


Table 1 Possible mechanisms of COVID-19–related cognitive dysfunction

Indirect CNS involvement through inflammatory or immune response
Viral encephalitis due to direct CNS invasion
COVID-19–related organ failure (lung, heart, kidney, or vasculature) and metabolic dysfunction
COVID-19 ICU-related delirium
Large-vessel stroke or lacunar stroke syndrome
Exacerbation or unmasking of underlying cognitive impairment or neurodegenerative process
Medication-related adverse reaction
Other unknown mechanism

Abbreviations: CNS, central nervous system; COVID-19, coronavirus disease 2019; ICU, intensive care unit.

be pursued, including COVID-19 testing during this pandemic.¹⁰

Walid A. Alkeridy, MBBS, MSc 

Department of Medicine, King Saud University, Riyadh, Saudi Arabia

Division of Geriatric, Department of Medicine, University of British Columbia, Vancouver, British Columbia, Canada

Ibrahim Almaghlouth, MBBS, MSc

Department of Medicine, King Saud University, Riyadh, Saudi Arabia

College of Medicine Research Center, King Saud University, Riyadh, Saudi Arabia

ACKNOWLEDGMENTS

The authors would like to thank Salwa Almomen, MBBS, MSc, for reviewing the manuscript.

Conflict of Interest: The authors have no conflict of interest to declare.

Author Contributions: Dr Alkeridy wrote the manuscript. Dr Almaghlouth reviewed, edited, and approved the final version.

Sponsor's Role: This study was not sponsored by any party.

REFERENCES

- Annweiler CBA, Faucon E, et al. Neurological, cognitive and behavioral disorders during COVID-19: the nitric oxide track. *J Am Geriatr Soc.* 2020. <https://doi.org/10.1111/JAGS-1153-L-May-20>.
- Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegel AP, Horwitz RI. Clarifying confusion: the confusion assessment method: a new method for detection of delirium. *Ann Intern Med.* 1990;113(12):941-948.
- Girard TD, Thompson JL, Pandharipande PP, et al. Clinical phenotypes of delirium during critical illness and severity of subsequent long-term cognitive impairment: a prospective cohort study. *Lancet Respir Med.* 2018;6(3):213-222.
- Inouye SK, Westendorp RGJ, Saczynski JS. Delirium in elderly people. *Lancet.* 2014;383(9920):911-922.
- Fong TG, Tulebaev SR, Inouye SK. Delirium in elderly adults: diagnosis, prevention and treatment. *Nat Rev Neurol.* 2009;5(4):210-220.
- Hughes CG, Pandharipande P, Ely EW. Delirium: Acute Brain Dysfunction in the Critically Ill. *Cham: Springer;* 2020.
- Iroegbu JD, Ifenatuoha CW, Ijomone OM. Potential neurological impact of coronaviruses: implications for the novel SARS-CoV-2. *Neurol Sci.* 2020;41:1329-1337. <https://doi.org/10.1007/s10072-020-04469-4> [Epub ahead of print].
- Mao L, Jin H, Wang M, et al. Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China. *JAMA Neurol.* 2020; e201127. <https://doi.org/10.1001/jamaneurol.2020.1127>.
- Pleasure SJ, Green AJ, Josephson SA. The spectrum of neurologic disease in the severe acute respiratory syndrome coronavirus 2 pandemic infection: neurologists move to the frontlines. *JAMA Neurol.* 2020. <https://doi.org/10.1001/jamaneurol.2020.1065>. Online ahead of print.
- Alkeridy WA, Almaghlouth I, Alrashed R, et al. A unique presentation of delirium in a patient with otherwise asymptomatic COVID-19. *J Am Geriatr Soc.* 2020. <https://doi.org/10.1111/jgs.16536>. Online ahead of print.

