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TELEAUDIOLOGY IN PRACTICE

De Wet Swanepoel, PhD

1. Dept of Speech-Language Pathology & Audiology, University of Pretoria,
2. Ear Science Institute Australia, Subiaco, Western Australia

De Wet Swanepoel, PhD

Dr. De Wet Swanepoel is a professor in the Department of Speech-Language Pathology and Audiology, University of Pretoria and senior researcher at the Ear Science Institute Australia. Prof Swanepoel's research capitalizes on the growth in information and communication technologies to explore, develop, and evaluate innovative technologies and service delivery models to improve ear and hearing care. He has published more than 170 peer-reviewed articles, books, and book chapters and is funded by the NIH, UK Academy of Medical Sciences, National Research Foundation, industry, and has received numerous national and international awards in recognition of his work. Prof Swanepoel serves as Editor-In-Chief of the International Journal of Audiology, past-president of the International Society of Audiology and co-founder of a digital health tech company called the hearX group.

- **Presenter Disclosure**: Financial: DeWet Swanepoel, PhD, is the founder and scientific advisor of the hearX Group. He received an honorarium for this presentation. Non-financial: DeWet Swanepoel, PhD, is a member of the Phonak Pediatric Advisory Board and the Ida Institute Advisory Board.

- **Content Disclosure**: This learning event does not focus exclusively on any specific product or service.

- **Sponsor Disclosure**: This course is presented by AudiologyOnline.

Learning Outcomes

- After this course, participants will be able to:
- Describe how COVID-19 has accelerated teleaudiology.
- Compare the differences between high-, low- and no-touch audiology.
- Explain how teleaudiology can address barriers to hearing care across the patient journey.

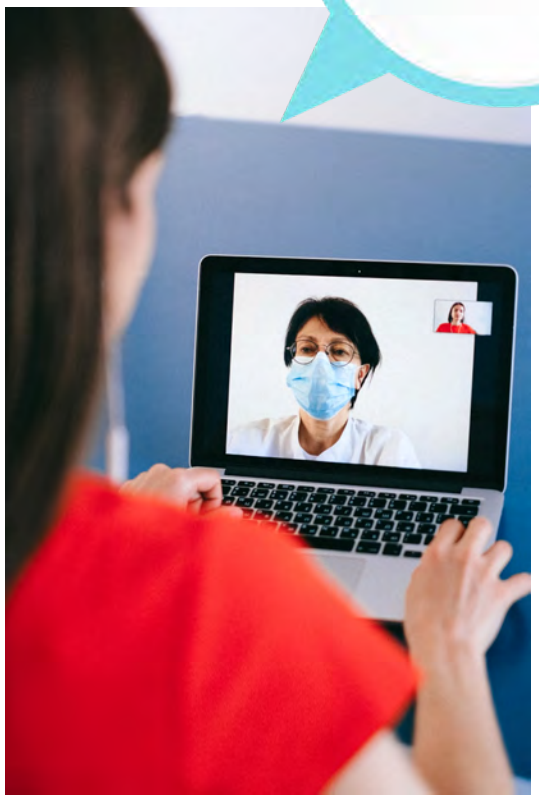
OUTLINE

Telehealth definition & concepts

Potential of Teleaudiology

Telehealth service examples for COVID-19 and beyond

- Low & no-touch audiology
- Online screening



TEAM

Herman Myburgh (Co-investigator, UP)
Cas Smits (Co-investigator, Netherlands)
David Moore (Co-investigator, USA)
Claude Laurent (Co-investigator, Sweden)
Robert Eikelboom (Co-investigator, Australia)
Faheema Mahomed (Research associate)
Susan Eksteen (PhD student)
Husmita Ratanjee Vanmali (PhD student)
Karina De Sousa (PhD student)

FUNDING
NIH, Newton Advanced Fellowship, William Demant foundation, Hear the World foundation, Sonova

Disclosure: co-founder, scientific advisor

TELEHEALTH – DEFINITIONS & CONCEPTS

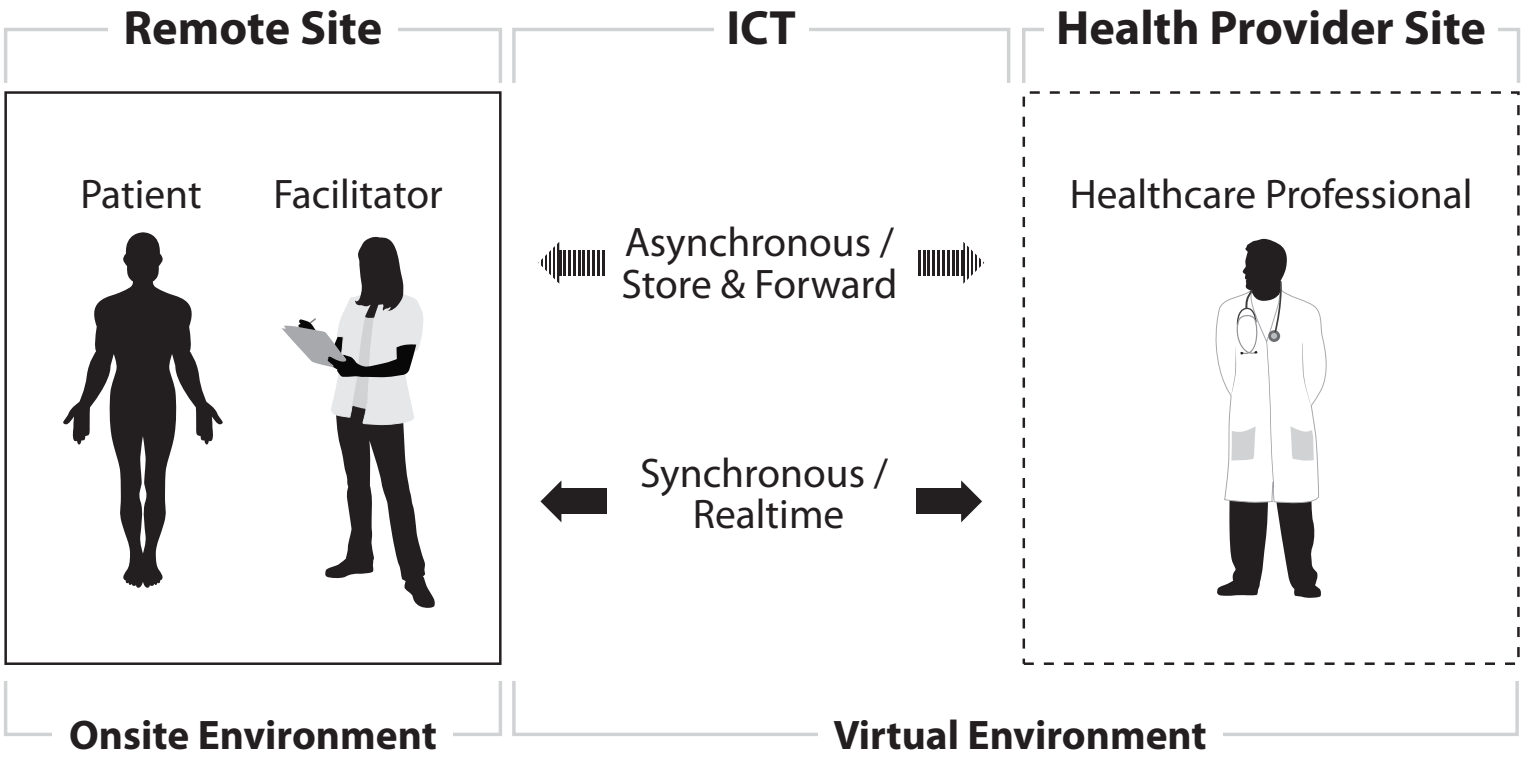
Providing health care at a distance using information and communication technology

”Delivery of health care services, where patients and providers are separated by distance. Telehealth uses ICT for the exchange of information for the diagnosis and treatment of diseases and injuries, research and evaluation, and for the continuing education of health professionals.”

