



Prof. Ernst Lehnhardt-Stiftung



Dr. Dr. h.c. Monika Lehnhardt



# Rehabilitation pre- and post- Cochlear Implant era

**Dr. Dr. h.c. Monika Lehnhardt**  
Founder of Lehnhardt Academy and  
Chairwoman of Prof. Ernst Lehnhardt-Foundation

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Further information: [www.monika-lehnhardt.net](http://www.monika-lehnhardt.net)



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## A retrospective look into the history of deafness

Deafness - congenital or acquired - was considered to be an irrevocable blow of fate until the seventies of the 20<sup>th</sup> century. Congenital deafness resulted inevitably in muteness for many of the affected children. Educational support to develop speech and spoken language relied on visual perception and the feeling of vibrations for more than 400 years. Despite major efforts from the deaf child together with the teacher, it was rather an exception that a deaf-born infant would learn to listen and talk than common practice.

The reason for deafness was seen to be retro-cochlear, which we know is not the case in 95 percent of the deaf population. In other words, it was misbelieved that muteness was not the result of deafness but of an injury of the brain in the area of the hearing nerve. Parents felt guilty or ashamed to have a deaf child and would try to hide it away.

Famous people made some strong statements:

*Aristoteles* (384- 322 before Christ) expressed the view that “deaf people are not subject to any education” and that “hearing has the most significant contribution to intelligence and knowledge”.

*Paulus* wrote “Ex auditu fidem” (“Belief is based on hearing” and *Augustinus* thought that “hearing impairment is a deficiency which impedes belief”.

*Leonardo da Vinci* (1452 – 1519) looked at deaf people as “an object for visual perception” and he recommended studying anatomy and deaf people to his pupils.



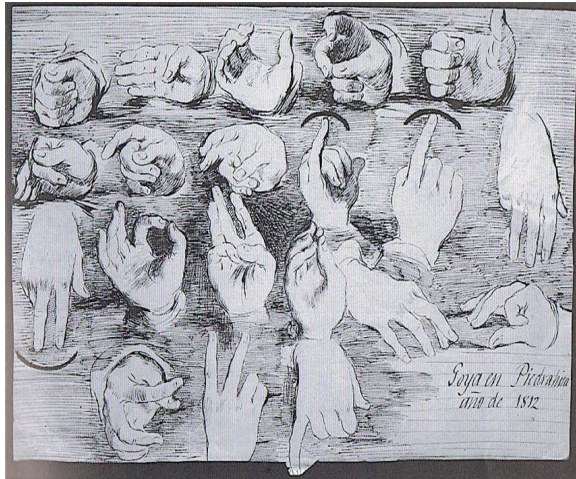
Obviously deaf people also feel a need to communicate and this is why they use sign language or finger alphabet in the absence of the capability to use spoken language.

Interestingly, the first finger alphabets were developed by monks living in a silent community in medieval times. Since the 16<sup>th</sup> century, finger alphabets have been used by deaf people.

The perception of sign language has also been controversial over times. Some hold that this is not really a language, but only gestures without grammar.

Philosophers in the middle of the 18<sup>th</sup> century, like *Diderot* and *Rousseau*, saw it as a language of full value.

*Francisco de Goya* (1746 – 1828) was a revolutionary and pioneer of modern arts and he, like *Beethoven*, who lived at the same time (1770 – 1827), became totally deaf.



He lost his hearing at the age of 46 in 1792 after a life-threatening illness, whereas Beethoven became progressively deaf (from around 1800 until 1819). Both artists suffered tremendously, as can be concluded from the letters of Goya to his nephew and Beethoven to his brother. (Heiligenstädter Testament 1802).

More than 60 years later Bedrich Smetana, the famous Czech composer, suffered the same fate. He lost his hearing

in 1874 as a consequence of an illness.

The effect of deafness is reflected in the artistic work of all these artists. Beethoven's later oeuvre is very different from his early – his music becomes much darker and more dramatic. The same is true for Goya: he paints and draws dark pictures, full of misery and horror; and Smetana retired and ended up with a mental derangement.

