Utilizing the 5-Item Modified Frailty Index to Predict Postoperative Complications After Cochlear Implantation

UNIVERSITY of MARYLAND SCHOOL OF MEDICINE

Daniel Fong, BS[1], Chris Wen, MD[2], Marcelina Puc, MS[3], Adam Kaufman MD, PhD[2]

[1]University of Maryland School of Medicine, Baltimore, MD
[2]Department of Otorhinolaryngology – Head & Neck Surgery, University of Maryland School of Medicine, Baltimore, MD
[3]Thomas F. Frist, Jr. College of Medicine, Belmont University, Nashville, TN

Introduction

Age-related sensorineural hearing loss (ARHL) affects approximately 30% of individuals aged 65-74 and over 50% of those aged 75 and older in the United States.[1] With 466 million people worldwide suffering from disabling hearing loss and projections reaching 900 million by 2050, cochlear implantation (CI) has become the standard of care for ARHL.[2,3] However, only about 5% of eligible adults pursue implantation, partly due to perceived risks of surgery in elderly patients.[1] While chronological age has traditionally been used to assess surgical risk, frailty has emerged as a superior measure of surgical candidacy, providing a comprehensive assessment of physiologic reserve.

The 5-Factor Modified Frailty Index (mFI-5), derived from the Canadian Study of Health and Aging Frailty Index, has shown effectiveness in predicting post-operative complications across various surgical specialties.[4] Given the low utilization rates among older adults who could benefit from CI, understanding how frailty predicts postoperative outcomes is crucial for improving patient selection and counseling.

Methods

- Retrospective cohort study of cochlear implantation using Epic Cosmos National Electronic Health Record database
- Analyzed approximately 257 million patients across over 1,500 hospitals and 34,000 clinics from 2015-2023
- Tracked patient demographics, medical comorbidities, and outcomes using mFI-5 frailty index
- Grouped patients by age and frailty scores
- Examined –
  1. Device Explantation
  2. Post-Operative Inpatient Admission
  3. Discharge to Non-Home Location
  4. Major Complications
- Chi-squared testing, Fisher exact tests, and Cochran-Mantel-Haenszel testing were performed to analyze relationships between age, mFI-5 scores, and outcomes
- Binary logistic regression was used for univariate and multivariate analyses

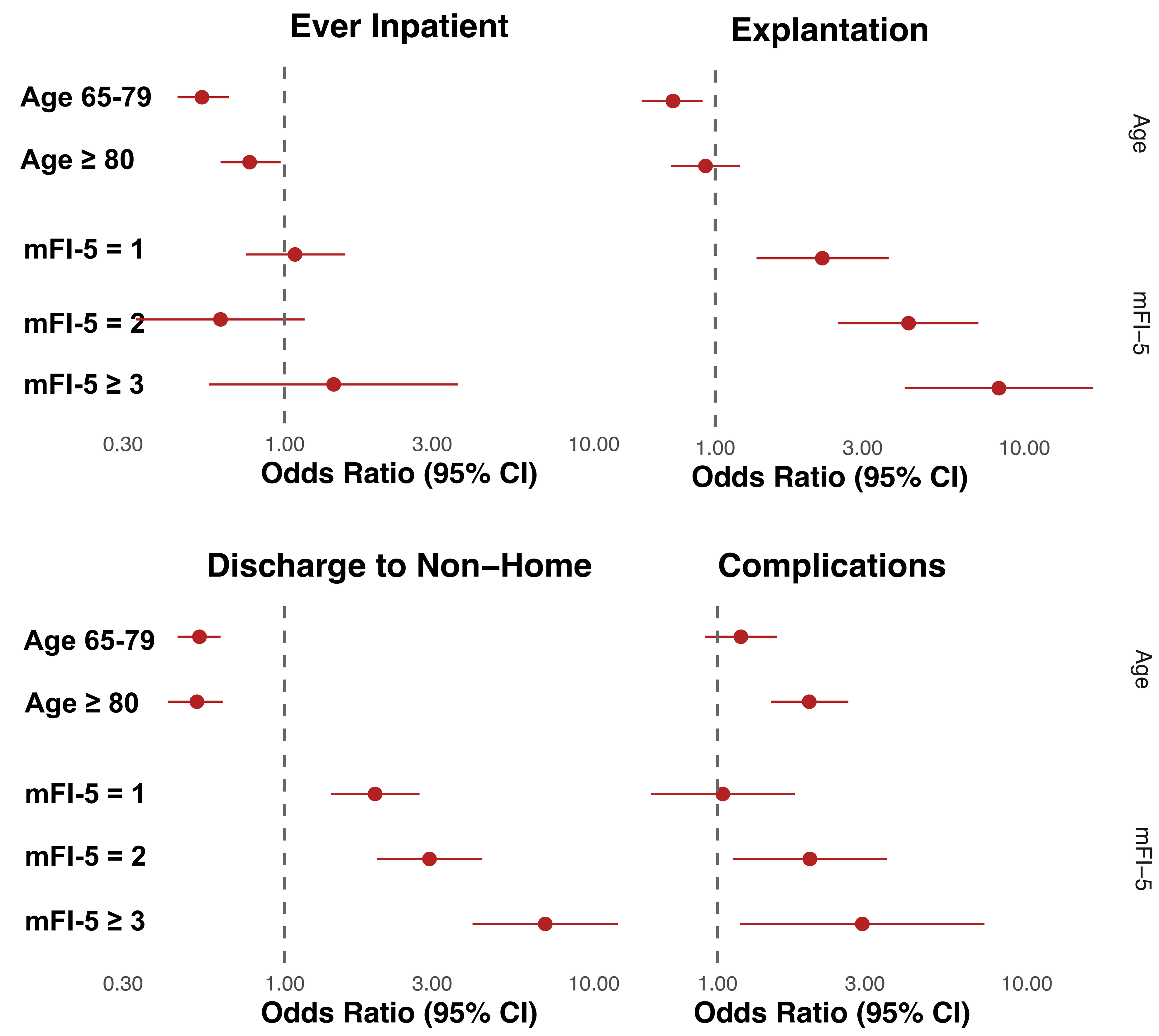

Figure 1: Multivariate Analysis
Age 18-64 and mFI-5 = 0 were used as reference groups

Results

- 23,550 cochlear implantations studied, with average patient an age of 64.1 years (53.1% male)
- Average mFI-5 frailty score of 0.66, with 53% of patients scoring 0
- Postoperative complications were rare (each <1%)
- Each point increase in mFI-5 score significantly increased:
  - Inpatient admission odds – 1.84x
  - Non-home discharge odds – 1.41x
  - Major complication odds – 2.15x
- Severely frail patients showed even higher risk of adverse outcomes
- Age was less predictive than frailty scores

Discussion

- Cochlear implantation remains a safe procedure with low overall complication rates
- Frailty serves as a significant predictor of post-operative outcomes
- Our focus on major systemic complications, our large sample size and national scope of our database provides a clearer picture of serious surgical risks
- Chronological age showed less predictive value than frailty scores, supporting the use of frailty indices over age alone in surgical planning
- The strong association between higher mFI-5 scores and increased complications suggests that frailty should be core to pre-operative risk assessment

Conclusion

- Cochlear implantation demonstrates excellent safety with overall low complication rates (0.5% major complications)
- The mFI-5 score shows strong predictive value for post-operative outcomes:
  - Higher scores correlate with increased risk of major complications
  - Patients with mFI-5 ≥3 have significantly higher odds of adverse outcomes
- Chronological age alone is not a reliable predictor of surgical complications
- Frailty assessment should be incorporated into pre-operative evaluation for CI candidates

References

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