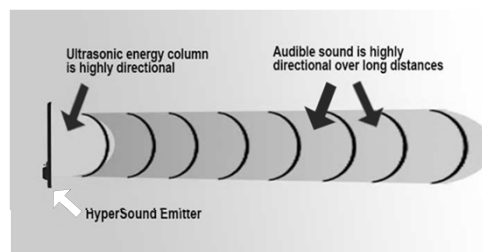


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### ***How sound travels through the air ultrasonically***

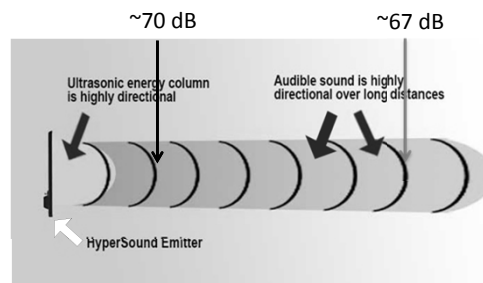


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## ***How sound travels through the air ultrasonically***



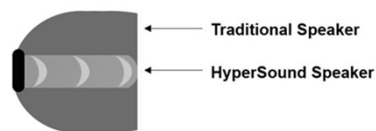
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## ***HOW HYPER SOUND WORKS***

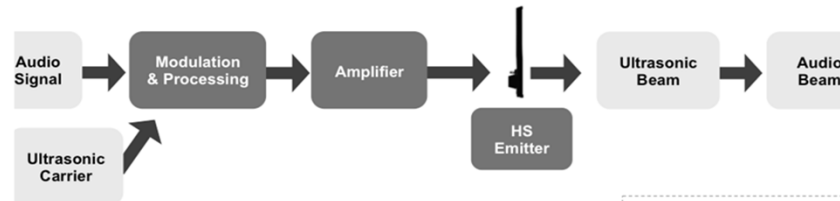
- Utilizes a 100kHz ultrasonic carrier frequency
- Modulates audio on top of carrier frequency
- Transmits a very tight beam of sound – virtual reality surround sound zone
- Utilizes the non-linear coefficient of air for audible range
- Eliminates background noise when in beam



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## HOW HYPERSOUND WORKS



**Figure 1: Diagram of HyperSound Process**

Figure 1 displays a functional diagram of HyperSound's audio beam system. First, the emitted ultrasonic wave is inaudible, but as it impresses audio signals onto the carrier in the air, the audio signal is demodulated by the parametric array effect and becomes audible. This demodulated audio wave retains the directivity of the ultrasonic wave, thus producing an audio beam.

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15. Johannes, R., Gan, W. (2009). 3D Sound Effects with Transaural Audio Beam Projection. Retrieved from [http://www.researchgate.net/publication/228751051\\_3D\\_Sound\\_Effects\\_with\\_Transaural\\_Audio\\_Beam\\_Projection/file/3deec5170069f736e6.pdf](http://www.researchgate.net/publication/228751051_3D_Sound_Effects_with_Transaural_Audio_Beam_Projection/file/3deec5170069f736e6.pdf)