In 1797, five years after he lost his hearing, Goya published the *Ydioma universal* – a sign language for the deaf, which is in the Museo del Prado in Madrid now and another 5 years later, in 1812, he completed a drawing showing the **alphabet for the deaf-mute**.

*Abbé de l'Épée* (1712 – 1789) founded the first school for the deaf in 1770 in France. This was a time when in Germany and in the English-speaking countries, oralism was the predominant concept.

In America, *Thomas Gallaudet* founded the first school for the deaf in 1816. Oralism culminated in the **Congress of Milano** in 1880, when the decision was made that deaf children were to be educated in oral language.

It took until 1970 for finger alphabet to be reintroduced into classes in deaf schools in Germany. In France, sign language was banned until 1976, and in Austria the ban was lifted only in 1984.

Gottfried Diller et al (Germany) list 4 serious “*hearing movements*” during the 19<sup>th</sup> and 20<sup>th</sup> century

1. Itard (1774 – 1838) in France, Urbantschitsch (1847 – 1921) in Vienna, Bezold (1842 – 1908) in Munich and Kroiss (1861 – 1945) in Würzburg tried to find out how to develop hearing despite a severe hearing impairment. Results were disappointing as the technical quality of hearing aid instruments was poor.
2. Consequently, in the second movement (1930-1960), emphasis was laid on vision, lip reading / reading from the mouth and perception via vibration.
3. During the 3<sup>rd</sup> movement (1960-1985), not only pioneers in this field started to understand the importance of early detection and intervention. Armin Löwe introduced a programme for early support and intervention in Heidelberg in the year 1959. It is difficult to believe that it took until 2009 for neonatal hearing screening to become obligatory in Germany!
4. In the late 80s, a new era began

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## The landscape of deafness has fundamentally changed

With the advent of new high-quality technology for test equipment, hearing aids and cochlear implants, we experience a shift of paradigm in the methodology of rehabilitation for severely hearing-impaired and deaf people.

Neurophysiology has significantly contributed to this shift as we started to understand the development of hearing and speech and learnt that we hear not with our ears, but with our brain or, more precisely, with the possibilities of the central nervous system.

Reliable test equipment has become available to screen for congenital hearing loss, the quality of audiometers and other instruments to diagnose the kind and the severity of hearing loss has improved significantly. Intervention started at a very early age – even before the child received bilateral hearing aids by the age of one. In the meantime, professionals agree that intervention can start at the age of 3 months, fitting of bilateral hearing aids at the age of 6 months and, if needed, a cochlear implant can be provided at the age between 9 and 12 months.

*Deafness is no longer considered an irrevocable blow of fate but – in the case of congenital deafness – a neuro-developmental emergency.*

With continuously improving results, the indication for CI has broadened significantly, and children with residual hearing are considered to be candidates for a CI. We have also learnt that a combination of hearing aids and CIs can be very successful, as the human brain is able to process the different inputs. We see children who can imitate dialects, children who learn a second or even third language and children who enjoy music.

But, we also see children who do not benefit to the same extent, who cannot attend mainstream kindergartens and schools, who have difficulties in finding their way into inclusion programmes. The question is: *what causes the difference*: the quality of the CI, the quality of the surgery, the quality of the fitting, the quality and intensity of rehabilitation, the level of intelligence and talents of the child, the support from parents?

I believe the major components are clearly the **support from parents and the choice of the communication option**. We all agree that educational intervention is necessary for a child with a significant hearing loss. The child has to learn to interpret the new auditory stimulation. Normally, parents make the choice of which communication option to select, and these options can be presented on a continuum from visual to spoken language.

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## Rehabilitation

### Methodologies currently applied working with children with CIs

1. **Sign language** can be of larger or lesser importance, depending on the country or the institution. In Sweden, parents of children with CIs are more than encouraged to learn sign language. Some parents speculate that this is only because teachers in schools for the deaf are frightened of losing their jobs in view of the fact that there are no more deaf children without CIs (neonatal hearing is in place and intervention – in most cases bilaterally – takes place at a very early age), as children with CIs do not need schools for the deaf.