Addressing Hearing Loss to Improve Communication During the COVID-19 Pandemic

To the Editor: Change occurs quickly in emergencies. The coronavirus disease 2019 (COVID-19) response has resulted in rapid modifications in healthcare delivery. Home-based medicine and telemedicine are swiftly evolving and being promptly deployed, as is in-room videoconference technology for inpatients. Necessary precautions, including distancing and personal protective equipment (PPE), have become the norm.^{1,2} Importantly, these changes may exacerbate communication barriers faced by persons with hearing loss.

Hearing loss affects half of all adults older than 60 years.³ However, little consideration is given to addressing hearing loss for effective communication.^{4,5} Hearing loss limits communication via poor auditory encoding of speech signals, resulting in reduced clarity of speech. Cognitive processing, especially working memory, may also be impacted as adults with hearing loss attempt to make sense of poor signals. The stressful, busy, and noisy hospital⁶ environment exacerbates problems, leading to limited treatment understanding and increased frustration.

Importantly, poor communication may mediate the association between hearing loss and health outcomes. Adults with hearing loss have increased risk of 30-day readmission, experience longer length of stay, and are less satisfied with care.^{7,8} Moreover, hearing loss is associated with poor functional recovery following intensive care unit admissions.⁹ Sensory deprivation may increase risk to experience delirium as older adults are cut off from communication and their environment.

The current extended use of PPE during the COVID-19 pandemic limits visualization of the mouth, preventing lip-reading, and acts as a general sound barrier. Even when using videoconferencing equipment, lag and poor image quality may cause significant visual barriers. Coupled with noisy hospital environment (e.g., alarms and constant communication among staff), these visual barriers render the natural sensory substitution compensation methods used by adults with hearing loss as futile. Additionally, distancing may limit access to caregivers or interpreters (American Sign Language) to facilitate conversations during visits.

Thoughtful consideration of addressing barriers is needed (Figure 1). In the outpatient and telehealth setting,

This article was published online on 2 July 2020. An error was subsequently identified in the Acknowledgment section. This notice is included in the online and print versions to indicate that both have been corrected on 15 July 2020.

DOI: 10.1111/jgs.16674

Addressing Hearing Loss Checklist		
Technologic Considerations		
<input type="checkbox"/>	Handheld Amplification	Simple handheld devices, such as the Pocket Talker (Williams Sound, Eden Prairie, MN) or SuperEar (Sonic Technology Products, Nevada County, CA), allow users use standard headphones and easily amplify sound to their desire with the volume control to improve communication.
<input type="checkbox"/>	Amplified and Caption Telephones	These telephones are specially designed for persons with hearing loss and provide increased amplification and captioned conversation
<input type="checkbox"/>	In-Room Videoconferencing	Leveraging video technology to communicate with patients may seem like it would pose barriers; however, it allows for providers to speak clearly and show their mouth for lip-reading. In addition, technology companies can amplify frequencies important for speech and use speech to text to caption the video in real time.
<input type="checkbox"/>	Speech to Text	Speech to text applications, such as the software provided by Google (Mountain View, CA), are increasingly available. These applications can provide live transcription of conversation to assist those with hearing loss.
<input type="checkbox"/>	Smartphone Amplification	Applications, such as Google Sound Amplifier (Mountain View, CA), offer high quality noise reduction algorithms and amplification in personal smartphones. These may represent an option when handheld amplifiers are not available.
Environmental Modifications		
<input type="checkbox"/>	Remove Background Noise	Reducing background noise by turning down the television and closing the door to noisy areas can improve communication.
<input type="checkbox"/>	Improve Room Lighting	Proper lighting helps persons with hearing loss visualize the speaker to aid in lip-reading, but overwhelming lighting (such a window reflection) can be distracting.
<input type="checkbox"/>	Preprepared Placards	Preprinted placards of common phrases, questions, and comments used throughout the hospital stay or outpatient visit can be helpful. Using large font with high contrast color can further help older adults.
<input type="checkbox"/>	Whiteboards or Tablets	Although it can be cumbersome, using whiteboards to write out conversation or tablets to type out conversational items represents a last resort option.
Communication Considerations		
<input type="checkbox"/>	Ensure Attention	Conversation and communication require both parties to be attentive and ready.
<input type="checkbox"/>	Face-to-Face Communication	Ensuring that the listener can see your face to leverage lip-reading skills is important. This also ensures sound is being directed at the listener rather than in another direction. This means looking up from charts and away from computers when possible to communicate.
<input type="checkbox"/>	Visualization of the Mouth When Possible	Covering the mouth area is a must to prevent spread of the COVID-19 virus. However, any opportunity possible to use clear masks or distance videoconferencing without masks can help people who consciously and subconsciously lip-read
<input type="checkbox"/>	Speak Slow and Low	Age-related hearing loss generally occurs in higher frequencies and limits the clarity of speech. Slowing down and using a slightly lower tone can help listeners with hearing loss follow the conversation.
<input type="checkbox"/>	Do Not Shout	Most age-related hearing loss is an issue of clarity rather than volume. Although some increased volume helps, shouting often further distorts information.
<input type="checkbox"/>	Give Context to Conversation	By placing the conversation in context, it helps the listener decipher and fill in the gaps of difficult to hear words. This means adding supporting information like common descriptions or actions associated with topics and adding redundancy to information presented.
<input type="checkbox"/>	Rephrase Rather than Repeat	Rephrasing can help the listener gain new context about the conversation and use words that are easier to hear. Repeating can create a frustrating negative feedback loop.

