

Hearing Loss and Health Care Outcomes and Experiences: State of the Science

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Patient-Provider Communication

- IOM 2001: Patient-provider communication is a cornerstone of patient-centered care
 - “...care that is respectful of and responsive to individual patient preferences, needs, and value...”
 - Patient-provider communication is related to health care outcomes
 - Time to diagnosis
 - Treatment understanding
 - Long term post-hospitalization outcomes
- Very few patient-provider communication studies even mention consider hearing loss in (Cohen et al. JAGS 2019)
 - <6% include in model (<25% even mention hearing loss)

Hearing Loss and Health Care Expenditures

Table 2. Adjusted Cost of Health Care Services^a

Type of Cost	Adjusted Mean (95% CI), \$		
	Patients With HL Who Received Any HS (n = 36 323)	Patients With HL With No HS Record (n = 244 559)	Patients Without HL (n = 280 882)
Total	13 797 (13 530-14 069)	14 165 (14 091-14 239)	10 629 (10 576-10 681)
Hospital ^b	32 942 (31 962-33 952)	33 116 (32 719-33 518)	33 890 (33 480-34 306)
Outpatient services, including HS	8634 (8515-8755)	7980 (7937-8023)	5473 (5446-5501)
HS	2879 (2871-2887)	NA	NA
Prescription medication	3136 (3082-3192)	2956 (2936-2976)	2348 (2333-2363)

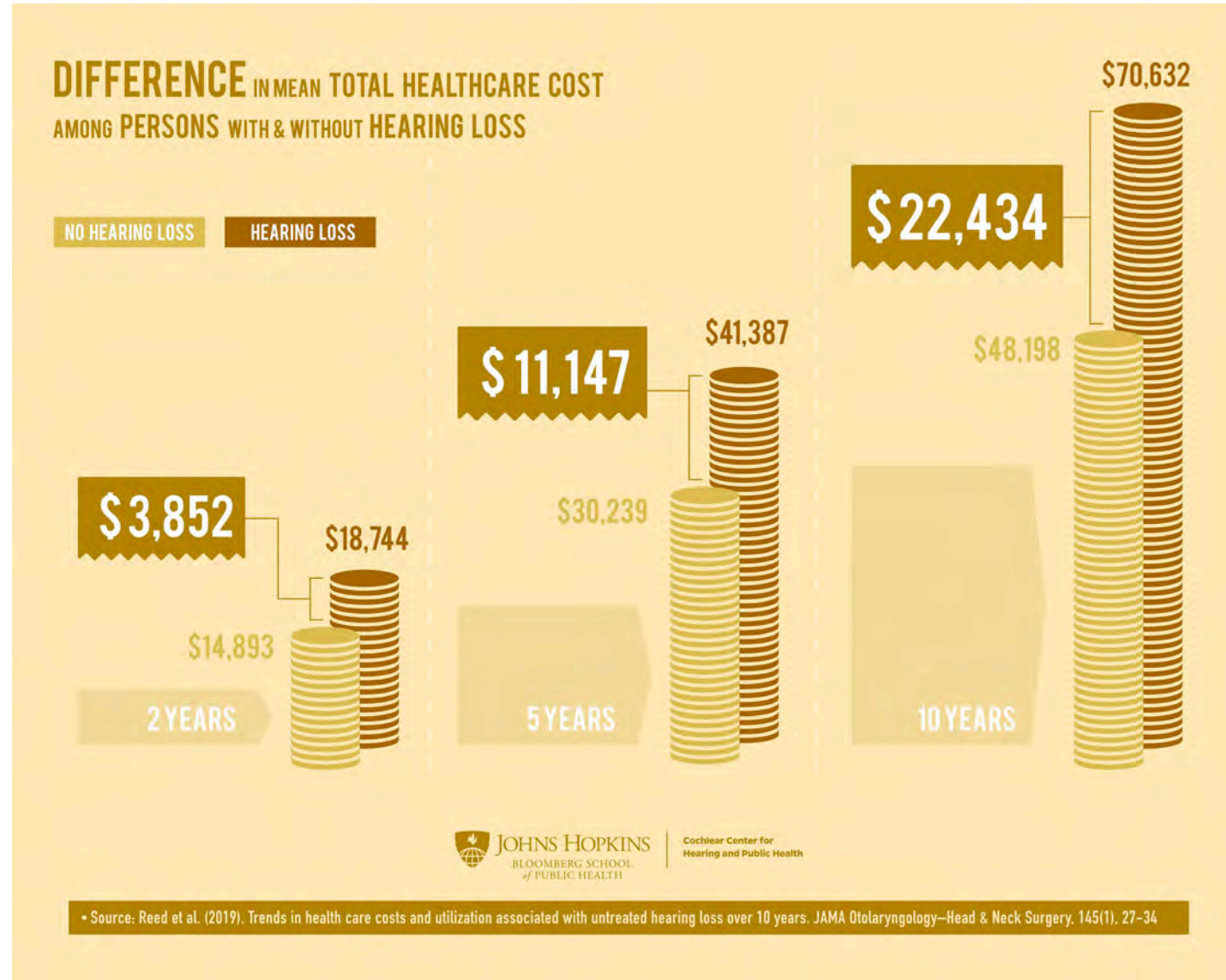
Abbreviations: HL, hearing loss; HS, hearing services; NA, not applicable.

