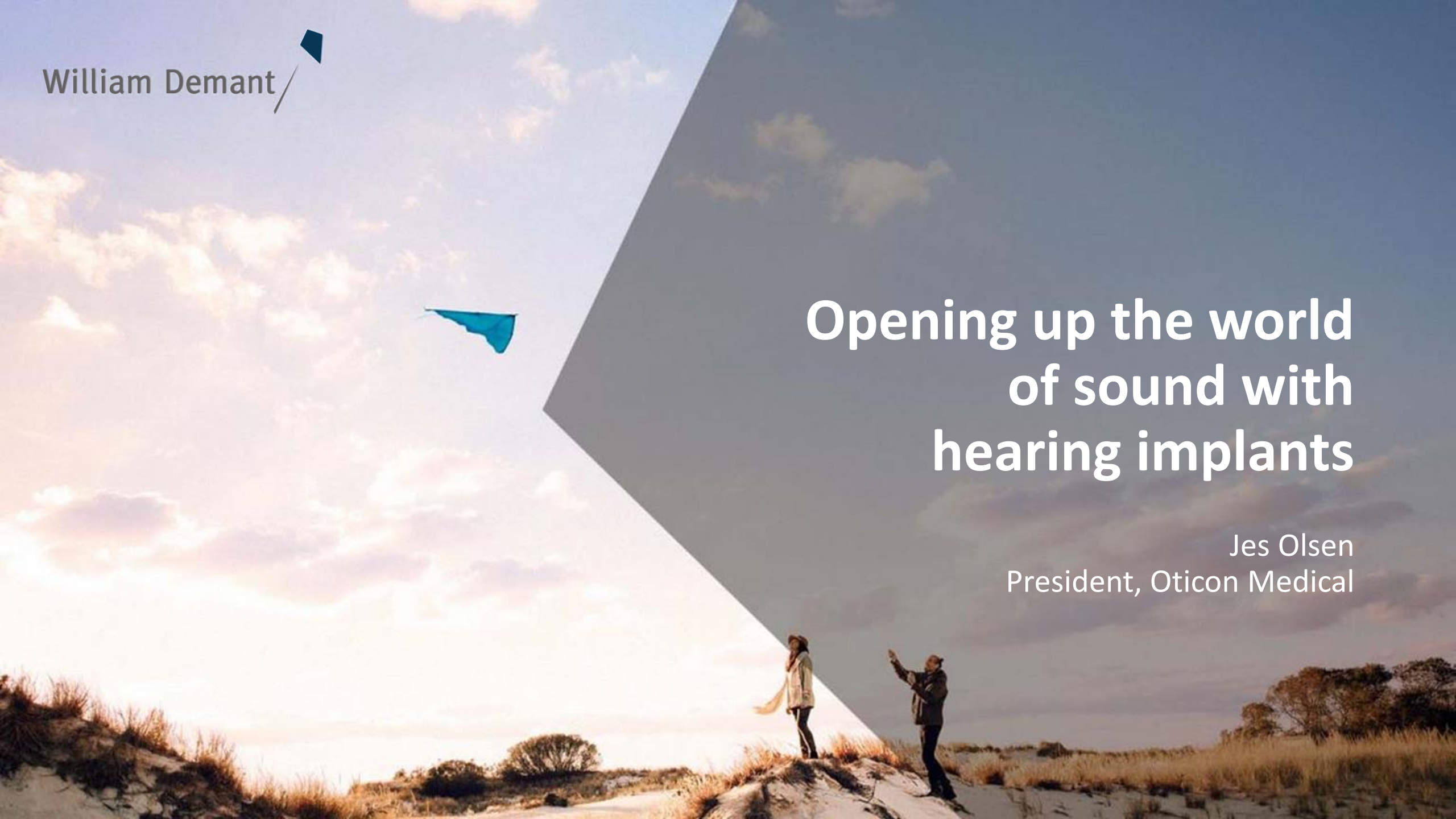


William Demant



Opening up the world of sound with hearing implants

Jes Olsen
President, Oticon Medical



Jes Olsen

President, Oticon Medical

Curriculum

- Born in 1960
- B.Sc. in electronic engineering and electroacoustics
- Employed with Group since 1986
- General Manager, Oticon AB, Stockholm 1993-1996
- Various senior management roles in Oticon, including Vice President of R&D 1997-2008
- President, Oticon Medical since 2008



Agenda

Hearing implants market

Oticon Medical

The Neuro System: Scientific-based outcomes

Prof. Prof. h.c. Dr. med. Thomas Lenarz, Hannover Medical School

The Neuro system: Status

The Ponto system: Innovation fuelling better outcomes

Q&A



The market for hearing implants



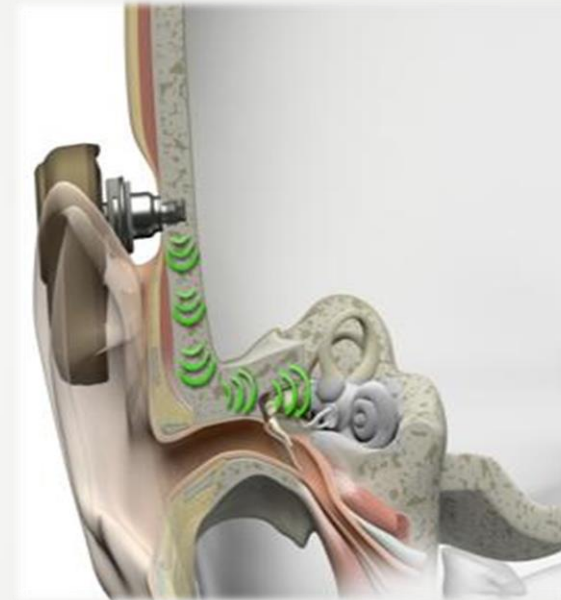
Primary technologies within hearing implants

Cochlear implants (CI)



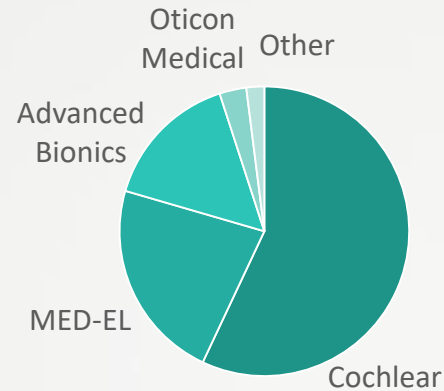
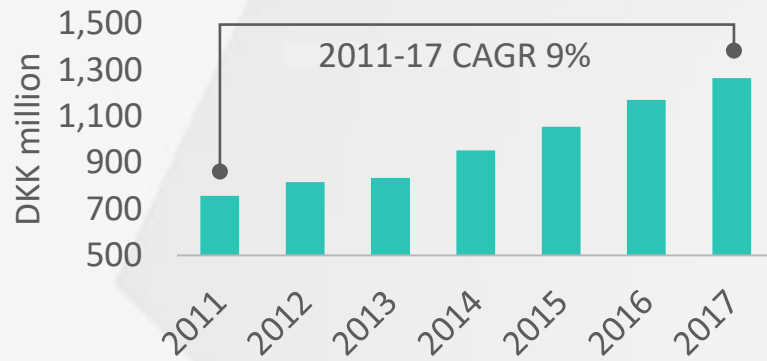
A cochlear implant makes sense of sound for people with severe to profound sensorineural hearing loss

Bone anchored hearing systems (BAHS)



A bone-conducting hearing system is suited for people with conductive hearing loss, unilateral hearing loss or single-sided deafness

Cochlear implant (CI) market



2.5%

of all aged 75+ have a hearing loss that qualifies them for a CI



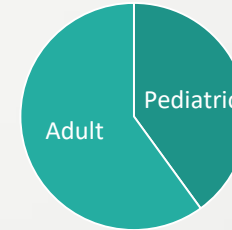
130,000+ new CI candidates a year with severe/profound hearing loss

- Significant variations between markets
- Given our small market share, we are focused on current adressable market



Growth drivers

Education, reimbursement, new indications, new markets, innovation, ageing population

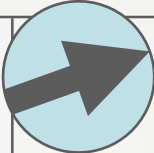
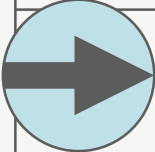
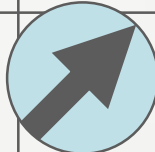


40/60 split between paediatric/adult in a market of ~65,000 implantations a year

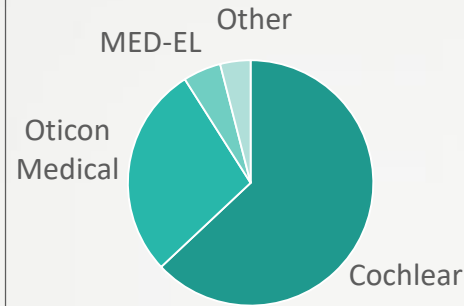
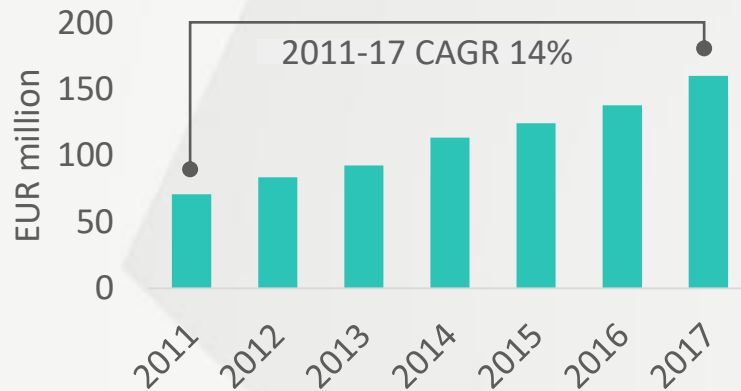


Total market size of approx. EUR 1.3 billion

Where does CI market growth come from?

	Emerging markets	Developed markets
Paediatric	 Paediatric  <i>Strong growth</i> • Improved newborn hearing screening • Reimbursement in most countries	 <i>Moderate growth</i> • Mandatory newborn hearing screening • Increased indications • Mature market
Adult	 Adult  <i>Limited growth</i> • Generally limited focus • No reimbursement in place	 <i>Strong growth</i> • Increased indications • Improved reimbursement and awareness

Bone anchored hearing systems (BAHS) market



~5%

Penetration rate and only approx. 20,000 implantations per year



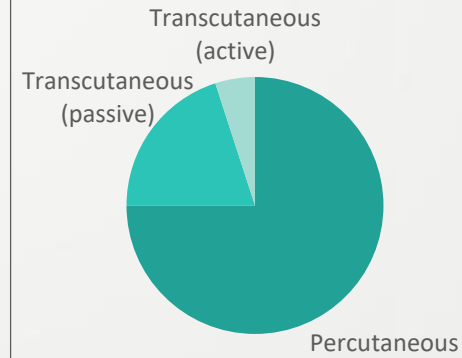
190,000+ users across the world and fastest growing hearing implant segment

- Growth in BAHS market is highly product-driven



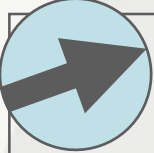
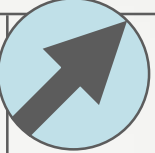
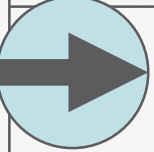
Growth drivers

Education, awareness, reimbursement, innovation, cosmetics



Total market size of EUR 150+ million

Where does BAHS market growth come from?

	Emerging markets	Developed markets
 Paediatric	 Moderate growth • Increased focus but from a low starting point • Limited or no reimbursement in place	 Strong growth • Better technology and cosmetics • Awareness of consequences of hearing loss • Reimbursement in place
 Adult	 Limited growth • Generally limited focus • No reimbursement in place	 Strong growth • Awareness of consequences of hearing loss • Reimbursement in place

William Demant

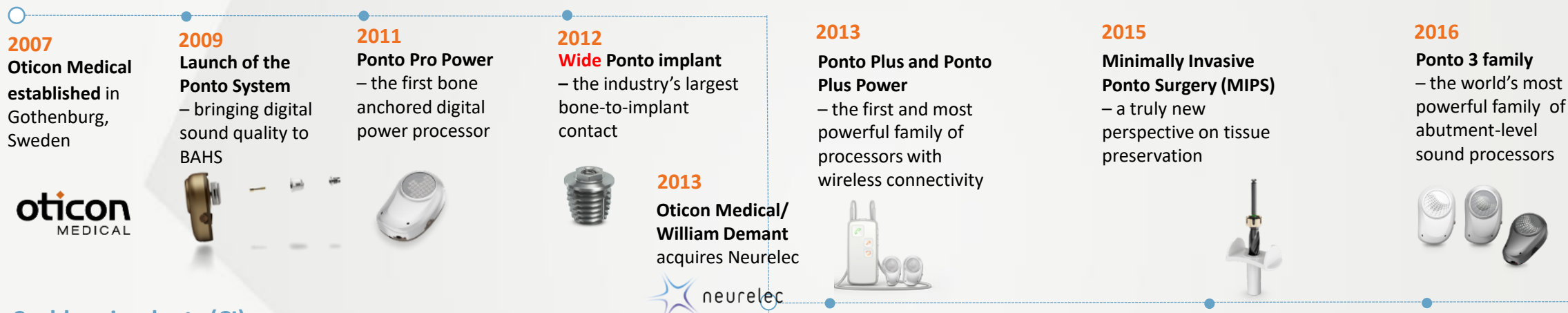


Oticon Medical

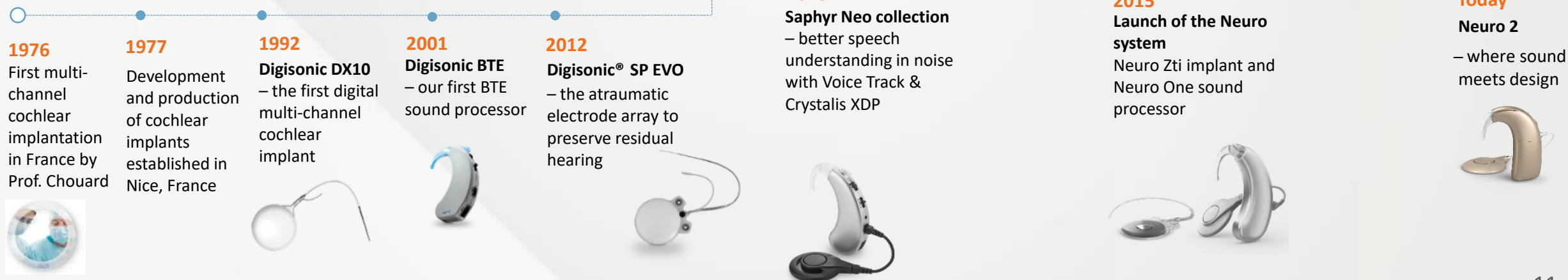


History of Oticon Medical

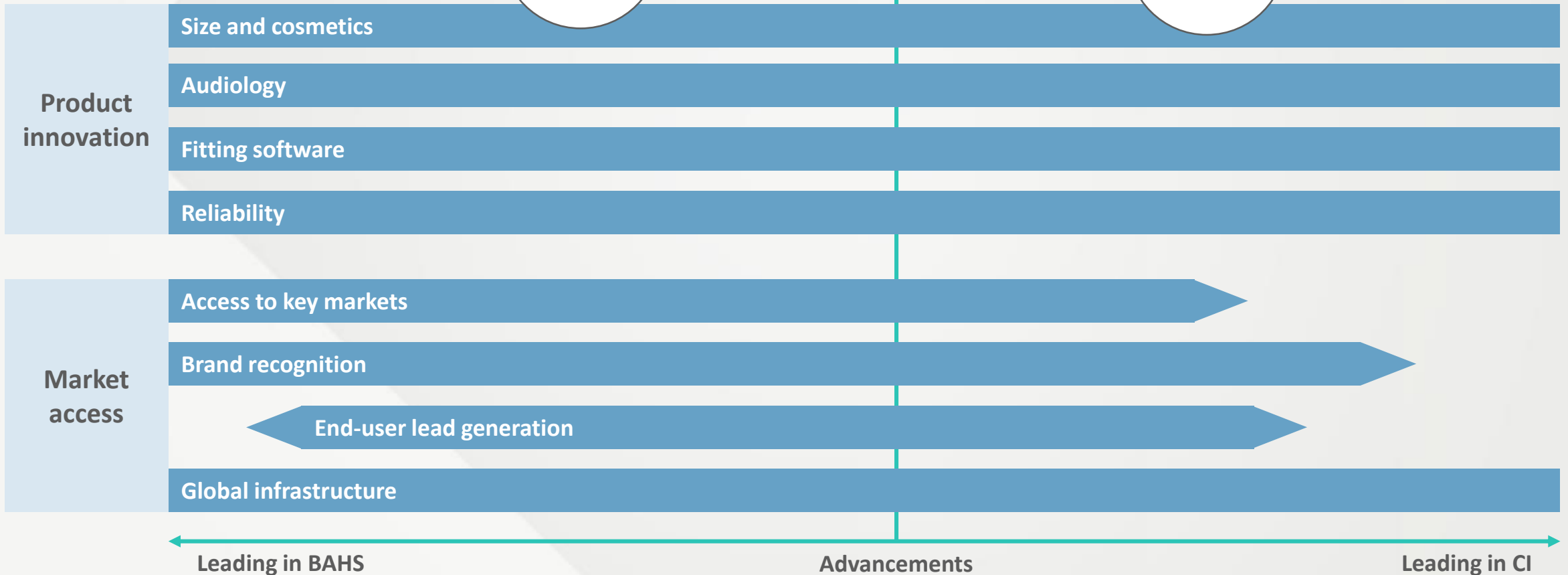
Bone anchored hearing systems (BAHS)



Cochlear implants (CI)



Oticon Medical's position in hearing implants



Synergies with the William Demant Group



Leading cross-functional R&D



Strong retail network



Power house of hearing



Global operations infrastructure



Proven ability to grow businesses



Financial strengths and committed owner



Specialised primary research facility



Founded on care

BrainHearing™

*“The ears hear
things...”*

*...the brain makes
sense of them “*



From BrainHearing™ in hearing aids ...



