



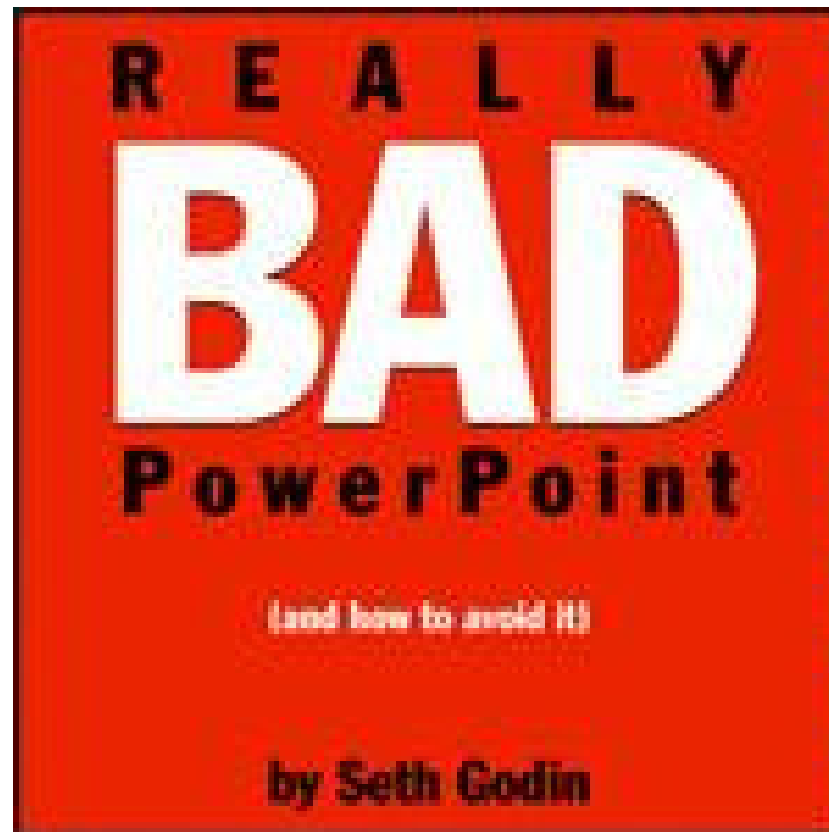
# Remote Assessment

Telemedicine Applications in an Early Hearing Loss  
Detection and Intervention Program

Bill Campbell, Audiologist  
Thunder Bay District Health Unit



# Remote Assessment





# Issues in EHDI

- Loss to Follow Up
- Training and support of EHDI professionals
- Second opinion/difficult diagnosis
- Waiting list for service
- Quality assurance



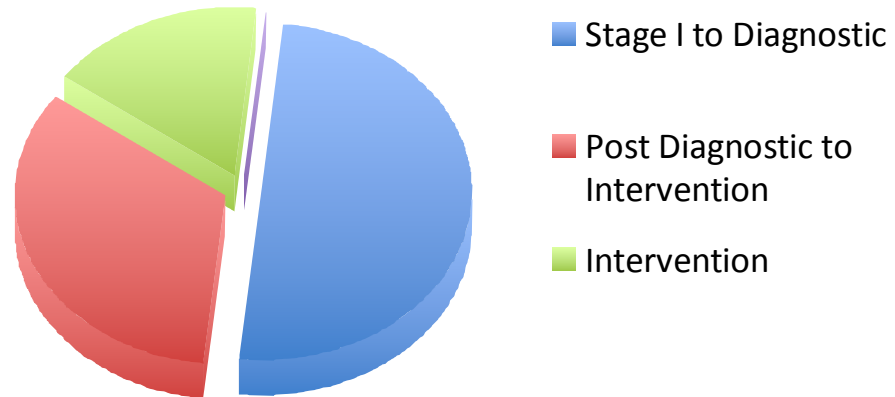
# Loss to Follow Up

- Infants missed at hospital before discharge.
- Infants who refer at Stage I and do not return for Stage II
- Infants who refer from Stage II and do not return for assessment.



