Hearing Loss and the Healthcare system

Nicholas S. Reed, AuD
Assistant Professor | Dept. Otolaryngology
Core Faculty | Cochlear Center for Hearing and Public Health
Johns Hopkins University
Baltimore, Maryland
Prevalence of Hearing Loss in the United States, 2001-2008

Hearing loss defined as a better-ear PTA of 0.5-4kHz tones > 25 dB

Lin et al., Arch Int Med. 2011
Hearing Loss and Health Aging

- Cognitive Vitality & Avoiding Dementia
- Avoiding Injury
- Maintaining Physical Mobility & Activity
- Keeping Socially Engaged & Active
- Health Resource Utilization

Healthy Aging

Hearing Loss

Lin JAMA 2014
Hearing Loss & Hearing Aid Use
Prevalence in the U.S. 1999-2006

Chien, W. Arch Int Med. 2012
Hearing Loss: Primer

**AUDIOPGRAM**

*An example presbyacousis (sloping high-frequency hearing loss) synonymous with the ageing process.*
Hearing Loss: Primer

Diagram showing the relationship between dB (decibels) and Hz (hertz) to illustrate different levels of hearing loss. The levels are categorized into:

- **Normal** (up to 25 dB HL)
- **Mid** (26 to 40 dB HL)
- **Moderate** (41 to 70 dB HL)
- **Severe** (71 to 90 dB HL)
- **Profound** (including deafness (+91 dB HL))
Hearing Loss: Primer

“You should go to the pharmacy before you get to your house.”
Patient-Provider Communication

- IOM 2001: Patient-provider care is cornerstone of patient-centered care
  - “...care that is respectful of and responsive to individual patient preferences, needs, and value”

- Only 23.9% (16/67) of patient-provider communication papers involving older adults included any mention of hearing loss
  - Of those 16, only 4 included hearing loss in analyses

- Systematic review of inpatient patient-provider communication
  - 13/13 studies that included hearing loss found it associated with poorer patient-provider communication

Patient-Provider Communication

- Patient-provider communication impacts healthcare metrics
  - quality of care
  - time to diagnosis
  - length of stay
  - treatment adherence
  - satisfaction with care

Shukla et al. 2018 (under review); IOM 2001
Objectives of Talk

Part 1; Secondary Analyses

- Hearing Loss and satisfaction: Cross sectional analyses
- The impact of hearing loss on health care cost and utilization measures

Part 2; Primary Data

- Development and feasibility investigation of a systematic strategy to address hearing loss in the inpatient setting
Secondary Analysis
Satisfaction - Methods

Data Sources:

- Medicare Current Beneficiaries Survey 2015
  - Sample weighted national sample of 12,311 US Medicare Beneficiaries
  - Interview conducted survey (8% respond by proxy)

- Atherosclerosis Risk in Communities Study
  - Objective audiometry pilot offered to ~300 persons
  - Washington County, MD site

Reed et al. (2018) JAGS (in press); Reed et al. 2018 (in-prep)
Secondary Analysis
Satisfaction - Methods

Exposure: Hearing Loss

- Medicare Current Beneficiary Survey
  - No trouble hearing
  - A little trouble hearing
  - A lot of trouble hearing
  - If applicable: w/ hearing aid

- Atherosclerosis Risk in Communities
  - Objective pure-tone audiometry
  - Conducted in sound booth with calibrated equipment
  - Pure-tone average (speech frequency sounds)
  - Defined according to W.H.O criteria

Reed et al. (2018) JAGS (in press); Reed et al. 2018 (in-prep)
Secondary Analysis

Satisfaction - Methods

Outcome: Self-report satisfaction

- Medicare Current Beneficiaries Survey:
  - “Please tell me how satisfied you have been with the following: The overall quality of the health care [you have] received [over the past year/since (reference date)].”
  - Very Satisfied, Satisfied, Dissatisfied, Very Dissatisfied

- Atherosclerosis Risk in Communities:
  - “Overall, how satisfied are you with the quality of care you received from your healthcare providers over the past 12 months?”
  - Very Dissatisfied, Somewhat Dissatisfied, Somewhat Satisfied, Very Satisfied

Reed et al. (2018) JAGS (in press); Reed et al. 2018 (in-prep)
Outcome: Self-report satisfaction

- Medicare Current Beneficiaries Survey:
  - “Please tell me how satisfied you have been with the following: The overall quality of the health care [you have] received [over the past year/since (reference date)].”
  - Very Satisfied, Satisfied, Dissatisfied, Very Dissatisfied

