

Optimizing Medical Care in Audio-Only Patient Management

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Abstract

Objective: To address the challenges and opportunities in the use of audio-only telemedicine for patient assessment and management.

Methods: A review of current practices in telemedicine is presented, with a focus on audio-only patient care. Comparisons are made between audio-only care versus in-person history-taking to identify key priorities for effective audio-only patient management. A framework using a systems-based approach for optimizing audio-only care is presented to identify reasonable best practices by acknowledging the differences in the standard evaluation of patients.

Results: A triage algorithm for audio-only care is proposed. Facilitated examination maneuvers that can be coached by the practitioner to better the assessment are presented, and evaluations are included in this systems-based approach. This leads to future considerations, and how advancing technology can create improved medical evaluation to continue to enhance this modality of patient care.

Conclusion: Effective audio-only patient management requires understanding the limitations and opportunities of audio-only encounters. By leveraging best practices in audio-only encounters, healthcare providers can have a starting point to deliver optimal care as technology continues to progress and provide more tools in medical assessment.

Plain Language Summary

This review presents considerations in the application of the telephone or other audio-only interaction as applied to medical assessment and care. Key issues are discussed, including assessment and diagnosis, documentation with a review of legal and regulatory concerns, and other considerations for the application of audio-only care for different components of the medical.

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While telemedicine has broad adoption and a wide range of use cases, the existing literature on remote patient management focuses on televideo as a tool for the assessment and management of acute patient needs, including suggestions for how to best deliver care.¹⁻⁴ There has not been a commensurate exploration of the role of audio-only care. Despite this, the data suggest that nearly half of adult telehealth services used audio-only care rather than video.⁵ Among 711 Medicare patients who were offered

a choice of modality for virtual visits, 43.1% specifically chose phone visits.⁶

It is reasonable to acknowledge that televideo has distinct advantages over audio-only care, deriving from the ability to see the patient on real-time video. A recent systematic review demonstrates equal or better, but not inferior, outcomes for consultations delivered by televideo compared to audio-only care.

That review incorporates a wide range of clinical settings and specific services. Notably, these were primarily

telemedicine uses within a medical setting for consultation, with over a third of studies from countries apart from the U.S., and these typically explored telemedicine for specific services like smoking cessation or rehabilitation.⁷ The applicability to a more general or undifferentiated assessment for acute management, or to patients outside clinical settings with home-based medical care, is less certain.

Regardless of whether audio-only care reaches non-inferiority, televideo might not always be feasible. One study of 4,691 community-dwelling Medicare beneficiaries whose care offered telemedicine revealed that 23% of respondents attended practices where phone visits were the only option (no video visits).⁶ The Health Insurance Portability and Accountability Act (HIPAA)-compliant platforms are required to leverage video technology. Connectivity concerns can limit the availability of video in some situations, such as in remote settings. Patient comfort and proficiency with televideo show wide variability. Some patients might not have the smartphone, laptop, or tablet hardware needed or may not be able to navigate the televideo platform. In fact, age is the strongest predictor of audio-only versus video use, with video use declining with age. Young adults have an odds ratio of 4.55 for video use compared to adults 65 years and older.⁵ However, findings are mixed on receptiveness and barriers to telemedicine in older adults.^{8,9} Regardless, at least a subset of patients may opt for audio-only care as their preferred or only option.

The impact is that patients who might potentially be older, sicker, or have more comorbidities may also be managed with audio-only assessment and not be able to access the possible added advantages of televideo assessment. There remains a need to leverage telephonic or audio-only medical care skillfully in our evolving telemedicine world. South Carolina statutes make the expectation explicit that a medical evaluation needs not be in person “if the licensee employs technology sufficient to accurately diagnose and treat the patient in conformity with the applicable standard of care.”¹⁰ And even in states without the expectation as clearly defined, achieving the highest possible quality of clinical care should be the goal. This requires both maximizing the useful clinical information able to be obtained in these interactions and consciously acknowledging the limitation of the audio-only alternative.

This review focuses on optimizing audio-only patient management for acute medical concerns and tele-urgent care. The content is based on our experience managing geriatric, multi-morbid Medicare Advantage beneficiaries. Our management of acute medical concerns is in the context of established patients with access to both longitudinal care and up-to-date medical records in our system. The content of this review incorporates personal practices

and clinical opinions, noting a dearth of clinical trials or externally validated protocols available in the existing literature on validated assessment. Guidance is applicable to the telephonic assessment and management of acute concerns—or tele-urgent care—only. It is not intended to explore the use of telephonic management specifically in longitudinal/maintenance care, as a primary care alternative for specialist care or hospital-in-home.

First Priority: Sick—Not Sick

“The first step to success is knowing your priorities.”

—Aspesh

The audio-only telephonic encounter must emphasize, as its first priority, the identification of those sickest patients warranting a higher level of care. To take the patient *in extremis* or with frankly altered mental status, for example, there might be a broad differential diagnosis for these presentations. However, once the medical acuity is recognized, there is no further obligation to pursue a definitive diagnosis or management, aside from perhaps some appropriate temporizing management.

Such patients are outside the scope of what can appropriately be managed through audio-only remote management, or even in-home management in most cases. In fact, given the diagnostic uncertainty inherent in this initial audio-only evaluation, patients with more than a reasonably low potential for severe or life-threatening disease should be escalated to a higher care, acknowledging that the true diagnosis might be more benign. For example, chest pain in patients at risk for cardiac disease warrants a higher level of care for a more complete cardiac rule-out. Even if that workup ultimately ends up negative, the remote clinician must appreciate the lack of discriminative ability to distinguish acute coronary syndrome from more benign causes of chest pain.