WHO, 2016

Concept as old as telecommunication mediums

TELEHEALTH – DEFINITIONS & CONCEPTS



TELEHEALTH – DEFINITIONS & CONCEPTS

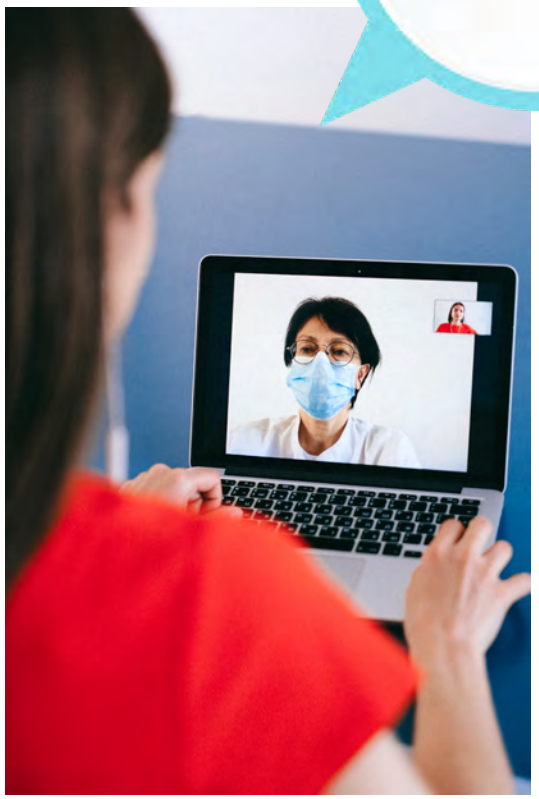
Terminology

- Telemedicine, telehealth
- eHealth, mHealth
- Remote care, virtual care
- Digital health, connected health

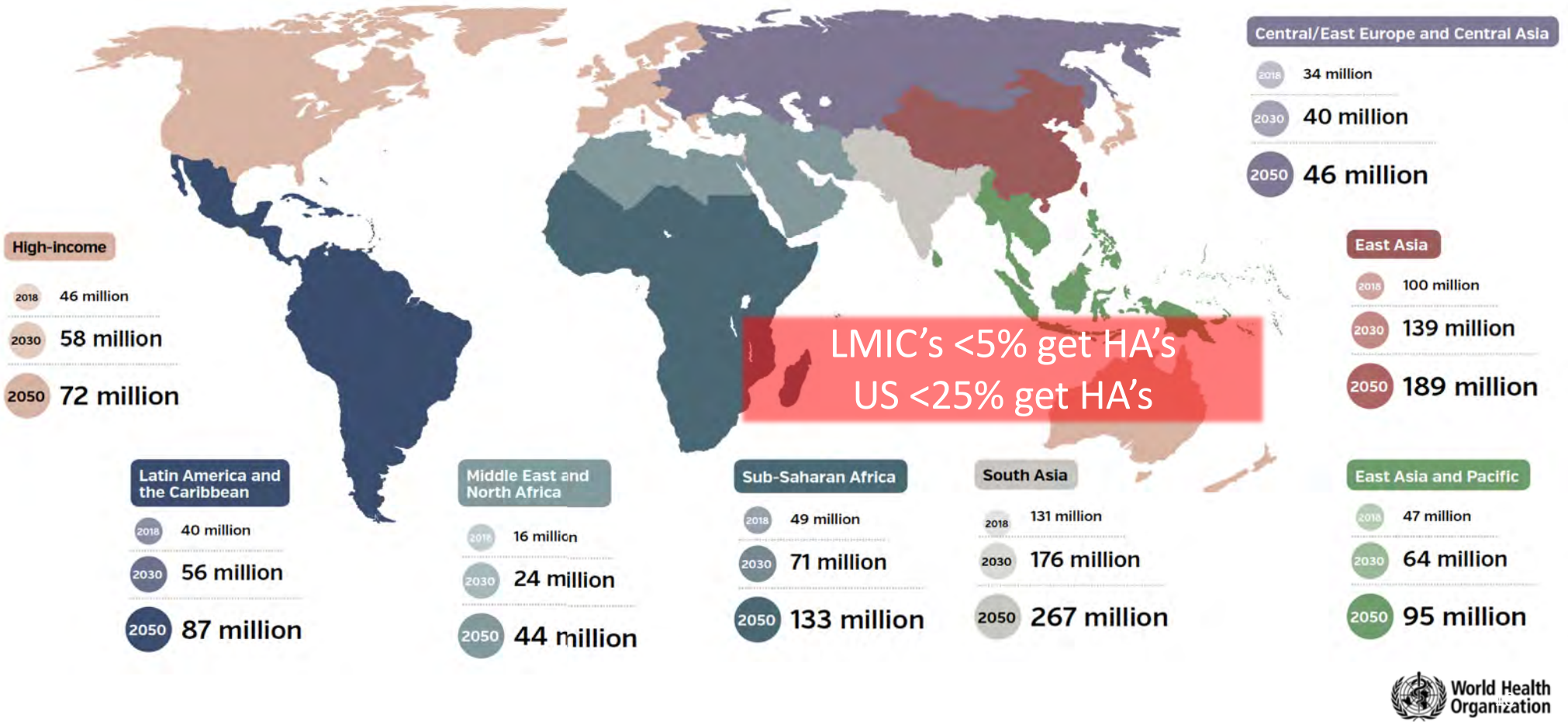
- Face-to-face, in-person
- Remote, virtual, online
- Synchronous, real-time
- Asynchronous, store-and-forward

POTENTIAL OF TELEAUDIOLOGY

1. To improve access to hearing care
2. To enhance efficiency, convenience (& quality)
3. To enable care during COVID-19 (and beyond)



TO IMPROVE ACCESS TO HEARING CARE



TO IMPROVE ACCESS TO HEARING CARE

Advocacy & awareness

HR for hearing care

Centralized services

Efficiency challenges

Expensive equipment

Expertise required

continued

Improve access to hearing care

Table 1 Barriers to Traditional Hearing Care and Opportunities Using eHealth Technologies in Low- and Middle-Income Countries

Traditional hearing care barriers	Enabling eHealth technologies
Limited access to professionals	Increase access • Nonhearing professionals • Automation • Smart decision making (AI) • Quality control - Inclusive UIs
Costs (e.g., equipment, environment, amplification, support)	Improve affordability • Minimally trained persons • Off-the-shelf technologies • Environmental management and surveillance • Amplification: Diversification by established manufacturers and competitive pricing by new players Integrated with test equipment Noncustom molds Rechargeability Remote support
Centralized services	Decentralized point-of-care • Mobility • Nonprofessional hearing care providers • Community-based models, i.e., primary health care, home-based, occupational, wellness, mobile • Optimized triaging • Point-of-care hearing aid fittings - Remote support options

eHealth Technologies Enable more Accessible Hearing Care

De Wet Swanepoel, Ph.D.[1,2,3]

SEMINARS IN HEARING/VOLUME 41, NUMBER 2 2020

ENHANCE EFFICIENCY & CONVENIENCE

TELEHEALTH

Home

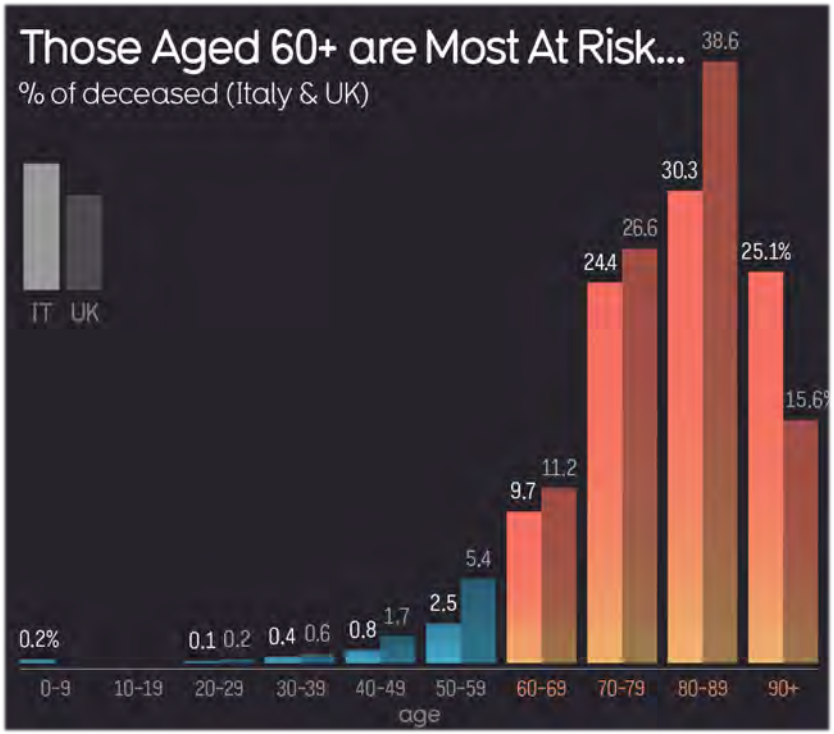
Awareness	Detection	Diagnosis	Intervention		Rehab & Support	
Screen	Motivate	Diagnostics	HA fittings	Adjust	Monitor & support	Rehab

