Arkadiusz Wąsowski, Henryk Skarżyński, Łukasz Bruski, Artur Lorens, Anita Obrycka, Piotr Skarżyński

NATIONAL NETWORK OF TELEAUDIOLOGY IN CLINICAL PRACTICE FOR COCHLEAR IMPLANT PATIENTS
BACKGROUND

- 1992 First Cochlear Implantation in Poland
- 1993 Opening of Cochlear Center
- 1996 Creation of Institute of Physiology and Pathology of Hearing
- 2003 Opening of International Center of Hearing and Speech
- 2012 Opening of World Hearing Center

- Over 200,000 consultations per year
- Over 60 surgeries per day
OUR NEED FOR TELEMEDICINE

- Improvement of "quality of service" (travel time, cost, weariness)
- Better access to specialists
- **Screening** programs in cities and rural areas (hundreds of thousand recipients)
- Consultations of difficult cases by experts from different clinics
- Method to cope with **growing number of patients**: redirection of some easier tasks to less experienced staff, supported by experts (expert model)
- Education of medical doctors, speech therapists, clinical engineers, students
OUR TELEMEDICAL ACTIVITIES

- 2000 – Telediagnostics (medical doctors uses live internet connection to evaluate videootoscopic pictures during patient’s visit)
- 2000 – Internet based hearing, voice and vision screening programs “I Can Hear”; “I Can Speak”; “I can See”
- 2004 – Home Rehabilitation Clinic (supported by videoconsultations)
- 2007 – Telefitting
- 2008 – Nationwide Hearing Screening
- 2009 – Nationwide Network of Telerehabilitation
- 2011 – Nationwide Network of Teleaudiology
TELEFITTING - MOTIVATION

- Cochlear implant system is an electronic prosthesis that allows direct electrical stimulation of the auditory nerve.

- Optimal fitting – setting the values of many electrical stimulation parameters is necessary to obtain hearing benefits after cochlear implantation.

- Fitting is based on results of many psychophysical and objective measurements performed by experienced multidisciplinary team during repetitive fitting sessions.
MOTIVATION

- Long travels, high cost, limited reliability of tests results caused by travel weariness are disadvantages that should be solved to improve the quality of service for cochlear implant users.
  - More than 74% of cochlear implant patients come from outside Mazowieckie county – more than 100km to travel
  - Several patients from other countries

- Estimations show, that in 7 years there will be 7 to 10 times more patients – need to establish ways to cope with growing number of patients in the same time ensuring expert medicine
FROM IDEA TO PRODUCT

- 2005 – requirements assessment, fitting methodology development
- 2006, I-II – first trials without patients, infrastructure development, risk assessment, troubleshooting
- 2006, III-IV – first clinical study with patients, N = 20
- 2007 – multicenter clinical study „Remote Fitting”, N = 70 Warsaw, Freiburg (Germany), Las Palmas (Spain), Thessaloniki (Greece), Mechelen (Belgium)
- 2007 – first clinical introduction between Łeba and Warsaw
- 2008 – second clinical introduction, addition of Szczecin, Olsztyn, Katowice, Rzeszów
- 2009 – Nationwide Network of Telerehabilitation (from 2011 Nationwide Network of Teleaudiology)
- 2010 – first international introduction, Odessa, Ukraine
NATIONWIDE NETWORK OF TELEAUDIOLOGY

Supported by a grant from Norway through the Norwegian Financial Mechanism (60%)
Programme for Development of National Network of Hearing Telerehabilitation
Total Cost: 1.4 Million Euro
NATIONWIDE NETWORK OF TELEAUDIOLOGY

- 20 centers in Poland, 1 center abroad (Odessa, Ukraine)
  - International Center of Hearing and Speech
- Over 40 trained support specialists
- Over 20 experts in International Center of Hearing and Speech
- Over 240 hours of training and workshops for specialists
- Telerehabilitation
- Telediagnosticstics
- Teleeducation
- Telefitting
Videoconference equipment (High Definition): Teleconference endpoints - Polycom HDX8006, Multipoint Control Units - RMX2000

Telepresence systems – Polycom OTX 300, Polycom RPX HD 418M

At least 2 Mbit/s symmetric Internet connection

Clinical Interfaces for fitting of Cochlear, MED-EL and Advanced Bionics cochlear implant systems, PC/Internet controlled Impedance audiometers

Remote desktop applications (Logmein)

Speech therapy applications (YDP Logopedia, exercise sounds)

Videootoscopes, Surgery Microscopes and other tools connected to the network
NATIONWIDE NETWORK OF TELEAUDIOLOGY
I think RF is an efficient alternative to face-to-face programming.