OpenSound Navigator

*Keeping speech clear
and other sounds
available, but not
disturbing*

Enjoy **30%**
better speech
understanding

Reduce your
listening effort
by **20%**

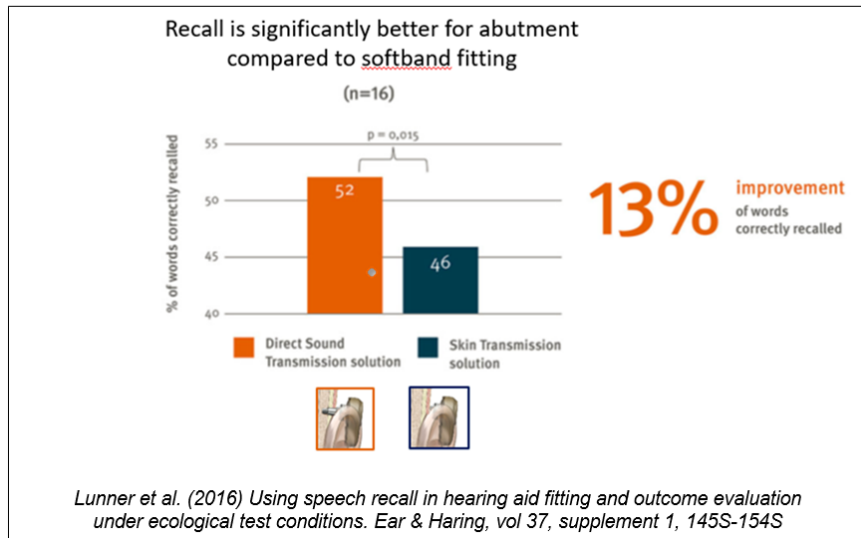
Remember **20%**
more of your
conversations



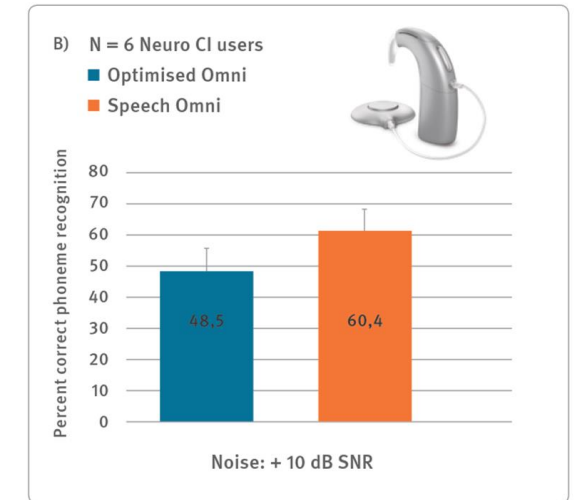
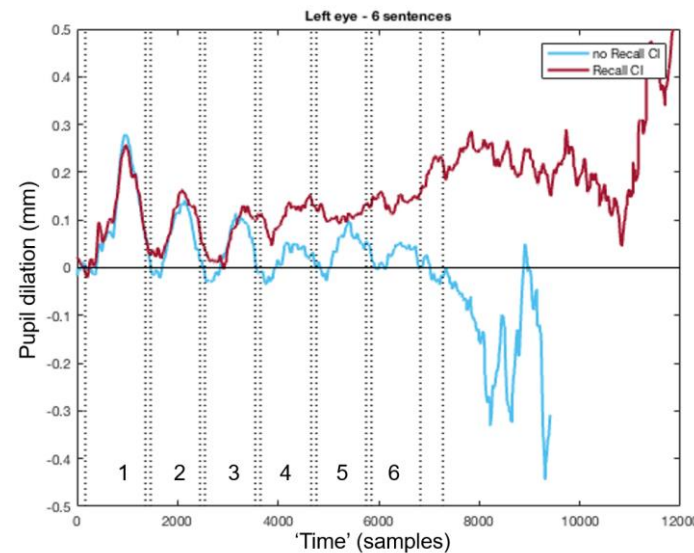
... to BrainHearing™ in hearing implants

BAHS

SWIR: Direct Sound Transmission vs. Skin drive



CI: Combined SWIR and pupilometry



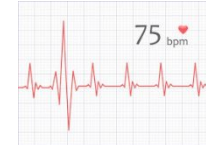
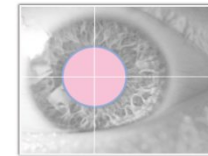
Speech audiometry scores with Speech Omni
Compared to Opti Omni in 6 Neuro CI users

Committed to BrainHearing™

- Our portfolio of studies is large and growing
 - EEG measures
 - Behavioural tests, e.g. SWIR Recall
 - Pupilometry solutions (several set-ups, SMI, Tobii, Pupil labs etc.)
 - Functional near-infrared spectrometry
 - Heart rate changes
 - Infield research platform (self-assessment app, sound, HR data)
 -
- Partner in several EU H2020 projects on cognitive hearing



- SWIR:
 - Repeat last word of 7 sentences
 1. Kämm dir bitte noch deine **Haare!**
 2. Wollen wir einen Teppich **kaufen?**
 3. Die Straße war sehr **befahren.**
 4. Das Wildschwein wird **geschossen.**
 5. Iss noch ein Stück **Torte.**
 6. Morgen will ich unsere Fenster **putzen.**
 7. Ihr wolltet doch bei mir **anrufen!**
 - Recall final words ○ ○ ○
- “...Haare, befahren, Torte, putzen... umm!”

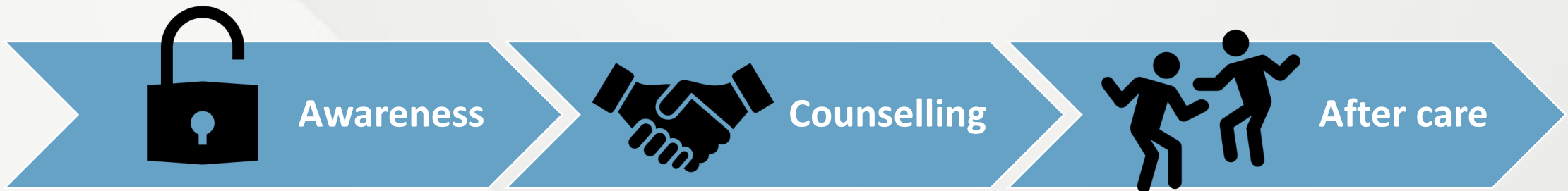


HearECO ITN

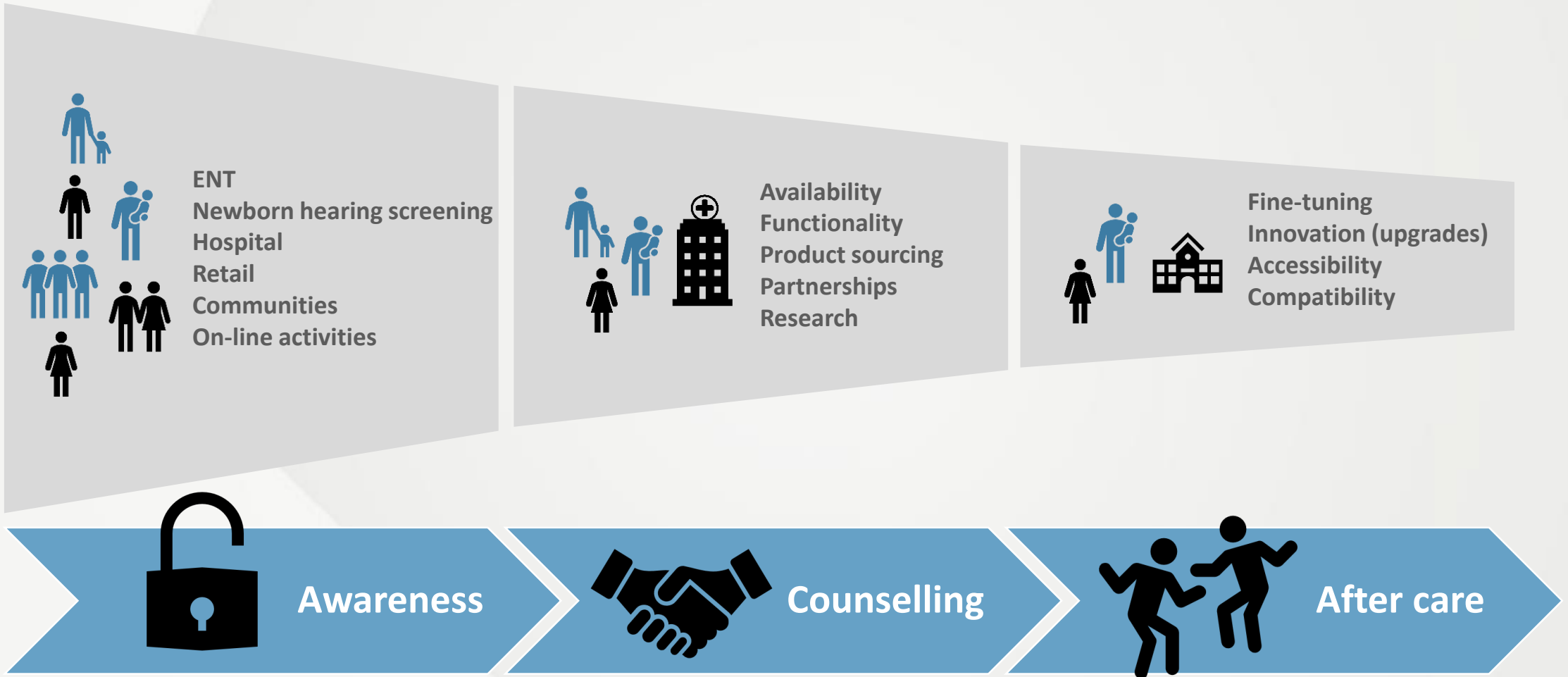


Patient journey – focus on people

- With hearing implants, you are on a life-long journey with the end-user
- Continuous innovation and long-term commitment are crucial factors for success
- Winning the customers takes time – and it should
- You should be easy to do business with and ensure easy access to information
- Recurring business and obligations when winning the customers' loyalty



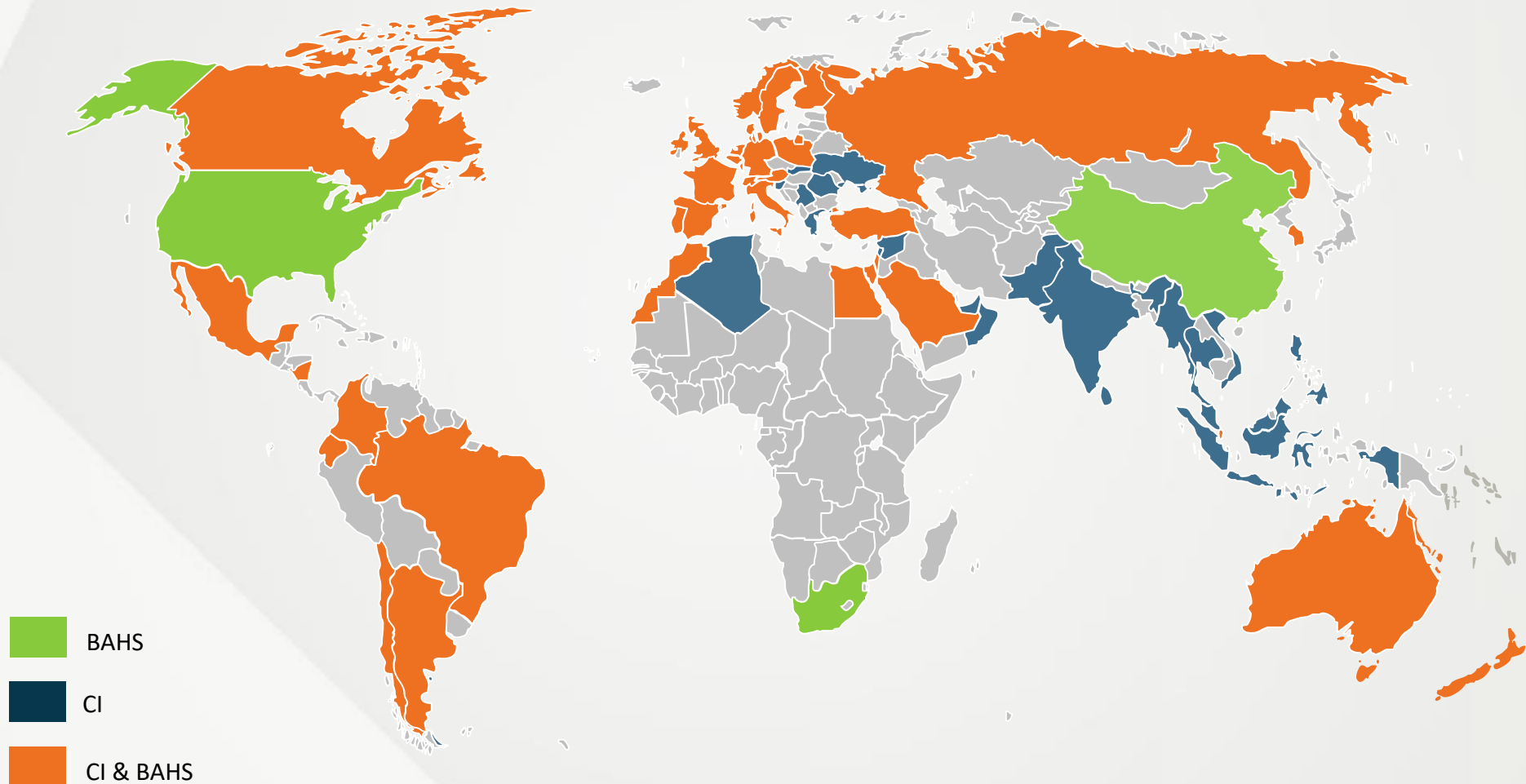
Patient journey – funnel



Patient journey – synergies with rest of Group



Oticon Medical: Our world





The Neuro system: Scientific-based outcomes



Neuro Zti cochlear implant

New standard in MRI compatibility

No risk of magnet extrusion at 1.5T– rigid body
No pain due to receiver movement – fixation system
Removal made easy and safe for compatibility at 3T

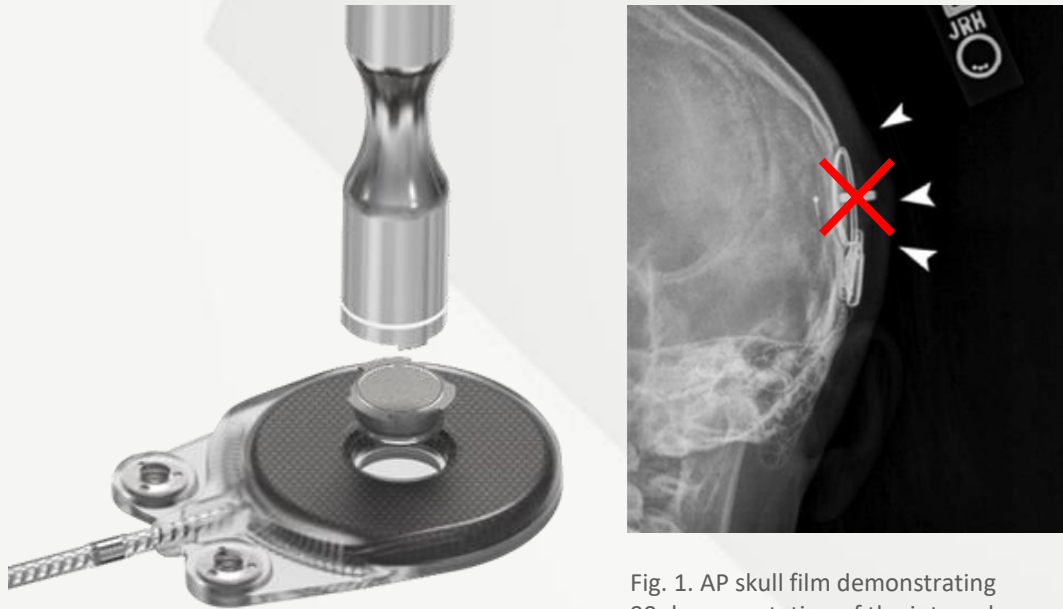
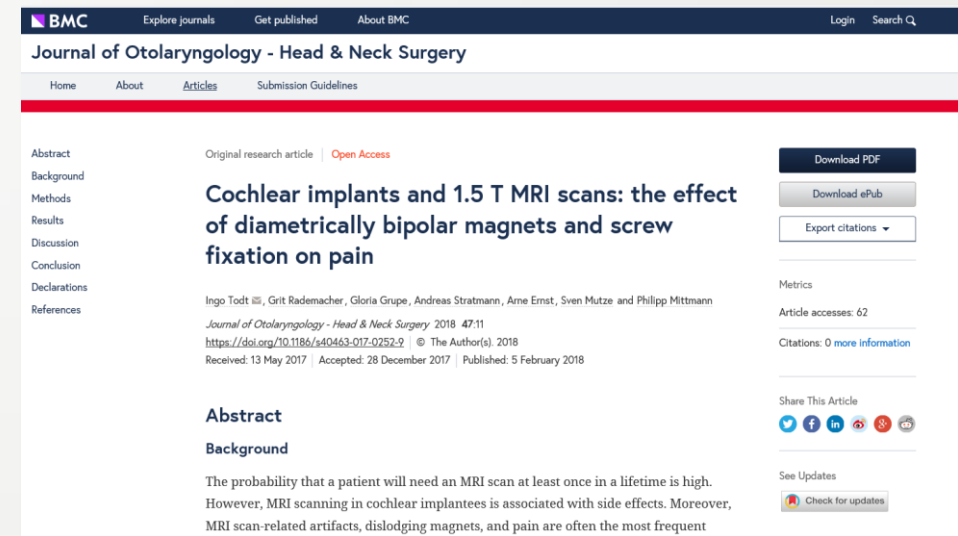


Fig. 1. AP skull film demonstrating 90 degree rotation of the internal magnet. There is associated protrusion of the scalp tissues (arrowheads).