Clinic

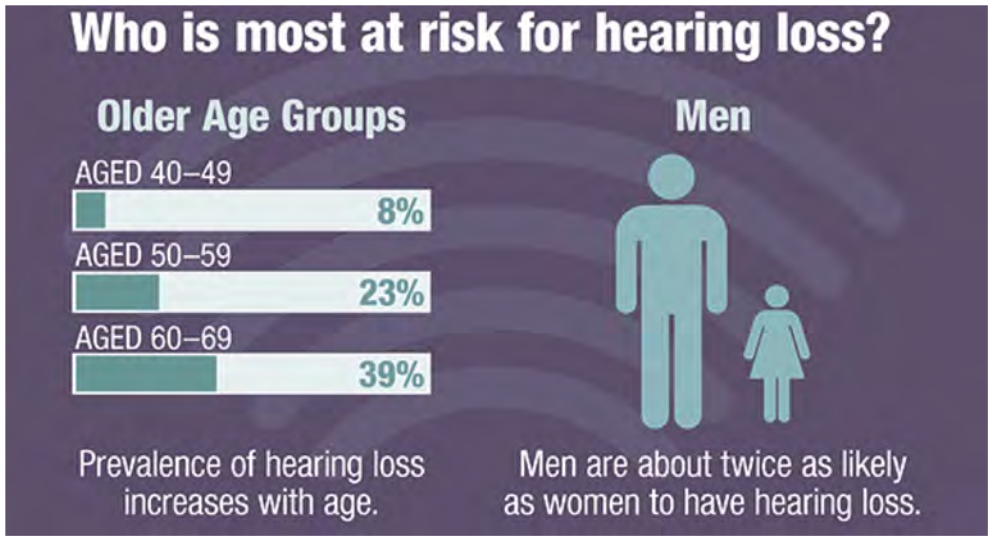
Swanepoel and Hall, 2020;

COVID-19 & TELEAUDIOLOGY

1. Audiology patients at highest risk of mortality and morbidity

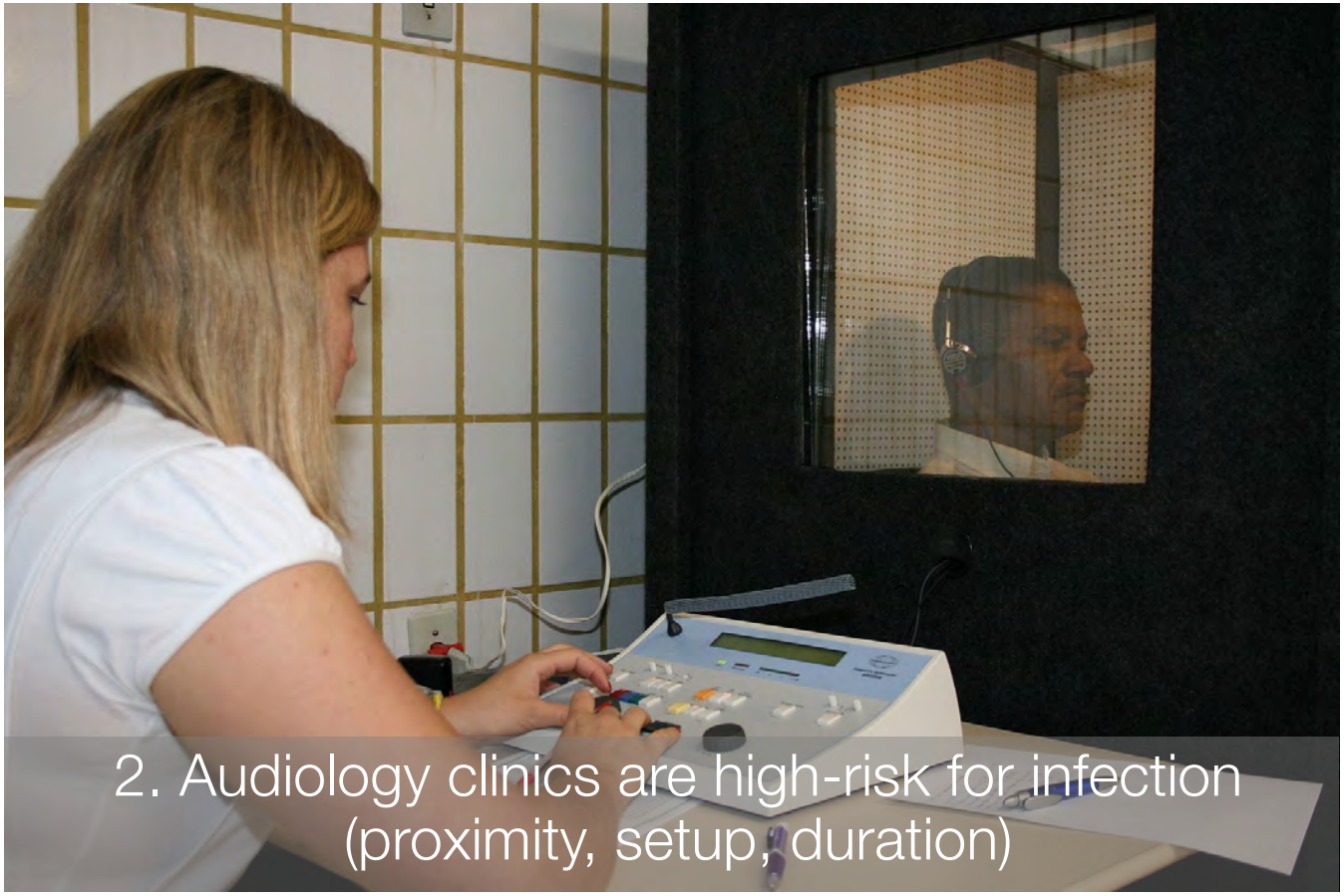


Study of 3,372 death cases in UK & 21,551 deaths in Italy
Sources: Italian Portal of Epidemiology for Public Health, UK Offices of National Statistics



National Institute on Deafness and Other Communication Disorders

COVID-19 & TELEAUDIOLOGY



2. Audiology clinics are high-risk for infection (proximity, setup, duration)

continued

The COVID-19 CATASTROPHE

What's Gone Wrong and How to Stop it Happening Again

by RICHARD HORTON

COVID-19 & TELEAUDIOLOGY

3. A new reality for audiology

"Perhaps COVID-19 represents an impermeable boundary between one moment in our lives and another. We can never go back."

COVID-19 & TELEAUDIOLOGY

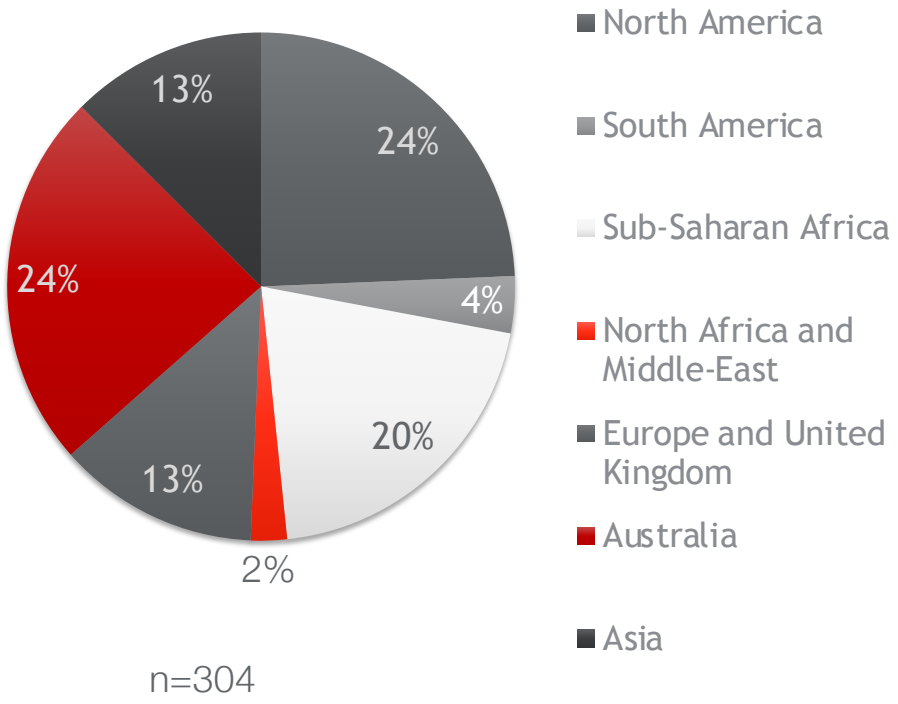
4. Changing times require changing practices