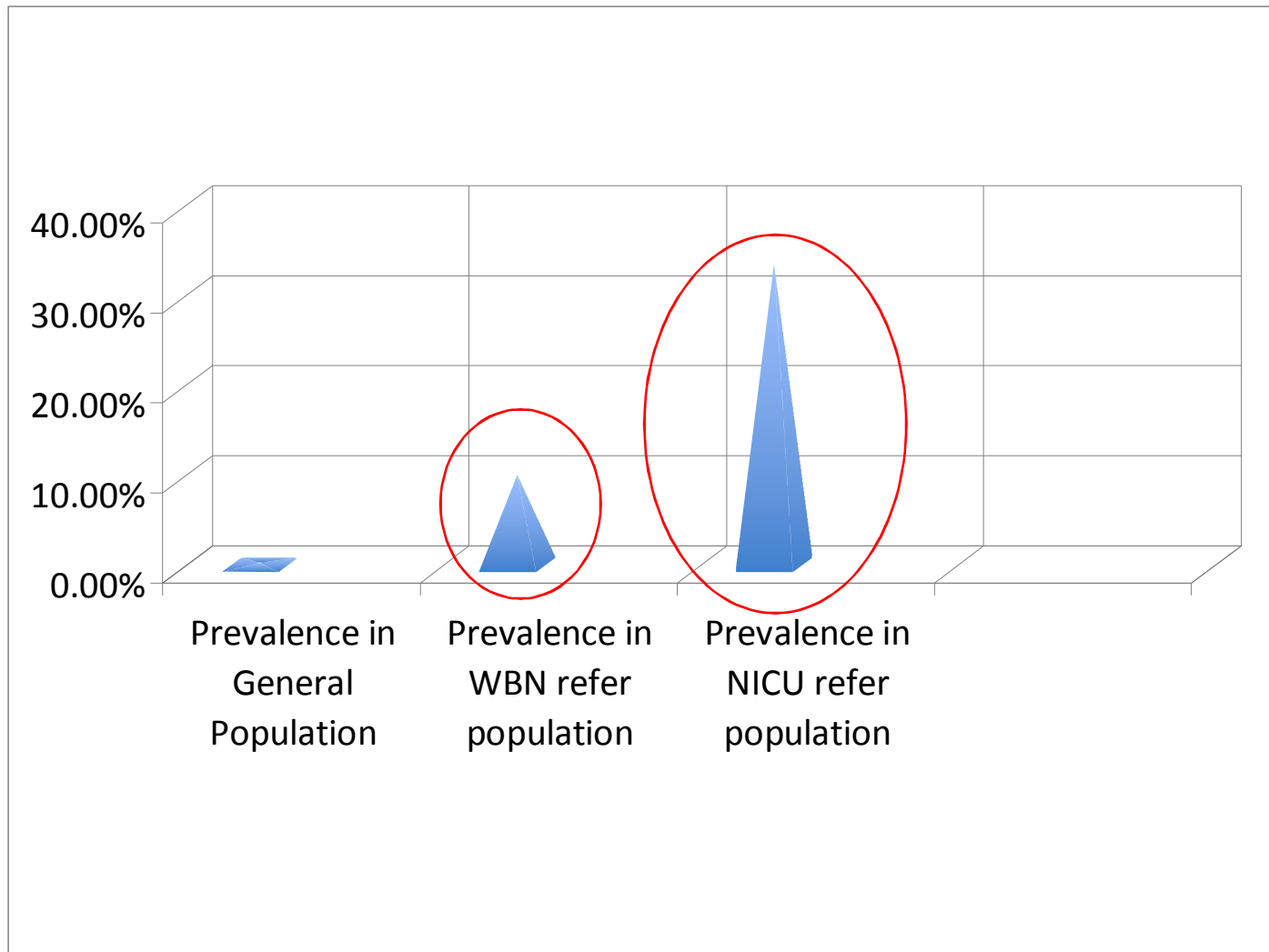
# Loss to Follow Up

Loss to Follow Up





# Probability of HL



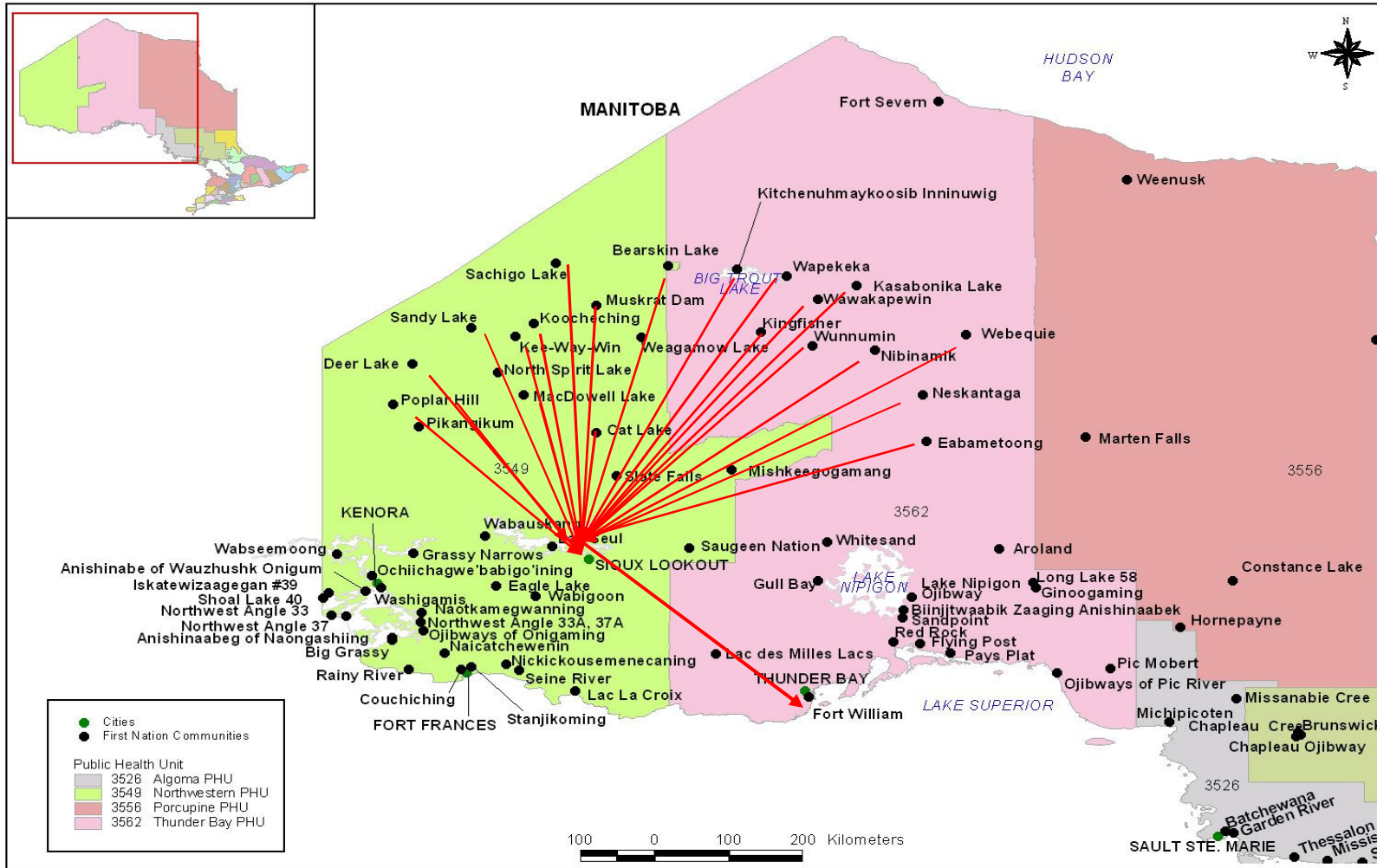


# Distance

- Ontario = 416,000 sq. miles
- Texas = 269,000 sq. miles



# First Nation Communities by Public Health Unit, Northwestern Ontario



Source: Location of First Nation