These parents complain heavily and claim that there is no structure for rehabilitation at all, and progress with a few certified AV therapists is slow.

2. **Cued speech** is a visual communication system which uses eight hand shapes in four locations (cues) in combination with natural mouth movements during speech to enable the distinguishing of all sounds of spoken language from each other.
3. **Total communication** is the combined use of oral, manual and visual modalities in communicating and in teaching children with hearing loss. The Total Communication approach is meant to be fluid, individualised, and context- and situation-dependent.
4. **Simultaneous Communication** is a mode of communication sometimes utilised by children with a hearing loss, in which both spoken language and a manual version of that language (i.e. English and Manually Coded English) are used simultaneously. The difference between Simultaneous Communication and Total Communication is that use of hearing technology is not considered to be a component in Simultaneous Communication, whereas it is a key component in Total Communication.

“Cued speech” and “total communication” are still in use, especially in the US.

5. **Verbo-tonal or the Guberina method**, which is also called SUVAG (Méthode Système Universel Verbotonal d’Audition Guberina” or “Méthode de maman” is popular in Russia and other Eastern European countries, but also in France, Italy and in the “La purissima” institutions in Spain. Other therapists, like Gisela Batliner, believe that this method is obsolete. It is focused on training speech and pronunciation and not on verbal communication. It was originally developed by Guberina as an aid for learning a foreign language (i.e. French),



and children with CIs who can hear in all frequencies do not need this kind of training.

6. **The Natural Auditory Oral or Natural Aural approach** relies on an optimal use of hearing technology, development of spoken language and integration into the hearing community. Traditionally, the Auditory-Oral approach encouraged the use of lip-reading, facial expressions and naturally occurring gestures. This approach teaches children with a hearing loss to use their individual hearing in combination with lip-reading and other cues to better comprehend and use spoken language. This is advocated by therapists like Gisela Batliner, Morag Clark, Gottfried Diller et al.

Advocates of this method do not teach the mother tongue. They help parents to provide an environment in which the child is surrounded by the mother tongue and so has the chance to learn it. They make the fullest use of residual hearing and/or the CI and they make sure that the child learns to listen. We can call this incidental learning, and this is what normal hearing children do.

This approach has also been referred to as Auditory Verbal Education.

7. **Auditory-Verbal Therapy** facilitates the acquisition of spoken language through listening by newborns, infants, toddlers and young children with hearing loss. It promotes early diagnosis, one-on-one therapy, and aggressive audiological management and technology.



Parents and caregivers actively participate in therapy. Through guidance, coaching and demonstration, parents become the primary facilitators of their child's

spoken language development. The parent must always be present in the individual child/parent session. Auditory-Verbal Therapy must be conducted in adherence to all the 10 Principles of Auditory-Verbal Therapy. It is very similar to the Auditory Oral approach, the difference being that this method is more directive. Therapists consider themselves experts, and some parents may feel stressed and guilty that they cannot do what the professionals expect them to do. Parents get homework and the therapist expects specific language to be learnt between sessions. Some of the most well known champions are Susann Schmid-Giovannini, Warren Estabrooks, Judy Simser and Dimity Dornan.

Regardless of which methodology is applied, the most convincing argument is the success of the therapy. The German ENT Society defined the goal as follows: "After

A handwritten signature in blue ink, appearing to read 'MLL'.

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*cochlear implantation it is an important goal to establish hearing as an integral part of the child's life, to develop her/his communicative and verbal skills and improve them continuously over the years".*

I believe this definition of "success" will be acceptable to all parents regardless of their personal goals and expectations.

### **Organisation of rehabilitation for paediatric CI recipients**

The next question is: *Is there is an optimal way of rehabilitation for hearing-impaired children?*

In Germany, this was defined in the *Cochlear Implant Guidelines*, where a distinction is made between rehabilitation (which is a minimum 3-week stay in a special rehabilitation clinic, of which there are only two in Germany – Bad Nauheim and St. Wendel) and therapy.

