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Cost-effectiveness of pediatric bilateral cochlear implantation in Spain

Jorge Pérez-Martín - Francisco Javier Díez

UNED, Madrid, Spain

www.ia.uned.es/~fjdiez

www.cisiad.uned.es

Acknowledgments – Disclaimer

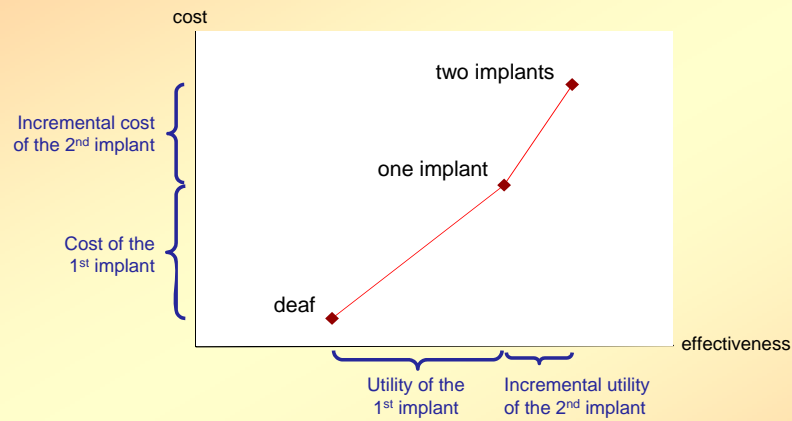
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- ◆ Research grant from MED-EL, GmbH

MED-EL

Incremental cost-effectiveness ratio of bilateral CI



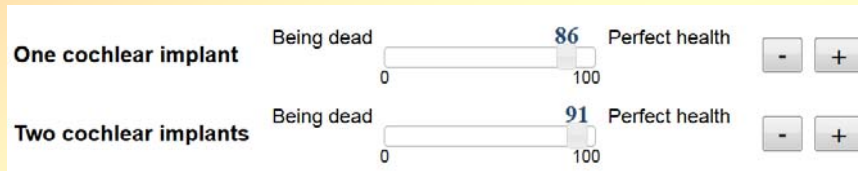
- Unilateral cochlear implantation (UCI) is clearly cost-effective.
- The cost-effectiveness of bilateral CI (BCI) is not that clear.

When is an intervention cost-effective?

- ◆ Incremental cost-effectiveness ratio (ICER)
= Δ cost (in monetary units) / Δ effectiveness (in QALYs)
- ◆ QALY = quality-adjusted life year
 - one year of life with perfect health,
 - or two years with a quality of life of 0.5,
 - or three years with a quality of life of 0.33, etc.
- ◆ Cost-effectiveness threshold (a.k.a. willingness to pay)
 - USA: \$ 50,000 - 100,000 / QALY
 - UK: £ 20,000 - 30,000 / QALY
 - Spain: € 30,000 - 35,000 / QALY

Our study for measuring the quality of life

◆ Visual analog scale (VAS)



◆ Time trade-off (TTO)

I think that living for years with **perfect audition** is equivalent to living for 20 years with **one CI**.