First independent study published Todt et al., JOHNS 2018

Comparing two technical solutions for MRI compatibility:
Neuro Zti and Competitor A



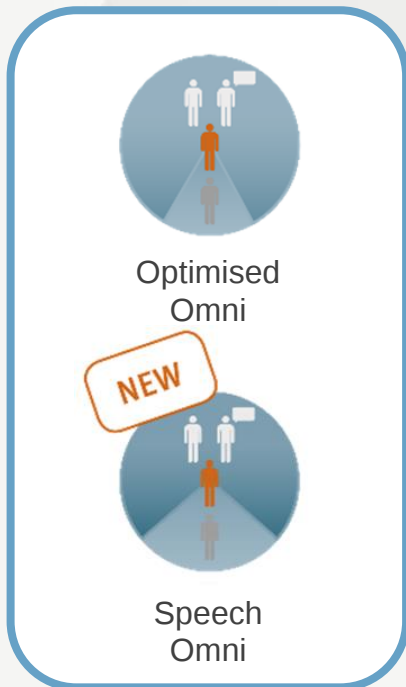
Neuro Zti is comparable to the best competitor product in the domain and outperforms products from two other manufacturers.

BrainHearing™ and the Neuro 2 sound processor

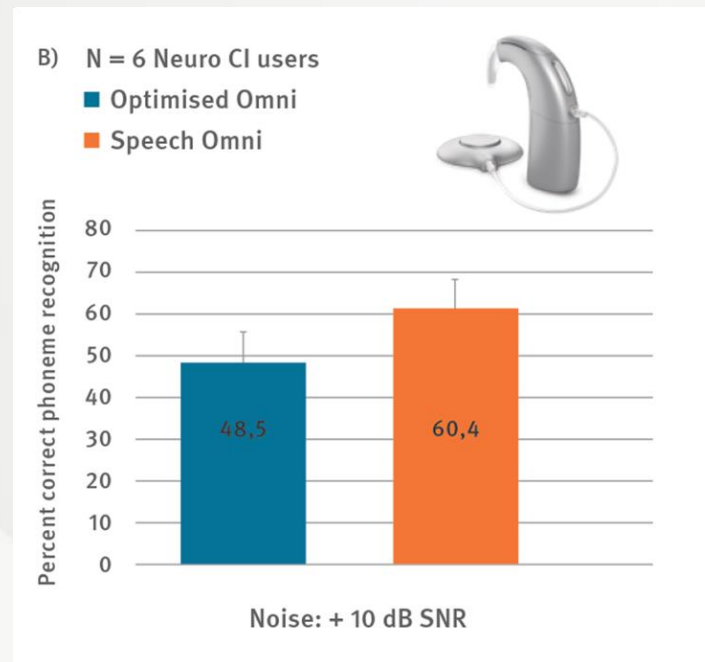
Speech Omni setting in FreeFocus directional system



Technology inspired
by the brain

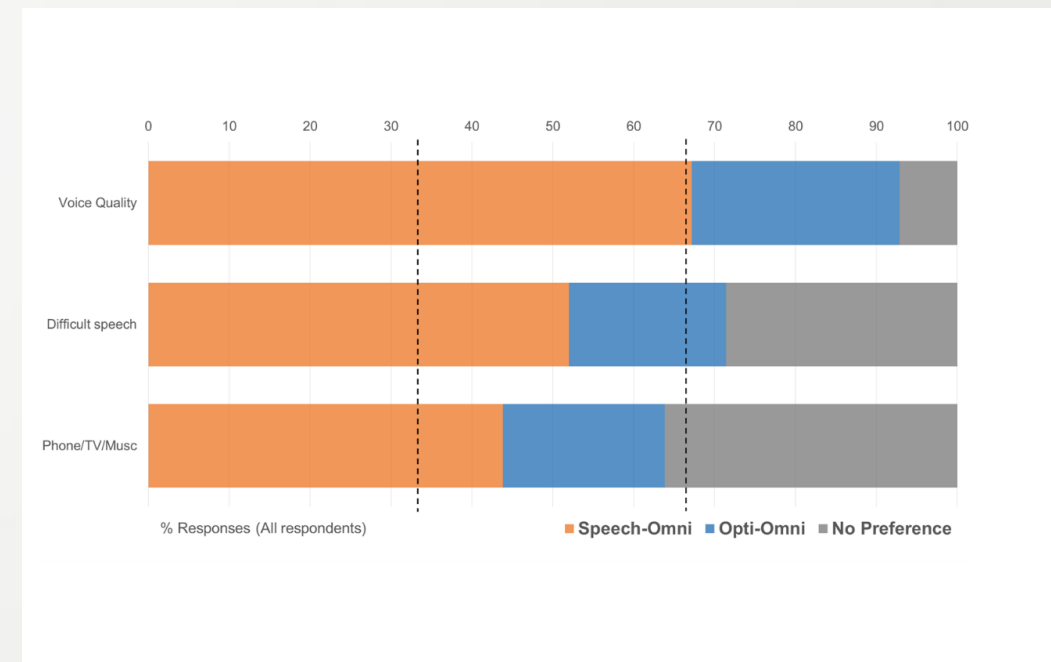


Providing measurable benefits ...



Speech audiometry scores with Speech Omni compared to Optimised Omni in six Neuro CI users

... that patients want to use



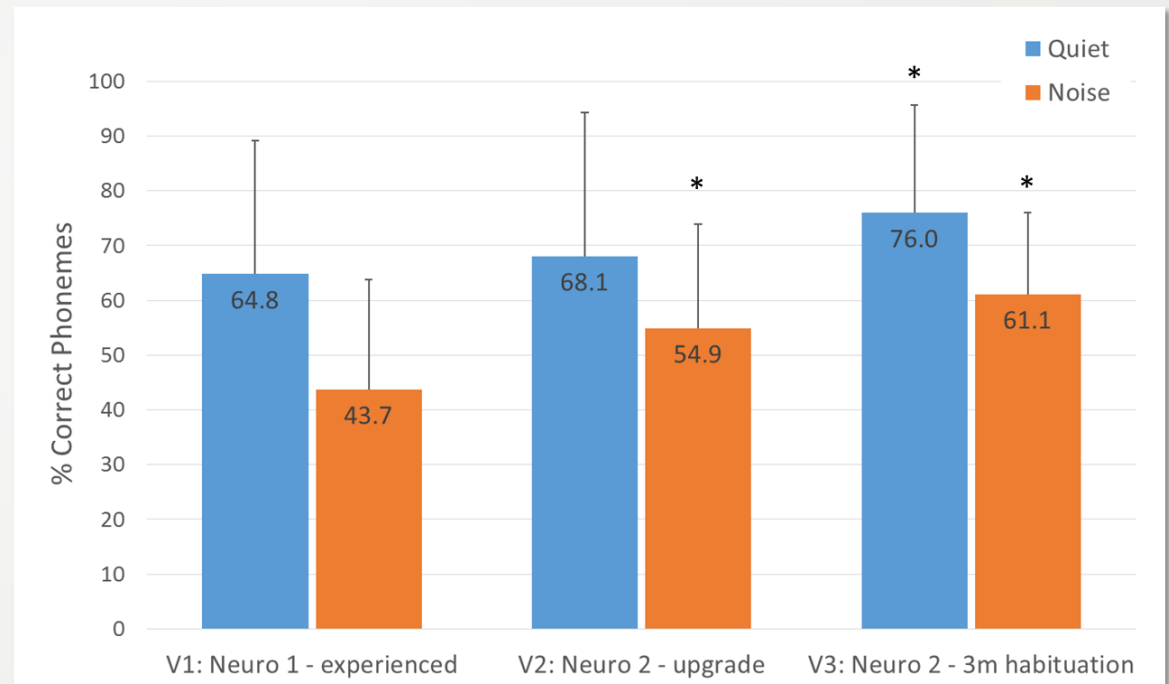
Subjective preference in different listening situations for Speech Omni vs. Optimised Omni in 35 Neuro CI users

Neuro 2 sound processor

New standard in terms of battery life and design

Industry-unique aesthetic characteristics in combination with superior performance and increased outcomes

Objective measure: Speech audiometry scores





Opening Up the World of Sound With Hearing Implants

Thomas Lenarz, MD PhD

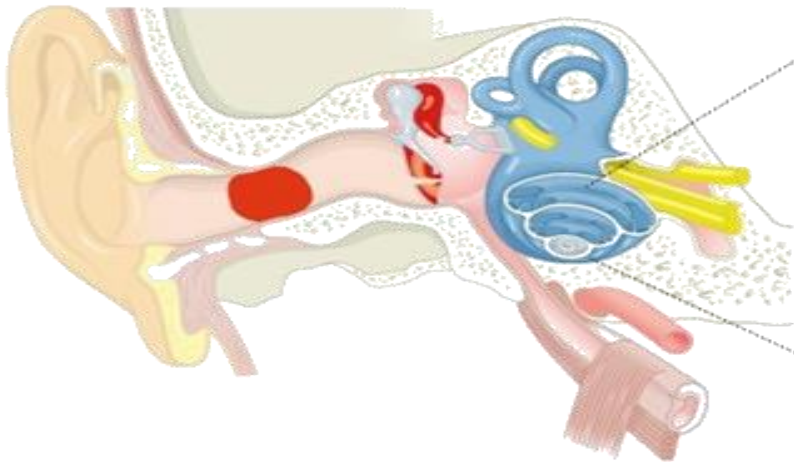
Department of Otolaryngology
Hannover Medical School, Germany

