Cochlear Implant Decision Making Study

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A cochlear implant is an electronic device that can help a person who is profoundly deaf or hard of hearing to improve their hearing (NIH, 2011)
Spatial hearing

Monaural/Binaural hearing

HINT test

PTA test

Groups (I, II, III, IV)
Objectives

First

Detect whether one cochlear implant (CI) or two CIs are needed in a patient in order to validate theoretical guidelines for CI selection strategies from Perreau et al (2007)

Second

Optimize the candidacy process for binaural and monaural cochlear implantation
Methodology

- The study tested 311 patients with cochlear implants at the University of Iowa Hospital and Clinics
  - One implant
  - Two implants

- Data Reformation

- SAS version 9.3

- Correlations (Zero Order)

- Logistic Regression:
  - $0 = 1$ Cls
  - $1 = 2$ Cls
Logistic Regression Model

\[ Status = -1.91 + 0.03 \times maxPTA + 0.01 \times maxHINT - 0.15 \times eduYears + 0.02 \times implantAge \]

- \( maxPTA \) = worse ear PTA score
- \( maxHINT \) = maximum ear HINT score
- \( eduYears \) = number of years of education
- \( implantAge \) = subjects age in which the implantation cochlear implant was received
Based on the data used, this study found that our model can be significantly determined by the explanatory variables:

- the worse ear score in the pure tone audiometry (PTA) test ($p$-value = 0.0390)
- years of education ($p$-value = 0.0094)

Resulting in 67% precision
Goodness of Fit

- Percent concordant: 67.4
- Percent discordant: 32.6
- C: 0.674
The membership of the CIs can possibly be predicted by the variables:

- worse PTA
- years of education

More analysis is needed

Include more variables in the analysis, to project a better response of the cochlear implant selection
Future Work

- Perform a discriminant analysis to confirm results for logistic analysis.
- Add the variables,
  - duration of deafness
  - years of hearing aid use
- Compare their pre-implant unilateral data to bilateral data
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References