- Atherosclerosis Risk in Communities:
  - “Overall, how satisfied are you with the quality of care you received from your healthcare providers over the past 12 months?”
  - Very Dissatisfied, Somewhat Dissatisfied, Somewhat Satisfied, Very Satisfied

Reed et al. (2018) JAGS (in press); Reed et al. 2018 (in-prep)
# Secondary Analysis

**Odds Dissatisfaction With Care**

## Medicare Current Beneficiaries Survey:

<table>
<thead>
<tr>
<th>Self-Report Difficulty Hearing</th>
<th>Total N (unweighted)</th>
<th>Total N (weighted)</th>
<th>Dissatisfied with Care</th>
<th>Odds Ratio [95% CI]</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Trouble Hearing</td>
<td>5915</td>
<td>26.1 million</td>
<td>3.10%</td>
<td>REF</td>
<td></td>
</tr>
<tr>
<td>A little Trouble Hearing</td>
<td>4667</td>
<td>19.3 million</td>
<td>4.64%</td>
<td>1.47 [1.06-2.03]</td>
<td>0.021</td>
</tr>
<tr>
<td>A Lot of Trouble Hearing</td>
<td>865</td>
<td>3.2 million</td>
<td>6.52%</td>
<td>1.74 [1.15-2.62]</td>
<td>0.009</td>
</tr>
<tr>
<td>Total</td>
<td>11447</td>
<td>48.6 Million</td>
<td>3.94%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Logistic Regression model includes age, sex, race, income, education level, general health, functional limitations, and martial status; Sensitivity Analyses using ordinal logistic and excluding disabled led to similar results.

Reed et al. (2018) JAGS (in press); Reed et al. 2018 (in-prep)
Secondary Analysis

Odds Dissatisfaction With Care

➢ Atherosclerosis Risk in Communities:

➢ 75-year-old participant:
  ➢ Every 10 dB increase in HL, odds of < satisfied increased .94 (95% CI:0.74-1.20).

➢ 85-year-old participant:
  ➢ Every 10 dB increase in HL, odds of < satisfied increased 1.33 (95% CI:0.96-1.83).

Note: Logistic regression model for odds of less than optimal satisfaction and hearing loss adjusted for age, sex, global cognitive score, comorbidity count (diabetes, hypertension, myocardial infarction, asthma, cancer, stroke, and hospital stay).

Reed et al. (2018) JAGS (in press); Reed et al. 2018 (in-prep)
Objectives of Talk

Part 1; Secondary Analyses
- Hearing Loss and satisfaction: A cross sectional analysis
- The impact of hearing loss on health care cost and utilization measures

Part 2; Primary Data
- Development and feasibility investigation of a systematic strategy to address hearing loss in the inpatient setting
Secondary Analysis

Cost/Utilization - Methods

Data Source:

- OptumLabs® Data Warehouse (Jan 1, 2000 to Dec 31, 2014)
- 125 million de-identified data claims from across US
- Private and Medicare Advantage
- Physician, hospital, prescription claims information
- Socioeconomic and satisfaction measures (survey)

Reed et al. (2018) JAMA-OTO
Secondary Analysis
Cost/Utilization - Methods

Outcome Variables:

1. Medical Costs
   - Total
     - Health plan paid
     - Out of Pocket
     - Isolated to hearing loss
2. Number inpatient hospitalizations
3. Total days hospitalized
4. Number of readmissions with 30-days of discharge
5. Number Emergency Department Visits
6. Number of days with at least one outpatient visit

Reed et al. (2018) JAMA-OTO
Secondary Analysis

Cost/Utilization - Methods

Exposure Variable:

- Evidence of Hearing Loss from ICD codes
  - ≥ 50 years
  - No hearing aid usage evidence from ICD codes
  - No hearing loss ICD code two years prior to index date
  - Included
    - ICD codes for hearing loss and/or sensorineural hearing loss
  - Excluded
    - ICD hearing codes such as sudden, hyperacusis, neural, conductive, central, etc.
    - Persons with same year code related to ear disease such as otorrhea, otalgia

Reed et al. (2018) JAMA-OTO
Sample:

- Propensity matched (1:1) to those with evident hearing loss to those without any evidence of hearing loss (at any point)
- Matching variables
  - Insurance type
  - Demographic (Age, Sex, Education, Income)
  - Census geographic region
  - Education level
  - Charlson comorbidity index
  - Number of office visits, inpatient stays, ED visits
  - Dementia, depression, stroke, cancer (breast, prostate, renal cell, colorectal)
  - Baseline medical costs

Reed et al. (2018) JAMA-OTO
## Baseline Characteristics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>2-year</th>
<th>5-year</th>
<th>10-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing loss</td>
<td>No hearing loss</td>
<td>Hearing loss</td>
<td>No hearing loss</td>
</tr>
<tr>
<td>(n=77,207)</td>
<td>(n=77,207)</td>
<td>(n=22,426)</td>
<td>(n=22,426)</td>
</tr>
<tr>
<td><strong>Age, mean (sd)</strong></td>
<td><strong>63.80 (9.74)</strong></td>
<td><strong>63.79 (9.70)</strong></td>
<td><strong>61.71 (9.22)</strong></td>
</tr>
<tr>
<td><strong>Female, N (%)</strong></td>
<td><strong>37,309 (48.3)</strong></td>
<td><strong>37,155 (48.1)</strong></td>
<td><strong>10,792 (48.1)</strong></td>
</tr>
<tr>
<td><strong>Race, N (%)</strong></td>
<td><strong>1,707 (2.2)</strong></td>
<td><strong>1,626 (2.1)</strong></td>
<td><strong>385 (1.7)</strong></td>
</tr>
<tr>
<td><strong>Region, N (%)</strong></td>
<td><strong>21,896 (28.4)</strong></td>
<td><strong>21,951 (28.4)</strong></td>
<td><strong>6,903 (30.8)</strong></td>
</tr>
<tr>
<td><strong>Net worth, N (%)</strong></td>
<td><strong>22,874 (29.6)</strong></td>
<td><strong>22,951 (29.7)</strong></td>
<td><strong>7,158 (31.3)</strong></td>
</tr>
<tr>
<td><strong>Education, N (%)</strong></td>
<td><strong>231 (0.3)</strong></td>
<td><strong>219 (0.3)</strong></td>
<td><strong>39 (0.2)</strong></td>
</tr>
<tr>
<td><strong>Charlson Comorbidity Index, mean (sd)</strong></td>
<td><strong>1.12 (1.71)</strong></td>
<td><strong>1.12 (1.68)</strong></td>
<td><strong>0.89 (1.48)</strong></td>
</tr>
<tr>
<td><strong>Acute Myocardial Infarction, N (%)</strong></td>
<td><strong>324 (0.4)</strong></td>
<td><strong>301 (0.4)</strong></td>
<td><strong>87 (0.4)</strong></td>
</tr>
<tr>
<td><strong>Depression, N (%)</strong></td>
<td><strong>8,358 (10.8)</strong></td>
<td><strong>8,325 (10.8)</strong></td>
<td><strong>2,147 (9.6)</strong></td>
</tr>
<tr>
<td><strong>Dementia, N (%)</strong></td>
<td><strong>2,104 (2.7)</strong></td>
<td><strong>2,189 (2.8)</strong></td>
<td><strong>381 (1.7)</strong></td>
</tr>
<tr>
<td><strong>Stroke, N (%)</strong></td>
<td><strong>1,963 (2.5)</strong></td>
<td><strong>1,953 (2.5)</strong></td>
<td><strong>461 (2.1)</strong></td>
</tr>
<tr>
<td><strong>Coronary Artery Disease, N (%)</strong></td>
<td><strong>8,744 (11.3)</strong></td>
<td><strong>8,850 (11.5)</strong></td>
<td><strong>2,119 (9.4)</strong></td>
</tr>
</tbody>
</table>
# Secondary Analysis

**Cost/Utilization - Results**

Post-Match, Unadjusted Health Service Costs and Utilization, Hearing Loss vs. No Hearing Loss