If the first step to success is knowing your priorities, the identification of severely ill patients warranting a higher level of care should be the first priority. This should not be superseded by a desire for a definitive diagnosis, diagnostic certainty, or definitive management. These additional endpoints should still be worthy secondary priorities and pursued when not done at the expense of the first priority. There must be recognition that the definitive cause of a patient’s presentation need not be determined once the threshold is reached to say the patient cannot be safely evaluated and managed remotely or in the home. Successful patient care may not mean successful diagnosis.

The handling of potentially emergent conditions by audio-only evaluation should incorporate a system for rapidly responding to any identified emergencies. When working with a larger team, robust and clear internal communication systems might help expedite any escalation of

care and timely responses. And there should be efforts to immediately dispatch local emergency services if felt to be indicated. Access to the appropriate emergency services dispatch for the patient's location is essential. We recommend the National Emergency Number Association for clinicians covering a broad area who may not have immediate access to the relevant emergency services dispatch number.¹¹

General Considerations to Optimize Audio-Only Assessment

Several factors can enhance the likelihood of successful implementation of audio-only or telephonic care. A few key points are emphasized.

Good Connection (Technology) and Rapport (Interpersonal) to Facilitate Communication and Encourage Patient Engagement and Active Participation in the Assessment

Body language and human touch are lost with audio-only interactions. While tone of voice, expressions of empathy, and active listening are still possible, it is even more important to emphasize these when in-person interactions are not possible. Good technology ensures that this is not a barrier to establishing rapport. This may be as simple as a good phone connection with a strong signal and a good headset. Any technological confounders complicate efforts to establish an interpersonal connection. Particularly given the need to actively engage the patient in the telephonic assessment, consciously establishing a rapport with the patient is essential.

Consider Caregivers or Family for Corroborating Information or to Facilitate the Assessment

As with in-person medical assessment, the patients in telephonic assessments often have family, friends, or caregivers with them for the interaction. A clinician may not even be aware of this unless they ask. Sometimes, caregivers or family are simply present. Other times they offer emotional support or even help to facilitate the interaction. And still other times, a caregiver or family member may be the primary source of information. But even in this last scenario, this does not negate the need to directly engage and assess the patient.

In each interaction, it is important to know who is with the patient and to confirm with the patient that the discussion can occur in the presence of caregiver or family member. In addition, it is important to read the interactions and recognize that those individuals with the patient might be a resource but, depending on the situation, alternatively might limit how forthcoming a patient is. Even in something as simple as situations where a patient wishes to send a picture to a clinician, for example, this additional person may be able to help obtain the picture or assist with sending it if the patient is not able to.

However, depending on the patient's personality and the specific situation, having this additional person may make the patient reluctant to send an image if it is sensitive or potentially embarrassing. These dynamics should be recognized to facilitate patient care.

Have Medical Records and Prior In-Person Assessments as a Supplement

Understanding a patient's baseline, existing medical issues, and any prior experiences with audio-only management is a valuable starting point for managing a patient appropriately during audio-only encounters. While geriatric patients and patients with multiple comorbidities can still be managed telephonically, this baseline information is increasingly important in more complicated patients when factoring in multiple diagnoses or medications. Mild cognitive impairment or dementia, health literacy, communication barriers, and the complexity of their medical history may make it harder to rely on the patient historian alone without corroborating records. While it can be done, patients with either increasing baseline complexity or with more unknowns and uncertainty do warrant a corresponding degree of caution regarding audio-only management.

Aside from the medical history itself, if the medical record documents any preestablished understanding of the patient's goals for care, this may guide discussions about escalating to a higher level of care. Such information could influence referral to a hospital or what alternatives to audio-only management align with that patient's goals.

Dependent on Pretest Suspicion, Do Not Exclude Severe Pathology Based on Telephonic Assessment Alone

Successful audio-only management requires appropriately selecting patients for this option. Key to this is recognizing that there may be some loss of sensitivity in the workup relative to either in-person assessment or the higher-level care that could be given with advanced diagnostics. As such, the clinician should question the ability to exclude severe pathology whenever there is a sufficiently high degree of suspicion. For patients where severe disease/life threats are not considered in the differential, the supplemental assessment is intended to lessen the risk of "false negatives" in the diagnostic assessment by capturing a broader differential and increasing sensitivity. As an example, if you have a high initial suspicion of subarachnoid hemorrhage, the diagnosis would not be effectively excluded by a telephonic maneuver to assess for neck stiffness. In contrast, if you have a low-suspicion headache, ensure the neck stiffness is assessed and normal reinforces the likely diagnosis. If severe disease/life threats are considered likely or possible, an audio-only assessment alone generally cannot effectively exclude this.

Recognize Limitations of Telephonic Assessment and When Care Needs to be Escalated

The telephonic management of patients may allow for more immediate provisioning of medical care with less overhead or resource utilization. But, it will never be a complete replacement for in-person medical care. While the ability to give appropriate medical care via an audio-only or telephonic assessment should be valued, its use should be limited to patients who can appropriately be managed in this way, with either definitive management or temporizing management until delayed in-person medical care can be coordinated.