WDH Capital Market's Day, London June 12, 2018



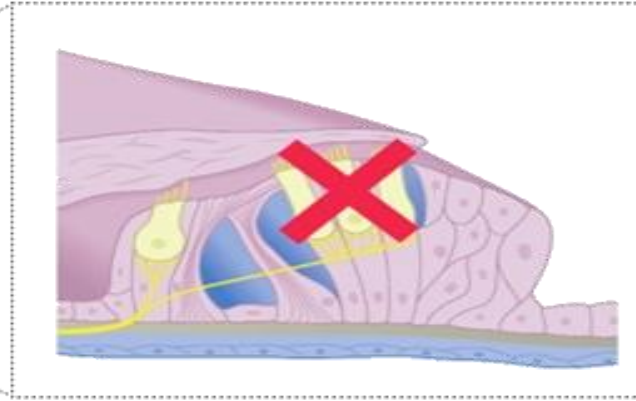
Hearing Disorders

Outer and middle ear



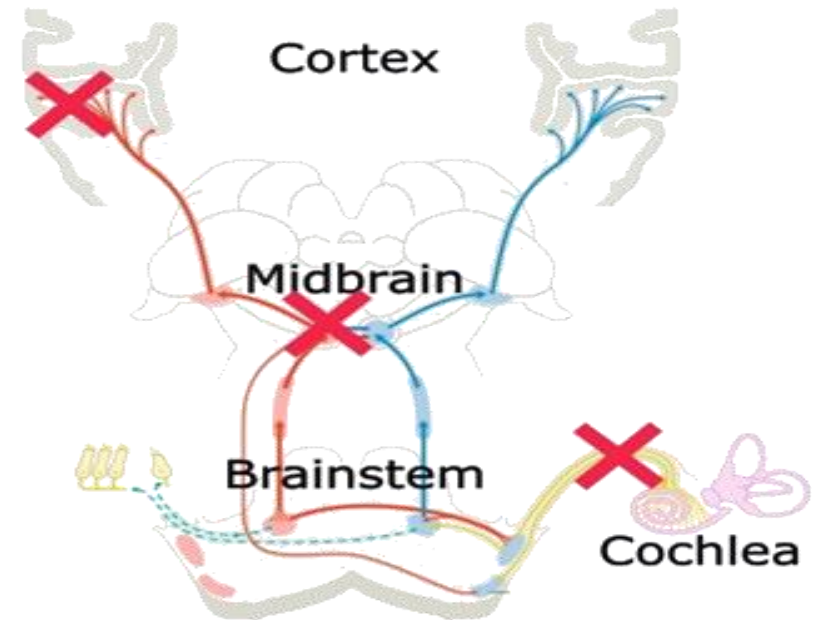
Conductive loss

Inner ear



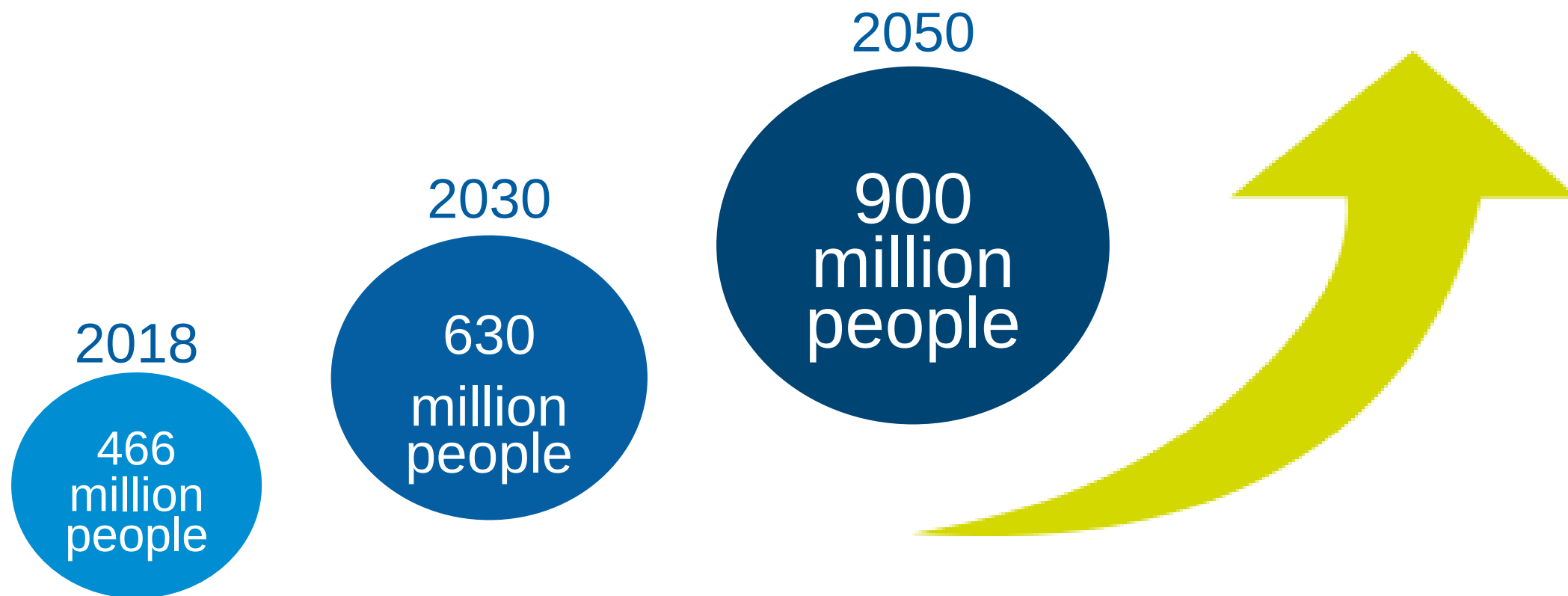
Sensory or cochlear loss

Auditory pathway



Retrocochlear loss

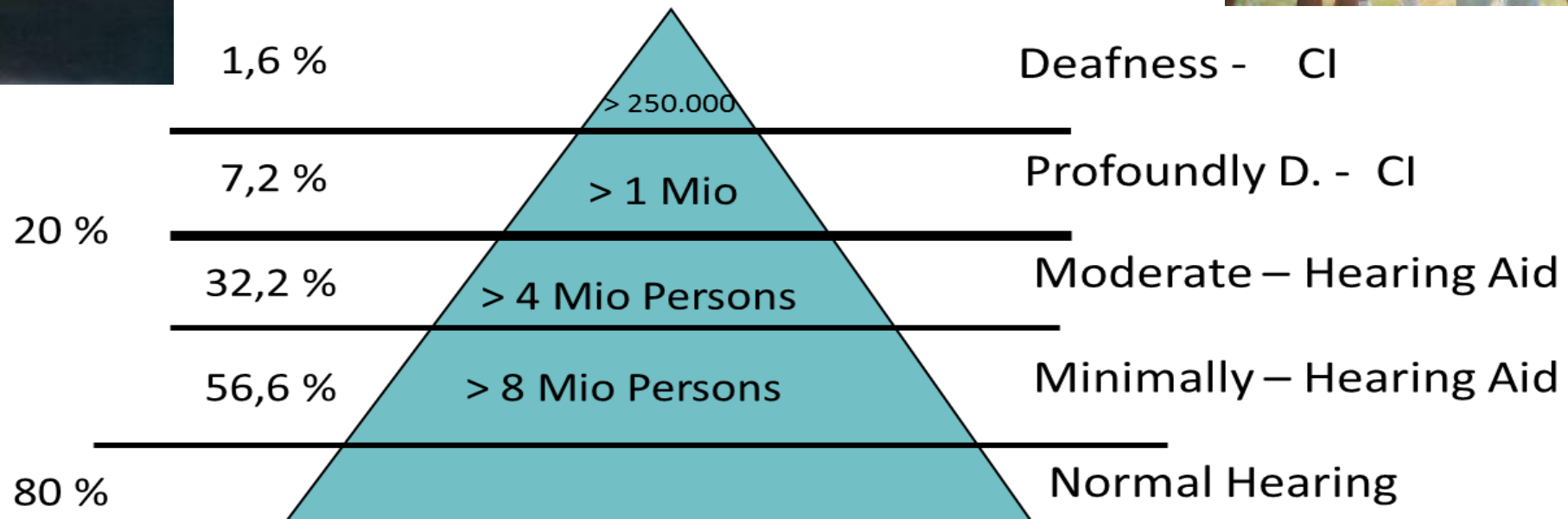
Hearing Loss: A GROWING GLOBAL EPIDEMIC



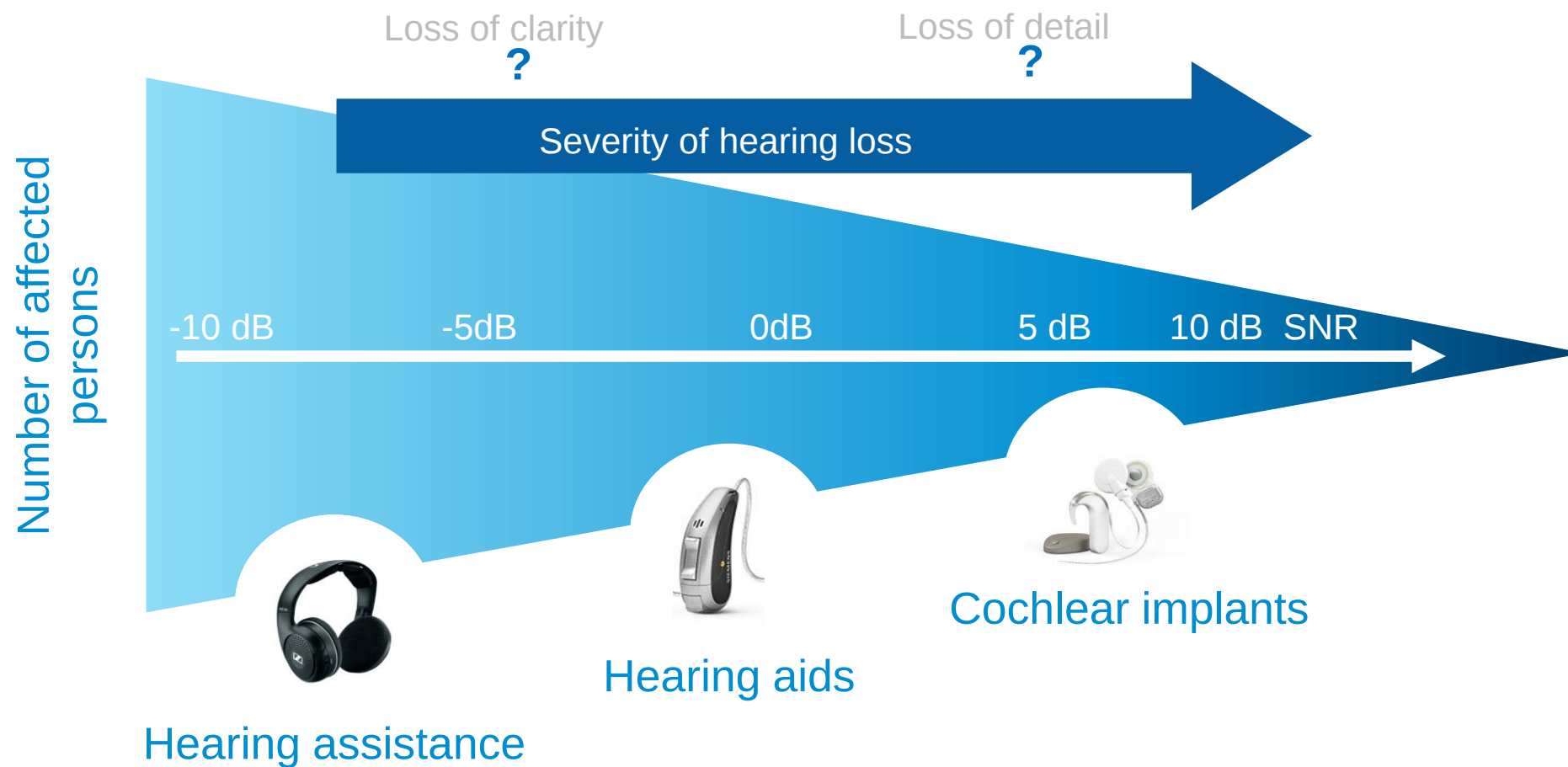
Hearing Loss in Germany



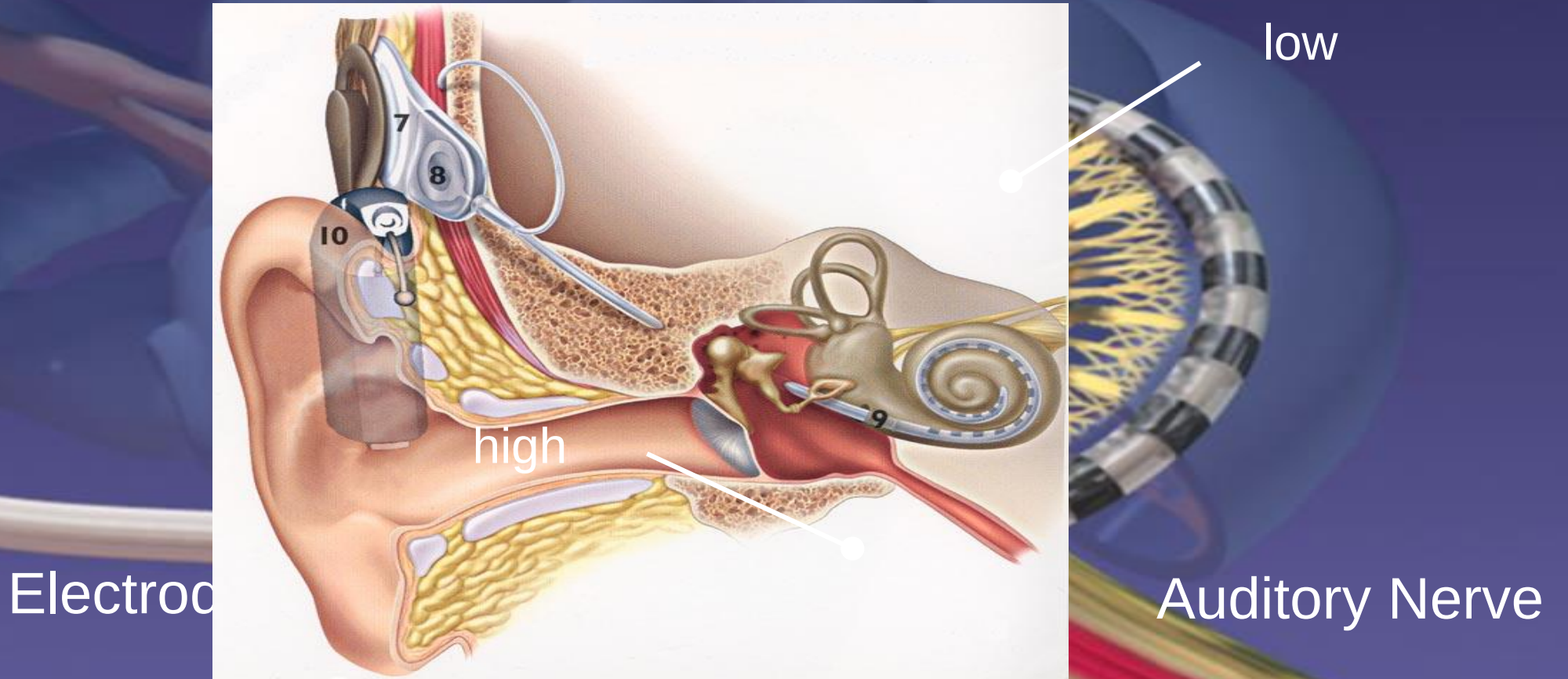
14 Mio. Hearing Impaired
in Germany
Every 2nd above 65 Years
2 in 1000 Children



Hearing Loss: Auditory Devices



Cochlear Implant



The “success story” of Neuroprotheses

> 500.000 Recipients Worldwide

Candidates in Germany: 1 Million

Implanted in Germany: 50.000

Contact
with the
world of
sound

Speech
discrimination
in a majority

Speech
discrimination
in all

Speech in noise &
music perception
in all

Time

First

Then

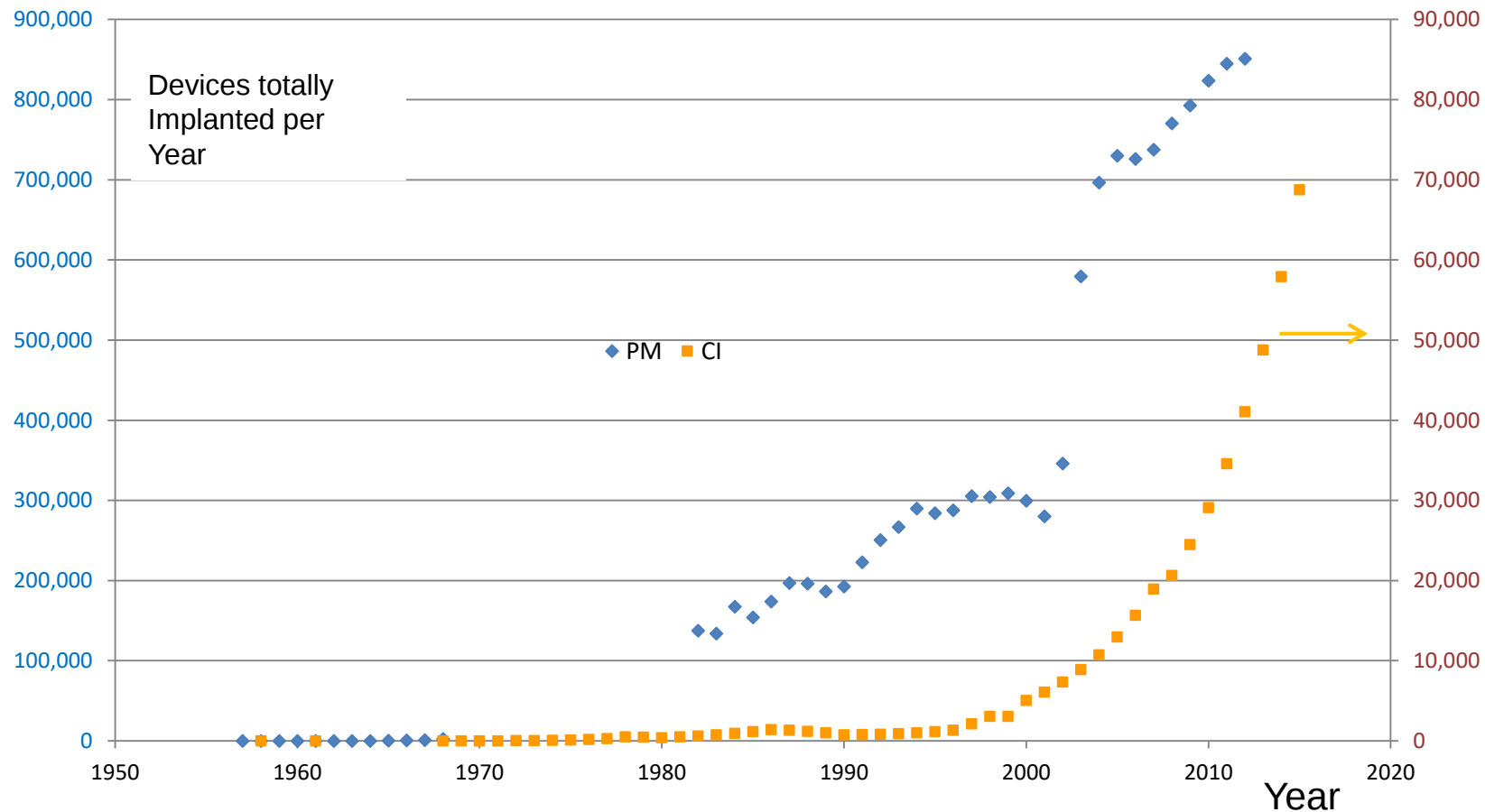
Now

Future



History and Future of Active Implants

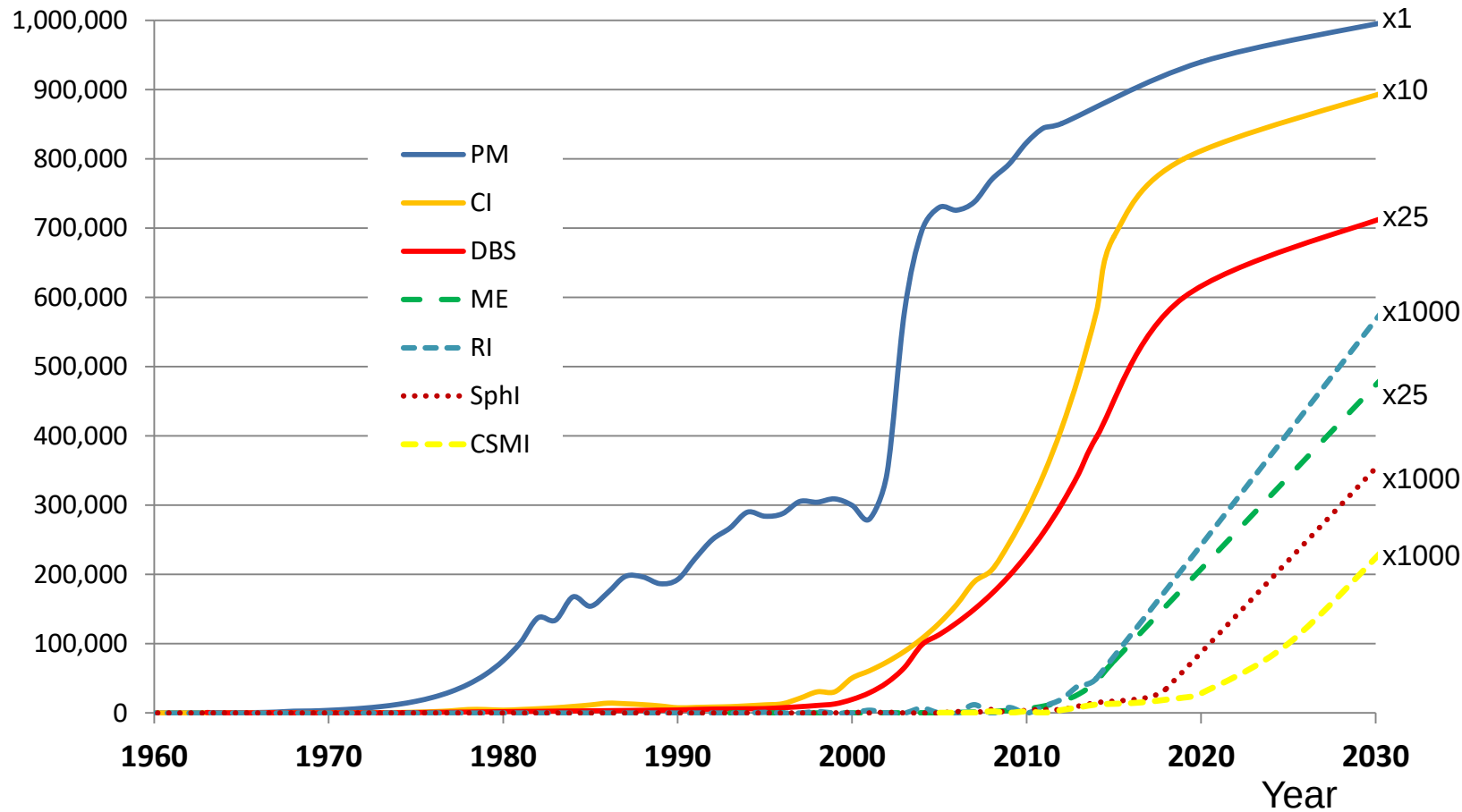
"...implants that rely for functioning on a source of electrical energy or any source of power other than that directly generated by the human body ..."(90/385/EEC MEDDEV)



- Pacemakers
- Cochlear Implants

Conservative Market - Expectations

Devices Implanted per Year



Conservative means early Saturation!