<table>
<thead>
<tr>
<th>Healthcare Outcome Measure</th>
<th>2-year</th>
<th>5-year</th>
<th>10-year</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Hearing Loss</em></td>
<td><em>No hearing loss</em></td>
<td><em>Hearing Loss</em></td>
<td><em>No hearing loss</em></td>
</tr>
<tr>
<td>(n=77,207)</td>
<td>(n=77,207)</td>
<td>(n=22,426)</td>
<td>(n=22,426)</td>
</tr>
<tr>
<td><strong>Medical costs, mean (sd)</strong></td>
<td>$18,744.36 ($40,628.30)</td>
<td>$14,892.70 ($32,038.23)</td>
<td>$41,386.64 ($64,387.99)</td>
</tr>
<tr>
<td><strong>Non-hearing loss Medical Costs, mean (sd)</strong></td>
<td>$18,362.40 ($40,613.22)</td>
<td>$14,892.70 ($32,038.23)</td>
<td>$40,916.95 ($64,371.86)</td>
</tr>
<tr>
<td><strong>Inpatient stays, mean (sd)</strong></td>
<td>0.28 (0.78)</td>
<td>0.24 (0.69)</td>
<td>0.62 (1.34)</td>
</tr>
<tr>
<td><strong>Inpatient days, mean (sd)</strong></td>
<td>1.57 (6.78)</td>
<td>1.31 (5.43)</td>
<td>3.25 (9.83)</td>
</tr>
<tr>
<td><strong>Outpatient visit days, mean (sd)</strong></td>
<td>40.18 (36.49)</td>
<td>32.72 (35.18)</td>
<td>90.76 (72.64)</td>
</tr>
<tr>
<td><strong>Non-hearing loss office visit days, mean (sd)</strong></td>
<td>39.62 (36.17)</td>
<td>32.47 (35.00)</td>
<td>89.69 (71.99)</td>
</tr>
<tr>
<td><strong>ER visits, mean (sd)</strong></td>
<td>0.64 (1.37)</td>
<td>0.52 (1.30)</td>
<td>1.39 (2.85)</td>
</tr>
<tr>
<td><strong>30 Day Readmission, N (%)</strong></td>
<td>1,542 (2.0)</td>
<td>1,198 (1.6)</td>
<td>829 (3.7)</td>
</tr>
</tbody>
</table>

Reed et al. (2018) JAMA-OTO
Difference in Unadjusted Mean Patient Paid, Plan Paid, and Total Costs, Hearing Loss vs. No Hearing Loss

Hearing loss associated with a 46.5% increase in healthcare costs over a 10-year period.

Reed et al. (2018) JAMA-OTO
Secondary Analysis

Results

Unadjusted Difference in 30-day Readmissions for Subjects with Uncorrected Hearing Loss vs. No Hearing Loss

Hearing loss associated with a 44% increase in risk of 30-day readmissions over 10-years

RD: Risk difference; CI: Confidence interval

Reed et al. (2018) JAMA-OTO
Hearing loss is associated with increase healthcare expenditures and resource utilization over a 10-year period.

Hearing Loss is associated with higher odds of dissatisfaction with medical care.

Patient-Provider communication as a mechanism?

Limitations:
- Claims data has inherent limitations
- Exposure capture (those with means to access healthcare)
- Hearing loss individuals in non-hearing loss group
- No indirect costs (hearing aids?)
- Residual unmeasured confounding (despite matching)
Objectives of Talk

Part 1; Secondary Analyses
- The impact of hearing loss on health care cost and utilization measures
- Hearing Loss and satisfaction: A cross sectional analysis

Part 2; Primary Data
- Development and feasibility investigation of a systematic strategy to address hearing loss in the inpatient setting
Screening and Intervention

Background

Development and feasibility investigation of a systematic strategy to address hearing loss in the inpatient setting

- No universal program to identify and intervene on hearing loss in adults in the hospital system
- Many calls for adult hearing screening but most have ignored basic principles of implementation science
Screening and Intervention

Background

Implementation Science: Translating evidence into sustainable practice

Current state of hearing screenings for adults:
- Run by foreign units (audiology)
- Single person screening all
- Generally from outside
- Purpose is generally for referral for formal hearing care
- Indirect implications
- Use specialized equipment
- Training, time
- Label patient (puts responsibility on patient)
- Lack training programs
- Lack of “buy-in”

1. Summarise the evidence
   Identify interventions associated with improved outcomes
   Select interventions with the largest benefit and lowest barriers to use
   Convert interventions to behaviours

2. Identify local barriers to implementation
   Observe staff performing the interventions
   “Walk the process” to identify defects in each step of implementation
   Enlist all stakeholders to share concerns and identify potential gains and losses associated with implementation

3. Measure performance
   Select measures (process or outcome)
   Develop and pilot test measures
   Measure baseline performance

4. Ensure all patients receive the interventions
   Implement the “four Es” targeting key stakeholders from front line staff to executives