At times, care might need to be escalated to facilitate a more complete examination, to allow for additional diagnostic or management options, or because more severe pathology has not been adequately excluded. Care may also need to be escalated if patient factors make telephonic management inadequate to meet the patients' needs. All of these represent the potential limitations of telephonic assessment. Managing patients with an audio-only assessment should be restricted to those who can do so appropriately and with a reasonable degree of safety.

Ensure Adequate Monitoring of Quality Measures and Outcomes

The National Quality Forum established an early framework to consider quality in telemedicine with 2017's "Creating a Framework to Support Measure Development for Telehealth." This provides a measurement framework organized into four main domains: (1) access to care, (2) financial impact/cost, (3) experience, and (4) effectiveness.¹² Such a framework remains relevant for monitoring quality and outcomes. The framework allows not only a comparison of telemedicine to in-person care but also the comparison between telemedicine modalities. This could include telephonic or audio-only care compared to encounters facilitated by video.

The effectiveness of audio-only care depends on optimizing the clinical assessment up to the limits of the modality. Below, we highlight opportunities for a more complete telephonic assessment and for leveraging the modality as fully as possible. How effective that can be relative to other modalities remains to be determined. A system for follow-up and monitoring patient outcomes is integral to ensuring high-quality telephonic and audio-only medical care and avoiding its use in cases where the quality of care suffers. When the quality of care suffers, one must ask whether this reflects limitations of the modality itself with audio-only care or the failure of the clinician to fully assess and manage the patient within the limitations of what audio-only care allows. While sources like the systematic review from Ilali and colleagues⁹ have identified only one study reporting negative outcomes with telephonic care, further monitoring and comparative analysis may eventually allow for more specific guidance on when it is most appropriate.

Documentation

The fundamentals of good documentation for an enhanced telephonic assessment are generally the same as good documentation habits in other interactions. Thoroughly documenting what was assessed and how it influenced medical decision-making remains standard. The greatest challenge may be how to capture subtle findings accurately, including those subtle or vague findings that might be contributing to a clinical gestalt or a general sense. These findings may not be explicitly assessed or even verbalized in other interactions, where it may be categorized as broadly as "no distress," "ill-appearing," or similar, for example. But tease out and describe the nuances when possible. Attention to detail and documentation accordingly are important to reinforce the assessment and medical decision-making in any associated documentation.

In addition, documentation should include an informed discussion with the patient who explicitly acknowledges the limitations of the audio-only modality while still validating the appropriateness of an audio-only encounter to meet the patient's needs (Table 1). When video or in-person management is options, both the patient and clinician should be comfortable with the decision for audio-only care. When these alternatives are not options that the clinician can provide, the rationale for directing patients to seek care elsewhere should be reflected in the documentation and in the instructions to the patient.

Legal and Regulatory Considerations

While the focus of this article is not to enumerate all the state-by-state legal and regulatory nuances, clinicians should ensure any audio-only medical care aligns with the relevant state-specific considerations. Aside from the broader state-by-state variations in telemedicine laws and regulations, a few relevant questions specific to audio-only and telephonic care are listed here.

Is Audio-Only Patient Care Covered by Existing Telemedicine Regulations?

While not specifically addressed in some state statutes, others, like Maine, specifically reference telephonic telehealth in their rules.^{10,13} Yet, in states like Connecticut, audio-only telephone is explicitly enumerated as not being considered telehealth.¹⁰

Can a Provider–Patient Relationship be Established by Telephonic Consultation Only?

West Virginia, for example, specifically notes "[a]udio-only calls or conversations that occur in real-time may be used to establish the physician-patient relationship."¹⁴ In contrast, in states where telephonic or audio-only care is excluded from the definition of telehealth, it is a logical

*Table 1. Suggested scenarios for documentation to include in audio-only patient management communications, with potential wording.**

Patient information is recorded and HIPAA verification.	<i>"Patient is informed of recorded time. [Number] forms of identification are checked for patient verification." [may choose to specifically list the forms of identification use]."</i>
Sick/not sick outside of scope without definitive diagnosis.	<i>"Patient is felt to be acutely ill beyond the scope of what can be safely managed with audio-only care. While I may be unable to definitely diagnose, I have concerns for [differential diagnosis or "red flag" symptom] and will direct the patient to an appropriate higher level of care to avoid potentially harmful delays in diagnosis and management."</i>
Emergency medical services calls with uncertainty (re: acuity of capacity).	<i>"Patient warrants emergent evaluation by emergency medical services (EMS) due to a high degree of suspicion for an acute medical condition and/ or lack of capacity to refuse indicated medical care. EMS was contacted by the [patient, the clinician, family/caregiver with family] to further assess and determine if medical transport is warranted."</i>
Refusal of hospital or urgent care.	<i>"Per my assessment, the patient participated in the decision-making discussion and demonstrated understanding. I have discussed risks, benefits, and alternatives to seeking a higher level of care or emergent evaluation. The discussed risks of not seeking this evaluation include, but are not limited to [enter specifics]. The patient demonstrates understanding of the condition and stated risks. The patient is advised that they can call back or seek additional care if they change their mind."</i>
Technical issues identified.	<i>"Technical issues identified include [specifics, i.e., poor connection]. Attempts to troubleshoot included [specifics, i.e., call back, alternative phone, etc.]. Issues [were/were not] felt to impede the medical evaluation."</i>
Caregivers for collaboration or facilitating the assessment.	<i>"Caregivers or family with patient [list specifically] participated in providing history and/or facilitating the examination with the patient's consent." [May list specific information obtained.]</i>
Any corroborating information (outside records, etc.).	<i>"Corroborating information/records were obtained from [name source]. Relevant findings include [List specifics]."</i>
Exclusion of severe pathology by adequately low clinical suspicion.	<i>"I have considered a broad differential, including the potential for any severe disease or potential life threats. Per my assessment, I have [low/ exceedingly low/negligible] suspicion for severe pathology at this time."</i>
Limitation of audio-only assessment and when care needs to be escalated.	<i>"I have considered a broad differential and determined the provisional diagnosis cannot be appropriately managed with audio-only care, or that I cannot adequately exclude severe disease or potential life threats in the differential diagnosis based on audio-only assessment alone. The patient will be directed to the appropriate level of care." [may specifically choose to list the workout that cannot be completed on audio-only assessment]."</i>
Acknowledging the limitations of the audio-only modality while validating appropriateness of an audio-only encounter.	<i>"The patient was assessed to the extent possible by audio-only modality, as described in the documented examination. Audio-only assessment has limitations inherent in assessing patients remotely and without visual cues. These limitations were not felt to impede the medical evaluation significantly. However, the patient was cautioned that if symptoms acutely worsen, progress, or new symptoms develop, they should call back for telephonic reassessment or seek care at urgent care, ED, or 911 to ensure nothing has been missed. Patient/caregiver indicated that these instructions were understood."</i>