^a Cost of health care services are estimated as the sum of insurance and patient payments (including all payments made by health care professionals and patients as deductibles, copayments, and coinsurance) in real 2010-2013 US\$. All estimates are adjusted for baseline characteristics listed in Table 1; the total cost of care model is also adjusted for cost of HS. Hearing services were

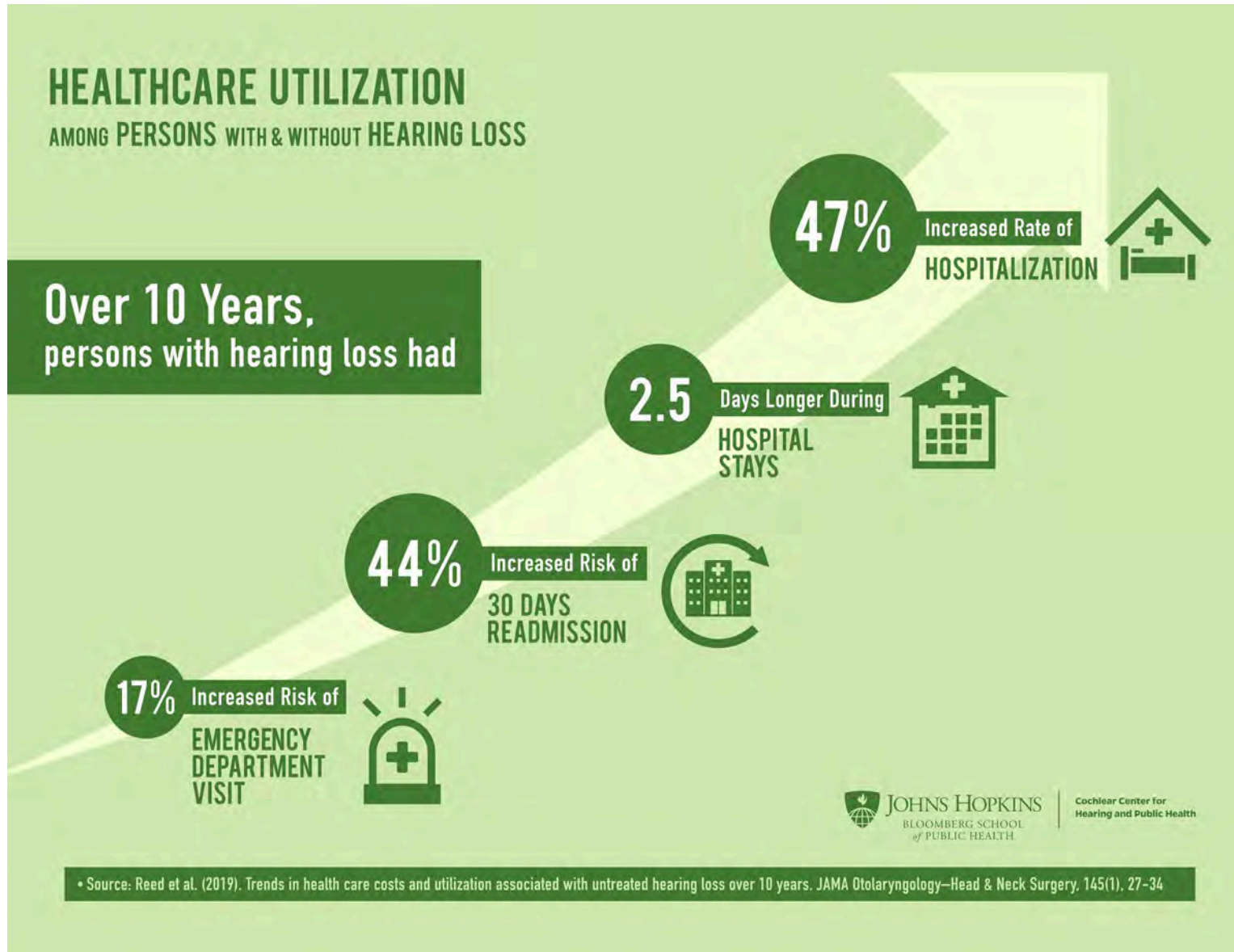
defined by summing payments for services with *Current Procedural Terminology* or Healthcare Common Procedure Coding System⁷ codes indicating service for hearing screening; hearing assessment; ear impressions; fitting, checking, or modifying a hearing aid; conformity evaluation; or other HS except those related to implantation of devices.