6 in 10 persons (US & UK) predict online consultations will be more popular than physical visits to doctor (Ericsson Mobility Report, 2020)

ISA Global COVID impact survey

Collaborators - Swanepoel, Eikelboom, Manchaiah, Bennett

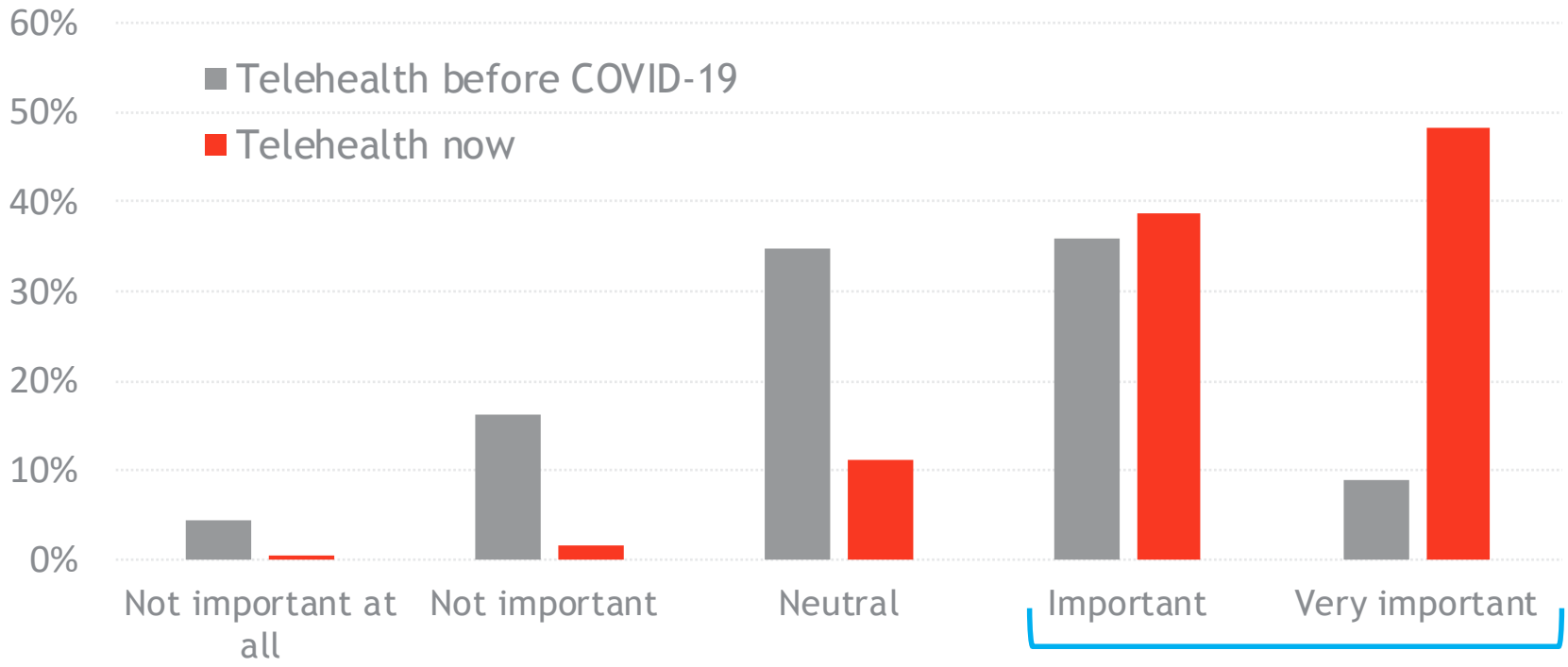
Teleaudiology feedback - 43.3% used telehealth pre-COVID; 61.4% using it now



n=304

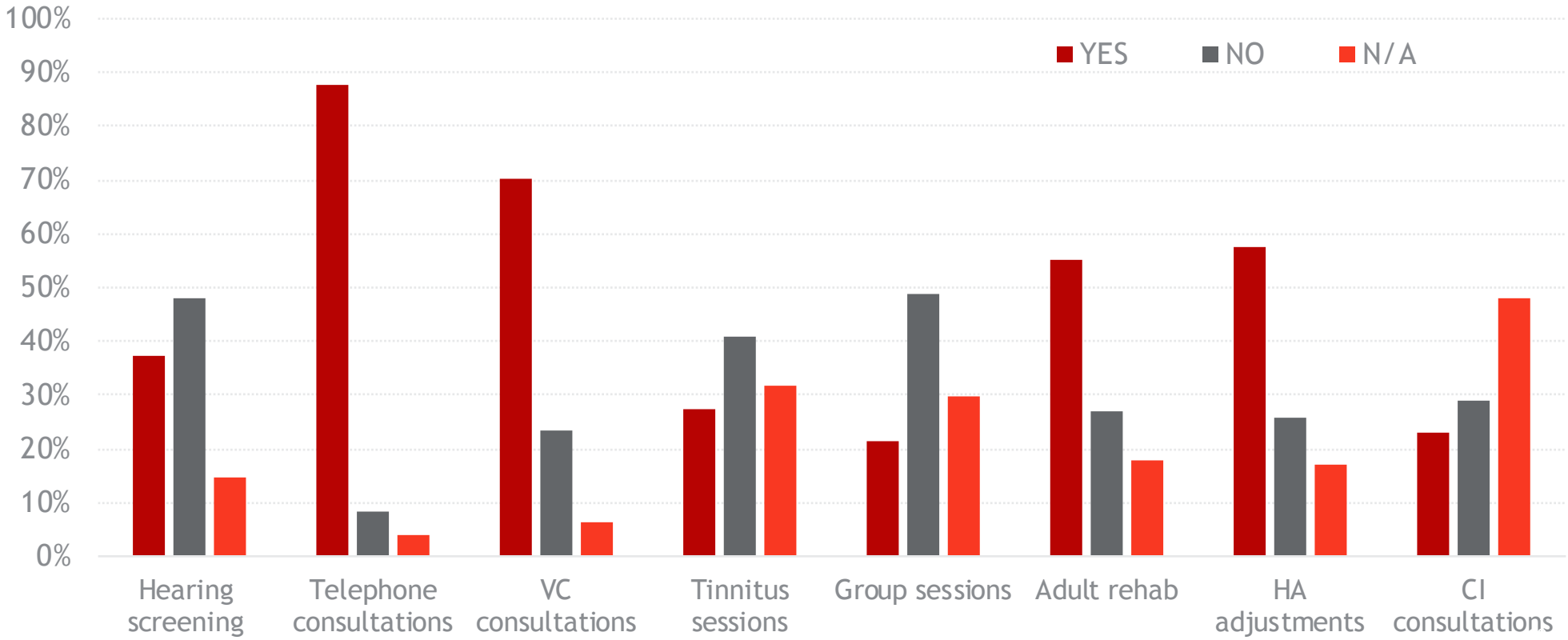
COVID-19 & TELEAUDIOLOGY

Importance of telehealth in audiology (n=271)