*Examples of wording are suggested but should be tailored to meet the needs of the documenter and the system in which medical care is being given.

extension that these modalities would not establish a telehealth provider–patient relationship.

What Are the Implications for Audio-Only Patient Care on Prescribing?

Telephonic and audio-only medical care might potentially face more stringent restrictions on prescribing. In Missouri, "[n]o healthcare provider shall prescribe any drug, controlled substance, or other treatment to a patient based solely on an evaluation over the telephone unless there is a previously established and ongoing physician-patient relationship." But, in Hawaii, "[t]reatment recommendations made via telehealth, including issuing a prescription via electronic means, shall be held to the same standards of appropriate practice as those in traditional physician-patient settings that do not include a

face-to-face visit but in which prescribing is appropriate, including on-call telephone encounters."¹⁰

Before providing audio-only patient care, clinicians should identify any restrictions relevant to their specific clinical practice to ensure compliance.

A Framework for Exploring the Audio-Only Assessment

As we consider the potential components of the audio-only assessment, we specifically explore what is lost relative to other interactions, what can still be assessed directly, supplemental history to consider, and any facilitated exam that can be performed. Consideration of these factors optimizes the medical care that can be given with audio only. A stepwise approach to audio-only patient management is presented in Figure 1.

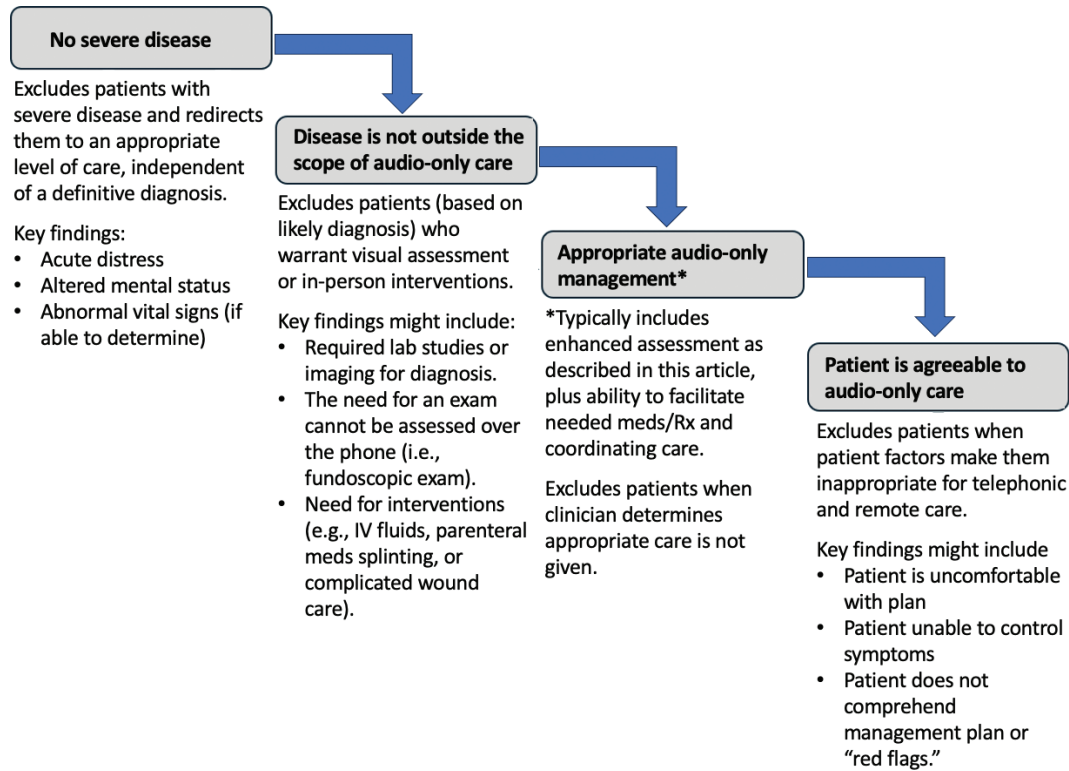


Fig. 1. A stepwise approach to audio-only patient management.