^b Includes only patients with a hospital admission.

Hearing Loss and Health Care Expenditures



Hearing Loss and Health Care Utilization



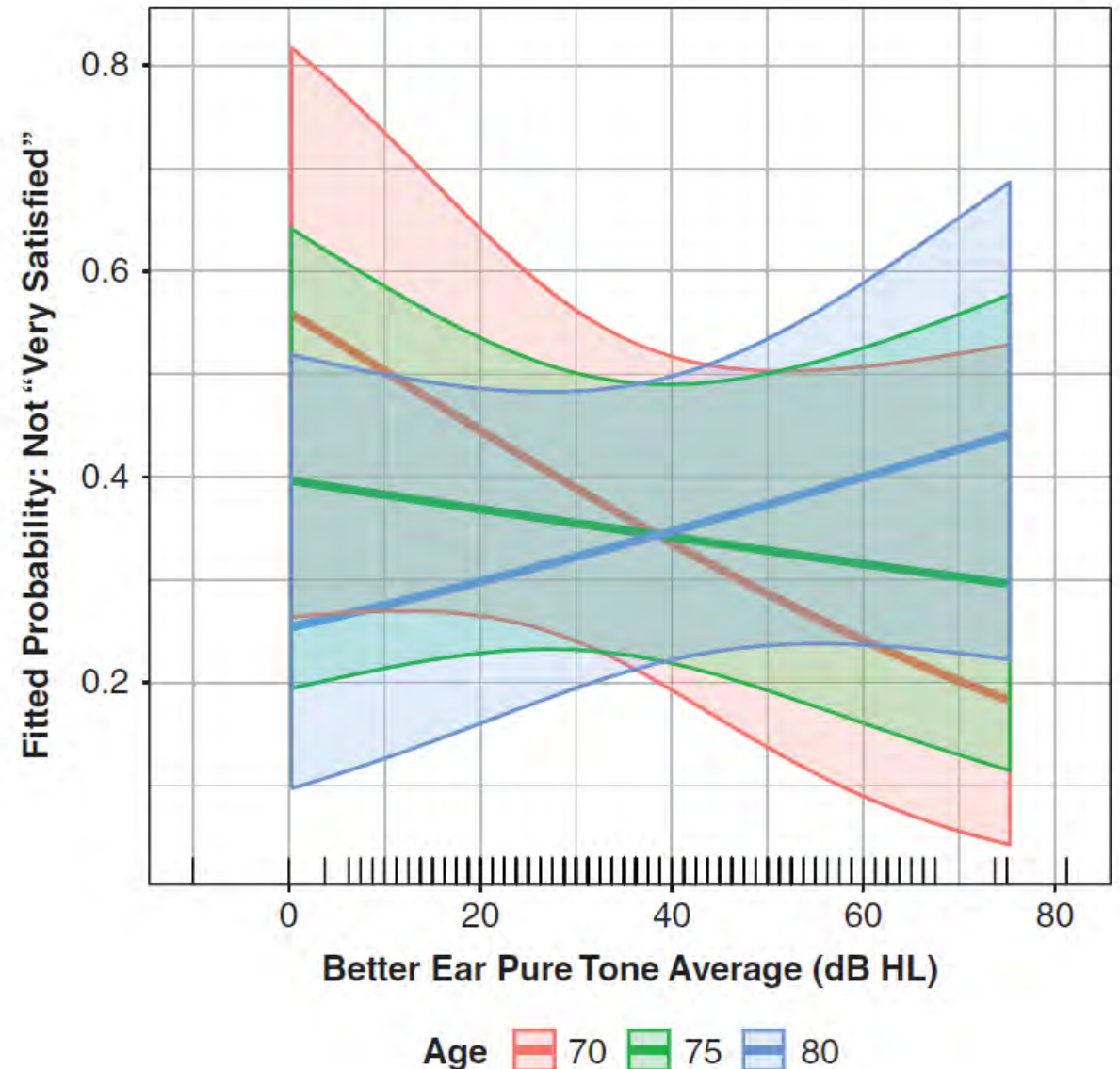
Hearing Loss and Satisfaction with Care?