Communities based on Statistics Canada 1996 Census Subdivisions, with current community names as of October 2002, provided by FNIHB-ON. Public Health Unit boundaries from Statistics Canada, 2000.



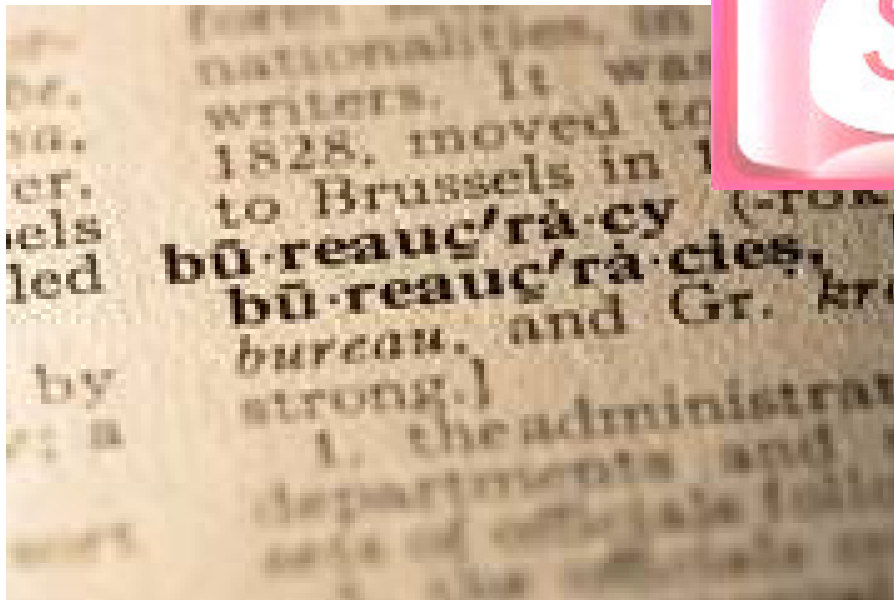


# Travel





# Funding





# Family

- Babysitting
- Work committments





And.....