Innovative Breakthrough like PM are always possible, but:

Medical Devices have long Delays due to Testing & Approval!

The “success story” of Neuroprotheses

> 500.000 Recipients Worldwide

Candidates in Germany: 1 Million

Implanted in Germany: 50.000

Contact
with the
world of
sound

Speech
discrimination
in a majority

Speech
discrimination
in all

Speech in noise &
music perception
in all

Time

First

Then

Now

Future



Objective: Develop auditory precision medicine



Every patient with
hearing
impairment is

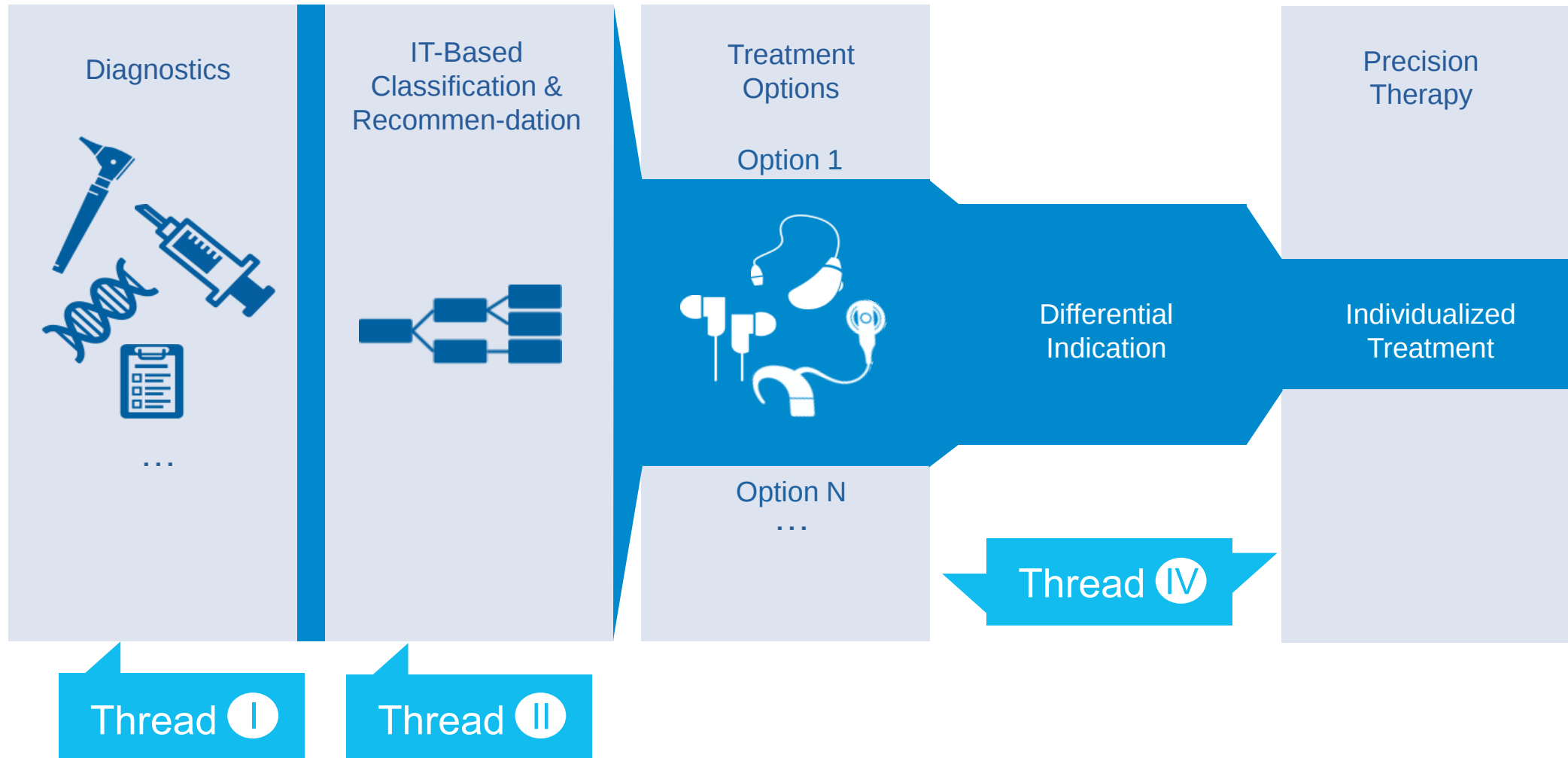




Precision Treatment for HearingLoss

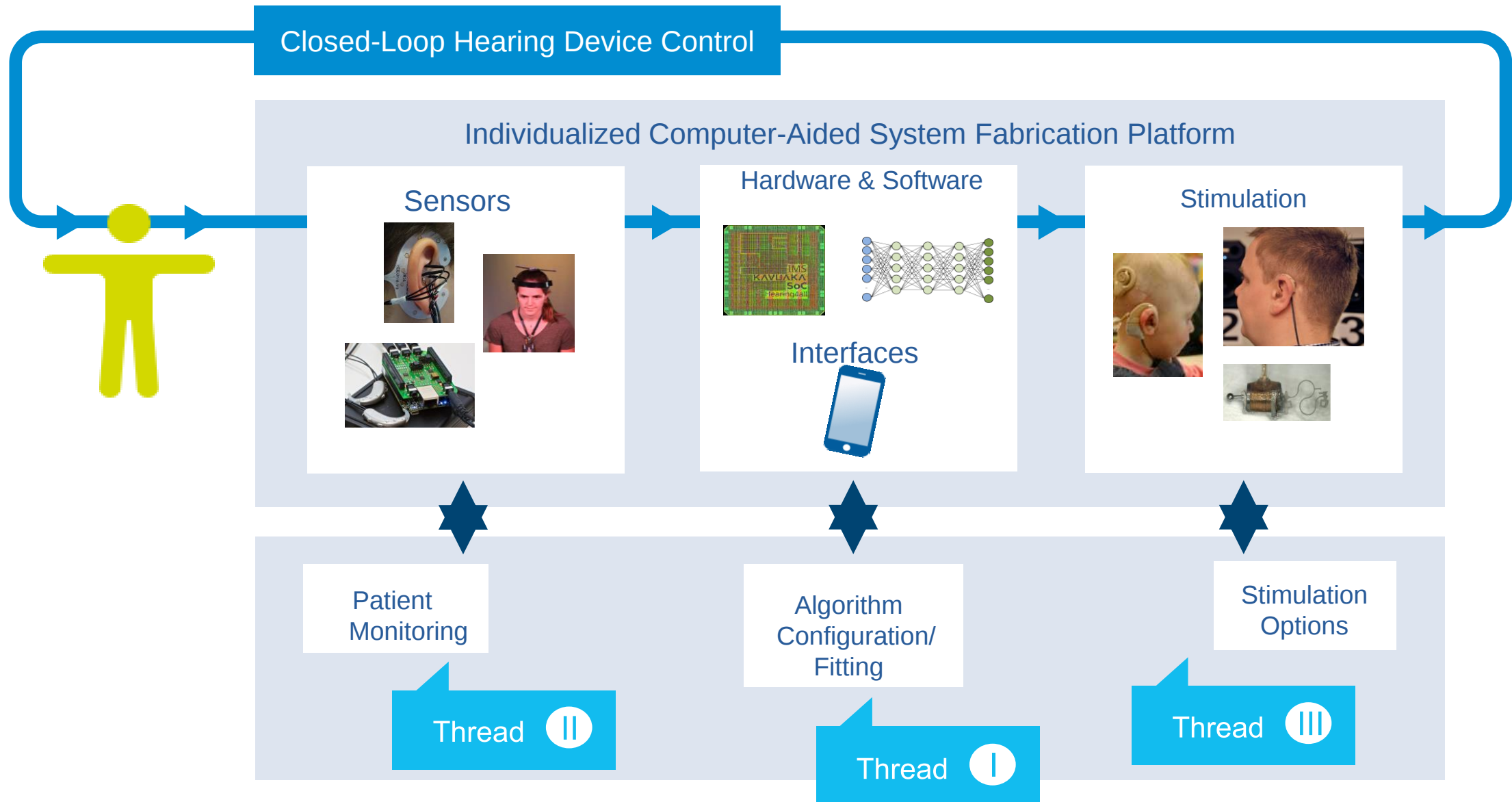


Hearing-
Impaired
Patient





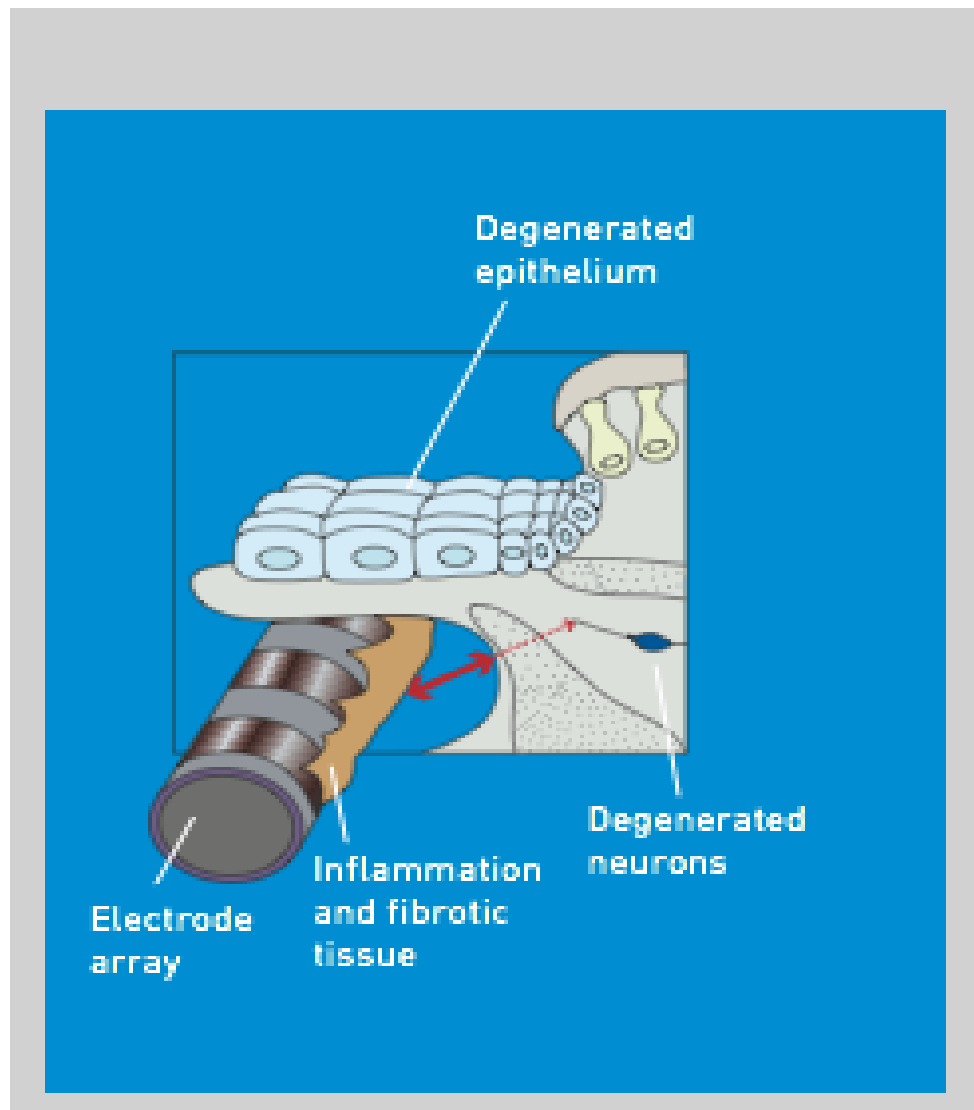
Hearing Implant of the Future



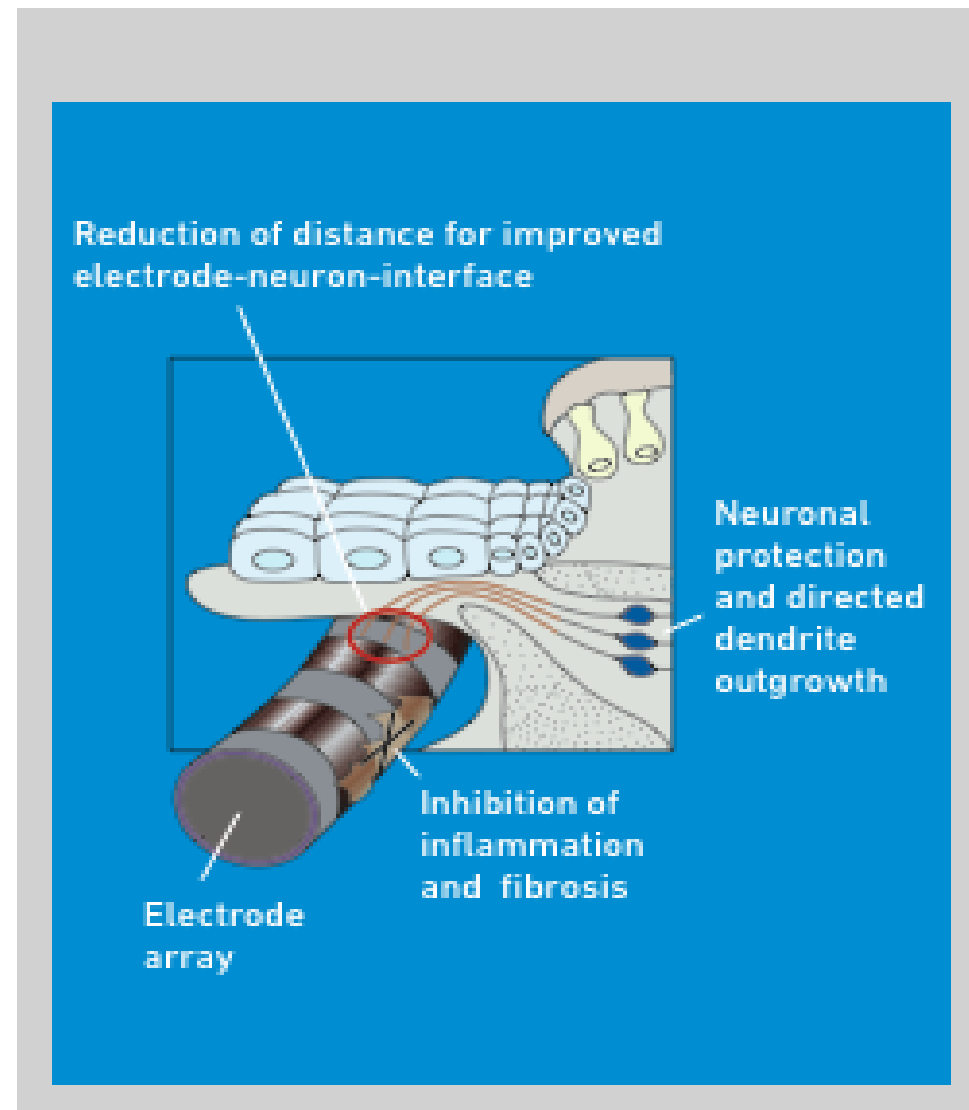


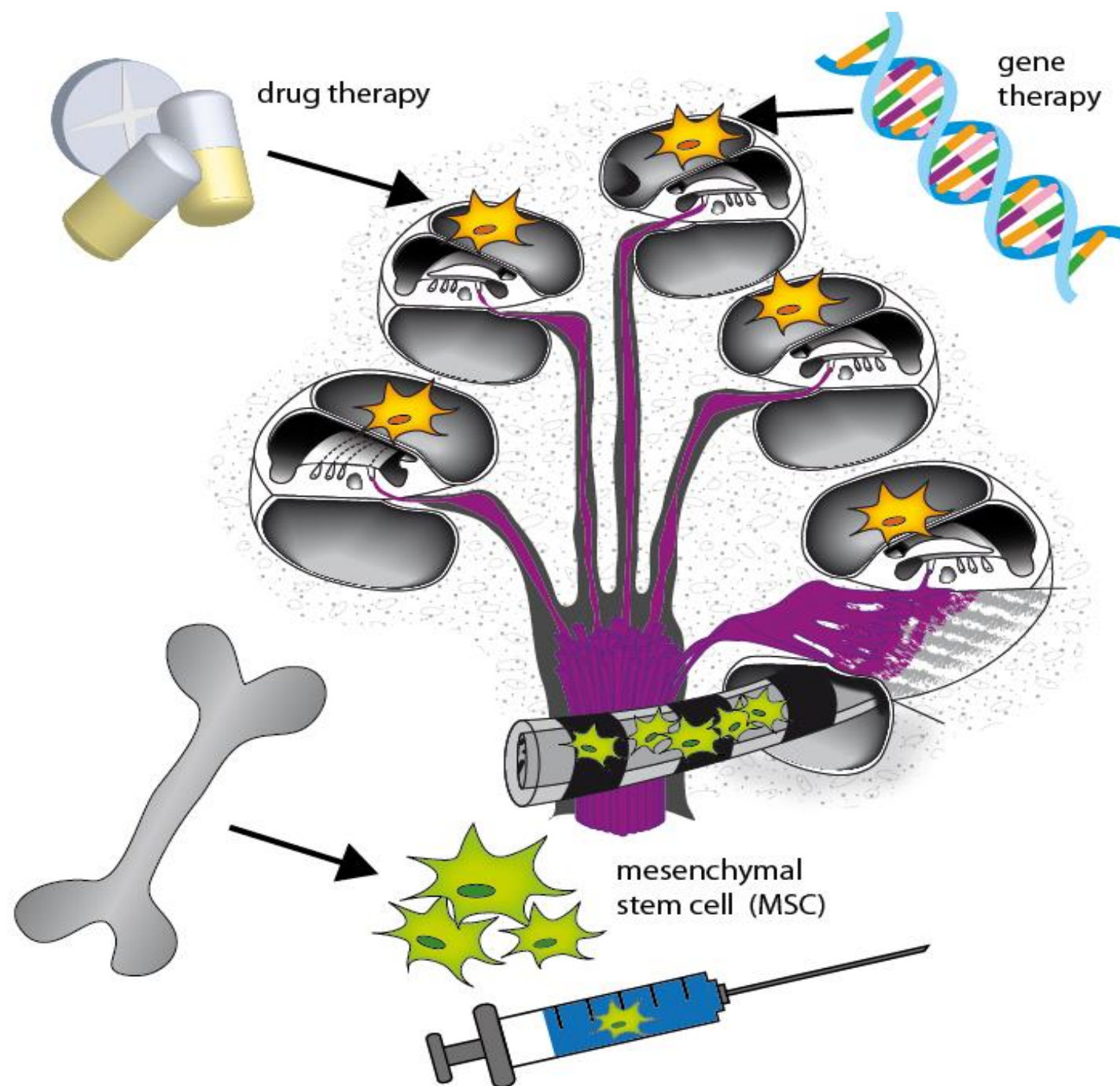
Spotlight — Advanced Auditory Implants

CHALLENGES

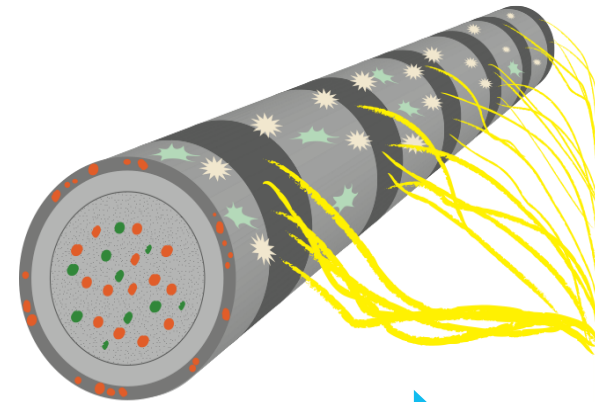


OBJECTIVES





- Bionic devices: bring biology into technical hearing solutions
- Artificial synapse
- Analogue-digital conversion
- Complete restoration of physiological hearing



1.000

Cochlear Implant Program in Hannover

Steps toward excellence:

1984	1st CI
1992	Children's implant Center
2003	German Hearing Center
2003	Collaborative Research Grant Medical implants
2013	Center of Excellence Hearing4All
2016	VIANNA in NIFE
2016	Fraunhofer Center of Biomedical Excellence

Clinic — with 25,000 outpatients and 6,000 inpatients each year
600 Cochlear Implantations per year – 10.000 in total

German Hearing Center — patients go with hearing loss

NIFE— laboratories of experimental otology basic research

VIANNA — transfer basic science into new products Companies

Fraunhofer ITEM — production, testing and certification



Centre of BioMedical Excellence

Translational Medical Engineering



Fraunhofer Excellence
Cluster
Supporting Structure



Institute of AudioNeuroTechnology
(VIANNA) **NIFE**

Niedersächsisches Zentrum für Biomedizintechnik,
Implantatforschung und Entwicklung

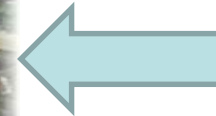
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CRC HANNOVER
CLINICAL RESEARCH CENTER



Auditory and Neuroimplant Research Cluster

Hannover Medical Park



German Hearing Center (DHZ)

- Integrated care for hearing impaired people
- One-stop shop
- Complete spectrum of diagnostic procedures
- Candidate selection
- Postoperative care and rehabilitation
- Conservative treatment of hearing loss
- Service centers of manufacturers for direct support of patients
- Remote care center hub and spoke
- Clinical research in fields of speech coding, electrodes, and acoustic implants

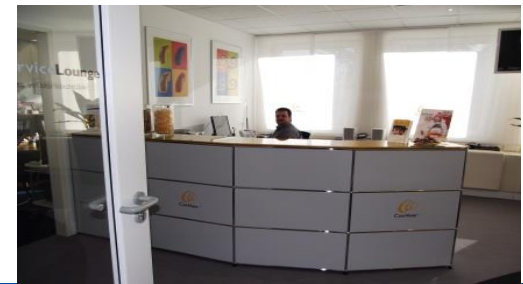
Head of clinical service:

Prof. Dr. Anke Lesinski-Schiedat



Head of technical service and research:

Prof. Dr. Andreas Büchner



Remote Care : Patient monitoring and Service

Hub and Spoke: 25 partners across Germany

Full service with spare parts, implant check and upgrade

Can be connected to the CI center any time

Future self fitting and automated patient monitoring through data transfer



Klinik und Poliklinik für Hals-Nasen-Ohrenheilkunde
der Medizinischen Hochschule Hannover
und Deutsches Hörzentrum Hannover
Direktor: Prof. h. c. Dr. med. Thomas Lenarz

Heimatnahe Nachsorge aus dem DHZ der MHH

Unsere Remote Care Center für Sie

Die Medizinische Hochschule Hannover ist dem Wunsch vieler CI-Patienten nach einer heimatnahen Nachsorge nachgekommen und hat mit dem Unternehmen auroc Hörsysteme aus Rheine ein Netzwerk gegründet, bei dem die Nachbetreuung des Sprachprozessors in Remote Care Centern – Fernanpassung – möglich ist, ohne auf die Kompetenz der Audiologen aus dem Deutschen Hörzentrum Hannover zu verzichten.

Die Fernanpassungen sind an folgenden Standorten möglich:

auroc Hör- und Tinnitus-Zentrum Leipzig
Krieger Straße 1, 04209 Leipzig
Tel: (0341) 42 90 00 88
Fax: (0341) 42 90 07 11