What You Lose

As an audio-only assessment, the telephonic examination does lose input from the remaining senses. Sight, touch, and smell are not conveyed in this modality. This impacts not only medical assessment but also aspects of the interpersonal relationship, including perception of body language. In addition, in-person diagnostics cannot be performed. In the following, we outline the impact of what is lost on the assessment of different symptoms. In light of this, guides like Adult Telephone Protocols remain focused on the history that should be obtained about specific symptoms or specific suspected diagnosis.¹⁵ While history is undeniably important in audio-only assessment, it would be an overstatement to say there is no more information to be obtained beyond that robust history, as we will explore what still can be assessed.

What You Can Do Directly (Audio Assessment)

Despite the loss of some information in audio-only assessment, what is retained should not be undervalued. This is clinical information obtained primarily by astute listening. At a minimum, the direct audio-only assessment can still help to identify patients in acute distress, frankly altered, or other concerning situations. Later, we take a systems-based approach to reviewing what can be directly assessed by audio only.

Supplemental History (i.e. Details Overlooked or That May Not be as Heavily Relied on as In-Person)

Overall, a thorough history is important for effective medical care, regardless of whether this is in person, by video, or over the phone. However, in audio-only patient assessments, this carries increased importance. This may obtain information that would otherwise be obtained by inspection, palpation, or auscultation and would be otherwise lost without this supplemental history. An example might be asking the patient for any home vital sign readings versus obtaining vital signs in the encounter as the clinician. Or this may be information that would normally be trumped by the in-person physical exam findings. For example, asking a patient about the fit of pants and belts may be less relevant in the in-person setting, where inspection and palpation for abdominal distension take precedence.

Facilitated Maneuvers (i.e. Have the Patient Do Things to Assess the Response or Get Additional Information That Might Not Come From Asking Questions Alone)

Some additional clinical information might not be immediately available, but this can be elicited through active engagement of the patient. These facilitated maneuvers can increase the reliability of the examination relative to history or patient reports alone. These steps do require interaction with a good rapport and the patient’s ability to

safely comply with any facilitated maneuvers. Often, they can be thought of as an attempt to replicate as completely as possible the examination that would be performed in person.

A Systems-Based Summary of the Audio-Only Assessment

We summarize here the specific opportunities to expand the utility of audio-only patient assessment, but we recognize these recommendations might not be all-inclusive. These suggestions for optimizing audio-only care are based largely on personal practices and clinical opinions. Given the dearth of clinical trials or externally validated protocols available in existing literature that are specific to audio-only medical care, whenever high-quality clinical trials or validated protocols do become available, we would encourage these to be incorporated into clinical practices. The Appendix presents a tabular summary of this material.

General

Visual gestalt is lost on audio-only assessment. Ensuring the patient passes the “look test” is replaced by making sure they pass the “listen test.” Consequently, often subtle auditory cues like tone can be particularly important. This may include trusting vague impressions (“They just don’t sound right.”) and resisting the urge to dismiss these cues when present. However, when a patient is speaking comfortably and in no distress, it can offer significant reassurance to lower the suspicion of potential missed, severe pathology.

Abdominal Assessment

In the absence of palpation, patients may poorly distinguish abdominal pain or discomfort from tenderness. Having a patient press on their own abdomen while asking if it elicits their pain might more reliably identify that pain. The nature of this tenderness can be further refined by asking if the pain is worse when pressing down or as it is released (i.e. rebound pain). The presence of tenderness, or any severe or progressive pain, should concern the clinician. Among the essential questions in the telephonic assessment of the abdomen is whether there is a surgical abdomen or an indication for imaging. Tenderness and severe or progressive pain would generally be among the indications to pursue higher-level care with the options for advanced imaging. However, effective use of the telephonic assessment can help distinguish those who warrant this advanced workup from those who can reasonably manage and monitor symptoms from home.

Cardiac Assessment

Evaluation of cardiac ischemia in the acute setting typically warrants laboratory studies and electrocardiography.

Similarly, the initial evaluation of arrhythmia typically requires electrocardiography, plus consideration for electrolytes, thyroid, or other triggers. Much of this is outside the scope of the audio-only assessment.

For patients who own them, a smartphone-linked personal electrocardiogram device or a few of the commercially available smartwatches and smart rings can provide a degree of rhythm interpretation.^{16,17} While these results can be leveraged if available, many patients will not have these to routinely supplement the audio-only assessment. Furthermore, their results must be scrutinized closely to ensure accuracy. Artifact and a more limited number of leads complicate their interpretation.

In the absence of a rhythm strip from some of these commercially available sensors, the audio-only assessment may focus primarily on a few features. This includes a determination of rate (either specific beats per minute or a more general slow/normal/fast). However, while the patient potentially can be guided to help identify irregularity on a pulse check, this does not distinguish the specific rhythm, such as premature ventricular contractions or atrial or ventricular dysrhythmias. Guiding the patient through peripheral circulatory findings such as distal pulses or edema can provide further insights into the cardiac evaluation as well.

Dermatological Assessment

When possible, a picture image of a dermatologic concern should be obtained. While patients can still palpate for warmth or describe to the best of their ability a rash, the picture avoids the challenges inherent in trying to describe a dermatologic finding for most non-clinician patients.