# Training and Support





# Caseloads

- Large waiting lists = delays in identification.
- Mt. Sinai = 200 infants annually, nearly one per day.
- US programs such as California see huge numbers of clients annually in larger centers.



# Quality Assurance/Standards

- Program standardization is key
- Deviation from evidence base means errors!
- Remember, it is the babies that we are trying to help!
- Early ID is critical (Sharma, 2007; Rubel, 2008)

# Necessity is the mother.....

Our Simple Automatic Burglar Alarm

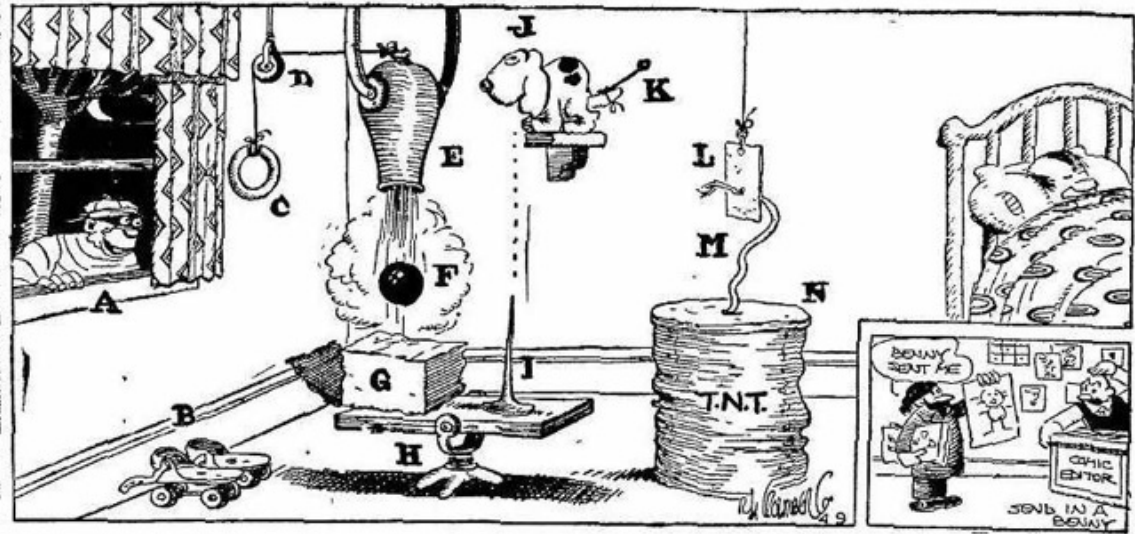
Copyright 1925 by R. L. Goldberg.

Reg. U. S. Pat. Off.

By RUBE GOLDBERG

**B**URGLAR (A) CLIMBS THROUGH WINDOW AND ACCIDENTALLY STEPS ON YOUR LITTLE BOY'S ROLLER SKATES (B) - HE GRABS RING (C) TO KEEP FROM FALLING, CAUSING STRING (D) TO SHOOT OFF CANNON (E) WITH LOUD REPORT - CANNON BALL (F) HITS TIN CAN (G) WITH GREAT CLATTER, CAUSING SEESAW (H) TO TOSS SHARP PEG (I) INTO AIR AND HIT OPERA HOUND (J) WHO LETS OUT A TERRIFIC SHREIK - DOG FALLS OVER AND MATCH (K) RUBS AGAINST SANDPAPER (L) IGNITING FUSE (M) AND SETTING OFF LARGE KEG OF T.N.T. (N) WITH TREMENDOUS EXPLOSION - BY THIS TIME THERE HAS BEEN SO MUCH NOISE THAT BURGLAR PICKS HIMSELF UP AND LEAVES HURRIEDLY - IF T.N.T. BLOWS YOU OUT OF THE WINDOW YOU WILL UNDOUBTEDLY LAND ON FLEEING BURGLAR AND TURN HIM OVER TO THE POLICE.