The first fitting of the speech processor should be done 5 weeks post-operatively, during 3-5 days, preferably in a Cochlear Implant Centre. This is a special institution financed from a variety of sources. Most importantly, CICs command teams of pedagogues, logopedes (speech therapists), engineers, ergo-therapists, music therapists, psychologists etc. In most cases, these centres are attached to an implant clinic, and therefore medical treatment and post-operative care are ensured.

The phase of first fitting lasts until a stable programme or map has been established in the speech processor. This is dependent on the age of the child. Therapy should comprise on average 12 days per year until the recipient reaches the age of 20. The number of days per year may change depending on the recipient's communication needs: for example, more days are needed when a child changes from Kindergarten to Elementary School.

In practice, the vast majority of children with CIs in Germany spend a total of 12 weeks in specialized Cochlear Implant Rehabilitation Centres. The parents can decide on the timing, which is very often dependent on the family's situation. In approximately 30% of cases it will be necessary to go to one of the two rehabilitation centres and spend three weeks there in order to improve the benefit from the CI as a communication aid.

This is what it should be, but reality is sometimes different and less positive. There are many reasons for that, and funding is definitely not one. German insurance companies cover all costs related to CI, and this applies to children as well as to adults and elderly people. Recently we have seen an increasing number of bilaterally-fitted CI recipients also funded by the insurance companies.



**Selected answers to specific questions**  
**from a variety of European countries**

When I began to investigate the situation in various countries related to organisation of rehabilitation and methodologies applied, I was initially surprised that these issues are not really documented as overviews. This is very different from the medical field, where surgeons and, to a certain extent, audiologists exchange knowledge and experience much more effectively than educational therapists in this field. The main reasons for this discrepancy may be that most medical professionals in the CI field are at university clinics, work scientifically and are therefore used to publishing and networking. In addition, they are financially well-positioned, like to travel and attend conferences worldwide. The majority of them are multilingual. All these factors do not really apply to therapists.

The only common denominator I found is that representatives of all the countries I contacted agreed more or less on what the golden standard should be, and it is basically in accordance with the guidelines in Germany.

The reality is that there are extensive differences not only between countries, but within a country between regions and between implanting clinics and surgeons.

In *Germany* with a population of 80 Million we find 60 centres including ENTs in private practices performing cochlear implants. This is somewhat unfortunate, because the number of CIs performed annually differs from 1 to more than 400 in a clinic. At the same time, it is generally accepted that a surgeon should perform a minimum of 15-20 CIs per year in order to maintain a high level of skills. Leading university clinics, like Freiburg and Hannover, follow the guidelines; and have special rehabilitation centres with professional teams to ensure a standard of excellence not only from a medical point of view, but also in therapy.

Others do not offer fitting, therapy and post-operative care. They make an appointment with the patient and a representative of the relevant CI manufacturer, who performs the fitting. In other cases, it is a hearing aid acoustician who takes on this task. The paediatric CI recipients then will work with their speech therapist or go to a school for the hard of hearing for their hearing training.

Experienced centres see patients after many months, sometimes after years of “therapy” without any improvement in hearing. In some cases, the simple reason is that the surgeon did not place the implant properly.

1. *Where does rehabilitation happen: in the hospitals or outside? In a health care facility or an educational facility? In a special Cochlear Implant Rehabilitation Centre?*

Post-operative care (comprising fitting, counselling and therapy) takes place in all the places mentioned above. As we said already, in Germany it can be in the hospital or outside; the same applies to Austria. In Switzerland, it is mostly outside the clinic and primarily in educational facilities. In Spain, rehabilitation happens mainly in schools, and differences between regions are small. The Ministry of Education pays for rehabilitation.

In Portugal, two clinics offer inpatient rehabilitation (Coimbra and Estefania), all others offer outpatient care.

In the UK, rehabilitation takes place in and out of the hospital, in health care as well as in educational facilities. There are no special Cochlear Implant Rehabilitation Centres, as we know them in Germany.

In Central and Eastern Europe, rehabilitation for children with CIs takes place mostly in educational facilities, usually in special schools for the deaf.

In the Czech Republic, where there only one clinic implants children, immediate post-operative rehabilitation is done in a health care facility (Mrazovka), later it happens close to where the family lives, in departments for special pedagogy in schools, or in local health care facilities. In addition, regular follow-up is done in the CI centre.

