WHITE PAPER

Jacoti Lola® Pilot Study

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Summary

The purpose of this quality improvement pilot study was to assess the efficacy of Jacoti Lola, an iOS-based assistive listening technology, during clinical otolaryngologic examinations in an urban hospital setting. It sought to investigate the impact of Lola on both patient-provider communicative interactions and on patient activation and involvement in their healthcare process.

Forty-four patients and three healthcare providers in an urban hospital setting participated in the field test of Lola over a period of ten weeks. The results revealed the following patient perceptions of the technology:

- Nearly 90% felt that Jacoti Lola enhanced efficacy of provider-patient communicative interactions and increased patient activation and involvement.
- Approximately 90% judged usability of the technology favorably.
- Both Spanish-speaking as well as Englishspeaking patients judged the smartphone technology to be efficacious in enhancing patient-provider communicative interactions and patient activation.
- The impact of the intervention was perceived as beneficial, regardless of whether patients reported hearing difficulty.

Introduction

Even a mild hearing loss adversely affects the quality of communications in challenging listening situations.[1 2] Because hospitals typically have high ambient noise levels, often exceeding limits recommended by the World Health Organization (WHO),[3 4] patient-provider communications in hospital settings can be especially difficult for people with hearing loss.[5]

Hearing loss adversely affects patient-provider communications in healthcare settings from both the provider and patient perspectives. Older adult patients with hearing loss judge patient-provider communications unfavorably because of misunderstandings due to hearing loss leading to feelings of ineffectiveness in participating in their own health-care decision process. The majority of healthcare providers also experience communication difficulties during interactions with patients having hearing loss, probably because of the increased need to repeat and explain; and one-third of providers have difficulty understanding patients with hearing loss.[6] Similarly, 59% of young adults with hearing loss mishear the healthcare provider; in 21% of that group, the mishearing was related to diagnosis, recommendations, and medications.[7]

The prevalence of hearing loss, the seriousness of the condition, and its impact on effective communications in a hospital environment often are underestimated and misunderstood, especially when the condition is untreated. Present solutions that enable effective communications between healthcare providers and patients with hearing loss in a hospital setting often are underutilized and inefficient.

There has been an increased interest in utilizing smartphones for communications by healthcare providers from various disciplines in healthcare settings. A recent study found that clinicians feel smartphones can be efficacious in enhancing healthcare communications and patient safety.[8] Responding to the call to action to use technology to address communication barriers imposed by hearing loss, investigators in another study assessed smartphone-connected devices in a group of hearing-aid users during the course of their daily activities.[9]

The purpose of this quality improvement pilot study was to investigate both the impact and usability of wireless assistive listening smartphone technology during in-hospital clinical examinations in an otolaryngology head and neck clinic of an urban hospital serving a community with a large Hispanic/Latino population.

1 Firszt JB, Reeder RM, Holder LK (2017). Unilateral hearing loss: Understanding speech recognition and localization variability – Implications for cochlear implant candidacy. Ear Hear 38(2):159-173.

2 Mondelli MF, Dos Santos Mde M, Jose MR. Speech perception in noise in unilateral hearing loss. Braz J Otorhinolaryngol 82(4):427-432.

3 Oleksy AJ, Schlesinger JJ (2019). What's all that noise-improving the hospital soundscape. J Clin Mon Comput 33(4):557-562.

4 Pope D (2019). Decibel levels and noise generators on four medical/surgical nursing units. J Clin Nurs 19(17-18):2463-70.

5 Shukla A, Nieman CL, Price C, Harper M, Lin FR, et al. (2019). Impact of hearing loss on patient-provider communication among hospitalized patients: A systematic review. Am J Med Qual 34(3):284-292.

6 Ibid

7 Henn P, O'Tuathaigh C, Keegan D, Smith S (2017, Feb 16). Hearing impairment and the amelioration of avoidable medical error: A cross-sectional survey. J Patient Saf.

8 Salehi HP (2018) Smartphone for healthcare communication. J Healthcare Commun 3(3:34).

9 Maidment DW, Ferguson M (2018). An application of the medical research council's guidelines for evaluating complex interventions: A usability study assessing smart-phone-connected listening devices in adults with hearing loss. Am J Audiol 27:474-481.

Methods

Healthcare providers in the otolaryngology clinic used specially configured iOS devices in examination rooms for face-to-face communications with patients. The technology incorporated Lola, a software application developed by Jacoti, BV, a Belgian-based hearing software company, for use as a wireless assistive listening device in a variety of meeting spaces including classrooms, seminars, lecture halls, and hospital examination rooms. Patients who used the technology were asked if they would anonymously complete, at the conclusion of their clinic visit, a brief survey regarding their perceptions of its efficacy. The pilot project ran over a ten-week period.

