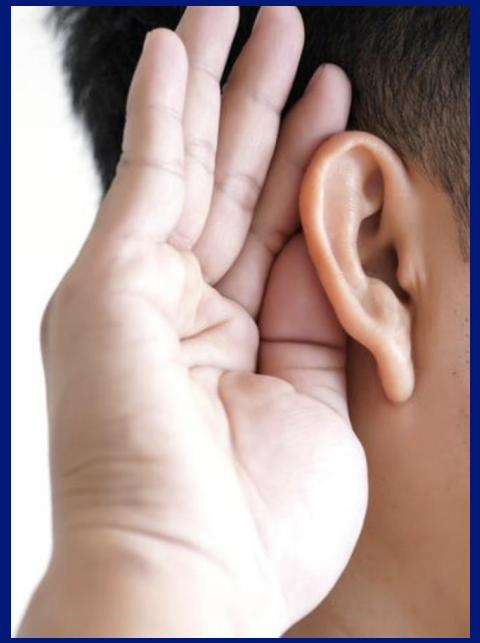
Modeling the risk of hearing loss from radiotherapy in childhood cancer survivors: Initial results from the (PENTEC) hearing loss task force



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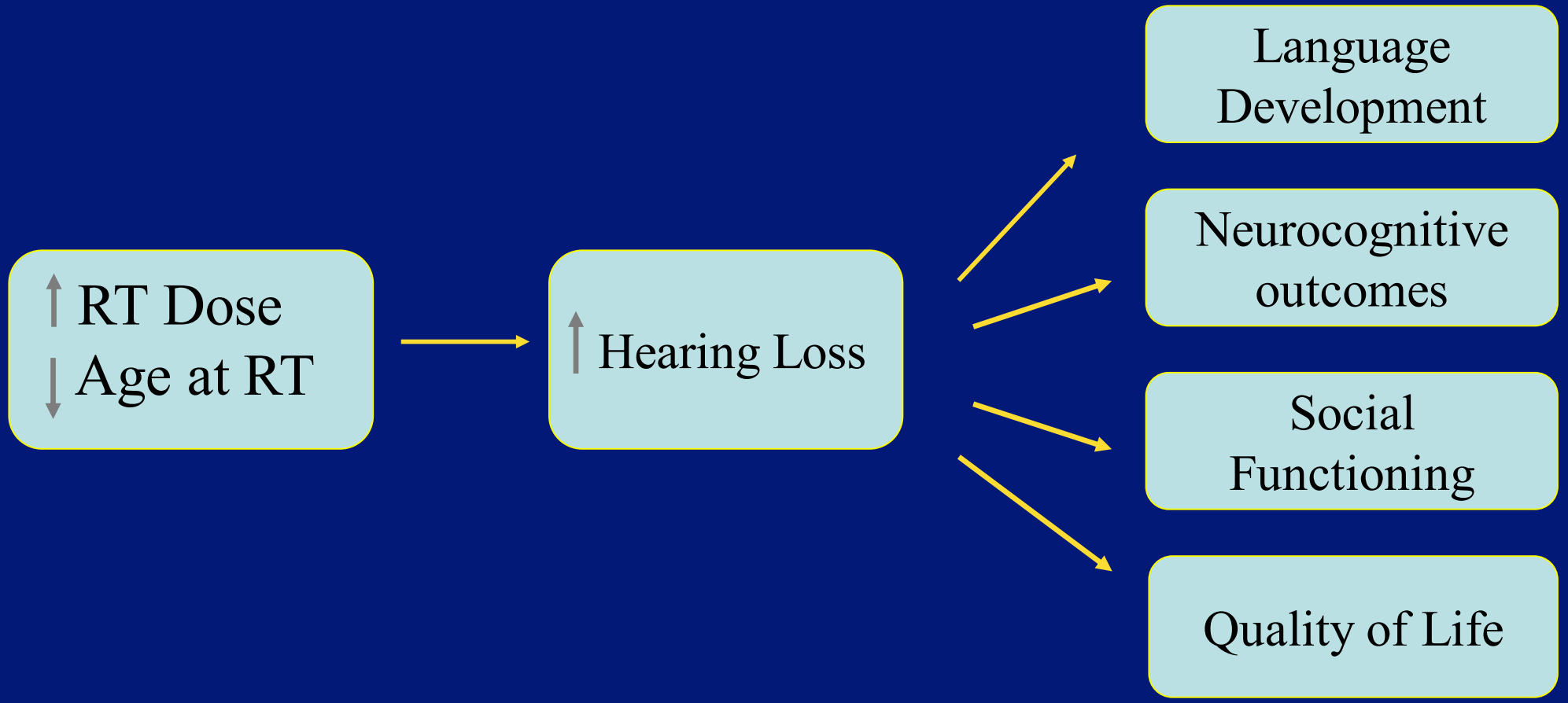
Background