Extremities Assessment

As with other examination elements where inspection may be particularly important, the telephonic assessment of the extremities relies heavily on either guiding the patient by providing a detailed description or obtaining a photograph through HIPAA-compliant mechanisms. In situations where an extremity is impacted unilaterally, comparisons to the contralateral side can be particularly helpful.

Genitourinary Assessment

Most testicular or vaginal pathology may fall outside the scope of what can reliably be assessed. While unilateral inguinal swelling may be a hernia, both assessment for incarceration and the potential for alternative causes of swelling or pain make telephonic assessment less than ideal. In fact, most of the telephonic evaluation of the genitourinary system is focused on the common conditions of urinary tract infections or candidiasis in patients who give a convincing history for these diagnoses. The palpation described on the abdominal exam may also provide

relevant findings for the genitourinary exam, specifically the presence of suprapubic pain in evaluation for possible cystitis. However, even in these cases with telephonic management of urinary tract infection, there should be consideration for prostatitis in men based on history and symptoms, which may require in-person assessment of the prostate.

HEENT Assessment

The HEENT (head, eyes, ears, nose, and throat) assessment allows a clinician to perform otoscopy and ophthalmoscopy, plus lymph node palpation, sinus transillumination, and percussion. This cannot be performed on audio-only assessment without supporting technology. However, relative to a video assessment, which also lacks the ability to do these exam maneuvers, it is worth noting that the audio-only assessment may lose relatively little in comparison.

Musculoskeletal Assessment

A musculoskeletal assessment by telephone primarily relies on obtaining a good history to guide a facilitated examination with evocative maneuvers. Having the patient describe the exact area of pain/injury or having them pinpoint the specific joint can bring more clarity to the telephonic-only assessment. For those musculoskeletal concerns not at the midline—such as shoulder girdle or unilateral chest wall—comparison to the contralateral side can be particularly helpful to distinguish differences.

Neurological Assessment

A perhaps surprisingly large portion of the neurologic exam can be replicated over the audio-only assessment using facilitated exam maneuvers. The distinction is that this exam relies on patient reports rather than witnessed findings to identify abnormalities. Extraocular movements can be assessed, but this relies on patients reporting double vision rather than witnessing a disconjugate gaze. Finger-to-nose can be performed, but this relies on the patient reporting missing the target rather than witnessing the deviation as the patient attempts the maneuver. Romberg or gait assessment can be performed and rely on patient reports rather than directly observing but notably should be done with caution (or even deferred altogether) if a significant fall risk is likely. There is even an abundance of literature that a Cincinnati Stroke Score performed by a dispatcher over the phone nearly reaches the sensitivity of an in-person exam with a paramedic.¹⁸

Psychiatric Assessment

Telepsychiatric care may, in some cases, benefit from in-person or video assessment for two reasons: first, to witness behavior, including psychomotor agitation and response to internal stimuli, and second, to facilitate the

establishment of clinician-patient rapport. However, with the right patients, a very thorough psychiatric assessment can, nonetheless, be obtained by telephone through engaging the patient, asking probing questions, and actively listening to responses. Patient selection is essential for telephonic assessment to be successful. Not all patients are equally forthcoming.

Pulmonary Assessment

An in-person pulmonary assessment allows for auscultation and objective observation of the work of breathing. A remote video-facilitated encounter only allows an arguably inferior assessment of the latter. However, much relevant information can be obtained by listening alone. Telephonic pulmonary assessment can, in fact, be a dynamic process. Significant information is obtained by facilitated maneuvers to elicit responses, such as any worsening of symptoms with ambulation or coughing with deep breathing. For patients with bronchodilators, trialing a dose to assess response may not only alleviate symptoms but, in fact, provide relevant diagnostic information at the same time. The Appendix lists considerations for optimizing medical care in audio-only patient assessment.

Vital Signs

These should be considered true until proven otherwise. Cautious interpretation is important as data may be obfuscated by something as simple as a poorly calibrated device, positioning, or drinking before taking an oral temperature. However, when the results make clinical sense and are obtained with adequate diligence, patients with the necessary medical equipment can obtain all the vitals the clinician could obtain in person.

Future Directions

Robust research and validation for the role of audio-only medical care are currently lacking. Nonetheless, it remains an often-used modality and, when done well, might be an effective solution to deliver healthcare. When used, it is incumbent on healthcare practitioners to deliver this care as effectively as possible.

This article highlighted the lack of research on audio-only telemedicine care, encourages an approach that fully recognizes the opportunities in audio-only care for medical management beyond triage, and attempts to suggest best practices that are admittedly largely anecdotal and based on clinical experiences. This stems largely from our own inability to find better evidence in the existing literature and a review of the current state of audio-only telemedicine.

The current recommendations should serve as a starting point and encourage the need for further validation or refinement based on more robust evidence. Empirical data, a comparative analysis of telehealth modalities, and

potentially even randomized controlled trials would provide opportunities to refine and strengthen recommendations. Such evidence might also help to more effectively identify patients and clinical scenarios where different telemedicine modalities may be preferred. Until such evidence can be incorporated, audio-only medical care must be delivered as effectively as possible, recognizing the full potential—and limitations—of the modality.