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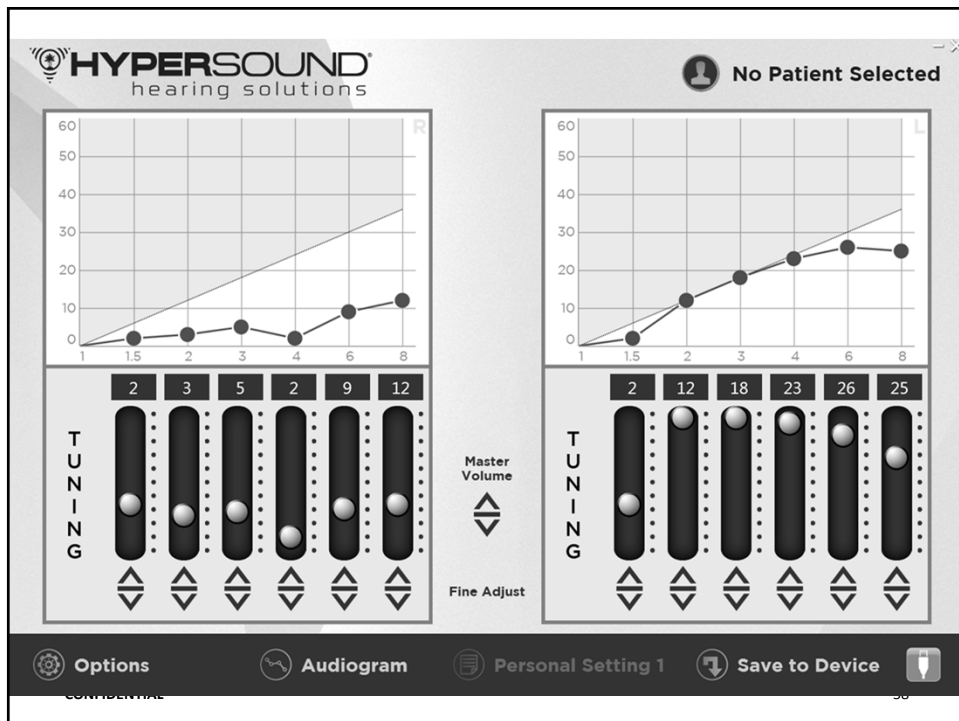
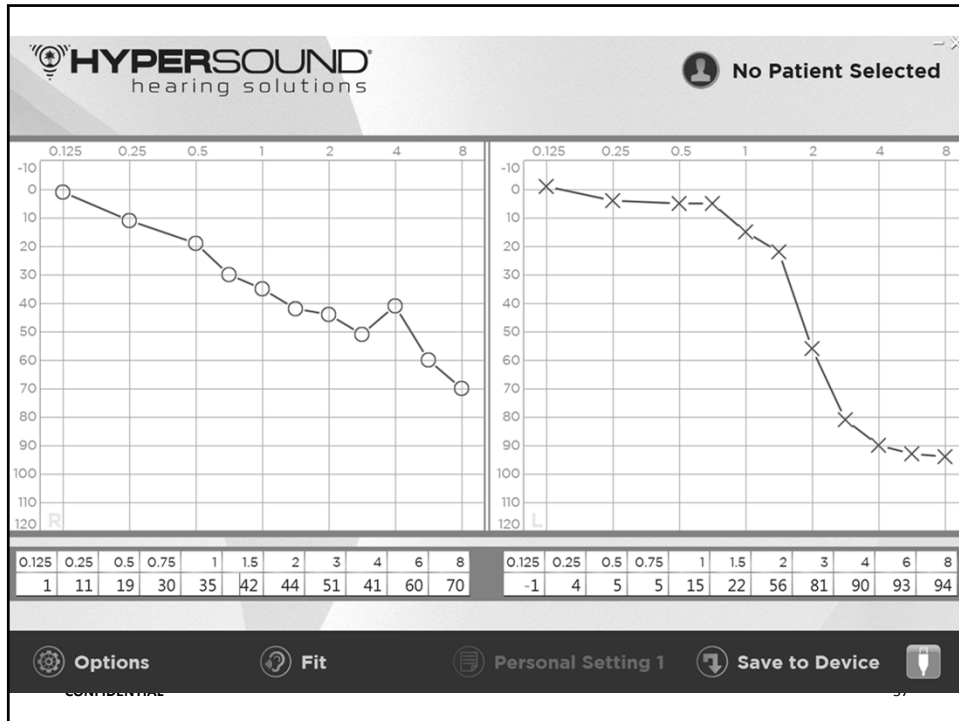
## Similar to hearing aids



- **Programmable with NOAH-compatibility**
- **Uses NAL targets as starting point for average level inputs**
- **multiple channels**