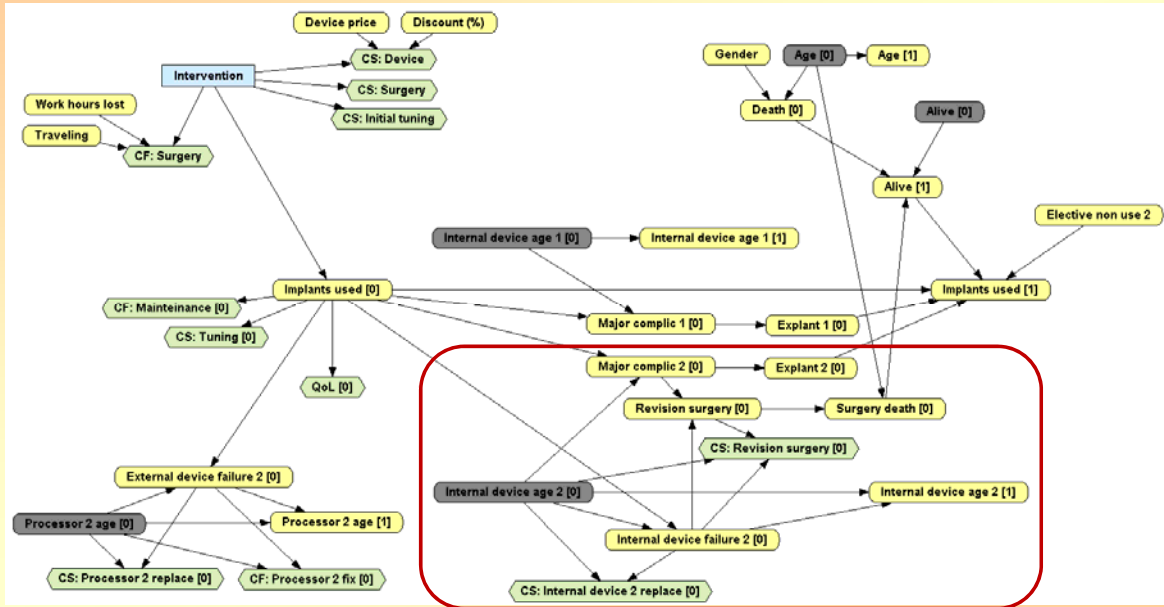
I think that living for years with **two CIs** is equivalent to living for 20 years with **one CI**.