Recognizing the continued use of audio-only patient assessment despite its limitations and the lack of comparative analysis, emerging technologies may one day address some of these challenges. The acoustic biomarker space is intriguing and has been around for about three decades but exploded since the COVID-19 pandemic.¹⁹ Innovations like Vital Audio might promise a future where digital voice biomarkers obtain vital signs from a telephone call alone.²⁰ A recent study done in Nairobi and colleagues²¹ found promise in the use of artificial intelligence (AI) software specifically for tuberculosis detection through passive cough sounds. Giant technology corporations like Google Research, USA, are also making innovations with AI models of their own, like HeAR-Health Acoustic Representations, a scalable self-supervised learning-based deep learning system.²¹ But, while technology like this may have the potential to significantly enhance audio-only assessment—or even televideo—in the future, these need further validation and widespread adoption before they significantly alter current audio-only medical management.

Conclusion

The delivery of healthcare continues to evolve, driven by technology, financial and logistical pressures, and patient expectations. An in-person assessment or remote video assessment undeniably has some advantages over audio-only interactions. But, the audio-only interaction between a patient and a clinician still often occurs and can be an opportunity for impactful patient care, beyond the more limited tele-triage function.

At this point, there is nothing definitively established to supplement or replace the robust assessment of astute clinicians looking to make the most of the information available to them. Effective use of audio-only encounters requires an appreciation of both the limitations inherent in these encounters and a recognition of the wide array of information available to the clinician to maximize the potential assessment.

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The authors declare that there are no relevant conflicts of interest.

Contributors

All authors contributed to the research and writing of this article.

Data Availability Statement (DAS), Data Sharing, Reproducibility, and Data Repositories

No data were generated or analyzed in the presented paper.

Application of Ai-Generated Text or Related Technology

None used.

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Appendix

Considerations for optimizing medical care in audio-only patient assessment.

What you can do, directly	What you lose	Supplemental history	Facilitated exam maneuvers
<p>General</p> <p>Tone of voice (for distress, alertness, etc.)</p> <p>Mental state, including cooperativeness or distraction.</p>	<ul style="list-style-type: none"> • Visual gestalt. 	<ul style="list-style-type: none"> • Explicitly ask how the patient feels relative to baseline (with specifics). • Family member/caregiver to compare to patient's baseline. 	<ul style="list-style-type: none"> • Fingertick glucose test (diabetics, if available)
<p>Abdominal</p> <p>Not applicable</p>	<ul style="list-style-type: none"> • Auscultation of bowel sounds. • Direct palpation for rigidity, rebound, pulsations, and mass. • Inspection for distension. 	<ul style="list-style-type: none"> • Ask the patient about the fit of pants (for distension). • Ask about passing flatus or belching and whether there is any relief of symptoms with this. 	<ul style="list-style-type: none"> • Coach the patient through pushing on their abdomen and flanks to elicit pain, tenderness, rebound, or pulsation. • Jump or stomp for pain. • Move in different positions for any change in symptoms. • Attempt food or drink for the ability to tolerate any change in symptoms.
<p>Cardiac</p> <p>Not applicable</p>	<ul style="list-style-type: none"> • Auscultation for murmur/rub/gallop. • Auscultation for bruit. • Reliable assessment of the strength of pulse or pulse deficits. 	<ul style="list-style-type: none"> • Ask about the number of pillows at bedtime. • Weight (particularly for CHF), with a log if available. • Data from sensors, including smartwatches or smart rings (if available). 	<ul style="list-style-type: none"> • Heart rate from home blood pressure cuff or pulse oximetry, including variability in the heart rate while monitoring (if available). • Coach patients through checking their pulse rate. • Have the patient lie flat to assess dyspnea. • Send the relevant clinical picture (must be HIPAA-compliant).
<p>Dermatological</p> <p>Not applicable</p>	<ul style="list-style-type: none"> • Palpitation for warmth, crepitus, or other features. • Nikolsky sign. • Blanching. 	<ul style="list-style-type: none"> • Not applicable (no additional history beyond the detailed history relevant to in-person assessment). 	<ul style="list-style-type: none"> • Coach the patient through palpitation for warmth (ideally comparing an affected vs. nonaffected area) or for fluid or crackles. • Mark the perimeter to outline the area for patient to monitor for subsequent spread. • Send any relevant clinical picture (must be HIPAA-compliant).
<p>Extremities</p> <p>Not applicable</p>	<ul style="list-style-type: none"> • Visualization for any asymmetry or pallor. • Pressing (for edema or warmth/coolness to touch). • Palpitation for compartment pressure. 	<ul style="list-style-type: none"> • Ask about any sock/shoe tightness or indentation. • Identify correlation with sleeping position or time of day. 	<ul style="list-style-type: none"> • Ask the patient to press "marching through" for point of tenderness. • Tape measure to quantify diameter/swelling and compare with contralateral limb. • Coach the patient through capillary refill (focused on appreciable differences in extremities if unable to time precisely).