↑ RT Dose
↓ Age at RT
↑ Hearing Loss
Language Development
Neurocognitive outcomes
Social Functioning
Quality of Life

Objectives

To utilize published investigations to determine the impact of the following variables on hearing loss:

- Radiation Dose
- Age at Treatment
- Time from Treatment
- Receipt of Ototoxic chemotherapy

Materials/Methods

731 abstracts screened

23 studies reviewed

15 studies included in meta-analysis

2 studies included in data extraction

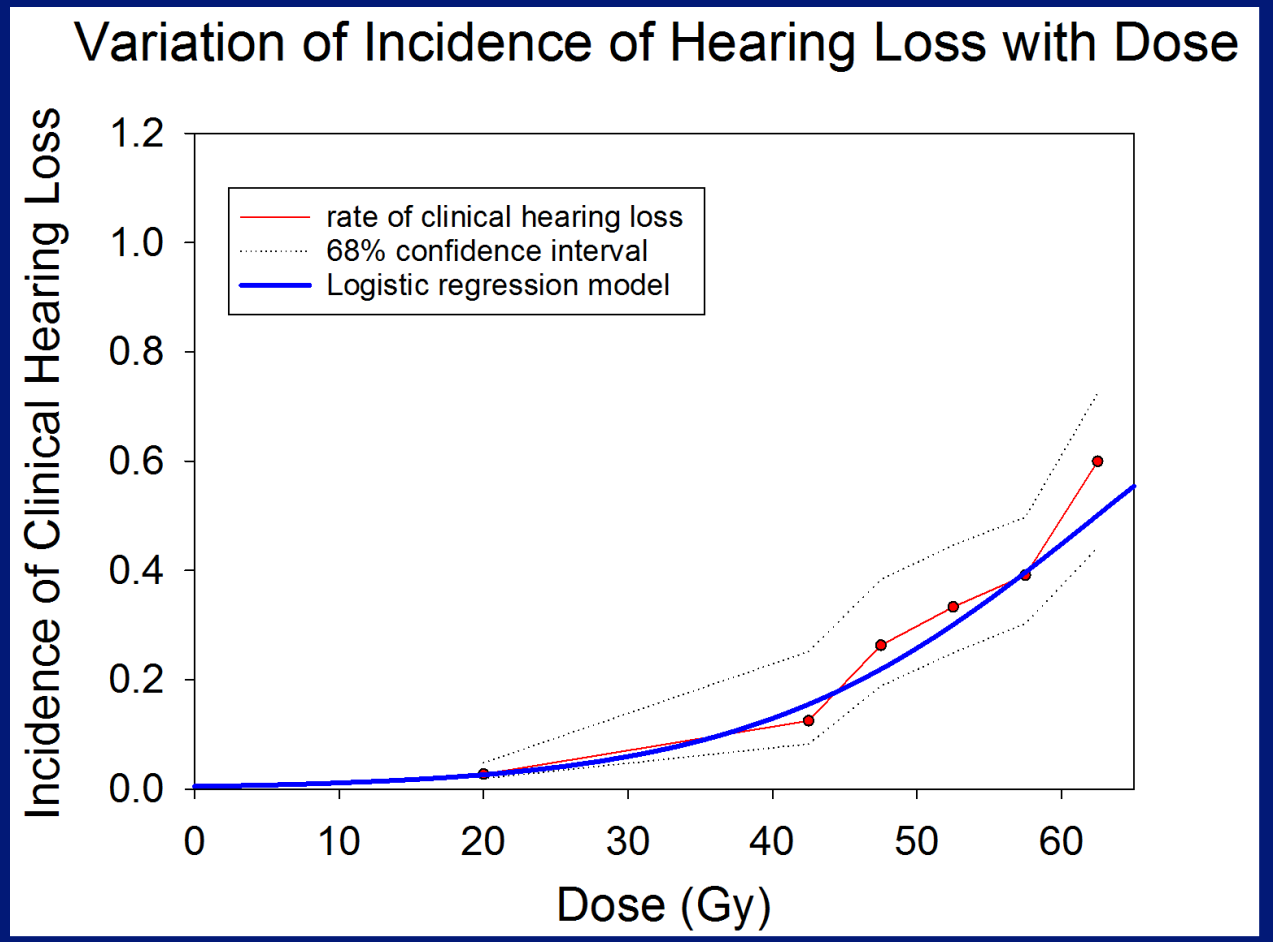
457 ears (RT only)
58 ears (chemoRT)