Come see our poster at 4:30pm

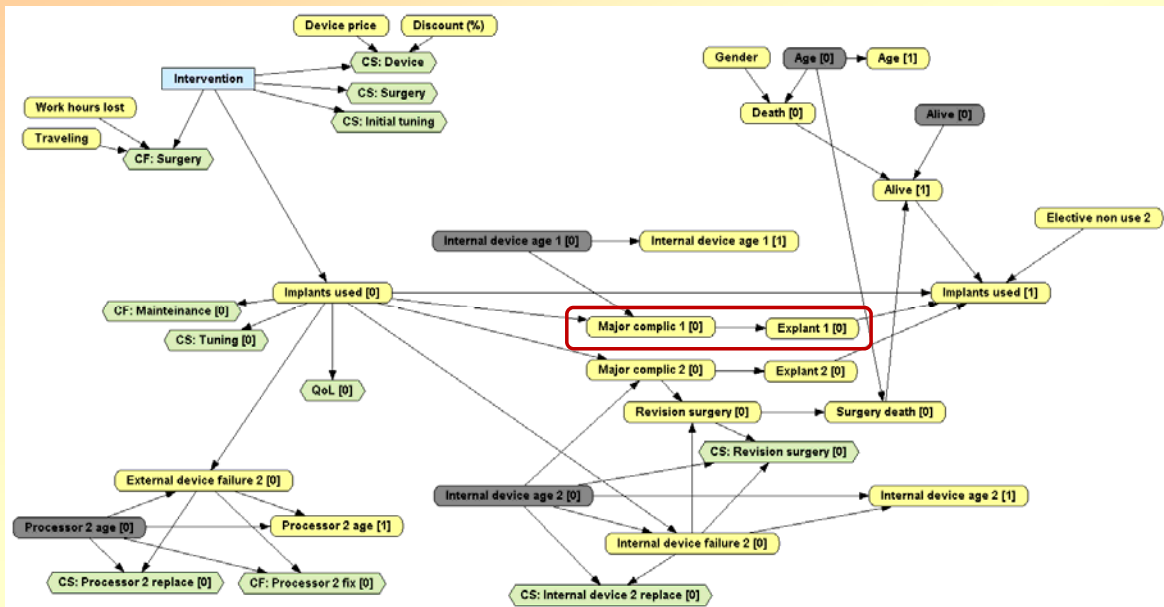
Incremental QoL of bilateral CI

Study	Target	Informants	Method	Increase in quality of life
Summerfield et al. [2002]	adults	experts	TTO	0.031
Summerfield et al. [2006]	adults	bilaterally implanted patients	HUI-3	0.015 (initial) 0.030 (adjusted)
Bichey and Miyamoto [2008]	adults and children	bilaterally implanted patients (or their parents)	HUI-3	0.11
Lovett [unpublished]	children	parents of bilaterally implanted children	VAS	0.33
Lovett et al. [2010]	children	parents of unilaterally and bilaterally implanted children	VAS	0.04
			HUI-3	-0.003
Summerfield et al. [2010]	children	experts, students and parents of children with other disabilities	VAS	0.06
			TTO	0.05
Sparreboom et al. [2012]	children	bilaterally implanted children	HUI-3	0.04
Chen et al., 2014	adults	doctors, implanted adults	HUI-3	0.03
Härkönen et al. [2015]	adults	bilaterally implanted patients	15D	0.03
Artaso, Díez [2015]	children	general populations (students)	VAS	0.25
			TTO	0.10