auroc.leipzig@aurc-hoercenter.de

auroc Hör- und Tinnitus-Zentrum Berlin-Schöneberg
Immerstr. 57, 10825 Berlin
Telefon: (030) 76 76 55 70
Telefax: (030) 76 76 84 45
auroc.schoenberg@aurc-hoercenter.de

auroc Hör- und Tinnitus-Zentrum Nordostalt
Ochtershausen 19
22868 Nordstedt
Telefon: (040) 31 10 89 50
Telefax: (040) 31 10 89 60
auroc.nordstedt@aurc-hoercenter.de

auroc Hörcenter Emden
Am Delft 11
26221 Emden
Tel.: (0482) 50 14 85
Fax: (0482) 50 14 84
auroc.emden@aurc-hoercenter.de

auroc Hörcenter Herne
Hauptstr. 80
44651 Herne
Tel.: (0232) 44 64 60
Fax: (0232) 44 64 17
auroc.herne@aurc-hoercenter.de

Hör-Implant-Centrum
Westfastr. 156 A
49154 Münster
Tel.: (0251) 92390 30
Fax: (0251) 92426 53
info@hoerzentrum-hammerstrasse.de

Hörzentrum Rheine
Charlottenstr. 4-6 (Breitenhaus)
49429 Rheine
Tel.: (0597) 99 34 9
Fax: (0597) 97 34 428
auroc.hfhoerzentrum-rheine.de

auroc Hörcenter Osnabrück
Kungelstr.
49074 Osnabrück
Tel.: (0541) 800 40 64 -1
Fax: (0541) 800 40 64 -2
auroc.osnabrueck@aurc-hoercenter.de

auroc Hörzentrum Stuttgart-Bad Cannstatt
Merkelstraße 48 8-9
70372 Stuttgart
Tel.: (0711) 05 34 80 16
Fax: (0711) 05 34 85 17
auroc.stuttgart@aurc-hoercenter.de

auroc Hörzentrum Hohentabor Land
Hohentaborstr. 1, 74773 Schönbach
Tel.: (0714) 72 100
Fax: (0714) 72 101
auroc.schoenberg@aurc-hoercenter.de

auroc Hörzentrum Karlsruhe
Münsterstr. 45 A
76123 Karlsruhe
Tel.: (07231) 61 67 602
Fax: (07231) 61 76 604
auroc.karlsruhe@aurc-hoercenter.de

auroc Hör- und Tinnitus-Zentrum Düsseldorf
Münsterstr. 4
70237 Karlsruhe-Dursch
Tel.: (07231) 15 17 839
Fax: (07231) 15 17 839
auroc.duesseldorf@aurc-hoercenter.de

auroc Hör- und Tinnitus-Zentrum Rastatt
Rastatt
Engelstraße 41
76637 Rastatt
Tel.: (07222) 94609 11
Fax: (07222) 94609 22
auroc.rastatt@aurc-hoercenter.de

auroc Hörzentrum Dachau
Münsterstr. 45 A
85733 Dachau
Tel.: (089) 31 61 67 602
Fax: (089) 31 61 76 604
auroc.dachau@aurc-hoercenter.de

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im Aufbau:

MHH
Medizinische Hochschule
Hannover

hno
mhh

DHZ
Deutsches Hörzentrum
Hannover

VIANNA

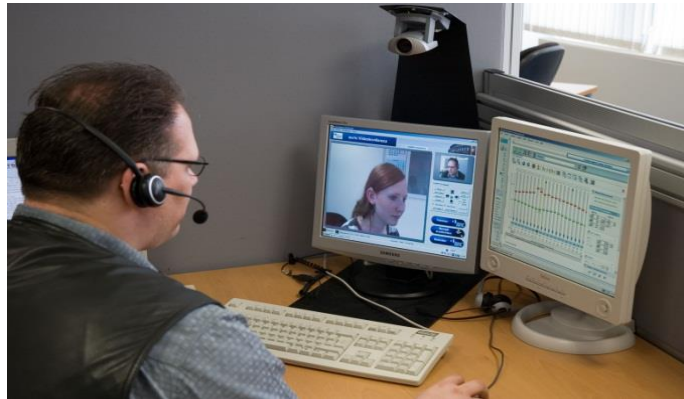
Hearing
4all

Remote Care with 2 way audio-visual connect

CI Center



Satellite



Hannover Medical School Experience with Oticon Neuro Implant



Because
sound matters

oticon
MEDICAL

The Neuro Cochlea-Implant system

Neuro One

- Oticon Technology Inside (Inium)
- Coordinated Adaptive Processing



Neuro Zti

- Compact design
- Future-proof technology
- Conventional and atraumatic electrode arrays

The Neuro Cochlea-Implant system

Neuro 2

- Oticon Technology Inside (Inium)
- Coordinated Adaptive Processing
- Smallest BTE processor in the market



Neuro Zti

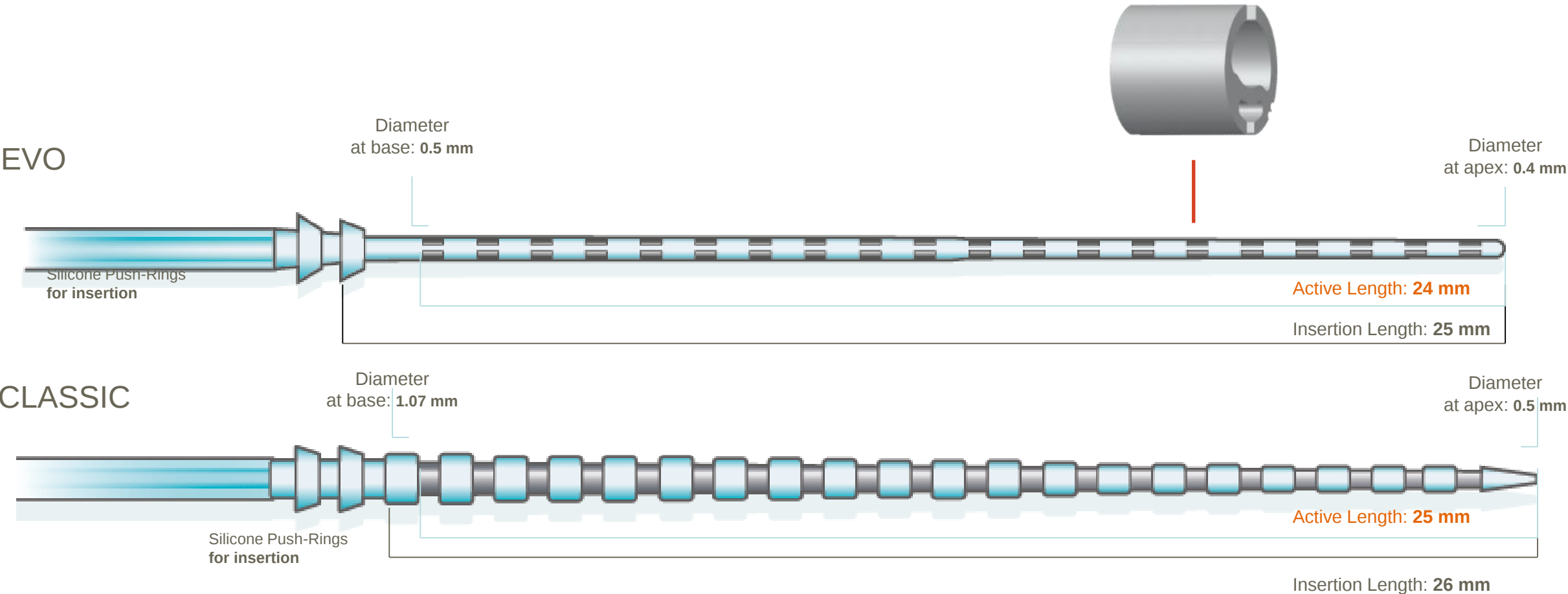
- Compact design
- Future-proof technology
- Conventional and atraumatic electrode arrays

Neuro Zti: feature summary

- ◊ Antenna protection inside the case
- ◊ 2nd generation fixation system
- ◊ Removable magnet
- ◊ MRI safe up to 3T with magnet removed
 - ◊ **1,5T with magnet in place**



Electrode options



Technological highlights: Neuro Zti

- ◊ 24 independent high-precision current sources
- ◊ Configurable ASIC with substantial reserves for future development in the area of signal processing
- ◊ 28 hermetic sealed feed through
- ◊ **Build-in DSP for signal processing**
 - ◊ ECAP
 - ◊ future: E-BERA or other AEPs



Neuro Cochlea Implants at MHH



- Up to now, 67 Oticon Neuro ZTI systems implanted at MHH
 - Average age: 62,3 yr.; avg. hearing impairment: 26,7 yr.; avg. deafness: 13,5 yr.
 - All patients fulfill our expectations related to achieved listening performance with CI
 - Automatic features of the Inium Sense chipset (AGC-free signal processing, beam former, noise reduction, etc.) are easy to program und perfectly accepted by the patients
 - ECAP measurement system provides curves with good signal-to-noise ratio. We are collecting data for further analysis of reliability.