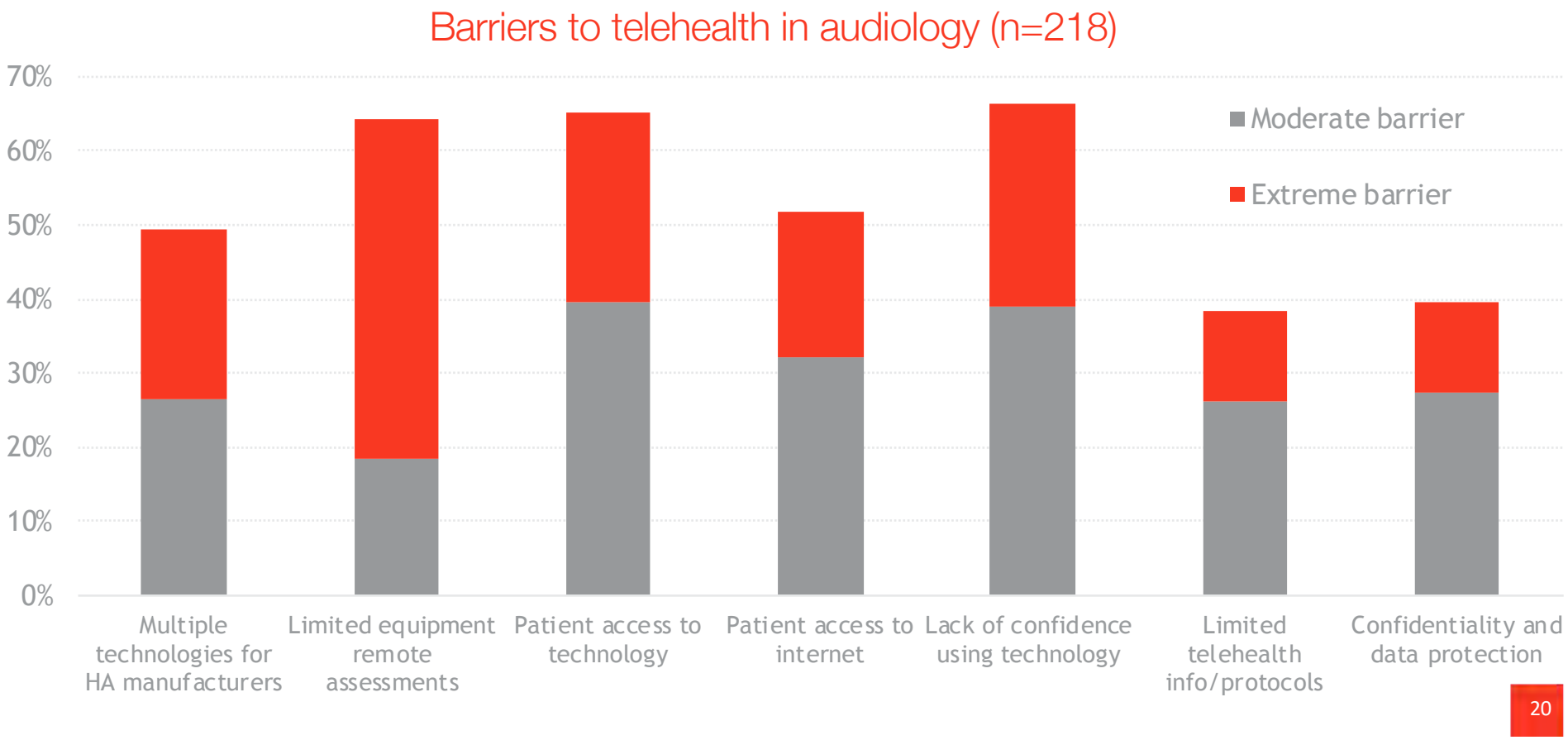


COVID-19 & TELEAUDIOLOGY

Telehealth consultations that will continue post COVID-19 (n=218)



COVID-19 & TELEAUDIOLOGY



4. Changing times require changing practices

"Never let a good crisis go to waste."

COVID-19 & TELEAUDIOLOGY

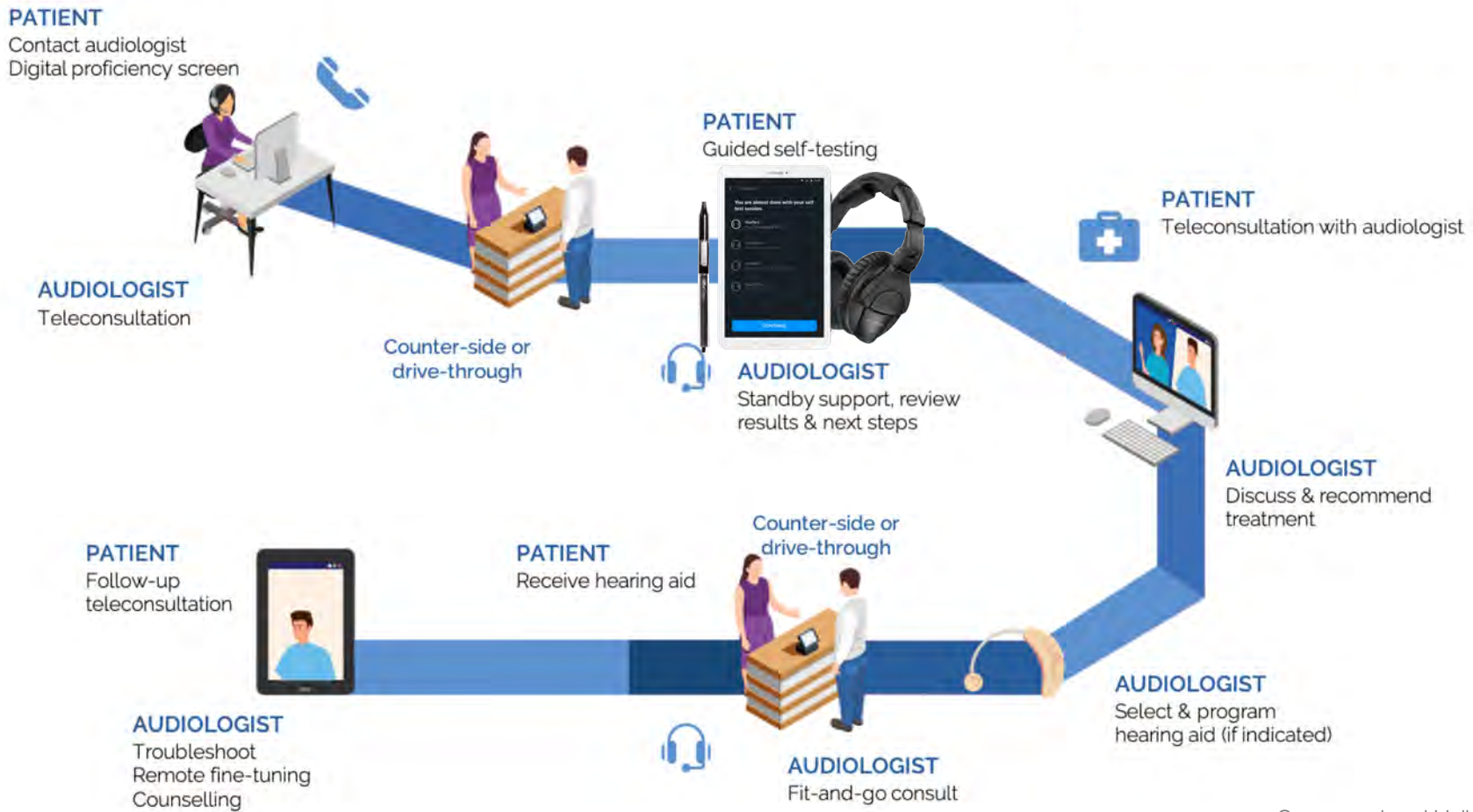
Making Audiology Work During COVID-19 and Beyond" Hearing Journal June 2020, Volume 72 Number 6

4. Changing times require changing practices

"....watershed moment for audiology [that] offers a unique opportunity to redefine and innovate how we reach and serve our patients in more responsive, efficient, and person-centered ways."