Setting, setup, instrumentation, and procedures

Two of the otolaryngology clinic's examination rooms were each equipped with three Apple iPod Touches (6th generation), a Wi-Fi-enabled iOS device similar to an Apple iPhone but without cellular capability. Instrumentation, software, logistical support, and consultation services were provided by Jacoti BVBA (Wevelgem, Belgium), a hearing health technology software developer.

Each iPod Touch was equipped with Jacoti Lola, an app that provides wireless, low latency, peer-to-peer high-quality sound transmission over Wi-Fi. Both the Jacoti Lola app and the iPod touch were chosen to provide a comfortable, non-intimidating assistive listening experience with consumer-friendly technology. All devices were configured to run in "single-app" or kiosk mode so that only the Lola app could be accessed by users on each device.

All devices[10] connected automatically to the appropriate Wi-Fi network for each of the two examination rooms. Each Wi-Fi network was password protected to ensure privacy and consisted of: (a) a standard router having a DHCP (dynamic host configuration protocol) server to provide IP (internet protocol) addresses to the devices; and (b) a Wi-Fi access point to which the router was connected via Ethernet. Each room was also equipped with a charging and storage station for the iPod Touches.

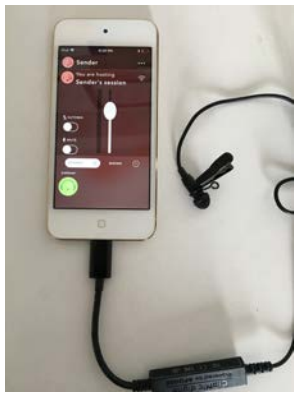
Two iPod Touches were set up for each room as speech transmitters (Sender) and one iPod Touch was configured as a receiver (Listener). The volume controls for both Senders and Listeners are accessed by pressing the buttons on the sides or by sliding an on-screen volume bar. (One iPod Touch served as a back-up Sender or Receiver.)

The healthcare provider wore a lavalier (lapel) microphone positioned near the mouth, typically clipped on the collar or neckline of a shirt or jacket. The lavalier microphone was attached to each Sender via a lightning cable and the Sender was placed in a pocket. The patient was provided with a Listener equipped with over-the-ear headphones. The patient either held the Listener or placed it in his/her lap. For the purpose of infection control, earphone cushions were covered by disposable earphone guards and alcohol wipes were used to wipe down the earphone cushions and headband after each use. At the end of the clinic day, disinfecting disposable wipes were used to disinfect all iPod Touches.

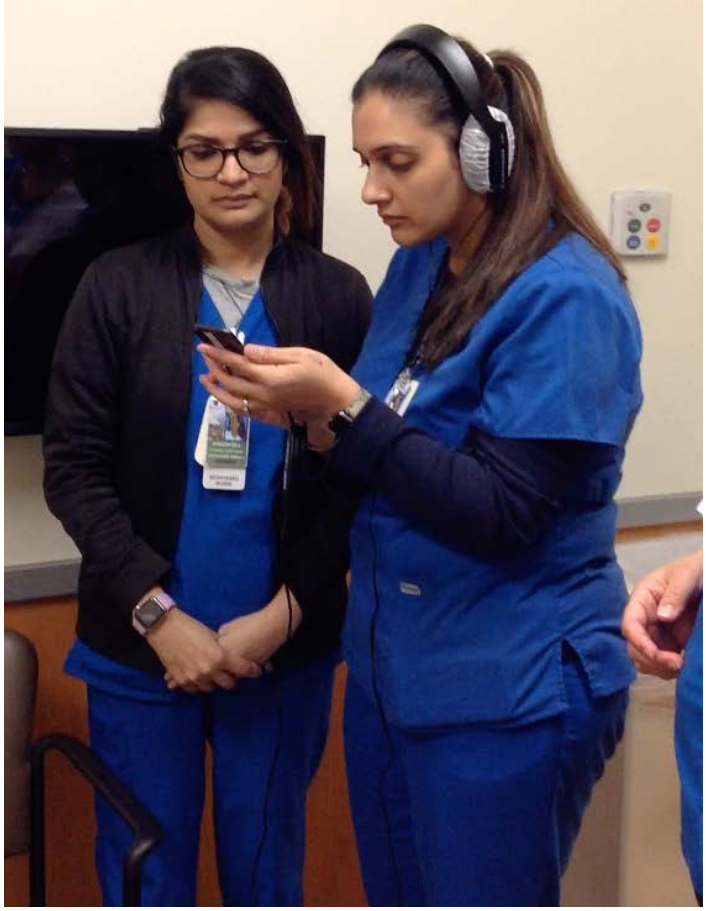
Installation of the instrumentation, setup, and one-on-one training of the healthcare providers occurred onsite over a three-day period. Training of the healthcare providers comprised an initial presentation regarding the effects of hearing loss on communicative efficiency and health; the purpose of the field test; and a demonstration of the Lola technology and use. A videotape on the use of the technology and another videotape on troubleshooting problems were developed and distributed to the healthcare providers involved in the smartphone intervention.