McNaught Syndicate, Inc., N. Y.







# Evidence Base

- *Using a Telehealth Medium for Objective Hearing Testing: Implications for Supporting Rural Universal Newborn Hearing Screening Programs. Krumm, M; Ribera, J; Schmiedge, J., 2005*
- *The Reliability of Click Evoked and Frequency Specific Auditory Brainstem Response Testing Using Telehealth Technology. Towers, A; Pisa, J; Froelich, T; Krumm, M., 2005*
- *Ethical and Legal Issues Related to Telepractice. Denton, D. and Gladstone, V., 2005*



## Some History

- Seminars in Hearing
  - Audiology Telepractice
  - Volume 26, #1, February 2005



# Terms and Definitions

- Host site: the clinic or office from which testing is performed.
- Remote site: the location of the infant being tested.
- Bandwidth: the ability of a connection between host and remote equipment to transfer data.
- Application Sharing Software: the software program used to control one computer from another. VNC is a proprietary name in this instance.
- VPN: Virtual Private Network. Any secure connection between 2 computers sharing data.

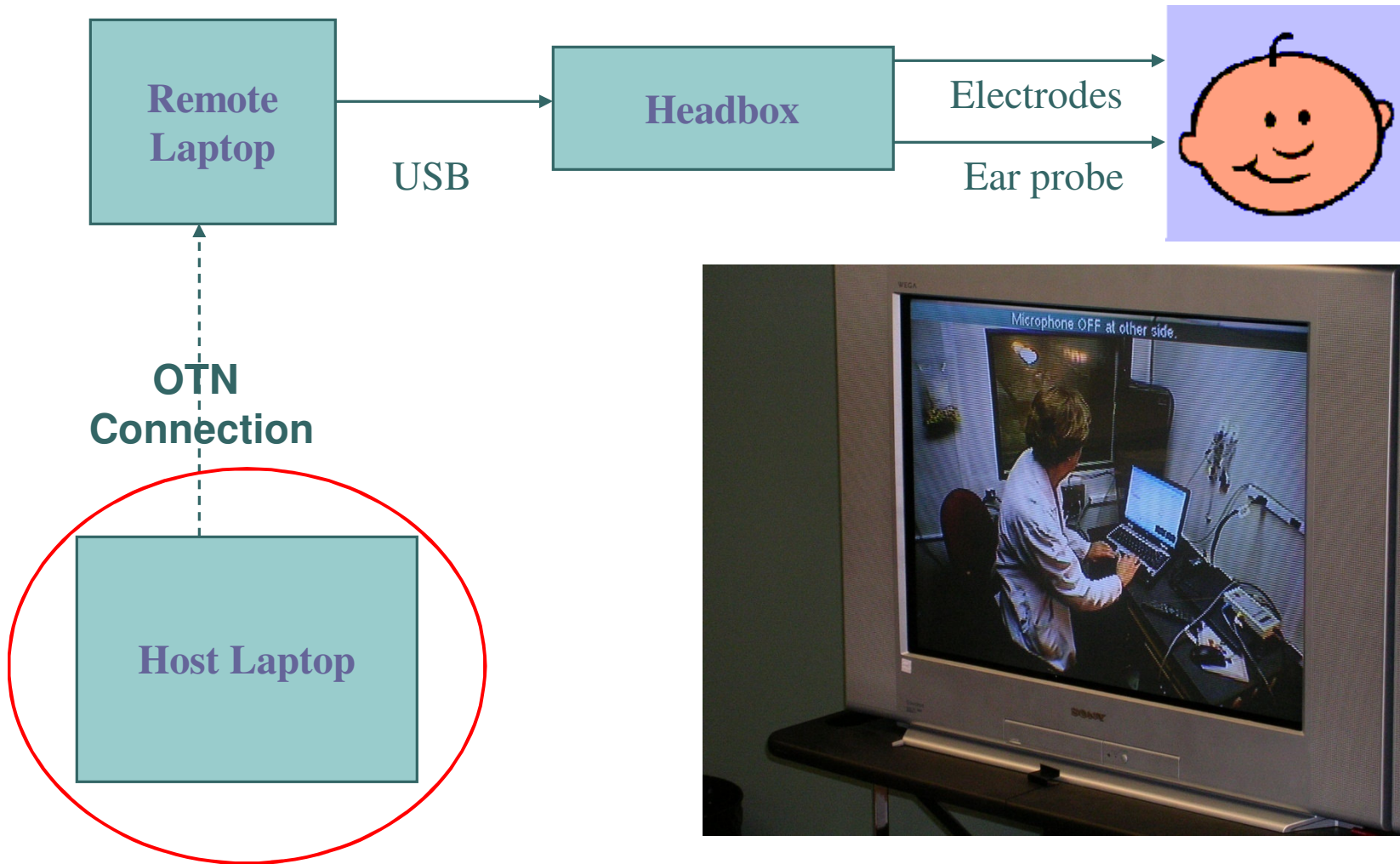


# Remote Assessment



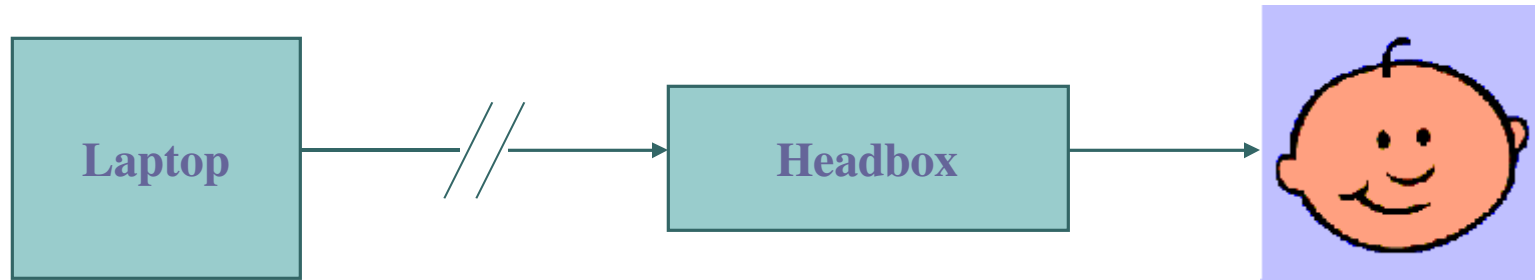


# Remote Assessment





# Early steps

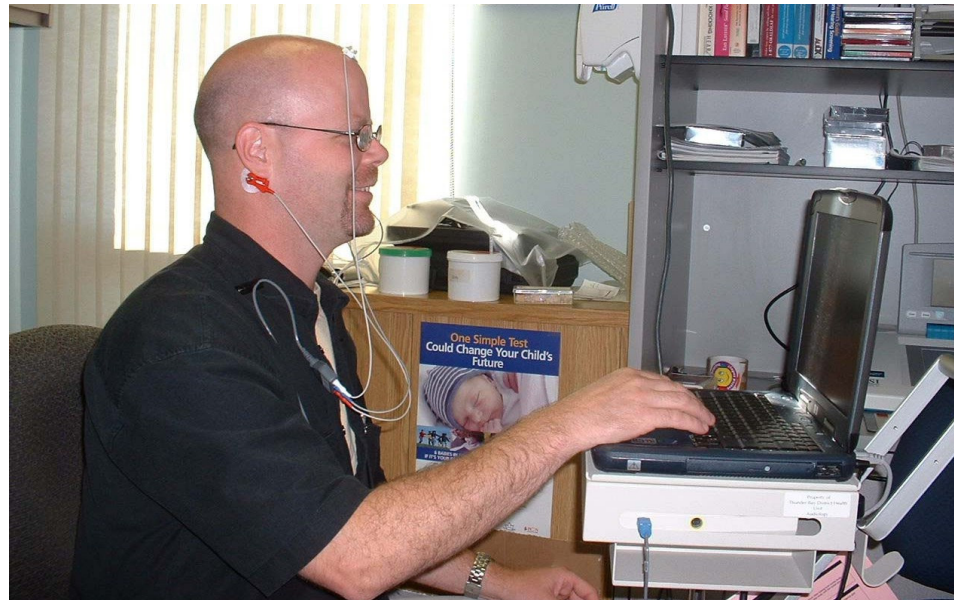


- Regional Health Unit audiologists attempt to deliver services via videoconference.
- Issues:
  - Technology/Software
  - Network/Systems