Developing low- and no- touch audiology pathways

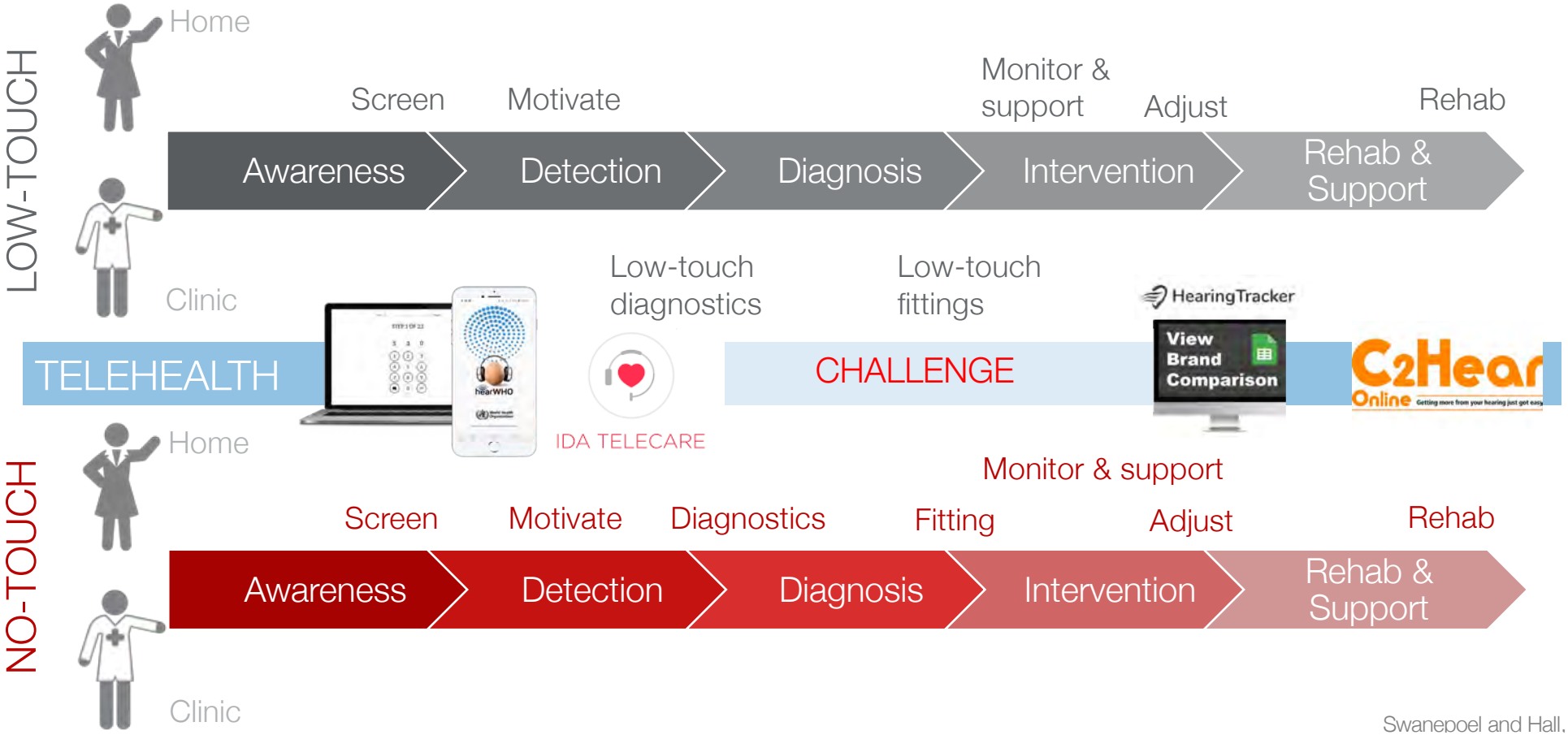
LOW-TOUCH AUDIOLOGY



Swanepoel and Hall, 2020;

NO-TOUCH AUDIOLOGY

COVID-19 & TELEAUDIOLOGY



Swanepoel and Hall, 2020;

COVID-19 & TELEAUDIOLOGY

SELF TEST KIT

1. Pure tone audiometry – calibrated headphones; rapid automated self-test (5 min)

2. Speech-in-noise – Binaural DIN test (3 min)

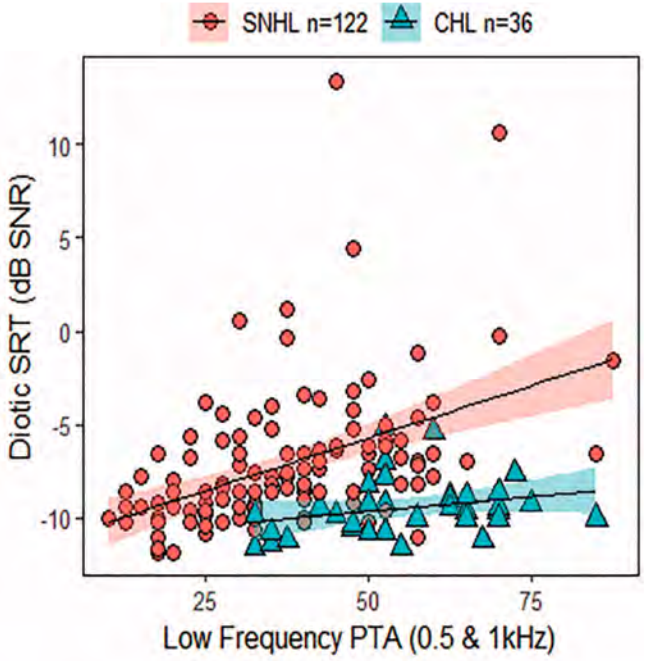
3. Risk assessment for ear disease (2 min)
   I. *Conductive loss risk algorithm*
   II. *Asymmetric loss screening;*
   III. *Red flag questions.*
   IV. *CEDRA questionnaire optional*

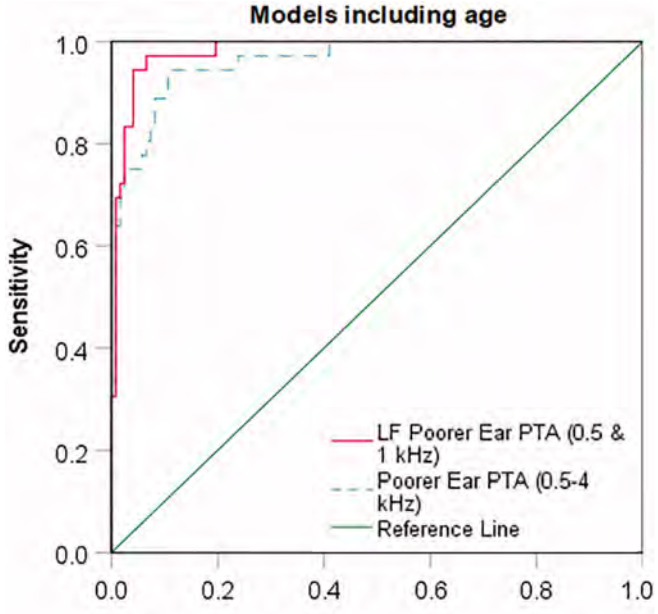
4. Digital AI otoscopy – optional (2 min)

Pure-tone audiometry without bone-conduction thresholds: using the digits-in-noise test to detect conductive hearing loss

Karina C. De Sousa[a], Cas Smits[b], David R. Moore[c,d], Hermanus Carel Myburgh[e] and De Wet Swanepoel[a,f]

INTERNATIONAL JOURNAL OF AUDIOLOGY
https://doi.org/10.1080/14992027.2020.1783585





AUROC
0.98

Sens/Spec
97.2/93.4%

COVID-19 & TELEAUDIOLOGY

SELF TEST KIT

1. Pure tone audiometry – calibrated headphones; rapid automated self-test (5 min)

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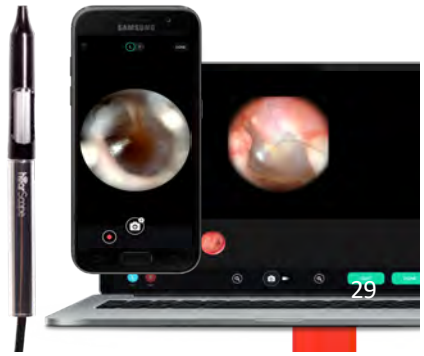
4. Digital AI otoscopy – optional (2 min)

AI OTOSCOPY DIAGNOSIS

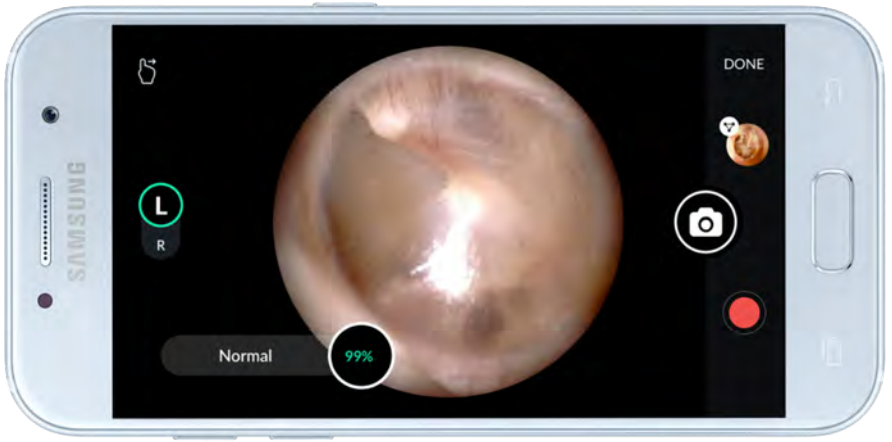
Beta release to existing users
(April 2020)