In Lithuania with one centre with 10 years of experience in Kaunas and one with less experience in Vilnius, rehabilitation is organized outside in educational institutions.

In Poland, where we have three big and three small implant clinics, rehabilitation sessions are offered once per month. Regular rehabilitation, however, is done outside in health care facilities. The Polish Association of the Deaf offers sessions for all hearing-impaired children.

In Latvia, there is one implanting clinic only and it is a health care facility, specialized in rehabilitation for CI recipients.

In Bulgaria with one big and one very small implanting clinic, it is done in various places, hospitals, schools and also a special Centre for the rehabilitation of CI recipients.

In Rumania with 4 implanting centres, the activity is carried out in state-owned special schools for deaf children or in private individual speech therapy offices. The only clinic having its own speech therapist is in Bucharest.

In Croatia with one big and one small implanting clinic, the situation varies regionally. The process may be well-organized, or left entirely up to the initiative of the hospital



or private persons. Mostly rehabilitation happens in special centres for hearing-impaired children or for children with additional impairments. Mostly they are financed by the health care system but some – like Slava Raskaj in Zagreb, Rijeka and Split – are financed by the social care system. In some smaller cities, rehabilitation is provided by ENT or logopedic departments in hospitals. An outstanding centre for rehabilitation is SUVAG in Zagreb, and it is they who see the majority of Croatian paediatric CI recipients.

In Serbia with three implanting clinics, there is practically no organized rehabilitation in Novi Sad, though it is well organized in Belgrade in the “Children’s House” associated to one of the clinics in this city.

## 2. *Is the surgeon globally responsible for the CI recipient or only for surgery?*



Almost everybody agrees that the surgeon should take the overall responsibility.

In Germany, it was Ernst Lehnhardt who understood that rehabilitation was of paramount importance when he started to provide cochlear implants to very young children in 1987/88. He met with a lot of resistance before he could convince the insurance companies that they had to fund not only the implants and the medical treatment, but also the post-operative care. He got hardly any support from the pedagogues, and this is why he founded the first Cochlear Implant Rehabilitation Centre in Hannover in 1989. Today, there are many such centres, e.g. Freiburg, Friedberg, Halberstadt, Straubing, Schleswig, Würzburg, Dresden etc. Unfortunately, even now not all German surgeons share Ernst Lehnhardt’s view.

The same applies to Austria, and in Switzerland the surgeon is not really responsible for rehabilitation but I know a few who are very interested in the progress of their little patients.

In the UK, the perception is that the surgeon is practically responsible for surgery only, but legally it is for the whole care in the hospital.

In Central and Eastern Europe, most surgeons are not involved in the rehabilitation process.

An exception is probably Estonia, where the programmes are well coordinated, NHS is in place and there is cooperation between the two centres (Tallinn and Tartu).

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In Lithuania, the exception is Kaunas, where the team works very closely together.

In Poland, where, again, NHS is performed and the CI programme is very advanced, the head of the clinic is globally responsible for the patient.

In the Czech Republic, the surgeon is responsible for surgery only, but he is regularly informed about the progress of individual children.

In other countries, like Latvia, Bulgaria, Romania, Croatia and Serbia, the perception is that the surgeon takes responsibility for the surgery only, with the one exception in Belgrade in the “Children’s House”.

3. *Is each professional (medical doctor, audiologist, therapist and psychologist) responsible for his own activity only, or is there one person with global responsibility. If so, who is it?*

Obviously, every professional is responsible for her/his work. In the ideal case, the head of the implanting clinic takes overall responsibility. Otherwise, a coordinator may ensure that an interdisciplinary approach is implemented. In Germany, this is the case in the clinics with a very high number of annual implantations.

A similar situation is found in the UK, where – depending on the centre – there is a “key worker” to coordinate all activities, but each professional is still responsible for his/her work.

The same is true in Poland, where there is one person with overall responsibility. It is not necessarily the surgeon, but his “right hand”, who is a medical doctor or audiologist. This is also the case in Latvia. In other Central and Eastern European states with a few exceptions (SUVAG in Zagreb, Children’s House in Belgrade and Mrazovka in Prague), this is not the case.