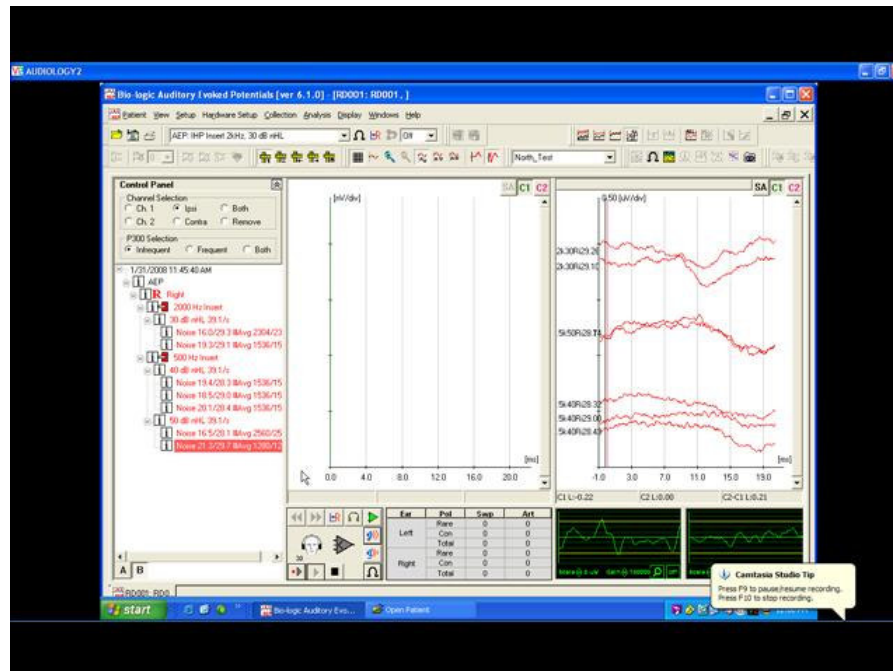
# Question #1

- Will it work?
- Early tests involving AABR and OAE software over a “vanilla” IP port indicated that the system would work.



# Question #2

- Can we get a Windows-based diagnostic system?
- Fortunately, yes. A Windows based system was released in 2006.