Oticon Neuro Implantation at Hannover Medical School



Because
sound matters

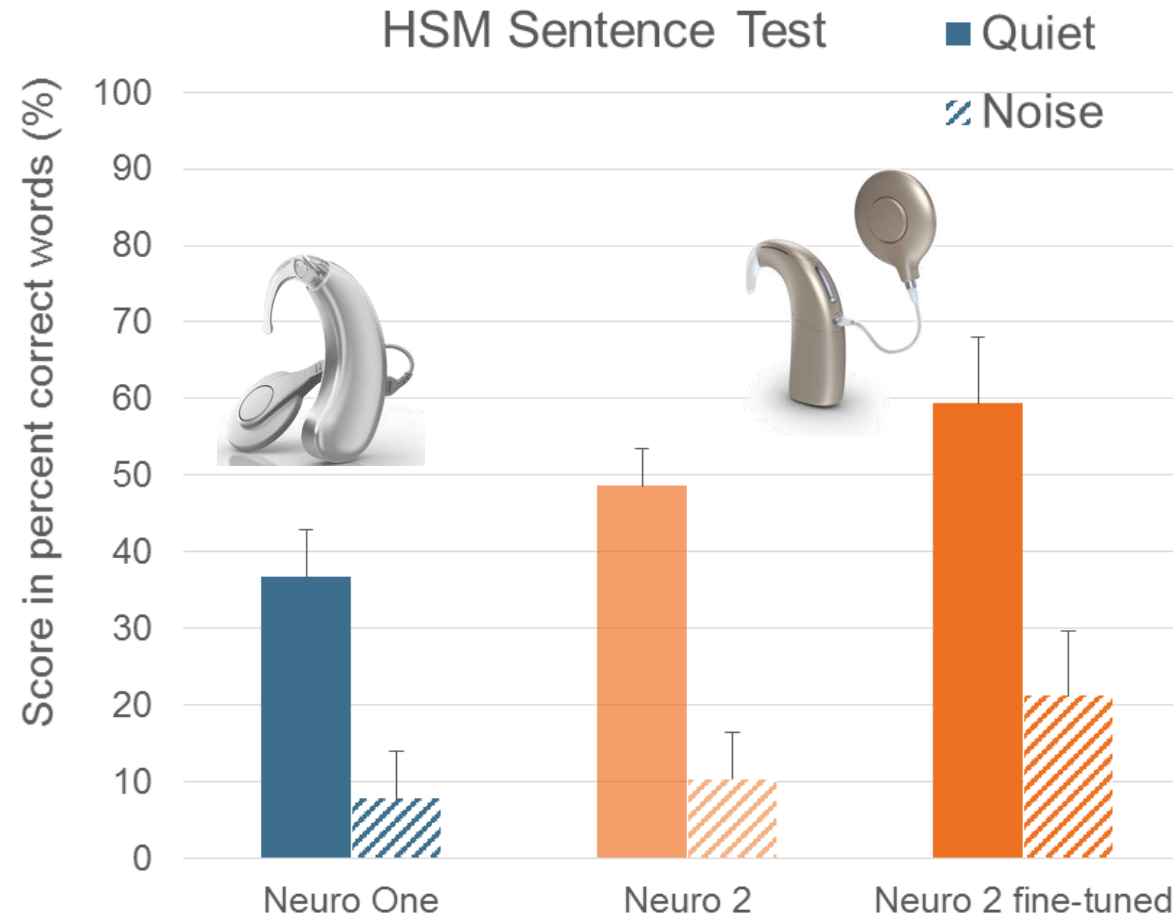
oticon
MEDICAL

First data on Neuro 2



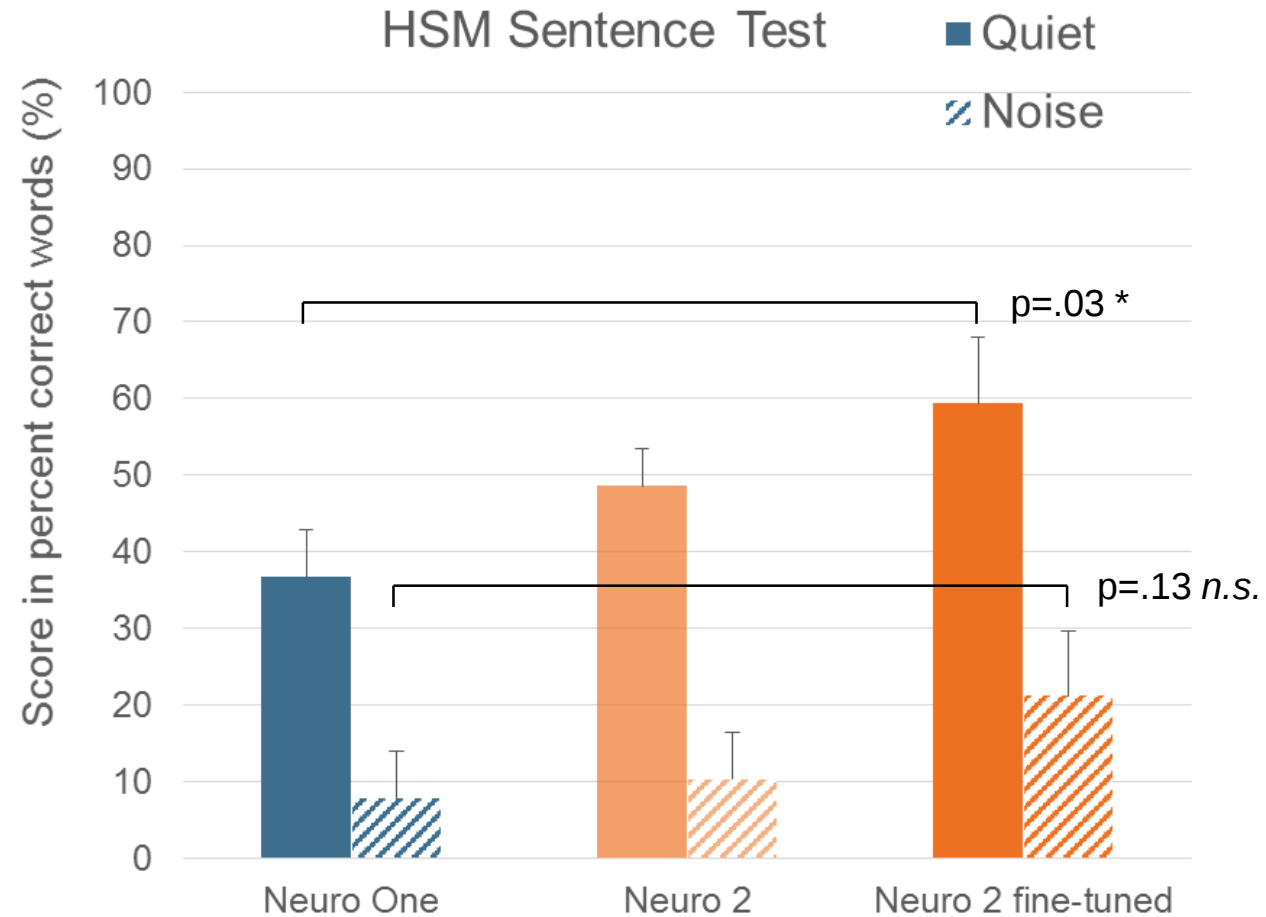
- Since February 2018, the Neuro 2 sound processor is available
- Up-to-now, 55 upgrades have been conducted
- Patients report significant improvements in sound quality and clarity
- Therefore, we are conducting comparing measurements at each upgrade visit with both, Neuro One and Neuro 2 sound processors in the sound field.

Preliminary performance data



N = 8
Average Age: 68,5 yr.

Preliminary performance data



Wilcoxon matched
pairs signed rank test

Summary

- In total, 67 Oticon Neuro Systems have been implanted at MHH
 - All surgeries have been conducted without complication
 - Pleased with level of OM inter-operative support provided
- All Neuro Zti patients at MHH are within expected listening performance, Neuro 2 obtains significantly better speech understanding results compared to Neuro One
- The signal processing chain in Neuro 2 is controlled by the Inium Sense Chip. Der Inium Sense Chip is widely used in Oticon's high-end hearing aids and allows for latest signal processing advances to be utilised in cochlear implant systems.
- As for all CI systems, technical support by the producer is essential. We are very satisfied with the support provided by Oticon Medical.

Thank you





The Neuro system: Status

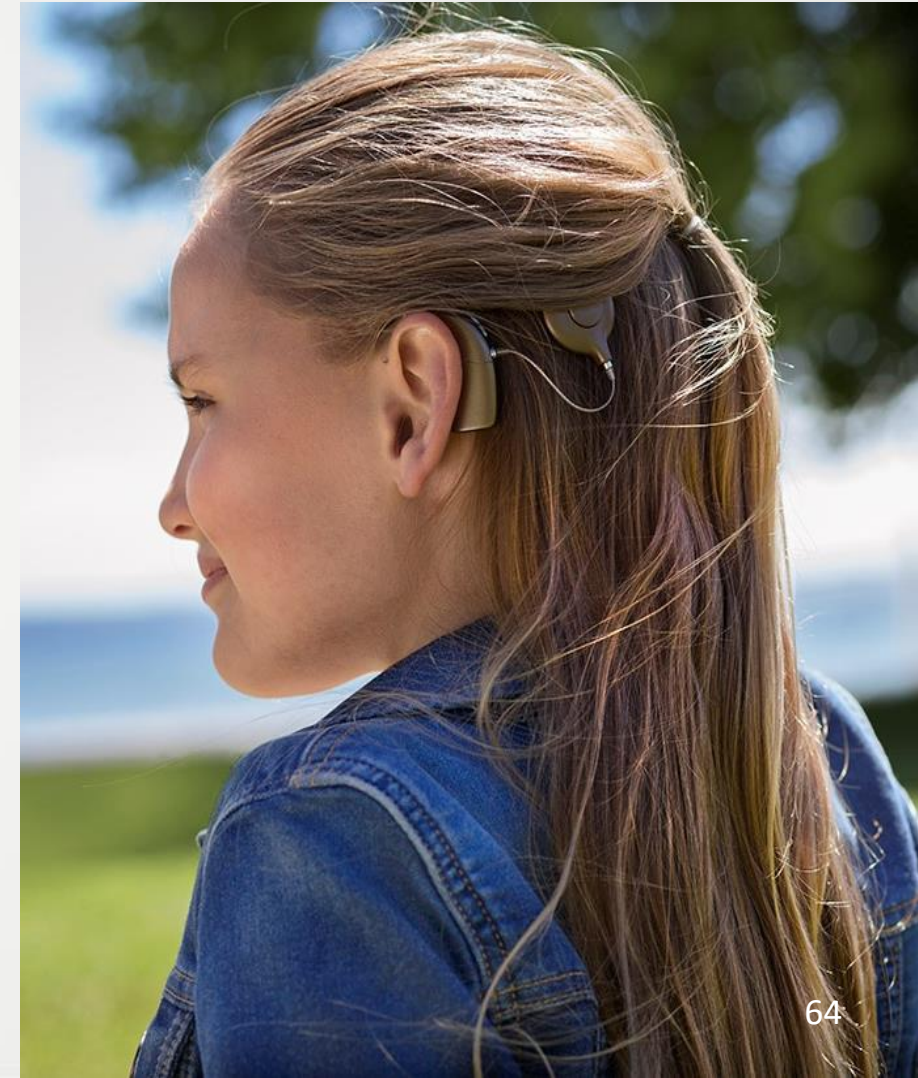


The Neuro system



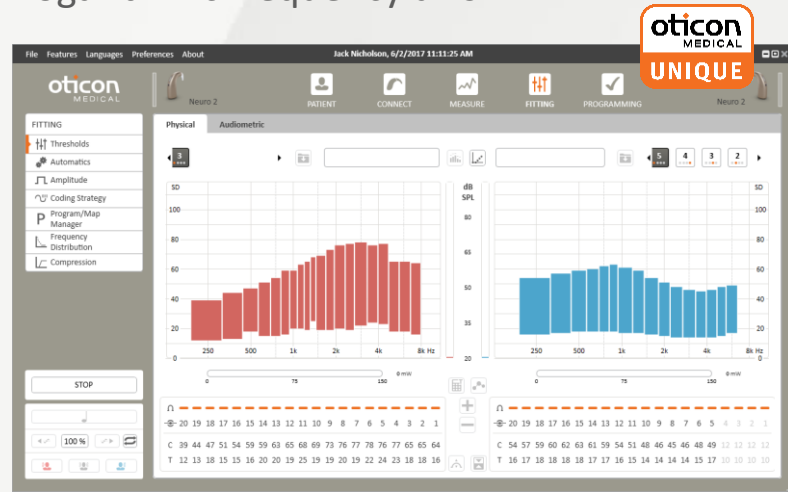
Neuro 2 launch status

- 500+ patients fitted with Neuro 2 in key markets
 - First users fitted at the end of February
- Focus on upgrading Neuro One exchange program users
 - Excellent feedback from users on: Sound quality, usability, battery life, rechargeable batteries and the comfortable physical fit of BTE on their ear
- Professionals are very excited about the easy fitting process and the general quality of the new Genie Medical CI
- Significant interest in the system; comprehensive training programmes are ongoing at key CI centres
- The vast majority of exchanges have been completed in the addressable markets
- Focus on roll-out to remaining markets

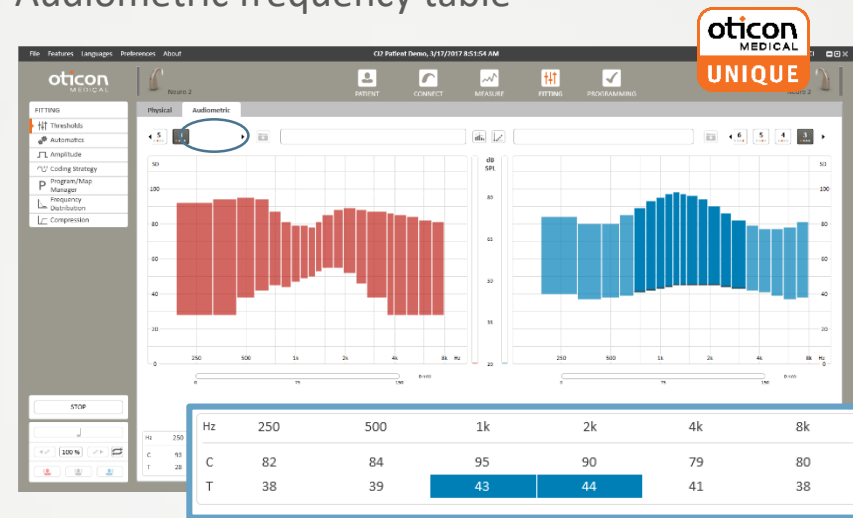


Genie Medical CI – designed for audiologists

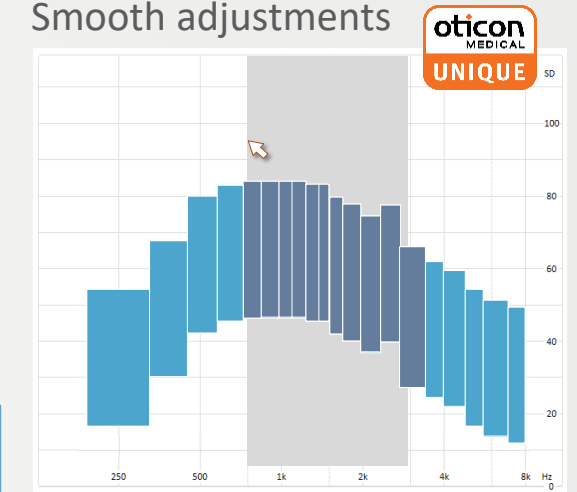
Logarithmic frequency axis



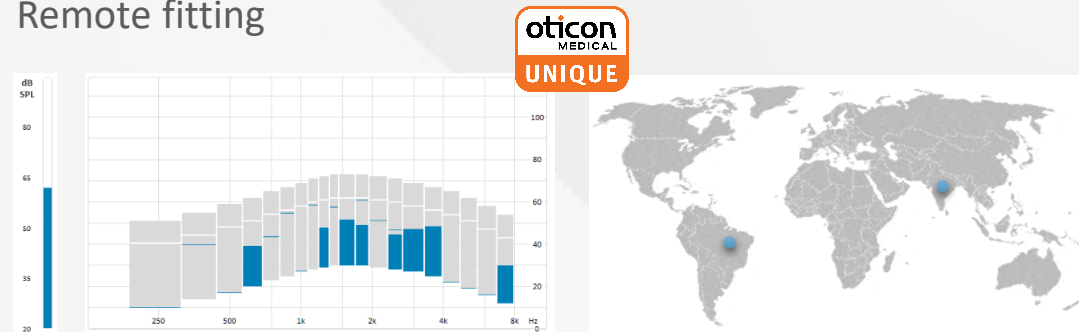
Audiometric frequency table



Free frequency selection
Smooth adjustments



Remote fitting



Live bilateral loudness adjustments



Multiple design awards for Neuro 2



reddot award 2018
winner

Red Dot Award 2018
Winner for Product Design
(Healthcare)



reddot award 2018
winner

Red Dot Award 2017
Winner for Design Concept
(Bionics)



iF Design Award 2018
Winner for Product Design
(Medical Device)



Danish Design Award
Finalist 2018
(Daily Life)



European Product Design
Award 2018
Gold prize winner
(Life ScienceDesign/Aids/
Prosthetics)



German Design Award
Winner 2018 for Excellent
Product Design
(Medical, Rehabilitation
and Health Care)



Good Design 2017
Winner
(Personal)



A'Design Award
Winner 2018 Gold
(Scientific Instruments,
Medical Devices and
Research Equipment Design)



IDA Design Awards
Gold Winner 2017
(IndustrialAnd Life Science
Design-Aids/Prosthetics)



The Ponto system: Innovation fuelling better outcomes



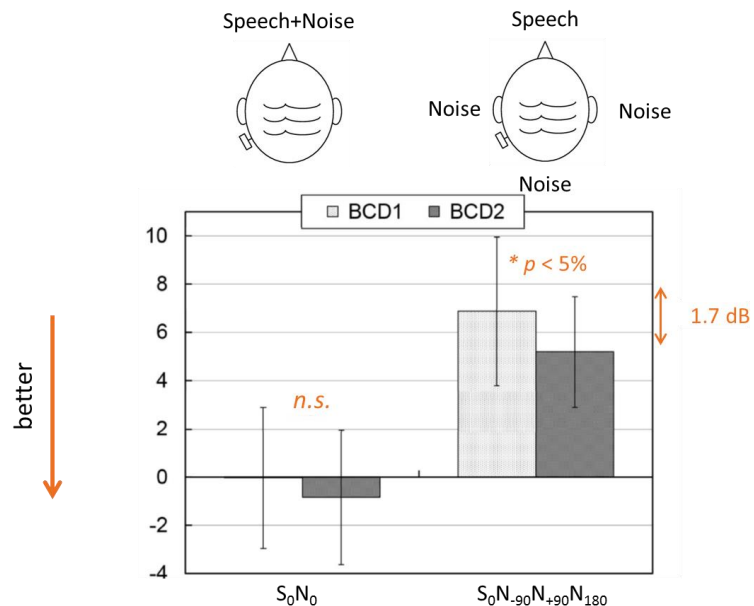
Ponto 3 SuperPower: The strongest abutment-level sound processor