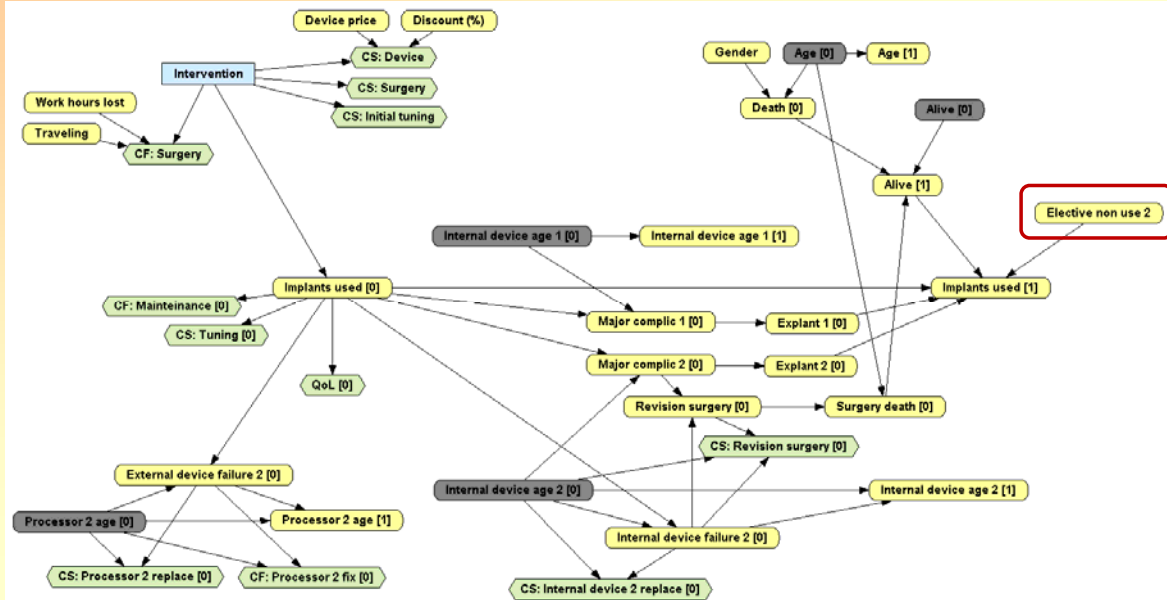
Our Markov model



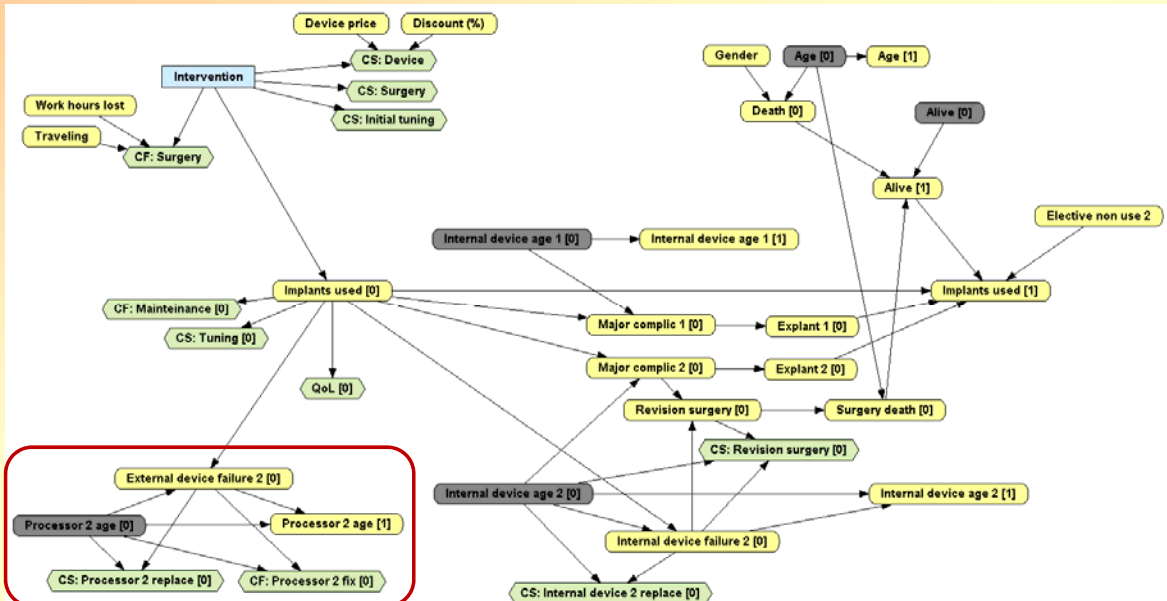
Our Markov model



Our Markov model



Our Markov model



Who pays for the costs of CI in Spain?

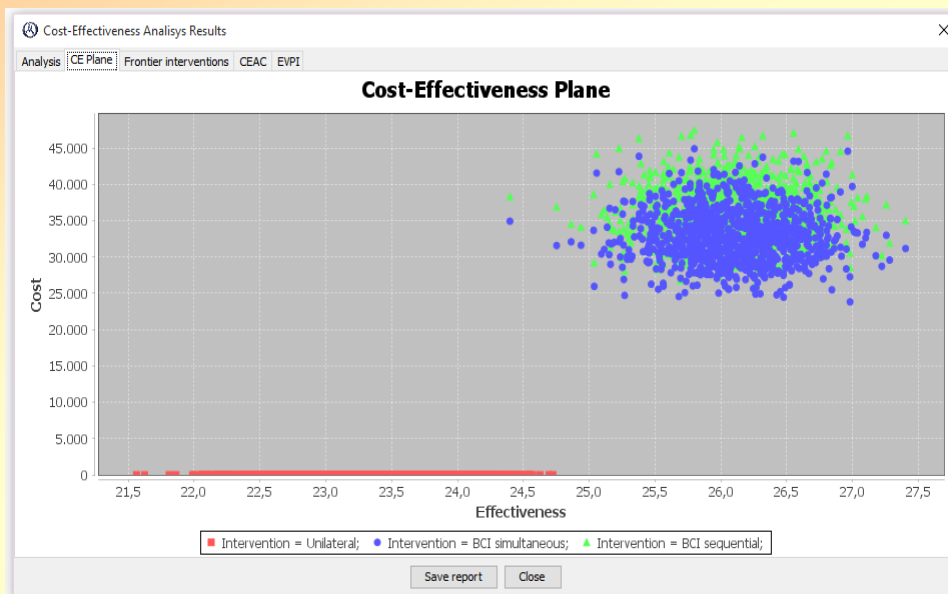
- ◆ Initial costs (assessment + device + surgery): the health system
- ◆ Failure of the internal components
 - first 10 years: manufacturer's warranty
 - after the 10th year: health care system
- ◆ Failure of the external processor
 - first 2 years: manufacturer's warranty
 - 3rd to 7th year: user or his/her family (usually repaired)
 - after the 7th year: if fails, replaced by the health system
- ◆ Microphone: if fails after the 4th year, replaced by the health system
- ◆ Coil: if fails after one year of use, replaced by the health system
- ◆ Cables and batteries: paid by the user or his/her family.