- Engage
  Explain why the interventions are important

- Educate
  Share the evidence supporting the interventions

- Evaluate
  Regularly assess for performance measures and unintended consequences

- Execute
  Design an intervention “toolkit” targeted at barriers, standardisation, independent checks, reminders, and learning from mistakes

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
ENGaging Healthcare to Address Communication Environments

- Imbedded within current workflow
- Universal training end education sessions
  - Improve fidelity and “buy-in”
- Purpose is to improve patient-provider communication
  - Direct implications for staff
- Onus of communication placed on staff/providers
- Self-report hearing loss
  - Minimizes training, time

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
Admission: Screen for hearing loss using self-report as part of common procedures

No Hearing Loss → No Intervention

Mild Hearing Loss → Communication Signage

≥Moderate Hearing Loss → Signage + Amplifier

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
Communication Tips for Patient with Hearing Loss

- Face patient when talking to them
- Turn down/ Reduce/ Remove background noise sources
- Ensure you have patient’s

How to Use Your Hearing Device

1. Turn the Device On
   - Turn the device on by moving the volume wheel until it clicks

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
ENHANCE

Background

COMMUNICATION TIPS

DON'T Talk with
- Face Covered
- Back Turned

Limit Background Noises
- Hearing Device Should be in Use

Face Patient When Talking To Them
- Turn off TV
- Close the door
- Reduce Extra Conversations

Ensure You Have Patient’s Attention

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
From Jan – Mar 2018: Feasibility Trial

Med A and Med B at Bayview Hospital (Community Hospital)

Engage (prior):

- 1 meeting with Armstrong Institute
- 2 meetings with ADA compliance office
- 3 meetings with Aesthetics Committee
- 3 meetings with Bayview Med A+B administration
- 5 meetings with Med A +B clinical nurse specialists, charge nurses
  
  **Champion:** Clinical nurse specialist

- 6 lunch and learn events with staff (3 each Med A and B)

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
ENHANCE
3-month feasibility

Educate:

- 6 lunch and learn prior to kick off
- Materials were printed and distributed to all staff and providers
- 8 lunch and learn during program (~15-20 minutes)
  - 4 in 2nd week
  - 4 in 4th week
- 16 check-in huddles (~1-2 minutes)
  - 4 in 1st week
  - 4 in 3rd week
  - 4 in 6th week
  - 4 in 8th week
- Amounts to 8 formal education opportunities per shift over period

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
ENHANCE
3-month feasibility

Evaluate: Patient perspective

502 screenings captured (77.9% of all admitted per charge nurse number reports)

41 indicated form not completed (15 unresponsive patient, 14 refusals, 12 time constraints)