available for logistic regression model

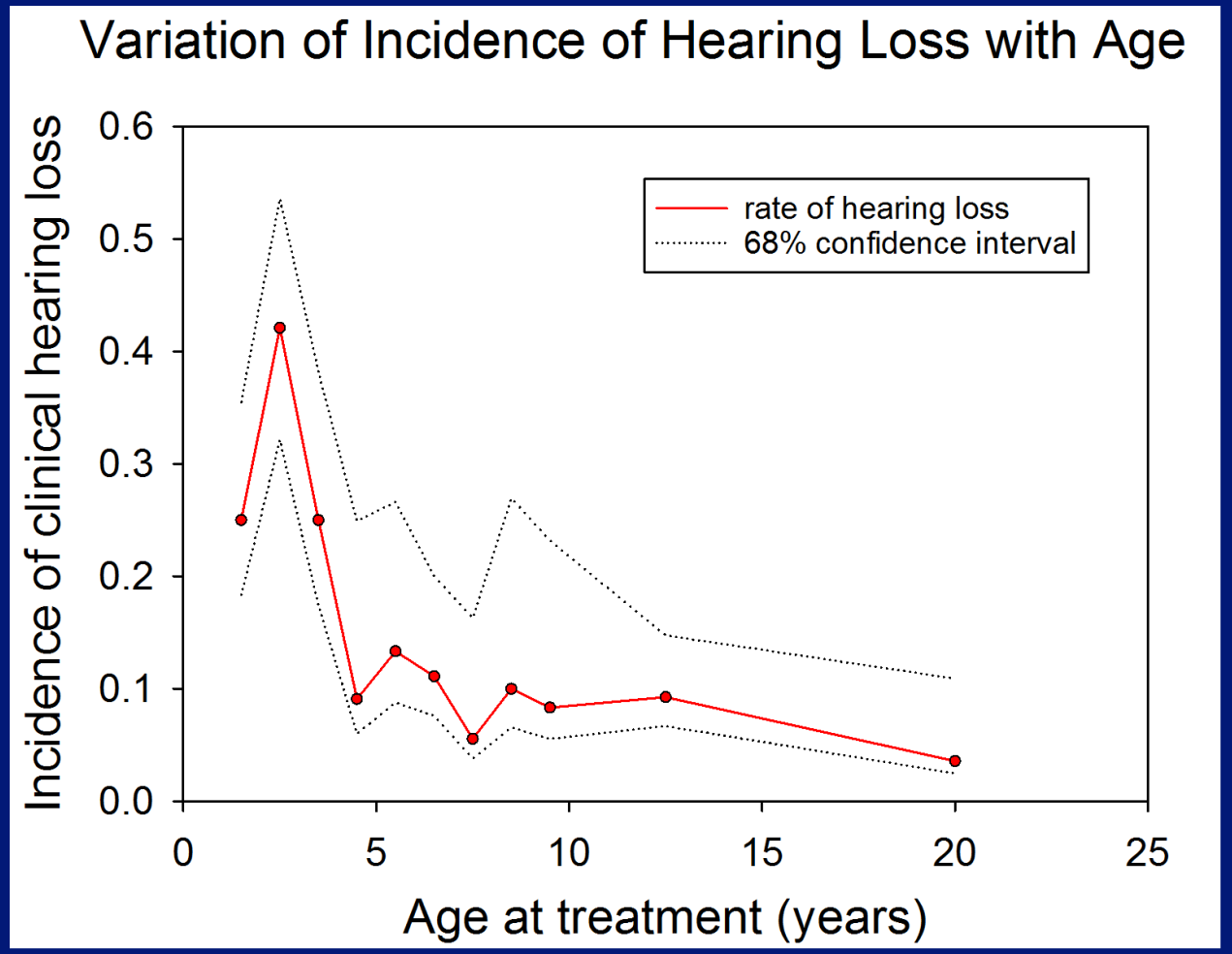
Results

- Risk of HL was **<5%** in ears receiving a **mean dose of ≤35 Gy**, but risk increased to approximately 30% at 50 Gy.
- HL risk ranged from **25-40%** in children **under 5 yo**, in contrast to only **10%** in older children.
- Average onset of HL was **3.6 years** (range 0.4-13.2) after RT.
- High-frequency HL was more common than low or intermediate frequency HL for any given cochlear exposure.