Figure 1. Checklist of methods to address hearing loss for clinician use. COVID-19, coronavirus disease 2019.

clear surgical masks allow visualization of the mouth. In hospitals, N95 masks that prevent visualizing the mouth are required in the patient’s room. However, utilization of clear surgical masks outside of the room could improve communication between patients and providers over

videoconferencing. Notably, utilization of clear surgical masks outside of the patient’s room could also improve communication among providers, most of whom have been required to wear surgical masks throughout the day during the COVID-19 pandemic.

Technology offers additional solutions. Handheld amplifiers can increase signal volume but require sterilization considerations (i.e., one device cannot be shared) and are not compatible with videoconferencing technology. More advanced solutions through smartphones, such as speech to text and amplifier applications with customization for user preferences, should be considered. Using smartphone applications eliminates the need for sharing products in some cases and may be integrated into videoconferencing technology. Moreover, simple methods, such as preparing common questions and statements on placards with large text and using whiteboard for written statements, can help facilitate communication.

Providers should adopt changes to communication beyond the environment and technology to accommodate the needs of adults with hearing loss across settings. The reductionist approach that increased volume from an amplifier is all that is needed oversimplifies hearing loss. Many adults with mild/moderate hearing losses (36 of the 38 million adults with hearing loss in the United States) benefit immensely from communication techniques, including ensuring attention, facing patients, speaking slowly rather than shouting, and choosing to rephrase rather than repeat information. These tactics also compliment and augment the technologic and environmental modifications noted above. Moreover, these techniques improve all communication regardless of hearing loss status and could go a long way in improving patient-provider communication in the United States.

Fundamental to addressing hearing loss is the need for better surveillance. Many with more mild losses do not recognize their hearing loss as it may pose few problems in everyday life. However, the demanding healthcare communication environment, especially during the pandemic, may pose significant barriers. At minimum, healthcare settings should ask about hearing loss and incorporate these methods to intervene with struggling adults.

Communication is vital to patient-centered care.¹⁰ Although improvements have been made to empathetic communication training, little consideration has been given to the communication needs of the millions of Americans with hearing loss. Addressing hearing loss to improve communication and treatment understanding could improve rehabilitation following intensive care unit stay and reduce risk of a 30-day readmission. Moreover, improved sensory awareness may prevent delirium, whereas improved patient-provider rapport may improve satisfaction with care. Although immediate accommodations must be made during this crisis, long-term consideration of sustainable approaches to address hearing loss are equally important.