543/644 for 84.3% capture rate

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
<table>
<thead>
<tr>
<th></th>
<th>Screened (n=502)</th>
<th>No HL (n=264)</th>
<th>Mild HL (n=157)</th>
<th>≥ Moderate HL (n=81)</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (sd)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>64.03 years (±7.87)</td>
<td>72.87 years (±7.52)</td>
<td>81.23 years (±6.71)</td>
<td>67.34 years (±4.35)</td>
</tr>
<tr>
<td>Device Distributed</td>
<td></td>
<td>0/264 (0%)</td>
<td>7/157 (0.4%)</td>
<td>75/81 (91.4%)</td>
<td>82/502 (16.3%)</td>
</tr>
<tr>
<td>Discharge Completed</td>
<td></td>
<td>121/264 (45.8%)</td>
<td>114/157 (72.6%)</td>
<td>71/81 (87.6%)</td>
<td>306 (60.9%)</td>
</tr>
<tr>
<td>Previous communication troubles?</td>
<td></td>
<td>Never</td>
<td>Sometimes</td>
<td>Most of the time</td>
<td>Always</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23 (19.0%)</td>
<td>71 (58.6%)</td>
<td>21 (17.3%)</td>
<td>6 (04.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17 (14.9%)</td>
<td>42 (36.8%)</td>
<td>46 (40.4%)</td>
<td>9 (07.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 (04.2%)</td>
<td>11 (15.5%)</td>
<td>41 (57.7%)</td>
<td>16 (22.5%)</td>
</tr>
<tr>
<td>Hearing an issue previously in communication?</td>
<td></td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>116 (95.8%)</td>
<td>5 (04.1%)</td>
<td>82 (71.9%)</td>
<td>32 (28.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19 (26.8%)</td>
<td>52 (73.2%)</td>
<td>5 (04.1%)</td>
<td>32 (28.1%)</td>
</tr>
<tr>
<td>Improved communication during current stay?</td>
<td></td>
<td>No difference</td>
<td>Slight Improvement</td>
<td>Improved A little</td>
<td>Improved A lot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21 (17.4%)</td>
<td>36 (29.8%)</td>
<td>46 (38.0%)</td>
<td>18 (14.9%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 (02.6%)</td>
<td>21 (18.4%)</td>
<td>58 (50.9%)</td>
<td>32 (28.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 (05.6%)</td>
<td>9 (12.7%)</td>
<td>17 (23.9%)</td>
<td>41 (57.7%)</td>
</tr>
<tr>
<td>Satisfied with communication during current stay?</td>
<td></td>
<td>Not Satisfied</td>
<td>Somewhat Satisfied</td>
<td>Mostly Satisfied</td>
<td>Completely Satisfied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11 (9.09%)</td>
<td>12 (9.92%)</td>
<td>18 (14.9%)</td>
<td>80 (66.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 (04.4%)</td>
<td>13 (11.4%)</td>
<td>15 (13.2%)</td>
<td>81 (71.1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 (01.4%)</td>
<td>4 (05.6%)</td>
<td>7 (09.9%)</td>
<td>59 (53.1%)</td>
</tr>
<tr>
<td>See communication program used in other healthcare settings?</td>
<td></td>
<td>No</td>
<td>Yes</td>
<td>Yes, with changes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>21 (17.4%)</td>
<td>92 (76.0%)</td>
<td>8 (06.6%)</td>
<td>6 (05.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 (05.3%)</td>
<td>103 (90.4%)</td>
<td>5 (04.4%)</td>
<td>3 (04.2%)</td>
</tr>
</tbody>
</table>
ENHANCE
3-month feasibility

Evaluate: Provider/Staff Perspective

“Best intervention ever! I normally have a loud voice and some people still can't hear me, but once they put the headphones on, then they can hear. It's nice not loosing your voice :)

“Such a wonderful program for patients. This has come in handy and patients truly benefit from this. This has made my job much easier! Thank you!“

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negatively disrupted workflow</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Took too long</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Made it easier to communicate with patients</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>During program, found I was repeating myself less often</td>
<td>6</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>During program, I found that patients were less confused when discussing care</td>
<td>7</td>
<td>3</td>
<td>11</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>I found the program saved me time by making communication easier</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>I found myself using best-practice communication more often regardless of whether patients had hearing loss</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Patients appreciated the program</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I felt like I needed more training to implement the program</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I would like to see this program implemented throughout the system</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>The hearing screening and intervention program has value in the medical setting</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Universal Adult Hearing Screening:
- Move towards acceptance
- Educating the rest of the medical community
- Future for objective measures

Professionals in the context of OTC:
- Raise awareness
- Potential for knowledge disbursement
- Establishing a hearing care ecosystem

HCAHPS (the Hospital Consumer Assessment of Healthcare Providers and Systems):
- Medicare reimbursement
- Hospital Incentive

Pronovost, Berenholtz, & Needham et al. (2008) JAMA; Reed et al. (2018) In-Progress
How might we create a sustainable culture that addresses communication with minimized burden on nurses in the inpatient setting?

Fall 2018:
- Redesign of materials
- Integrate demographic variables to calculate hearing loss
- Webinar training video with quiz

Spring 2018:
- Mass. General (Boston, MA): (2 floors, pre and post) nurse feedback, length of stay, HCAHPS
- Bayview Surgical Units: Process evaluation of new materials and webinar looking at compliance and retention of knowledge

Summer/Fall 2019:
- Johns Hopkins East Baltimore: cluster trial, length of stay
Special Thanks

Frank Lin, MD PhD
Jennifer Deal, PhD
Amber Willink, PhD
Josh Betz, PhD
Emily Boss, MD
Esther Oh, MD, PhD
Megru Liao, MFA
Emily Pedersen, MPH

Charlotte Yeh, MD (AARP)
Aylin Altan, PhD (OptumLabs)
Kevin Frick, AuD, PhD (MEEI, Harvard)

NIH KI2 – ICTR (Johns Hopkins)
Cochlear, Inc (Sydney, Australia)
Thanks.

nreed9@jhmi.edu

@NickSReed

https://www.jhuochlearcenter.org/