Odds of dissatisfaction with health care

Variable	Odds Ratio(95% CI)	SE	P
Functional Hearing Loss			
No trouble	REF		
A little trouble	1.468(1.060 – 2.029)	0.240	0.021
A lot of trouble	1.737(1.150 – 2.623)	0.361	0.009

Adjusted for Usual place of care, age, sex, race, marriage, education, income, general health, functional limitations, comorbidity count

The odds of being less than optimally satisfied by hearing loss (HL) for 70-, 75-, and 80-year-old individuals.



75-year-old participant: every 10 dB increase in hearing loss, the odds of being less satisfied increased 0.94 (95% CI:0.74-1.20).

85-year-old: for every 10 dB increase in hearing loss, the odds of being less satisfied increased 1.33 (95% CI:0.96-1.83)

Help-Seeking Behavior by Hearing Status

Table 3. Relative Risks of Healthcare-Seeking Behaviors Over the Past Year Among Medicare Beneficiaries by Functional Hearing Status.^{a,b}

Functional hearing status	Unadjusted model		Adjusted for socio-demographics ^c		Adjusted for socio-demographics and general health determinants ^d	
	RRR	95% CI	RRR	95% CI	RRR	95% CI
Avoiding seeing the doctor						
No trouble	REF		REF		REF	
A little trouble	.93	.85–1.02	1.01	.93–1.09	.98	.90–1.07
A lot of trouble	1.31	1.15–1.50	1.29	1.14–1.46	1.22	1.06–1.40
Delaying seeing the doctor when feeling sick						
No trouble	REF		REF		REF	
A little trouble	1.15	1.08–1.23	1.10	1.04–1.17	1.10	1.04–1.17
A lot of trouble	1.25	1.11–1.42	1.27	1.13–1.43	1.27	1.12–1.43
Worrying about health more than others their age						
No trouble	REF		REF		REF	
A little trouble	.93	.86–1.01	1.14	1.06–1.22	.99	.92–1.06
A lot of trouble	1.21	1.04–1.41	1.38	1.21–1.58	1.04	.92–1.17
Keeping to him/herself when feeling sick						
No trouble	REF		REF		REF	
A little trouble	1.04	.98–1.11	1.08	1.01–1.16	1.05	.98–1.12
A lot of trouble	1.13	1.01–1.27	1.12	1.00–1.25	1.04	.93–1.17

RRR = relative risk ratio; CI = confidence interval; SE = standard error; REF = reference.

^aData derived from the 2016 Medicare Current Beneficiary Survey public-use file ($n = 12,140$).

^bSurvey weights applied based on Medicare Current Beneficiary Survey 2016 Data User's Guide ([Office of Enterprise Data and Analytics, Centers for Medicare & Medicaid Services, 2018](#)) (weighted $n = 50,984,256$).