What you can do, directly	What you lose	Supplemental history	Facilitated exam maneuvers
<p>Genitourinary Not applicable</p>	<ul style="list-style-type: none"> • Direct inspection. • Pelvic examination. • Testicular palpation. • Rectal exam. 	<ul style="list-style-type: none"> • Recent blood glucose results (may increase potential for Candida or urinary tract infection). • Sexual activity. 	<ul style="list-style-type: none"> • Home urine dipstick test (if available). • Guide the patient on how to self-assess costovertebral angle tenderness, including comparison to the other side (or have family assess). • Coach the patient through pushing on their abdomen for tenderness (nontender in renal colic). • Fingertick glucose (diabetes). • Send the relevant clinical picture (must be HIPPA compliant). • Ask the patient to look in a mirror (or use a smartphone as a mirror). • Ask the patient to read something to identify gross visual changes. • Wipe the external ear with clean tissue to assess drainage/otorrhea.
<p>HEENT Audible congestion. Abnormal phonation/hoarseness</p>	<ul style="list-style-type: none"> • Inspection. • Visual acuity testing. • Otoscopy and ophthalmoscopy. • Sinus percussion and transillumination. • Lymph node palpation. 	<ul style="list-style-type: none"> • Clarify and trouble chewing, opening mouth, or swallowing. • Clearly localize pain. 	<ul style="list-style-type: none"> • Coach the patient on sinus percussion or to lean forward for sinus pressure. • Ask the patient to press on teeth for focal tenderness. • Scrape tongue for residue. • Ask the patient to swallow food or drink (dysphagia or odynophagia, heat or cold sensitivity). • Coach patient to feel the neck for swelling or mobility.
<p>Musculoskeletal Audible pain or distress with movement</p>	<ul style="list-style-type: none"> • Directly visualizing deformities, swelling, range of motion, or gait. • Palpation of the spine/chest wall and other bony structures for step-offs or more precise localization. 	<ul style="list-style-type: none"> • Ask about cracking, locking, looseness, or changes in range of motion. • Use the contralateral side for comparison (when possible). • Ask about any new limp or mobility assistance (i.e. new use of a cane). 	<ul style="list-style-type: none"> • Send any relevant clinical picture (must be HIPAA-compliant). • Coach the patient through rotation, flexion, and extension of the joints, neck, and back. • Ask the patient to ambulate (if able to do so safely, considering fall risk). • Ask the family/caregiver to press down the spine.
<p>Neurological Orientation Speech and phonation</p>	<ul style="list-style-type: none"> • Finger-to-nose and rapid alternating movements. • Extraocular movements, pupillary responses, or visual field cuts. • Strength assessment. • Detailed sensory assessment. 	<ul style="list-style-type: none"> • Specific questions may be needed that would otherwise be directly observed in person (e.g., Are you now needing an ambulation device or more assistance to walk? Are you dropping things?) • Cincinnati Stroke Score assessment.¹⁸ • Family caregiver to compare to patient's baseline. 	<ul style="list-style-type: none"> • Fingertick glucose (diabetes). • Have the patient flex/extend the neck for nuchal rigidity. • Ask the patient to follow verbal commands (especially those who can be verified, such as "clap your hands").

What you can do, directly	What you lose	Supplemental history	Facilitated exam maneuvers
<p>Psychiatric Assess thought process or distraction. Affect, tone, or speech pattern. Reports of hallucinations. Expressions of suicidal or homicidal thoughts.</p> <p>Pulmonary Audible wheezing, coughing, speaking in incomplete sentences, or other audible dyspnea (if the patient is not speaking more than brief sentences, ask them to speak more to better assess).</p>	<ul style="list-style-type: none"> • Watching for psychomotor agitation or responses to external stimuli. 	<ul style="list-style-type: none"> • Be vigilant to yes/no answers or paucity of speech (this may obscure symptoms). • Assess what you hear in the background. • Family/caregiver may corroborate or supplement. 	<ul style="list-style-type: none"> • Coach the patient for self-assessment of sensation, tandem gait, Romberg, etc. (if able to do so safely considering fall risk). • Have the patient close each eye and read from monocular vs. binocular diplopia or vision changes. • Be vigilant to yes/no answers or paucity of speech (this may mask word-finding or speech difficulties). • Instruct patients to repeat back in their own words information you've given (as receptive language, processing, and expressive language). • Check for toxidrome or glucose (this is to rule out other causes, rather than to make a psychiatric diagnosis, specifically).
<p>Vital signs Not applicable</p>	<ul style="list-style-type: none"> • Auscultation for adventitious and focal breath sounds. • Direct inspection of work of breathing or accessory muscle use. 	<ul style="list-style-type: none"> • Ask for a response to treatments or rescue medications. • Ask about pleuritic pain with breathing. • Identify any productivity to a cough (sputum, hemoptysis). • Ask if symptoms change with coughing. 	<ul style="list-style-type: none"> • Coach the patient to count respiratory rate. • Read aloud from a paper or book. • Assess breathing after ambulating, including any other changes in symptoms or distance able to walk. • Have the patient take a deep breath for any coughing/bronchospasm or difficulty. • Ask the patient to use a home inhaler/nebulizer to assess reversibility.
<p>Vital signs Not applicable</p>	<ul style="list-style-type: none"> • Confirmation that the blood pressure cuff is applied correctly and sized appropriately. • Correlate reported heart rate with examination (auscultation or pulse check). • Strength of pulses. 	<ul style="list-style-type: none"> • Ask for a description of how vital signs are being taken. • Last time, the home blood pressure cuff was calibrated. • Data from the wearable device (if available). • Any vital sign log the patient maintains. • Ask when they last ate/drank or took medications (i.e. antipyretics, diuretics, antihypertensives). 	<ul style="list-style-type: none"> • Ask the patient for the ability to check with home equipment (home cuff, thermometer, O₂ saturation probe, if available). • Coach the patient to check their pulse rate. • Ask the patient to stand for symptomatic orthostasis versus the potential to obtain orthostatic vital signs with a home cuff. • If available and able to do so safely, considering fall risk.

CHF: congestive heart failure; HEENT: head, eyes, ears, nose, and throat; HIPAA: Health Insurance Portability and Accountability Act.