

Association Between Hearing Aid and Cochlear Implant Internet Searches with Media Campaigns and Federal Announcements



Daniel R. S. Habib BA¹, Anthony E. Bishay BS¹, Alexander J. Langerman MD SM FACS², Kareem O. Tawfik MD²



¹Vanderbilt University School of Medicine; ²Vanderbilt University Medical Center, Department of Otolaryngology – Head and Neck Surgery

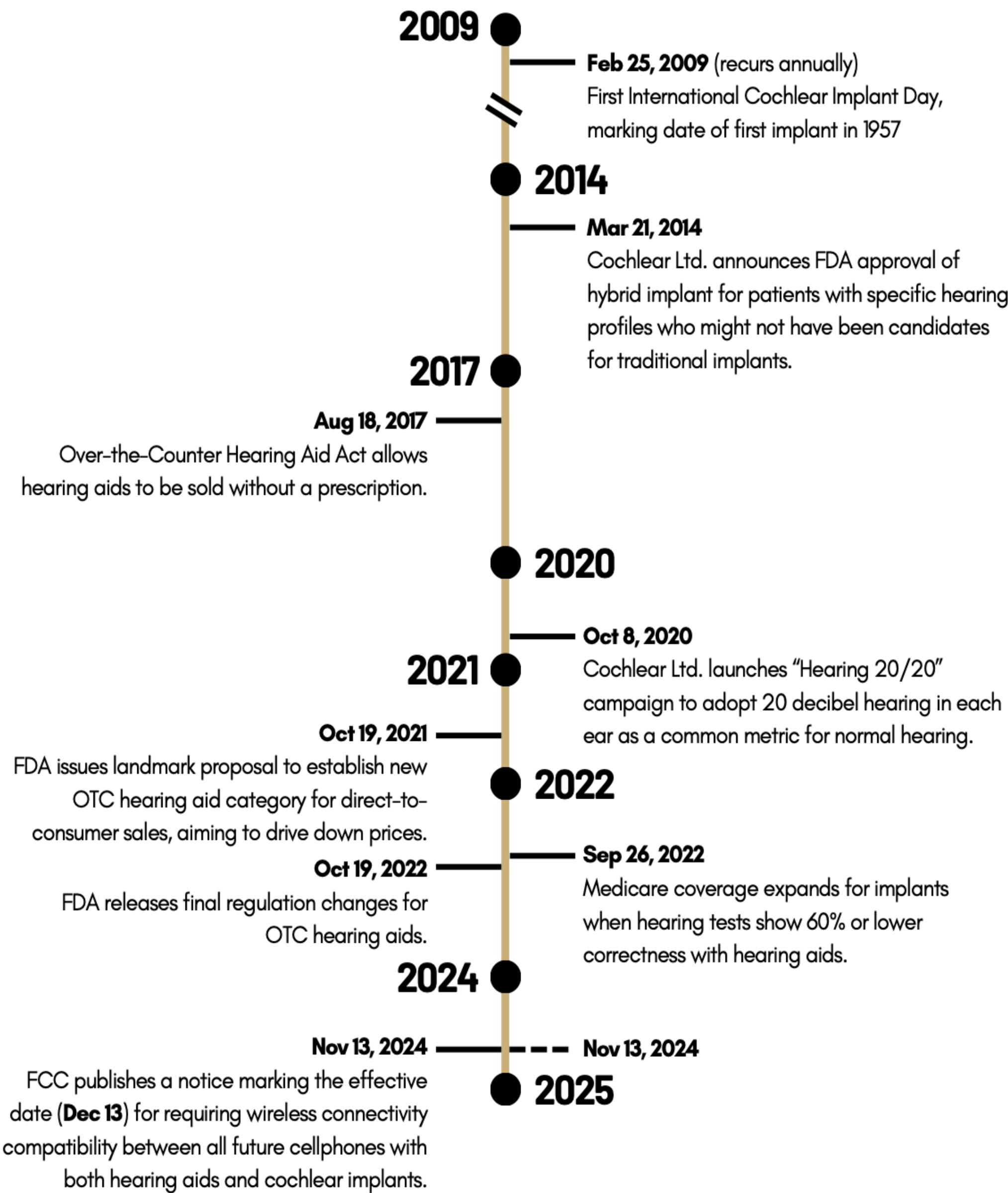
Introduction

- While 21% of eligible candidates use hearing aids (HAs), 2.1%-12.7% receive a cochlear implant (CI).^{1,2}
- Knowledge gaps and costs are two of the primary factors for underutilization.^{3,4}

Aims

- Quantify United States internet relative search volumes (RSVs) as a proxy for HA and CI general awareness around relevant events
- Compare HA and CI cost estimates