^cLog-binominal regression model adjusted for socio-demographics including age, race/ethnicity, education, income, and marital status; the pseudo-R² of this model = .043 (outcome = avoiding seeing the doctor), .027 (outcome = delaying seeing the doctor when feeling sick), .180 (outcome = worrying about health more than others their age), and .019 (outcome = keeping to him/herself when feeling sick), respectively. The AIC of this model = 13,623 (outcome = avoiding seeing the doctor), 15,857 (outcome = delaying seeing the doctor when feeling sick), 15,825 (outcome = worrying about health more than others their age), and 13,605 (outcome = keeping to him/herself when feeling sick), respectively.

^dLog-binominal regression model adjusted for socio-demographics and general health determinants including general health, functional limitations, self-reported history of dementia or Alzheimer's disease, and self-reported history of depression; the pseudo-R² of this model = .047 (outcome = avoiding seeing the doctor), .028 (outcome = delaying seeing the doctor when feeling sick), .260 (outcome = worrying about health more than others their age), and .024 (outcome = keeping to him/herself when feeling sick), respectively. The AIC of this model = 13,605 (outcome = avoiding seeing the doctor), 15,871 (outcome = delaying seeing the doctor when feeling sick), 10,051 (outcome = worrying about health more than others their age), and 15,762 (outcome = keeping to him/herself when feeling sick), respectively.

Unmet Health Needs by Hearing Status

EXHIBIT 2

Odds of reporting three outcome variables suggesting unmet health care needs among Medicare beneficiaries, by self-reported functional hearing difficulty, 2016

Level of functional hearing difficulty	Odds ratios for outcome variables		
	No usual source of care	Not obtaining needed medical care	Not filling a prescription
No trouble hearing	Ref	Ref	Ref
A little trouble hearing	1.038	1.595****	1.440***
A lot of trouble hearing	1.489**	1.854****	1.556**

SOURCE Authors' analysis of data from the Medicare Current Beneficiary Survey (MCBS), 2016. **NOTES** Survey weights were applied according to MCBS instructions. Logistic regression models were adjusted for age, sex, race/ethnicity, educational attainment, income-to-poverty ratio, marital status, Medicare Advantage plan, general health, functional limitations, and comorbidity count. ** $p < 0.05$
*** $p < 0.01$ **** $p < 0.001$

Hearing Aid Use?

- Hearing aid use is associated with similarly protective factors to the outcomes of interest

Matched Sample

Outcome Variables	No Hearing Care Services, Mean (95% CI)	Uses Hearing Care Services, Mean (95% CI)	Difference, Mean (95% CI)
Total Medicare spending, \$	10,709 (8878 to 12,541)	8196 (6670 to 9723)	2513 (150 to 4876) ^a
Medicare spending by service type, \$			
Home health	747 (517 to 977)	460 (274 to 645)	287 (7 to 568) ^a
Hospice	244 (28 to 459)	233 (26 to 440)	11 (-279 to 301)
Inpatient	3395 (2565 to 4224)	2513 (1640 to 3386)	882 (-311 to 2076)
Medical practitioner	2246 (1929 to 2563)	2238 (1887 to 2589)	8 (-484 to 500)
Outpatient	1176 (678 to 1674)	803 (538 to 1067)	374 (-197 to 944)
Prescription drugs	1492 (998 to 1986)	1416 (1194 to 1637)	76 (-476 to 629)
Skilled nursing facility	1192 (600 to 1785)	368 (112 to 623)	825 (193 to 1455) ^b

Abbreviation: CI, confidence interval.


^a*P* < .05.