In Varese, Italy, we find a very interesting and effective so-called trans-disciplinary approach. The “consulente” (a medical person or speech therapist) is the partner for the patient/parent and coordinates all results from investigations and opinions from professional representatives of various disciplines involved in the CI programme.

4. *Is rehabilitation a health care activity or an educational activity?*

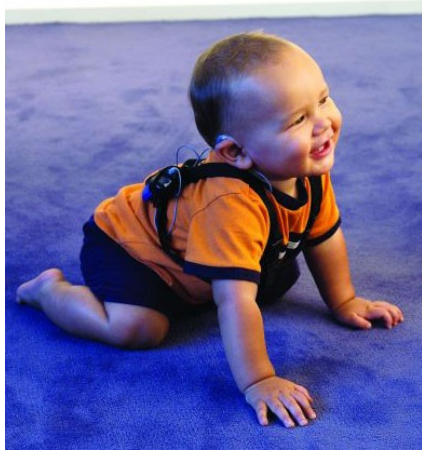
In Germany, it is regarded as a health care activity and this is reflected in the fact that it is paid for by the health insurance companies (Krankenkassen). The Ministry of Education pays only for local support of auditory training, mobile services and



schools for the hard of hearing. This is not restricted to CI recipients, but concerns hearing aid users as well.

In the UK, rehabilitation for CI recipients is regarded as a health care activity in the early phase and as an educational activity long-term.

Experts from Poland, Latvia, Bulgaria and Croatia also argue that it is a health care activity because it is paid for by the Ministry of Health.



Professionals from the Czech Republic and Serbia believe it is both. The Lithuanians call it an educational activity.

I personally believe that rehabilitation of paediatric CI recipients and –more importantly so – the counselling of parents is an educational activity, regardless of where it happens. Only several components, like the first fitting and regular adjusting of the speech processor, and regular medical follow-up, do not belong to the educational process.

The reason to “position” rehabilitation as a health care activity may be politically plausible, because the Ministry of Health in all European countries disposes of significantly more funds than the Ministry of Education.

There is yet another dimension of political sensitivity. We expect the majority of our very young CI recipients to be fully integrated, fully included in mainstream kindergarten, schools and other educational institutions. Therefore the question is, whether they are entitled to health care therapy or whether all they need is some educational support for them and their parents to smoothen the way to inclusion. As Morag Clark rightly says, these children do not need different things, they need more of the normal things.

On the other hand, costs are rather high when we take into account that in Germany, the insurance companies pay around € 25.000 for 12 weeks of post-operative care in a special rehabilitation centre.

Children with additional issues clearly have additional needs and – depending on the kind of their impairments – we will not expect them to be mainstreamed.

5. *What about the educational background / degree of the specialist in rehabilitation for the deaf CI recipient?*

Again, there is a broad variety. We find pedagogues for hearing-impaired, logopedes, audio therapists, psychologists, ergo therapists, teachers, social pedagogues, music therapists, paedaudiologists etc. In Germany, Austria and Switzerland there is no



legal requirement for a special degree, but most professionals working with CI recipients have a degree from a college, academy or university in special pedagogics more or less close to special pedagogy for hearing impaired. Interestingly, 90% are female.

The situation is practically the same in the UK, Spain and other Western as well as Central and Eastern European countries.

It is mainly speech therapists and teachers for the deaf (surdopedagogues). Most of them have a higher degree of special speech therapist (audiologoped), which means a few years of study at a university.

*6. Who does the rehabilitation of deaf people? Hearing specialists or experts in communication from a more general point of view?*

Pedagogues who are competent in sign language, work in the rehabilitation of deaf people. We could call them experts in communication.

For CI recipients, it is in all countries specialists for hearing (but not necessarily medical doctors).

*7. Are there centres dedicated exclusively to deaf care in your country? Are there special centres for rehabilitation for CI recipients?*

In Germany we used to have schools for the deaf for deaf people without CIs. We do not need these schools any more, as nearly all deaf-born children are privileged to receive a cochlear implant and increasingly even bilateral cochlear implants. These schools have either closed or have been changed into schools for the hard of hearing. As already mentioned, there are special rehabilitation centres for CI recipients in Germany.