Hearing Aids Cochlear Implants



Methods

- Collected *Google Trends* RSVs of "hearing aids" and "cochlear implant" normalized to peak volume
- Compared average RSVs of event (2w before and after) and non-event periods per device using Welch's t-tests
- Extracted Medicare data to calculate charge estimates

Outcomes

- HA and CI RSVs, average (standard deviation [SD])
- Estimated HA and CI costs

Discussion / Conclusion

Limitations

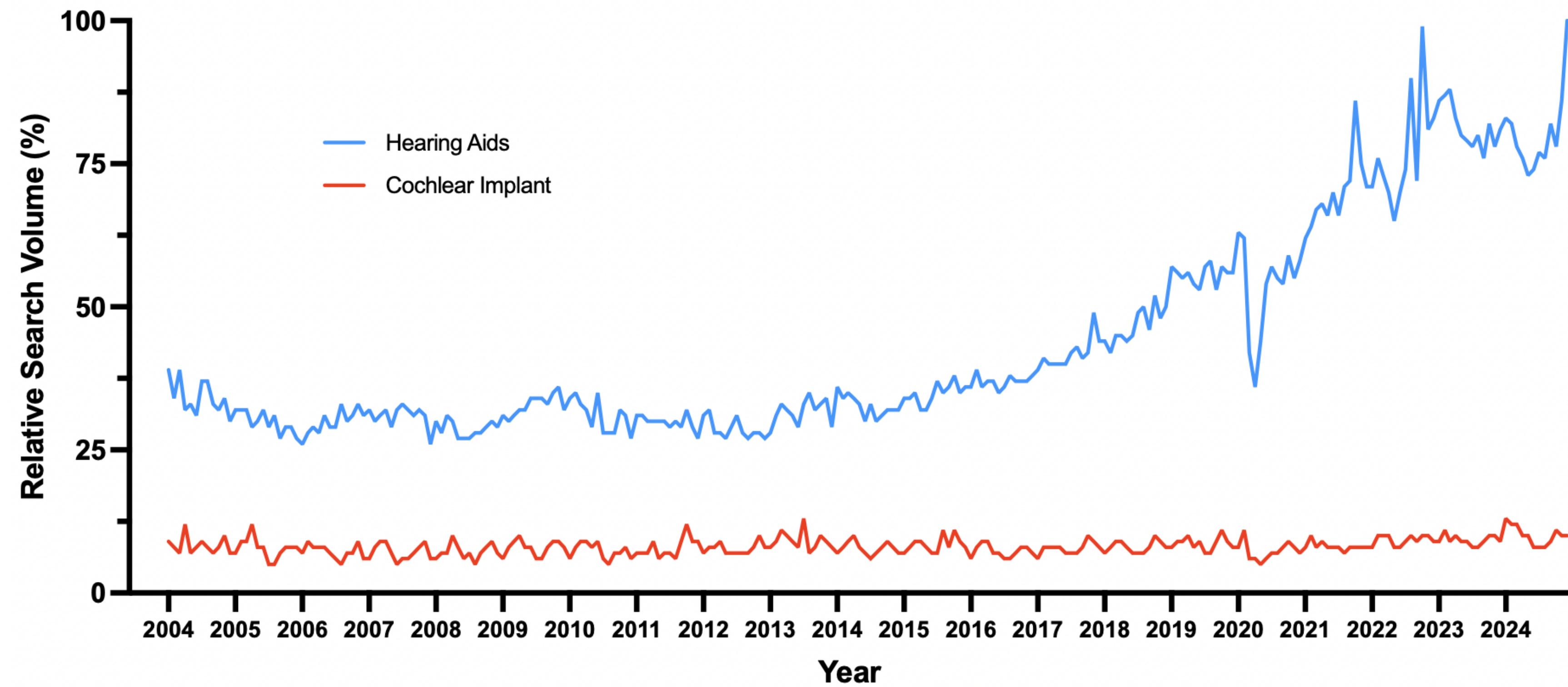
- Google Trends* measures RSVs—not true public awareness—and cannot infer causality; results may be skewed by search term choices and user demographics.
- HA and CI comparisons may be limited by differences in indications and accessibility.

Conclusions

- Unlike CIs, HAs exhibit steadily rising internet activity and substantially cheaper costs.
- Certain campaigns and policies were associated with increased RSVs while others were not.
- More effective public awareness and government strategies are needed to close knowledge and access gaps.

Results

Figure 1. United States RSVs for "Hearing Aids" and "Cochlear Implant" from Jan 2004 to Dec 2024



- From 2004-2024, HA RSV increased from 37% to 100% while CI RSV remained below 13%.