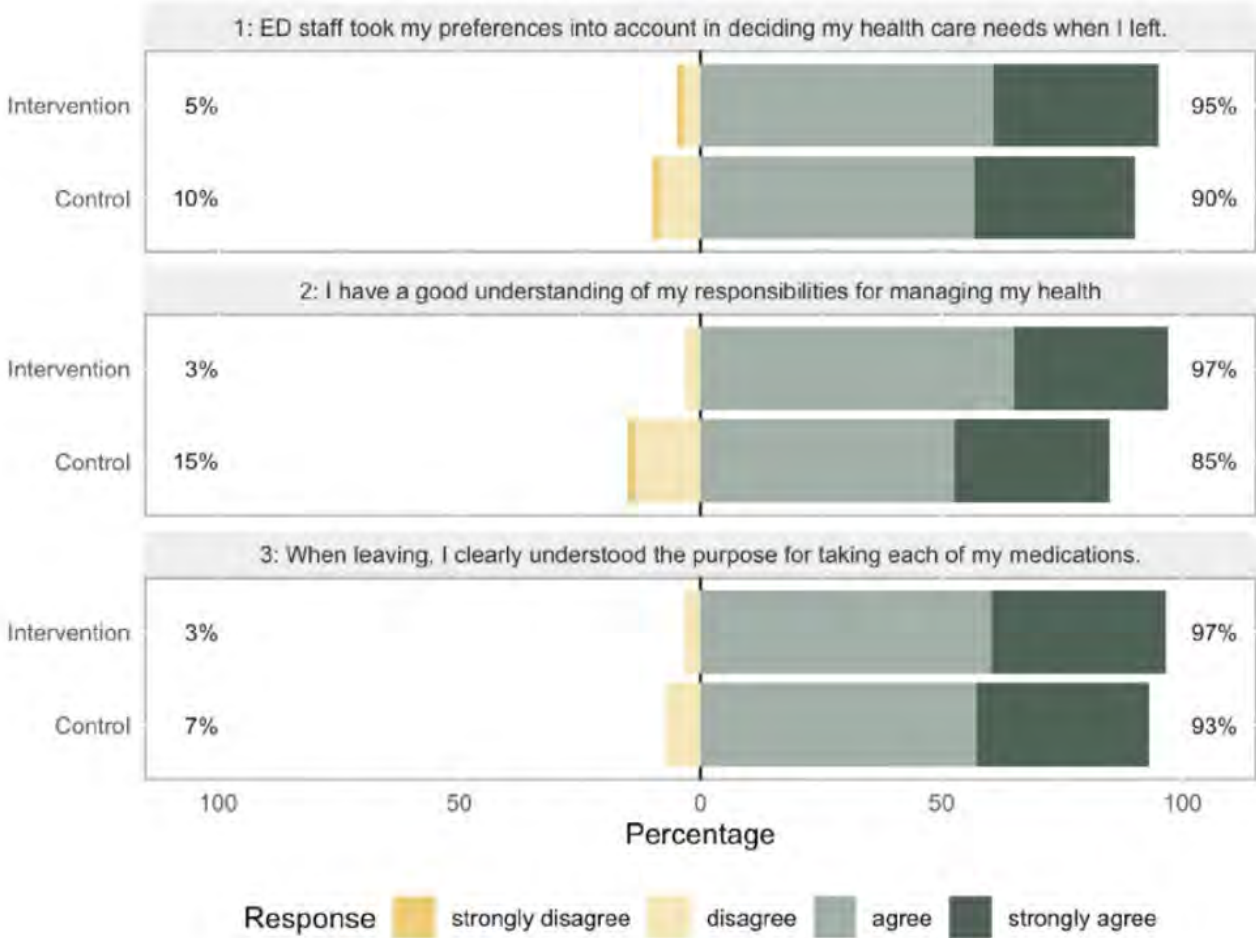
^b*P* < .01.

Hearing Care Services and Health Care Costs

- Older adults with hearing aids using hearing care services had total Medicare spending \$2,513 less than those who did not use hearing care services
- Post-acute care greatest difference

The HEAR-VA Pilot Study: Hearing Assistance Provided to Older Adults in the Emergency Department

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Take Home

- Hearing is a rarely considered factor during health care
- Overwhelming belief that sensory loss limits engagement with others and isolates patients but little objective research
- Lots of work on health outcomes but less work on understanding health care seeking behaviors
 - Little work using clinical measures of HL
- Sensory loss may be a preventable and modifiable risk factor for many negative health outcomes during hospitalization and poorer health care utilization
 - Simple adjustments in communication may prevent delirium
 - Deeper research is needed – RCT, Implementation Science



Thank You

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