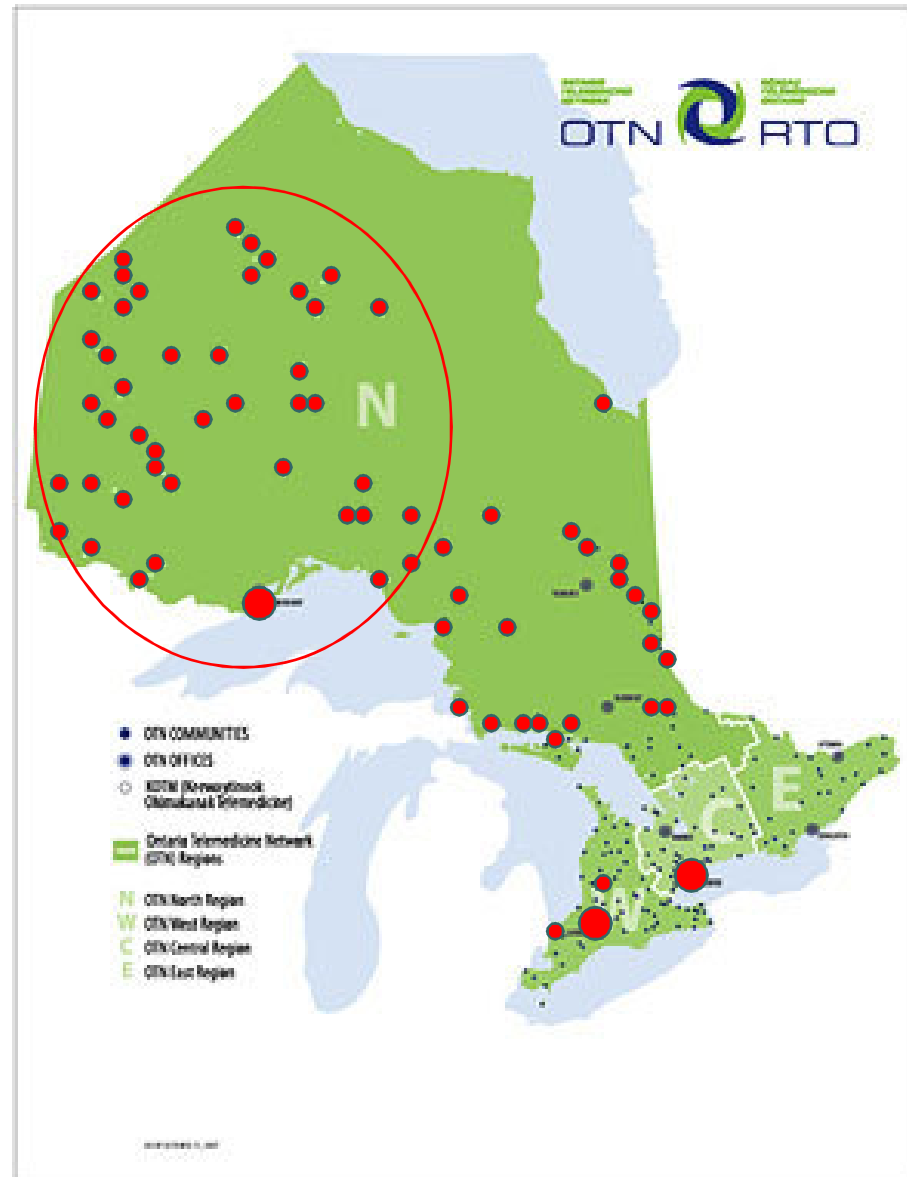
## Question #3

- Can we access a telemedicine network?
- The Ontario Telemedicine Network (OTN) 2006
  - merger between 3 large networks in Ontario.
- OTN provides province wide access, technical support and education.
- [www.otn.ca](http://www.otn.ca)



# OTN

- Access to sites across Ontario
- Central sites used as “host” sites
- OTN coordinators at each site.





## Question #4

- Inter-agency cooperation
  - Network security
  - Client privacy
  - Regional concerns
  - Site specific issues



# Ready to Roll Out

- What seemed a simple task took nearly 2 years to bring to fruition!
- Protocol development and research
- Systems development
- Equipment and software



# How we arrived

- 2005:
  - Idea of using videoconference system to test infants put forward.
- August 2006
  - OTN develops a strategic plan for software testing and “live” pilot
- December 2006
  - Full functionality testing at OTN tech offices in Toronto
- March 2007
  - Demo of remote diagnostics to program consultants and funding agencies

# ● ● ● | Baby Steps

- February 2007: Test of the system with adult subject.



# ● ● ● | Baby Steps

- February 2008:  
First system test with infant





## Current Status

- Performing regular tests on infants from Thunder Bay to northern sites
- Looking at adding host sites (2)
- Addition of remote sites across the province (2009/10)



# ● ● ● | Equipment

- Diagnostic ABR
- “Host” PC
  - Laptop or desktop
- Application sharing software
  - RealVNC
    - [www.realvnc.com](http://www.realvnc.com)
- Videoconference equipment
  - Tandberg Intern





# Equipment

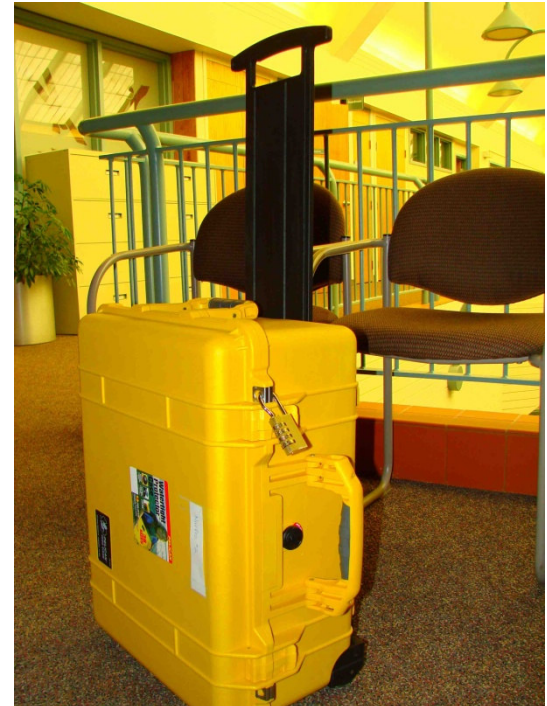
- Host site, portable or fixed.
- Host site, portable or fixed.





# Remote Site Criteria

- Video conference equipment.
- Ambient noise levels.
- Scheduling and accessibility.





# Privacy

- Client confidentiality is of primary concern.
- Coded data.
- Data entry performed by region “owning” the infant.
- Host site tracks tests performed, without client information.



# Staff Resources

- Host Audiologist
  - Proficient in infant diagnostics
- Remote site technician
  - Proficient in AABR screening
- Administrative support
  - Trained in videoconference practices



# Advantages to Remote Ax

- Reduced travel for families
- Reduced costs for families/funding agencies
- Ability to initiate funding and supports for identified infants



# Training and Data Review

Remote Diagnostics Test  
Jan. 30, 2008  
Thunder Bay to Sioux Lookout



# Potential

- Training
- Second Opinion
- Consultation
- Quality Assurance
- Research
- Behavioural
- Hearing Aid Program







Questions?