Results: ICERs

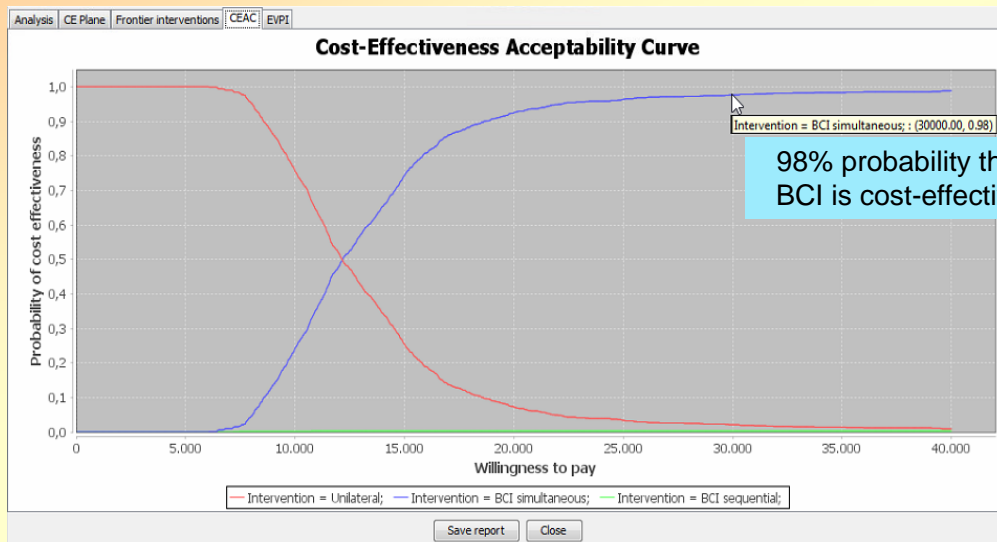
- ◆ Simultaneous bilateral vs. unilateral: € 12,133 / QALY
- ◆ Sequential bilateral vs. unilateral: € 13,232 / QALY
- ◆ Simultaneous, if the health system covered the repairs and supplies € 17,262 / QALY
- ◆ Sequential, if the health system covered the repairs and supplies € 18,362 / QALY
- ◆ In all cases, clearly below the threshold (€30,000-35,000/QALY).
- ◆ The effectiveness decreases with the age of implantation and the time between implantations.

Study	Country	Source of utilities	Population	ICER
Summerfield et al. [2002]	UK	own data	adults	£ 61.734/QALY
Summerfield et al. [2003]	UK	Summerfield et al., 2002	adults	£ 100.000/QALY
Summerfield et al. [2006]	UK	own data	adults	£ 102.500/QALY
Cochlear Europe Ltd. [submitted to NICE]	UK	projection of data	adults	£ 32,909/QALY
			children	£ 39,049/QALY
Bond et al. [2007, 2009]	UK	Summerfield et al., 2006	adults	£ 49,559/QALY
			children	£ 40,410/QALY
L-Pedraza Gómez et al. [2007]	Spain	Summerfield et al., 2002	adults	€ 53,018/QALY
			children	€ 44,199/QALY
Bichey and Miyamoto [2008]	USA	own data	adults and children	\$ 2,187/QALY
Summerfield et al. [2010]	UK	own data	children	£ 21,768/QALY
Chen et al. [2014]	Canada	own data	adults	\$ 55,020/QALY
Martín-Pérez, Díez [2015]	Spain	own data	children	€ 12,133/QALY

Probabilistic sensitivity analysis



Probabilistic sensitivity analysis



98% probability that BCI is cost-effective

Future work

- ◆ Make all the details available on a web page:
 - the raw data collected during the quality of life survey,
 - the analysis of those data,
 - the Markov model, and
 - a stable version of the software, with a user manual,so that everyone can reproduce the results of our study, because research needs to be reproducible to be credible.
- ◆ Analyze the cost-effectiveness of BCI for adults (and SSD).
- ◆ Adapt the model to other countries.

*If you wish to know more details about this study
or adapt it to your country*

please write to:

cochlear-implant@cisiad.uned.es.

Thank you very much!