Nicholas S. Reed, AuD,
Cochlear Center for Hearing and Public Health, The Johns
Hopkins University, Baltimore, Maryland
Department of Epidemiology, The Johns Hopkins
Bloomberg School of Public Health, Baltimore, Maryland

Lauren E. Ferrante, MD, MHS,
Section of Pulmonary, Critical Care,
and Sleep Medicine, Department of Internal Medicine,
Yale School of Medicine, New Haven,
Connecticut

Esther S. Oh, MD, PhD
Cochlear Center for Hearing and Public Health, The Johns
Hopkins University, Baltimore, Maryland
Division of Geriatric Medicine and Gerontology,
Department of Medicine, The Johns Hopkins University
School of Medicine, Baltimore, Maryland

ACKNOWLEDGMENTS

Conflict of Interest: N.S.R. reports salary funding from National Institute on Aging/National Institutes of Health Grant 1K23AG065443-01 to support research relevant to the area of interest. N.S.R. reports nonfinancial scientific advisory role with Shoebox, Inc. L.E.F. is supported by a Paul B. Beeson Emerging Leaders in Aging Career Development Award (K76 AG057023). There are no other reported relevant conflicts of interest.

Author Contributions: Concept and drafting and revision of the manuscript for important intellectual content: N.S.R., L.E.F., and E.S.O.

Sponsor's Role: Sponsors had no role in the design, methods, subject recruitment, data collection, analysis, or preparation of this study.

REFERENCES

1. Tumlinson A, Altman W, Glaudemans J, Gleckman H, Grabowski DC. Post-acute care preparedness in a COVID-19 world [published online ahead of print, 2020 Apr 28]. *J Am Geriatr Soc.* 2020;68(6):1150-1154. <https://doi.org/10.1111/jgs.16519>.
2. D'Adamo H, Yoshikawa T, Ouslander JG. Coronavirus disease 2019 in geriatrics and long-term care: the ABCDs of COVID-19. *J Am Geriatr Soc.* 2020;68(5):912-917. <https://doi.org/10.1111/jgs.16445>.
3. Goman AM, Lin FR. Prevalence of hearing loss by severity in the United States. *Am J Public Health.* 2016;106(10):1820-1822. <https://doi.org/10.2105/AJPH.2016.303299>.
4. Cohen JM, Blustein J, Weinstein BE, et al. Studies of physician-patient communication with older patients: how often is hearing loss considered? a systematic literature review. *J Am Geriatr Soc.* 2017;65(8):1642-1649. <https://doi.org/10.1111/jgs.14860>.
5. Smith S, Manan NSIA, Toner S, et al. Age-related hearing loss and provider-patient communication across primary and secondary care settings: a cross-sectional study [published online ahead of print April 7, 2020]. *Age Ageing.* 2020;afaa041. <https://doi.org/10.1093/ageing/afaa041>.
6. Busch-Vishniac IJ, West JE, Barnhill C, Hunter T, Orellana D, Chivukula R. Noise levels in Johns Hopkins Hospital. *J Acoust Soc Am.* 2005;118(6):3629-3645. <https://doi.org/10.1121/1.2118327>.
7. Reed NS, Altan A, Deal JA, et al. Trends in health care costs and utilization associated with untreated hearing loss over 10 years. *JAMA Otolaryngol Head Neck Surg.* 2019;145(1):27-34. <https://doi.org/10.1001/jamaoto.2018.2875>.
8. Reed NS, Betz JF, Kucharska-Newton AM, Lin FR, Deal JA. Hearing loss and satisfaction with healthcare: an unexplored relationship. *J Am Geriatr Soc.* 2019;67(3):624-626. <https://doi.org/10.1111/jgs.15689>.
9. Ferrante LE, Pisani MA, Murphy TE, Gahbauer EA, Leo-Summers LS, Gill TM. Factors associated with functional recovery among older intensive care unit survivors. *Am J Respir Crit Care Med.* 2016;194(3):299-307. <https://doi.org/10.1164/rccm.201506-1256OC>.
10. Institute of Medicine (US) Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st Century.* Washington, DC: National Academies Press (US); 2001.