Apps for Hearing Healthcare

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Abstract. The hearing healthcare scenario is rapidly evolving due to the pervasive use of m-Health solutions, in particular mobile apps. This brings along significant advantages and opportunities (e.g., accessibility, affordability, personalized healthcare, patient empowerment) as well as significant potential risks and threats (e.g., safety, misuse, quality issues, privacy). Our research aims at the identification and assessment of apps in the hearing healthcare domain. In this article we present an overview of the current availability, variety, and penetration of hearing-related apps.

Keywords. Mobile Applications, Hearing, Audiology, Telemedicine, Delivery of Health Care.

Introduction

In the many-aspects Internet-backbone network, "e-Health" is a multi-promising field of opportunities and often still experimental applications, and the future of hearing healthcare is not at all out of such field. "e-Health for Hearing" is a rapidly emerging application domain where high expectations are placed by a variety of actors - the general public, individuals with hearing problems, professionals in the hearing healthcare path as well as health decision makers and other stakeholders across the responsibility chain. Novel e-Health solutions (and, most prominently, m-Health innovations) can now tackle peculiar needs and challenges of the different stakeholders more effectively than conventional hearing healthcare delivery models [1]. Apps in particular are now making the leap from early adopters to mainstream, and give the way to an extremely sparkling m-Health branch in the hearing healthcare domain [2]. In the path towards the identification of guiding principles and practices for safe and effective use of medical apps and their scientific/technical accreditation, our research is devoted to the identification and assessment of apps in the hearing healthcare domain. In particular, this paper will present an overview of the current scenario in the hearing healthcare medical domain.

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1. Methods

The available apps in the field of hearing healthcare were reviewed by searching on the Apple Store, the Android Market on Google Play, and the Windows Phone store, using the following keywords: hearing, audiology, audio, auditory, speech, language, tinnitus, hearing loss, hearing aid, hearing system, cochlear implant, auditory training, hearing rehabilitation, assistive technology/tool/device. The available apps were classified according to the services and tools delivered and then grouped into five major categories that match the major 'needs' perceived by individuals with hearing problems (hearing loss, speech and language problems, communication or auditory processing disorders, tinnitus): i) education & information, ii) hearing testing, iii) rehabilitation, iv) sound enhancement, v) assistive tools.

2. Results

Figure 1 shows the distribution of the available apps in the five major categories that are relevant to hearing healthcare: i) education & information, ii) hearing testing, iii) rehabilitation, iv) sound enhancement, and v) assistive tools.

Apps in the "education & information" category include dictionaries, interactive atlases, videos, and high definition illustrations, educational material for helping patients and physicians, audio simulations of hearing loss and hearing amplification solutions, measures of environmental noise and information on noise induced hearing loss, service finders. This category answers, on the one hand, the needs of hearing professionals, students, and physicians for accessible and easy-to-handle scientific information and tools to support service delivery and, on the other hand, the need of individuals for timely, meaningful, reliable and properly tuned information on hearing and communication disorders and on the variety of rehabilitation options and benefits.

Apps in the "hearing testing" category include a variety of tools for hearing screening and assessment such as, for example, pure-tone audiometry, speech and speech-in-noise tests, tests with special sounds, temporal resolution measures, tinnitus pitch matching, self-assessment questionnaires, and services for hearing professionals. These services answer the individuals' need for easy to use, quick methods for self-assessment and self-monitoring of hearing ability and are a valued means to improve awareness on hearing loss and promote help-seeking behaviors and attitude to change.

Apps in the "rehabilitation" category include services for self-administered auditory training, a variety of speech-and-language rehabilitation tools, specific services for patients with auditory processing disorders, learning tools for children with hearing and communication disorders, services for remote consultation and support to patients' choices. Patients are thus better supported in their rehabilitation path, therapists and special education teachers can make profit of a large variety of personalized, interactive exercises and databases to support children learning.

The category "sound enhancement" includes tools to support hearing aid use (e.g., system control, support to hearing aid selection, ratings of listening experience, consumer engagement services, and so on) as well as personal enhancement tools for personalized sound amplification for people with mild or moderate hearing losses. Individuals with hearing aids can use these straightforward tools to personalize their settings in real time, greatly limiting the need for face-to-face appointments; people

with earlier signs of hearing loss can easily find benefit daily life using smartphone-based solutions for personal sound amplification.

The "assistive tools" category includes a variety of communication aids for deaf and hard of hearing people such as captions in phone calls or videos, sign language videos and dictionaries, as well as alerts (video, vibrotactile) on sound input, with an overall, tangible advantage for hard of hearing people in their independent living.
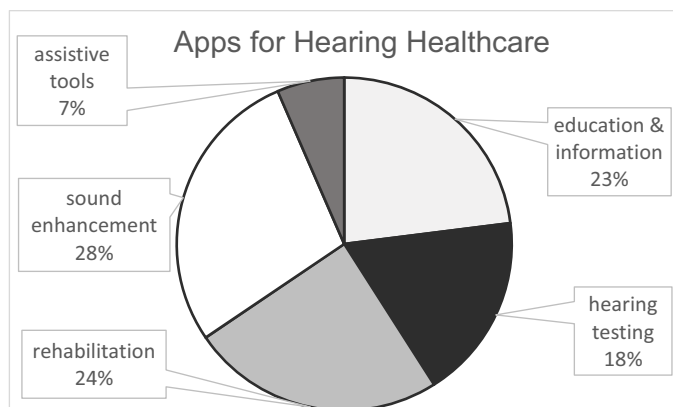

Figure 1. Distribution of the available apps for hearing healthcare (N = 200. As for Nov 5, 2014).

3. Discussion

The review of available apps in the hearing healthcare domain has revealed a very varied picture where a wide range of tools and services are available for the healthcare professionals and, most prominently, for individuals with hearing problems. Results revealed how the available m-Health solutions can tackle patients' and professionals' needs more effectively than conventional solutions and services for hearing healthcare.

Overall, the spread and penetration of these apps is contributing to a significant paradigm shift in hearing healthcare whereby the traditional hospital-centric model of professional-mediated care is now changing into a more flexible model where the patient is empowered and actively involved in the process, and provided with personalized, reliable, ubiquitous, and low-cost services to improve the overall experience and, most importantly, the benefits of the hearing healthcare path [3].

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