Significantly better speech understanding in complex situations

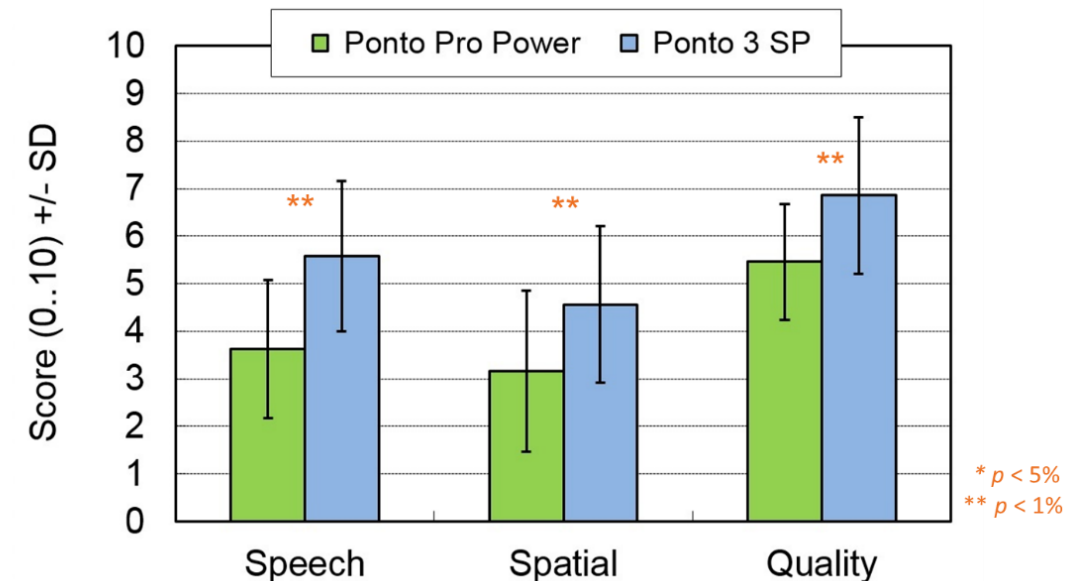
- Including effect of FreeFocus feature

Significantly better patient ratings

- Including effect of higher maximum output



Improvement



Ponto on softband: A proven solution for children

Data from bilateral microtia-atresia infants

(i) Children's auditory development reported for 40 infants

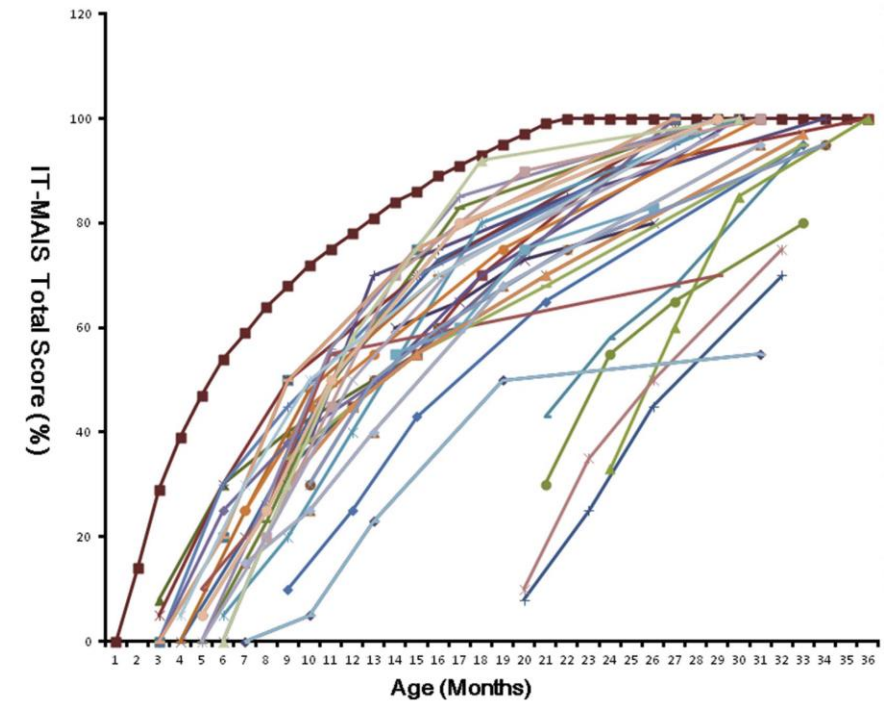
- Ponto sound processor on a softband improves auditory development

(ii) Treatment gives significant improvement over time

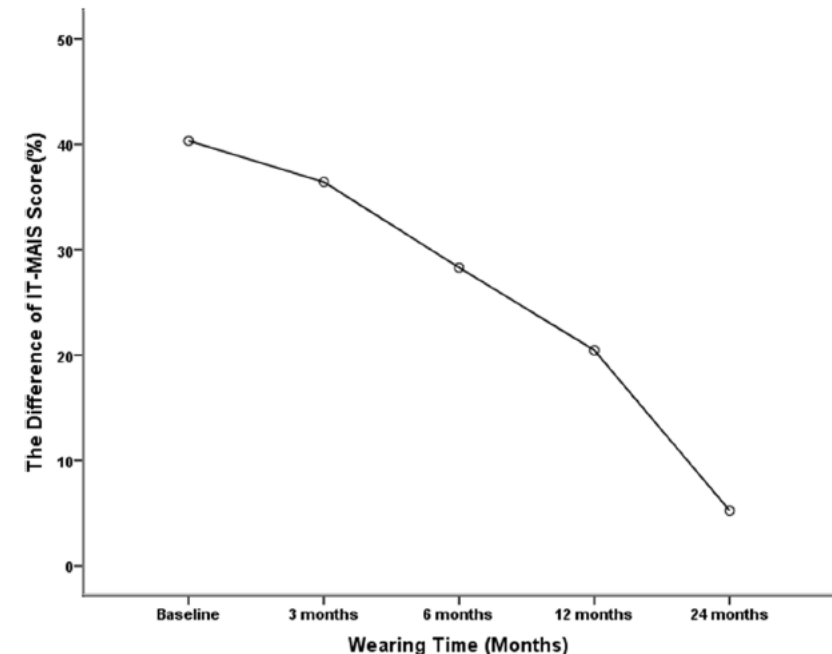
- On average, close to normal scores being achieved after 24 months' use of the sound processor

Wang, Y., et al (2018). Hearing improvement with softband and implanted bone-anchored hearing devices and modified implantation surgery in patients with bilateral microtia-atresia. *International journal of pediatric otorhinolaryngology*.

(i)



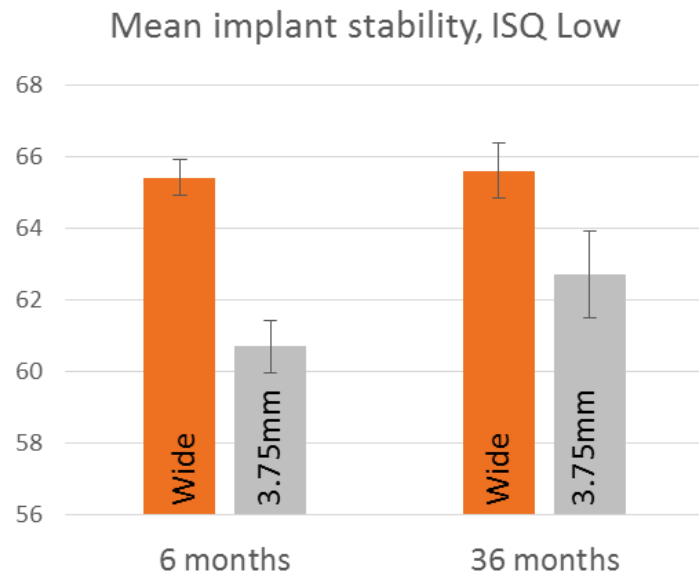
(ii)



Ponto: Long-term randomised controlled study of 60 implants

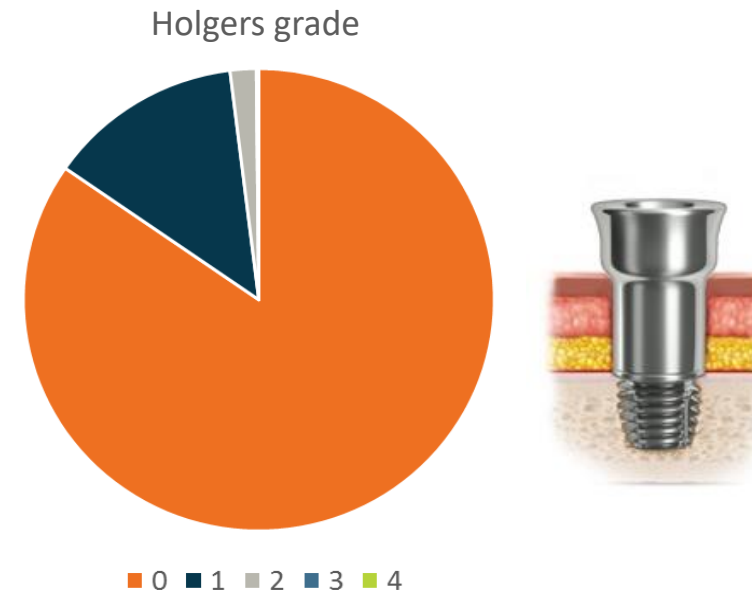
Excellent stability and survival over three years

- High implant stability and survival rates



Very few skin complications with Ponto implants

- Only 2% of visits reported skin complication in need of treatment (Holgers ≥ 2)



Kruyt, I. J., et al. (2018). Three-year Outcomes of a Randomized Controlled Trial Comparing a 4.5-mm-Wide to a 3.75-mm-Wide Titanium Implant for Bone Conduction Hearing. *Otology & Neurotology*.

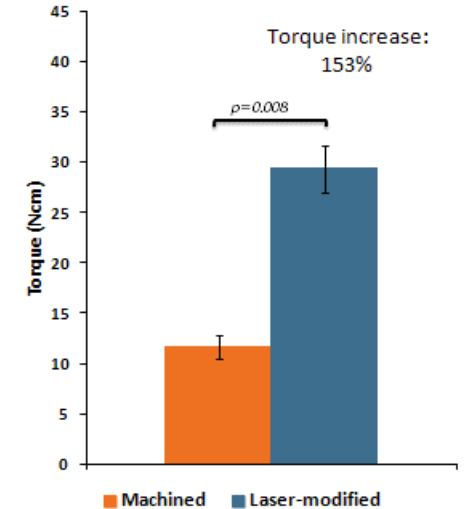
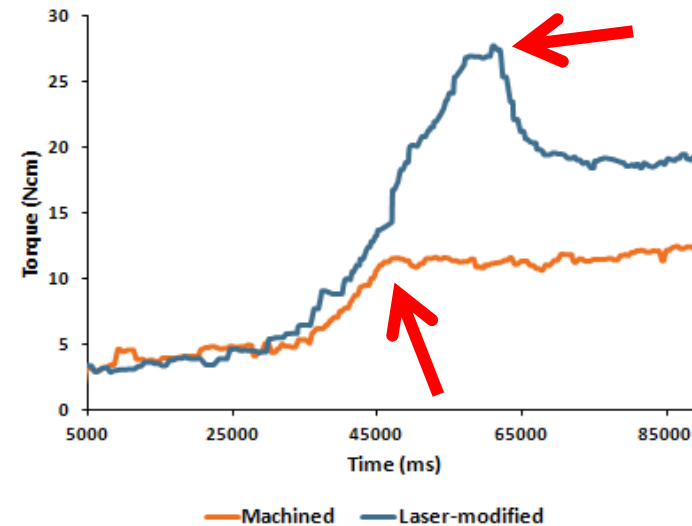
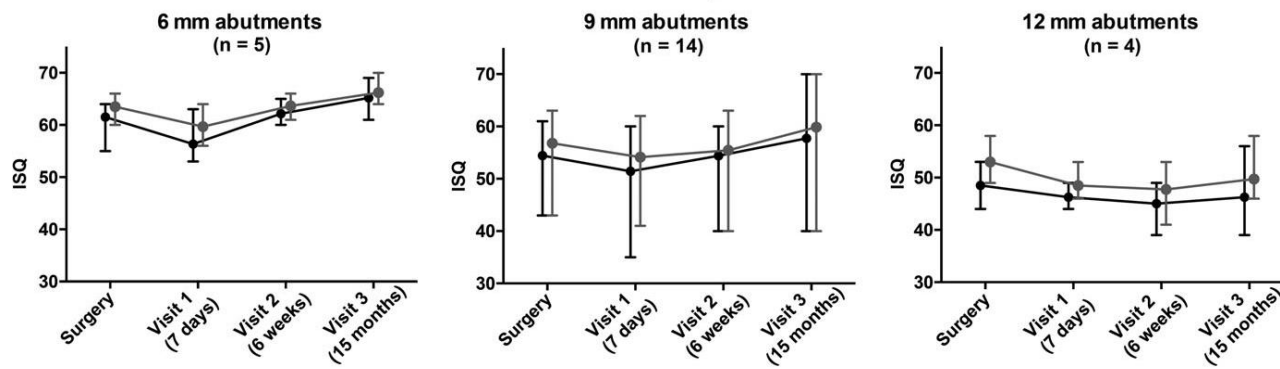
First clinical data on the Ponto BHX implant support earlier pre-clinical data

Clinical data from world-leading centres

- High implant stability and survival rates

Supporting unique osseointegration properties

- Stronger than bone



CORRESPONDENCE: OUR EXPERIENCE

DOI: 10.1111/coa.13060
Accepted: 22 December 2017

Clinical evaluation of a new laser-ablated titanium implant for bone-anchored hearing in 34 patients: 1-year experience

1 | INTRODUCTION

Successful bone-anchored hearing implantation requires good osseointegration of the titanium implant in the temporal bone and low complication rates. The introduction of a new design of laser-ablated titanium implant for bone-anchored hearing implantation is evaluated in this study.

Queen Elizabeth University Hospital (Birmingham, England) and James Cook University Hospital (Middlesbrough, England). In these centres, patients eligible for bone-anchored hearing implantation test all available hearing restoration options in daily life situations to determine the most suitable option for their hearing restoration.

Oticon Medical – well positioned for growth



Strong product portfolio in BAHS and CI with great outcomes



Scientific approach to support customer choice



Well integrated with Group R&D and Operations



Positioned to exceed long-term market growth



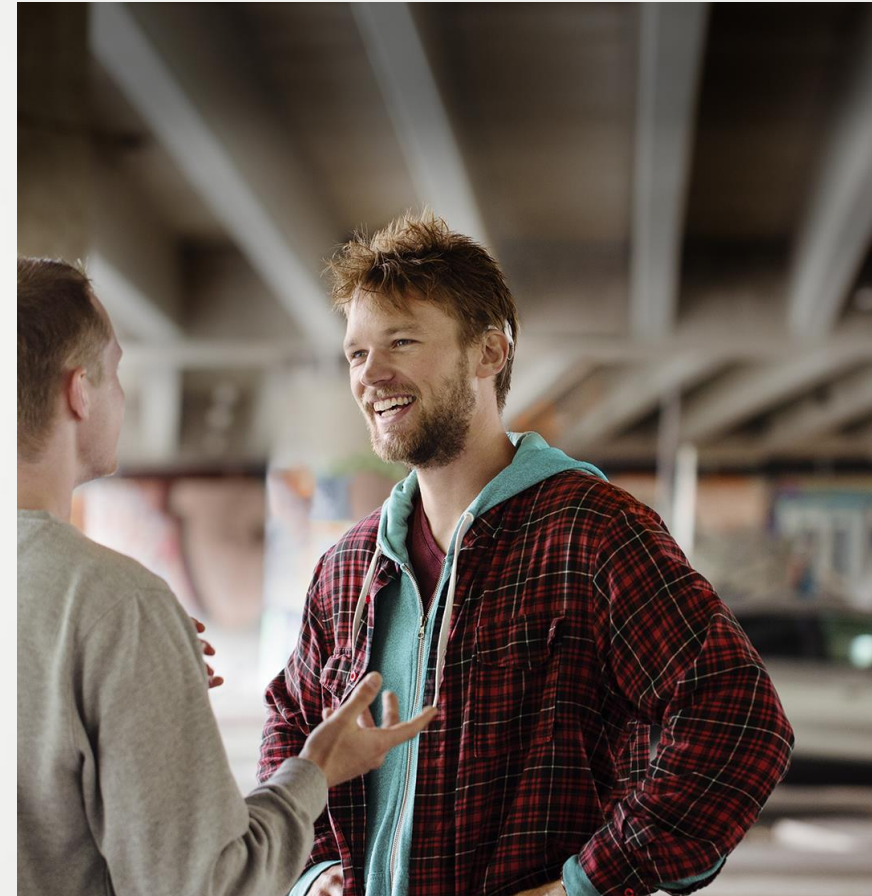
Global infrastructure and a strong local support organisation



Substantial synergies for market access



Long-term commitment and support from owner





Q&A