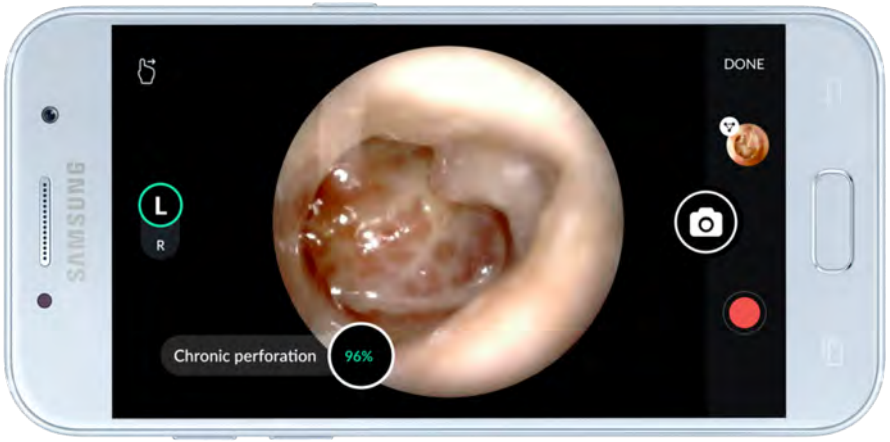
1. Old/ Traditional Otoscope — 64% to 80% accuracy
2. Diagnosis Decision Tree AI — 81% accuracy
3. Diagnosis Feed-Forward Neural Network — 86% accuracy
4. Deep Neural Network — 94% accuracy



Myburgh et al. 2016; 2018

AI IMAGE CLASSIFICATION

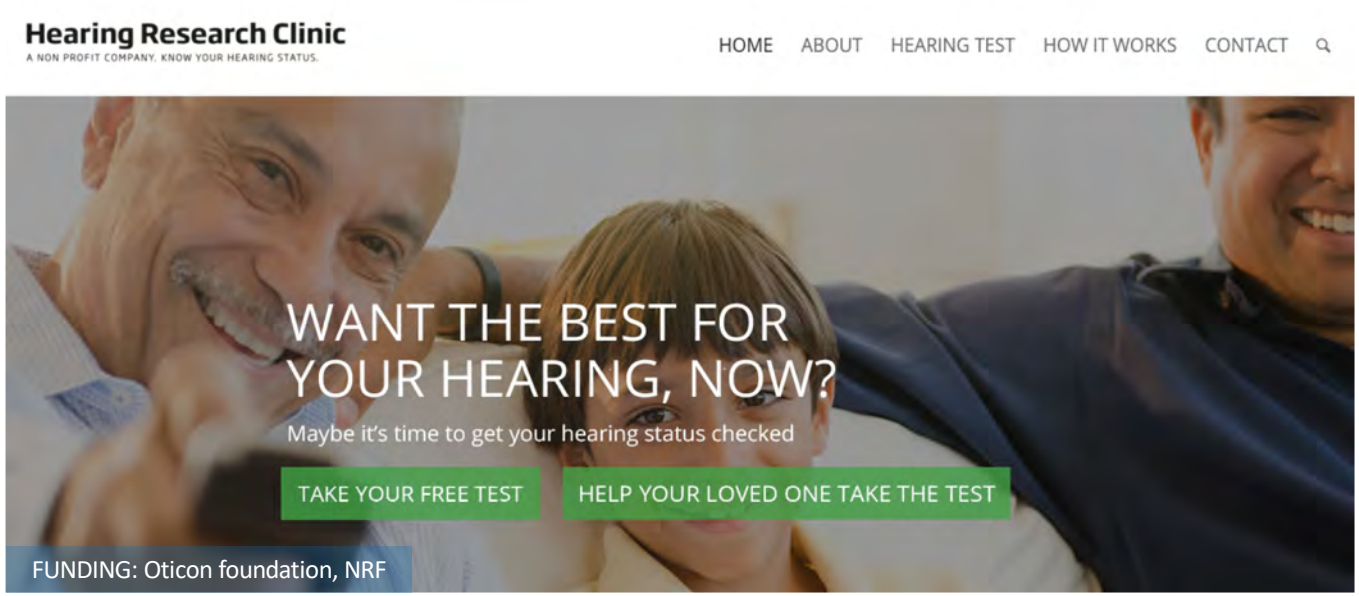




LOW- & NO-TOUCH AUDIOLOGY

- Adult patients (especially at risk)
- White glove / concierge service
- Convenience & preference
- >90% of adult patients with HL
- Telehealth support & guidance
- “Uber” hearing service

ONLINE HEARING SCREENING



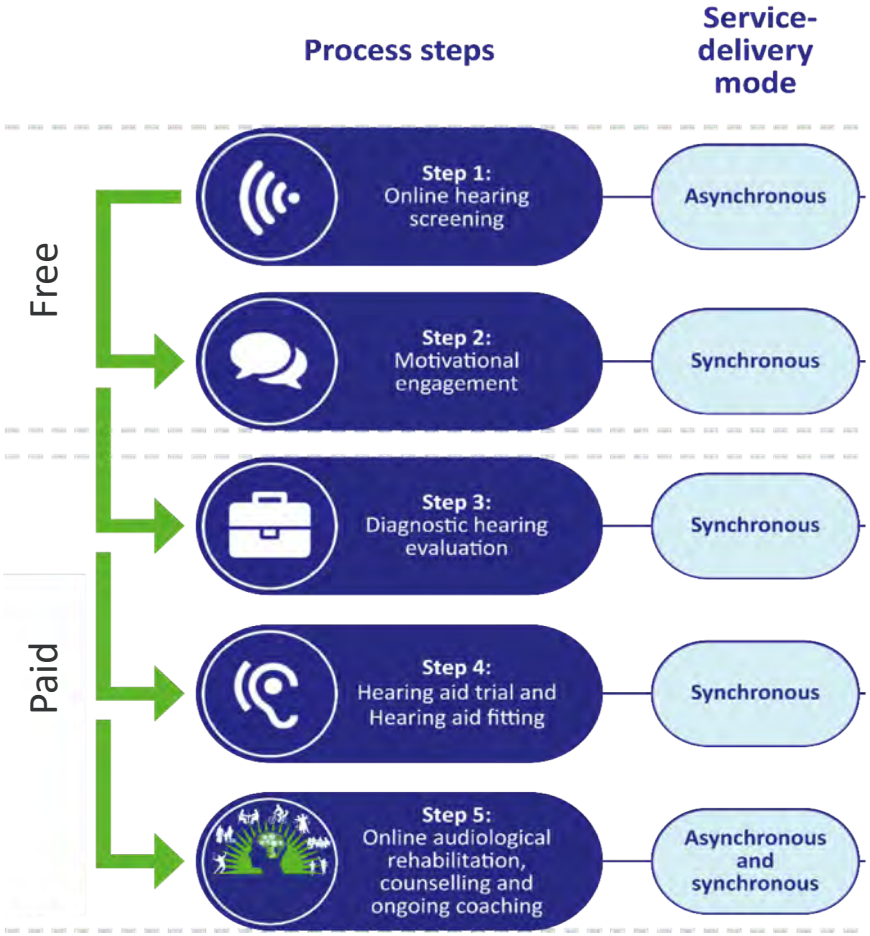
FUNDING: Oticon foundation, NRF

www.hearingresearchclinic.org

Husmita Ratanjee-Vanmali
Ariane Laplante-Lévesque
De Wet Swanepoel

- Hearing Research Clinic Non-Profit Company established in 2017
- Greater Durban area, South Africa
- Website created & online recruitment
- Online hearing screening test

HYBRID CLINIC – Online & face-to-face



International Journal of Audiology

Characteristics, behaviours and readiness of persons seeking hearing healthcare online

2019

Journal of Medical Internet Research

JMIR Publications

Patient uptake, experience, and satisfaction using Web-based and face-to-face hearing health services: Process Evaluation study