The results of the Remote Fitting session are satisfactory.

Remote measurements have been comparable efficient to face-to-face measurements (Expert).
Previous studies results (map difference)

Mean Current Level Difference

Current Level

Local to Baseline (T)  Remote to Baseline (T)  Remote to Local (T)  Local to Baseline (C)  Remote to Baseline (C)  Remote to Local (C)
EVALUATION OF CLINICAL INTRODUCTION - METHOD

- Each patient underwent teleconsultation procedure introduced in National Network of Teleaudiology
  - Local ENT, structured interview, free field audiometry and speech tests
  - Remote objective measurements (ECAP, ESR, Telemetry), psychophysical measurements (amplitude growth function, threshold detection), creation of new map, Live mode
- Questionnaires about quality and usefulness of telefitting
- Travel cost assessment calculated by multiplying „saved kilometers” by standard kilometer rate for the use of a private car (900 cm$^3$) for professional purposes (2007 regulation of Minister of Infrastructure)
EVALUATION OF CLINICAL INTRODUCTION - MATERIAL

- **114 children** (questionnaires filled by parents)
  - Mean age = 7.4 years, median 7 years, SD 3.8, Range 1 – 16 years
  - Mean experience = 48 months, median 41 months, SD = 33.5, Range 3 – 131 months

- **94 adults and older teenagers**
  - Mean age = 34.5 years, median 30.5 years, SD=16.9, Range 12 – 86 years
  - Mean experience = 57 months, median 48 months, SD = 42, Range 6 – 17 months

- **Users of Medel Pulsar, Sonata, Combi 40+; Cochlear Nucleus 3G, Freedom, Nucleus 5; Advanced Bionics Harmony**

- Experience with cochlear implant: from 9 months to 8 years 3 months

- All patients visiting one of **8 cooperating policlinics** selected for the study, scheduled for telefitting between March and May 2011, fitted by **4 different audiologists**, supported by **13 different support specialists**
### RESULTS (adults, n = 94)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tbody>
<tr>
<td>Quality of audio-video connection is good</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>33</td>
<td>56</td>
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<tr>
<td>I had good contact with audiologist</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>35</td>
<td>52</td>
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<tr>
<td>I felt safe and secure during telefitting</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>33</td>
<td>57</td>
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<tr>
<td>I'm satisfied with the course and effects of telefitting</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>38</td>
<td>51</td>
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<tr>
<td>Telefitting is an alternative for standard fitting</td>
<td>0</td>
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<td>4</td>
<td>32</td>
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<tr>
<td>Telefitting allowed for saving in time and money</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>22</td>
<td>69</td>
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## RESULTS (children, n = 114)

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<td>My child cooperated at least as good as during standard fitting</td>
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<td>My child feel secure and safe during the procedure</td>
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<td>73</td>
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<tr>
<td>My child functioned better during telefitting than during standard fitting</td>
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<td>36</td>
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RESULTS (both groups, n = 208)

- Time saved by coming to the center close to living place:
  
  mean = 11 hours, median = 9 hours, SD = 9, Range 0 - 48 hours

- Savings on travel per patient:  12.5 % of mean national salary
PROMOTION AND SPREAD OF INFORMATION

- Over 50 scientific papers and presentations on international conferences
- Over 40 press articles, several radio and TV programs
- Several awards, including gold medals on Brussels Innova 2008, Concours-Lépine 2009, INTARG 2010
DISCUSSION

- The Nationwide Network of Teleaudiology has proved to be a reliable platform for new models of telemedical care, improving quality of service for the patients and providing substantial time and money savings.

- There may be patients who do not comfortably fit into the telemedical environment – for them the standard path of postoperative care should be followed.

- Telemedicine can be a method to cope with growing number of patients in the future, but still allowing for use of expert model

- Still, there are some problems to overcome:
  - Recognition and financing of telemedicine
    - „entry” funding
    - „daily use” funding
  - Internet infrastructure, cost and reliability
  - Spread of information about real benefits of telemedicine to the society