To run each iteration of the field test, the healthcare provider asked patients at the beginning of the examination if they were interested in trying out Lola and provided instructions on its use. If they agreed, they were provided with a Lola receiver device and with headphones which were worn during their examination. Upon conclusion of the session, a brief, one-page, paper-based survey (Spanish or English version, depending on the patient's primary language) was administered to measure patient opinions and attitudes regarding the impact of the Lola on communicative efficiency during patient-provider interactions and ease of use of the technology.

10 https://support.apple.com/guide/mdm/welcome/web#/mdm8a42c4c4a to enable peer-to-peer aural communication



Part of the pilot study equipment: iPhones with Lola Installed, over-the-ear headphone and lavalier microphone



Hospital Staff training session

Results

All patients (N = 44) who were asked to participate in the intervention consented to participate and completed the survey (19 in the English language version and 25 in the Spanish language version). Of the 8 healthcare providers, 3 (2 nurse practitioners and 1 otolaryngologist) participated in the intervention.

The results are displayed in Table 1. The percentage frequency distributions reveal that slightly less than half of the participants self-reported hearing difficulty in quiet and about two-thirds of the participants self-reported hearing difficulty in noise. The overwhelming majority (88.4% to 90.9%, depending on the survey item) of patients reported favorable opinions about the efficacy and usability of the smartphone running Lola during patient-provider communications. A small minority of patients (2.3% – 6.95%, depending on the survey item) reported unfavorable opinions about the efficacy and usability of the technology. A markedly higher percentage of patients strongly agreed than disagreed (by a factor of 7 to 10) that the Lola smartphone technology intervention made it easier to hear hospital workers, improved communication in the hospital, and stated that they wanted to use the intervention the next time they went to the hospital.

Conclusion

This quality improvement pilot study was deployed in clinical examination rooms of an otolaryngology clinic in a hospital setting. Consumer-friendly iOS devices running the Jacoti Lola app were used to enable wireless, low latency, peer-to-peer high-quality (CD quality) sound transmission and reception over Wi-Fi for hands-free communication between the healthcare provider and the patient (who wore headphones attached to an iPod Touch held in the hands or on the lap).

The findings support the conclusion that patients perceived that smartphone technology is usable and has a beneficial impact on patient-provider communicative interactions and patient activation.

The importance of the Jacoti Lola assistive listening technology in the healthcare process is underscored in this present, and likely to be long-lasting, COVID environment. The wearing of face masks to reduce transmission of COVID adversely affects communicative interactions by greatly decreasing facial cues afforded from lipreading and facial expressions and by attenuating the intensity of speech sounds, particularly high-frequency speech sounds by an average of 3-12 dB, depending on the type of facial mask.[11] High-frequency sounds are much more important than low-frequency sounds for speech understanding. Jacoti Lola assistive listening technology would, in addition to the benefits reported in this investigation, offset the degrading effects of masking and social distancing on communicative efficiency.

11 1 Goldin, A., Weinstein, B., & Shiman, N. (2020). How do medical masks degrade speech reception? The Hearing Review. https://www.hearingreview.com/hearing-loss/health-wellness/how-do-medical-masks-degrade-speech-reception

Item	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
I usually have trouble hearing conversation when it's quiet	18.6	25.6	16.2	25.6	14
	44.2			39.6	
I usually have no trouble hearing conversation in noisy situations	14	18.6	11.6	27.9	27.9
	32.6			55.8	
I feel that the Lola device made it easier to hear hospital workers	46.5	41.9	4.65	4.65	2.3
	88.4			6.95	
I feel that the Lola device improved communication in the hospital	40.9	47.7	6.8	2.3	2.3
	88.6			4.6	
I feel that Lola was easy to use	40.9	50	6.8	0	2.3
	90.9			2.3	
I want to use the Lola device the next time I visit the hospital	47.7	43.2	4.5	2.3	2.3
	90.9			4.6	
I feel that the Lola device made me more confident in expressing my needs and concerns in the hospital	38.6	50	6.8	2.3	2.3
	88.6			4.6	

Table. Distribution of participant ratings on each questionnaire item.

About Jacoti

Jacoti BV | Hearing Technologies is a science-based company that develops hearing enhancement solutions embeddable in consumer devices. Its flagship product, Jacoti Inside, optimizes audio to each individual hearing requirement from consumer technologies to fully-fledged medical devices.

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