Table 1. Hearing Aid and Cochlear Implant RSVs Around Relevant Events

| Event | HA Event RSV, Average (SD) | HA Year RSV, Average (SD) | P Value | CI Event RSV, Average (SD) | CI Year RSV, Average (SD) | P Value |
|---|----------------------------|---------------------------|---------|----------------------------|---------------------------|---------|
| First International CI Day (Feb 2009) | 79.0 (1.9) | 83.5 (6.5) | <.001 | 21.7 (1.2) | 20.3 (4.5) | .093 |
| Hybrid Implant FDA Approval (Mar 2014) | 94.0 (3.8) | 90.9 (28.6) | .144 | 27.0 (3.9) | 22.1 (3.9) | .045 |
| OTC HA Act (Aug 2017) | 80.0 (4.4) | 81.4 (5.1) | .535 | 13.8 (1.5) | 15.1 (2.4) | .121 |
| "Hearing 20/20" Campaign (Oct 2020) | 89.8 (3.8) | 82.8 (11.8) | .001 | 14.3 (0.8) | 12.2 (9.1) | <.001 |
| New FDA OTC HA Category (Oct 2021) | 92.3 (5.8) | 78.4 (7.0) | .001 | 9.8 (0.8) | 9.5 (1.5) | .456 |
| International CI Day (Feb 2022) | 41.3 (1.5) | 44.3 (9.7) | .045 | 6.0 (0.9) | 5.6 (0.8) | .360 |
| Medicare Expands CI Coverage (Sep 2022) | 43.0 (2.5) | 44.3 (9.7) | .453 | 6.0 (0.7) | 5.6 (0.8) | .310 |
| Final OTC HA FDA Regulations (Oct 2022) | 56.5 (21.8) | 44.3 (9.7) | .235 | 6.5 (0.5) | 5.6 (0.8) | .008 |
| International CI Day (Feb 2023) | 88.0 (2.1) | 80.8 (7.0) | <.001 | 10.6 (0.9) | 10.1 (1.3) | .327 |
| International CI Day (Feb 2024) | 73.0 (3.1) | 73.8 (7.5) | .633 | 11.8 (0.4) | 9.7 (2.6) | <.001 |
| FCC Wireless Connectivity Date (Nov 2024) | 81.7 (9.5) | 73.8 (7.5) | .099 | 9.8 (1.0) | 9.7 (2.6) | .777 |

FCC: Federal Communications Commission; FDA: U.S. Food and Drug Administration; OTC: Over-the-counter

Expected RSV increases

- Hybrid CI approval (Mar 2014)
- "Hearing 20/20" Campaign (Oct 2020)
- New OTC HA category (Oct 2021)
- International CI Day (Feb 2024)

No RSV increase

- International CI Day (Feb 2009, 2022, 2023)
- FCC announcing when cell phones must have wireless connectivity to HAs and CIs (Nov 2024)

Table 2. Estimated Costs of Hearing Aids and Cochlear Implants

| Care Component | Prescription Hearing Aid Costs | | Cochlear Implant Costs | |
|------------------------------|--------------------------------|-------------------------|--------------------------|-------------------------|
| | Submitted (SD) | Post-Reimbursement (SD) | Submitted (SD) | Post-Reimbursement (SD) |
| Evaluation ⁵ | \$234.00 (\$75.39) | \$61.70 (\$5.93) | \$234.00 (\$75.39) | \$61.70 (\$5.93) |
| Device ^{3,4} | \$4,800 | \$0 | \$34,200 | - |
| Implant Surgery ⁵ | - | - | \$10,431.03 (\$7,985.45) | \$2,800.55 (\$2,737.68) |
| Programming ⁵ | - | - | \$366.80 (\$94.81) | \$114.06 (\$10.94) |

- Compared to the \$5,000 cost of prescription HAs, CI submitted charges totaled \$45,000.

References

- Nassiri AM, Ricketts TA, Carlson ML. Current Estimate of Hearing Aid Utilization in the United States. *Otol Neurotol Open*. 2021;1(1):e001. doi:10.1097/ONO.0000000000000001
- Nassiri AM, Sorkin DL, Carlson ML. Current Estimates of Cochlear Implant Utilization in the United States. *Otol Neurotol*. 2022;43(5):e558-e562. doi:10.1097/MAO.0000000000003513
- Sorkin DL. Cochlear implantation in the world's largest medical device market: Utilization and awareness of cochlear implants in the United States. *Cochlear Implants Int*. 2013;14(sup1):S12-S14. doi:10.1179/1467010013Z.00000000076
- Marcos-Alonso S, Almeida-Ayerve CN, Monopoli-Roca C, et al. Factors Impacting the Use or Rejection of Hearing Aids—A Systematic Review and Meta-Analysis. *J Clin Med*. 2023;12(12):4030. doi:10.3390/jcm12124030
- Centers for Medicare & Medicaid Services. Medicare Physician & Other Practitioners by Geography and Service. Published 2024.