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## Benefits to Practice

- Improved Patient Experience: Grow patient traffic, referrals, and HI volume, builds trust
- Shorten 5-7 year decision to purchase (dispense more HA's)
- New Revenue Streams:
  - Attracts new people into HHCP office (non- HA wearers)
  - Grow TLNS revenue (database and new patients)
  - Offer to existing HA patients still struggling with TV



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## *Clinical Studies*



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***HYPERSOUND – 2015 SAFETY  
CLINICAL STUDY***

- 20 normal hearing patients – 2 hour exposure – 2 meters
- No TTS (Temporary Threshold Shift)- - no new-onset otological symptoms
- Manuscript submitted for publication in peer reviewed journal

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***COMPARATIVE STUDY***

- Mehta, et al , California Hearing & Balance Center, La Jolla
- Comparison of HyperSound to Conventional Audio in SF
- Unaided condition
- 10 adult participants with range of hearing losses
- Word and sentence recognition testing using AZBio and CNC word lists
- 50 and 70 dB SPL intensity levels, quiet and noise (+10dB SNR)
- Submitted for publication

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## RESULTS



Condition	HSS			Conventional Speaker			p-value*
	Mean $\pm$ SD	Median	Range	Mean $\pm$ SD	Median	Range	
<b>AzBio<math>\Phi</math></b>							
50 dB, quiet	2.3 $\pm$ 5.0	0.0	0.0-13.3	0.5 $\pm$ 1.5	0.0	0.0-4.7	0.50
70 dB, quiet	38.2 $\pm$ 33.4	34.9	0.0-84.0	10.8 $\pm$ 16.4	0.0	0.0-45.9	0.008
70 dB, noise	42.6 $\pm$ 33.7	51.6	0.0-79.6	7.3 $\pm$ 10.7	1.8	0.0-32.8	0.008
<b>CNC Word test<math>\Phi</math></b>							
50 dB, quiet (whole word)	4.0 $\pm$ 6.5	0.0	0.0-14.0	0.2 $\pm$ 0.6	0.0	0.0-2.0	0.25
50 dB, quiet (phonemes)	8.7 $\pm$ 13.5	0.0	0.0-33.3	1.3 $\pm$ 2.9	0.0	0.0-8.7	0.125
70 dB, quiet (whole word)	44.4 $\pm$ 29.5	54.0	0.0-80.0	6.0 $\pm$ 9.3	0.0	0.0-26.0	0.004
70 dB, quiet (phonemes)	56.5 $\pm$ 31.5	63.4	0.0-92.7	15.4 $\pm$ 19.8	4.0	0.0-54.7	0.004

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360 MILLION

An estimated 360 million people worldwide suffer from some form of hearing loss

~80%

~80% of all patients want to hear the television better. Even after purchase, many still complain about battery life, dongle, neck loops, etc.

20-25%

Over the last 40 years, the penetration rate for adopting hearing aids has been approx. 20 – 25%

5-7 YEARS

The average time between the first visit with a hearing healthcare professional to purchasing a hearing aid is approximately 5-7 years

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## **A NEW PRODUCT CATEGORY: Directed Audio Solution**

 **HYPER SOUND**

- HyperSound Clear™ is the first-of-its kind directed audio solution designed specifically to help people with hearing loss hear the television better
- As indicated by clinical research\*, HyperSound® speakers improve sound clarity and speech intelligibility for patients without the need to wear headphones
- By beaming sound in a narrow column, patients get crystal clear sound where they want it and their families get normal television volume everywhere else

 **HYPER SOUND**  
**CLEAR™ 500P**



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Mehta, RP. Novel ultrasonic sound carrier significantly improves speech discrimination in subjects with hearing loss. Otolaryngology/Neurology Scientific Session presented at the Combined Sections Meeting of the Triological Society, January 22, 2015, San Diego, CA (Ten patients with mild to severe hearing loss in a single-blind, randomized cross-over study demonstrated improvement in sound clarity, measured with standard speech tests, over conventional speakers at 70 dB at 1 meter, including in background noise.)

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## **Questions**

 **HYPER SOUND**

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