We also have special institutions for early support and intervention (Frühförderung), special boarding schools and vocational training establishments.

In the UK, special Cochlear Implant Rehabilitation Centres do not really exist. Rehabilitation is provided in different places to support the development of spoken language for children with hearing aids as well as for CI recipients. Some UK experts consider travel to special centres to be a burden for the family.

My personal impression is slightly different. I have seen many very happy families or just mothers with their children in these CICs where they can fully concentrate on hearing assistance



communicating with each other, guided by various therapists and exchanging experience with other families. There are no other distractions, no other obligations, so that many think of these 5 days as a week of vacation.

In Central and Eastern Europe, special CI rehabilitation centres are an exception. Rehabilitation happens primarily in schools for the hearing-impaired (e.g. 15 in the Czech Republic). In Poland, there are two private centres that specialize in rehabilitation for deaf children (Orator in Wroclaw and Echo Foundation in Warszawa). In Rumania, the most advanced special school for deaf children (with hearing aids and CIs) is in the very centre of the country, in Sibiu. In Croatia there are still some institutions where sign language as a kind of total communication means, is used.

To summarize, we can say that a “golden standard” has been defined. However, it is not obligatory but optional. The level of its implementation varies greatly from country to country and even from region to region.

Key opinion leaders – mainly surgeons – make it happen and ensure excellence.

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## **The landscape of global communication has changed – Web-based Learning, Teaching, Fitting and Rehabilitation**

Twenty-five years ago, a quantum leap in technological advance allowed a completely new approach to the rehabilitation of deaf children.



The Internet has revolutionized the distribution of information, and over the past 10 years we have seen its impressively growing global social impact. Hundreds of millions of people communicate via social networks and forums and use interactive environments like Wikipedia.

This has a significant impact on teaching and learning through sharing knowledge in general, and therefore also on fitting, counselling, care and rehabilitation for CI recipients, their parents and therapists.

Key opinion leaders of all rehabilitation methods travel extensively like missionaries preaching what they hold to be the truth, while the dimensions of social media create a global and multisensory impact.

The key difference between a real or local physical presence in a conference room and the in so-called virtual, i.e. LiveOnline Room is that every participant (wherever she/he is) can become active at the same time by writing into the text chat that becomes visible to all participants who are logged in, including the presenter. Three communication modes are possible simultaneously: listen and talk, read and write, see and present.

We consider major advantages of implementing post-operative care for CI recipients in a web-based environment to be as follows:

- a) Independence of distance, which means open access, no need to travel for professionals, parents and CI recipients
- b) Higher probability of an increased frequency of “meetings” because of cost and time savings. Parents can have more frequent contact with the therapist, they will feel increasingly self-confident, which will, in turn, make them more active. Until recently, the vast majority of videos showing children with parents and/or their therapist were produced by therapists. We now see more and more parents producing videos in their home environment, and many of them

are willing to share these videos not only with their family members, but with therapists and with other families in a similar situation.

- c) Since the Internet is functioning technically on a high level and is very low-cost, parents can network globally and communicate not only in writing but also verbally via Skype or in LiveOnline Rooms.
- d) Another very important perspective is remote fitting.

With more and more children receiving CIs living in remote places, professional fitting becomes a serious issue.

First attempts have been made in this area as well, and it is realistic to expect that remote fitting sessions will take place between the Medizinische Hochschule Hannover and the Hearing Research Centre in Moscow in the very near future.

Once this is functioning, it is only a small step towards implementing remote fitting between Moscow and many other cities in Russia as well as with other Russian-speaking countries.

We are aware of the fact that remote online fitting is technically more demanding than online learning, counselling and care because of a higher level of technical requirements (speed of upload, data transfer and download).

We are convinced that a new era in the rehabilitation for CI recipients has just begun, and that web-based learning, teaching, fitting and rehabilitation will significantly improve the overall quality of the treatment, and thus the outcomes for CI wearers.

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