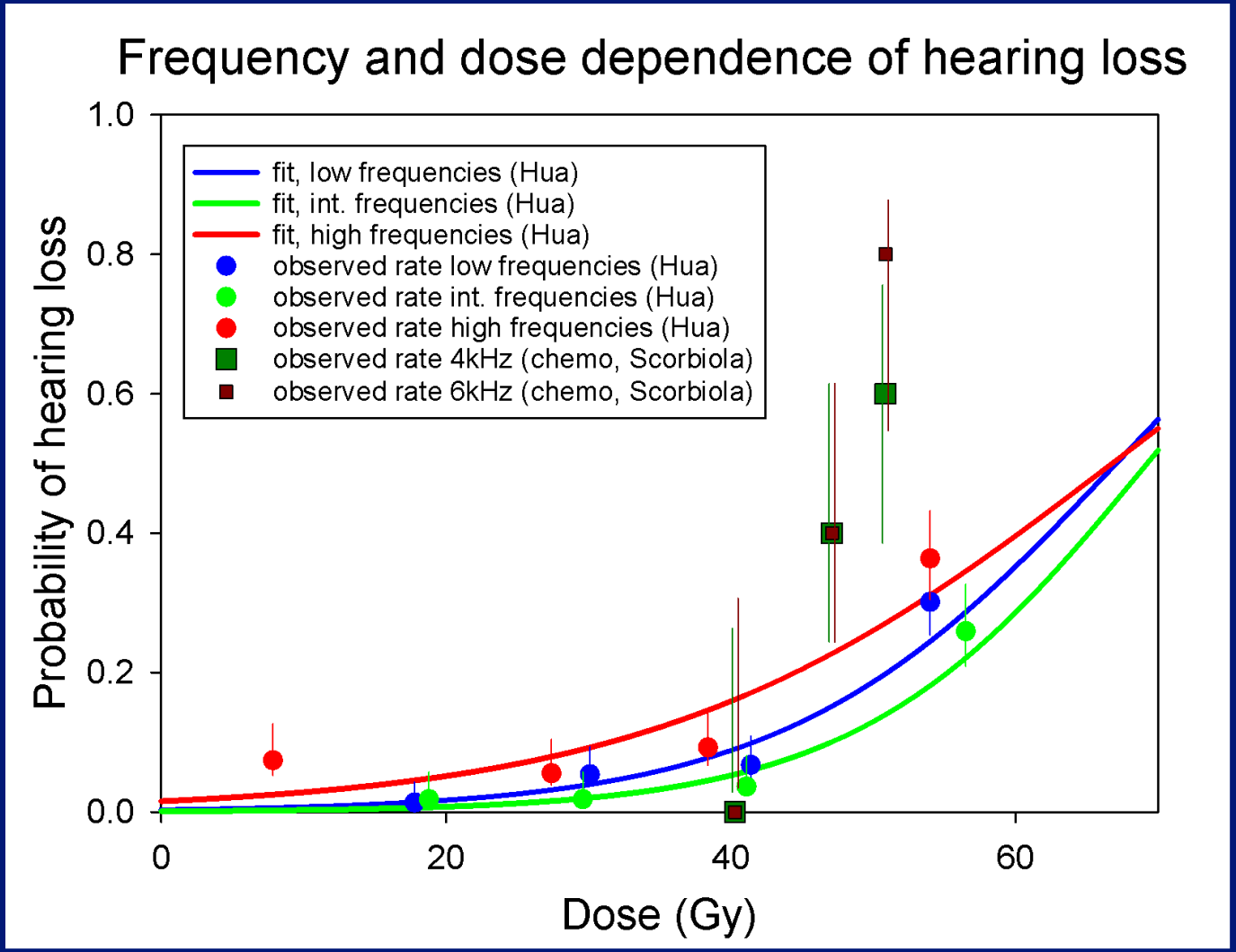
Hearing Loss vs. RT Dose



Hearing Loss vs. Age at RT



Frequency of Hearing Loss



Limitations

- Heterogeneity of grading systems used, and one standard needs to be adopted. This analysis was simplified by defining HL as any frequency HL with dB threshold of 25 or higher. (Johnnie Bass/T Yock are proposing new comprehensive scale for future use.)

- More granular data is needed to better delineate the time to onset of HL

- More data is needed to better determine the effects of chemoradiotherapy on hearing loss

Conclusions

- In children treated with RT alone, rates of HL below 35 Gy were <5%, but without a clear RT dose dependence.
- Prevalence of HL rose significantly when the cochlear dose exceeded ≥ 35 Gy.
- High frequency HL was more prevalent than low or intermediate frequency HL, but HL at all levels were affected by radiation dose.
- This analysis suggests that children <5 years may be at highest risk of developing RT-related HL, although independent effects of dose and age could not be fully elucidated.

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