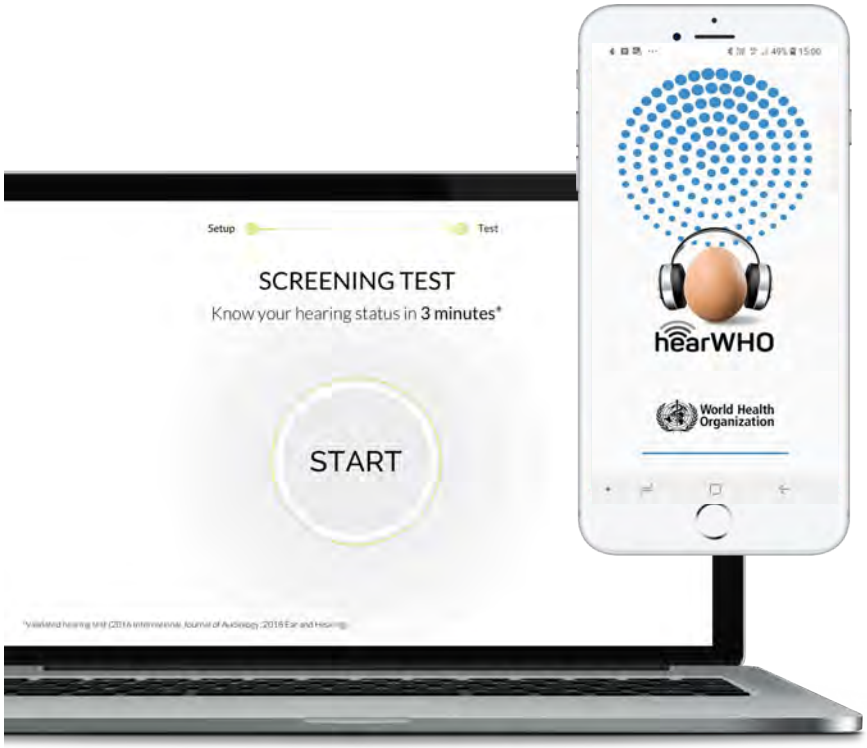
2020

AJA AMERICAN JOURNAL OF AUDIOLOGY

Digital proficiency is not a significant barrier for taking up hearing services with a hybrid online and face-to-face model

In press

ONLINE HEARING SCREENING



DIGITS-IN-NOISE TESTING

1. Speech-in-noise reflect real-life struggles
2. Rapid 2-min test
3. Validated and highly correlated with PTA
4. No calibration or specific headsets
5. Noise levels limited effect
6. Speech Recognition Threshold (dB SNR)
7. Requires low degree of linguistic competence

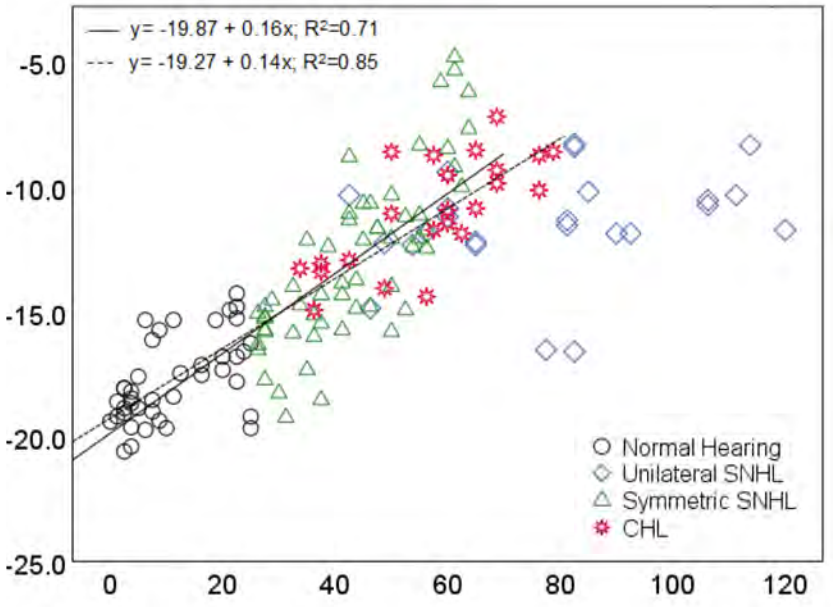
ONLINE HEARING SCREENING

Binaural test paradigms:

1. Diotic digits-in-noise (Potgieter et al. 2016; 2018)
   Rapid test of better ear
   Insensitive to conductive HL
   Insensitive to unilateral HL

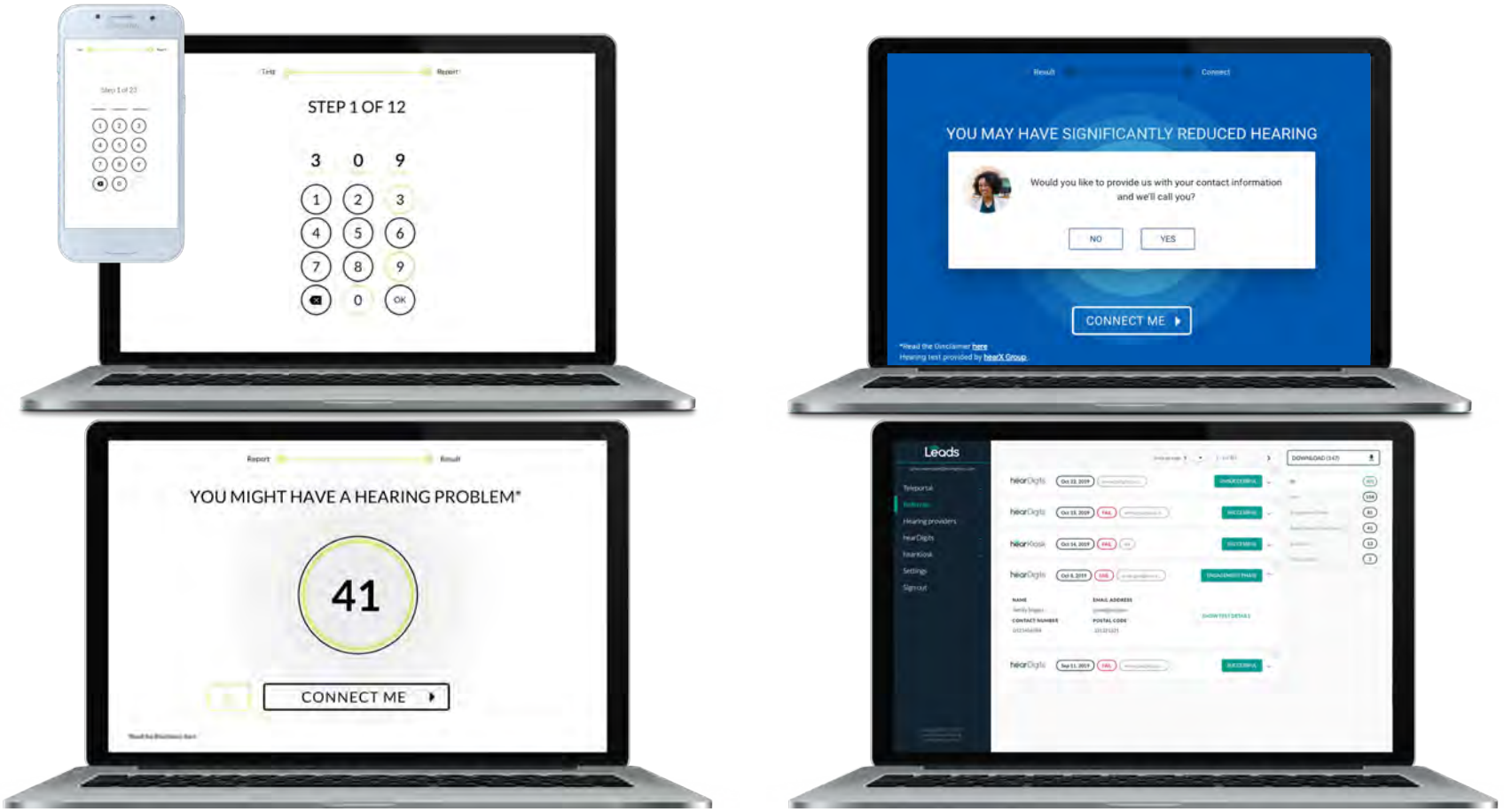
1. Antiphasic digits-in-noise (De Sousa et al. 2020)
   Rapid test of poorer ear
   Improved sensitivity to detect SNHL
   Sensitive to symmetric and asymmetric HL
   Detects conductive HL

Antiphasic DIN > 90% Sensitivity

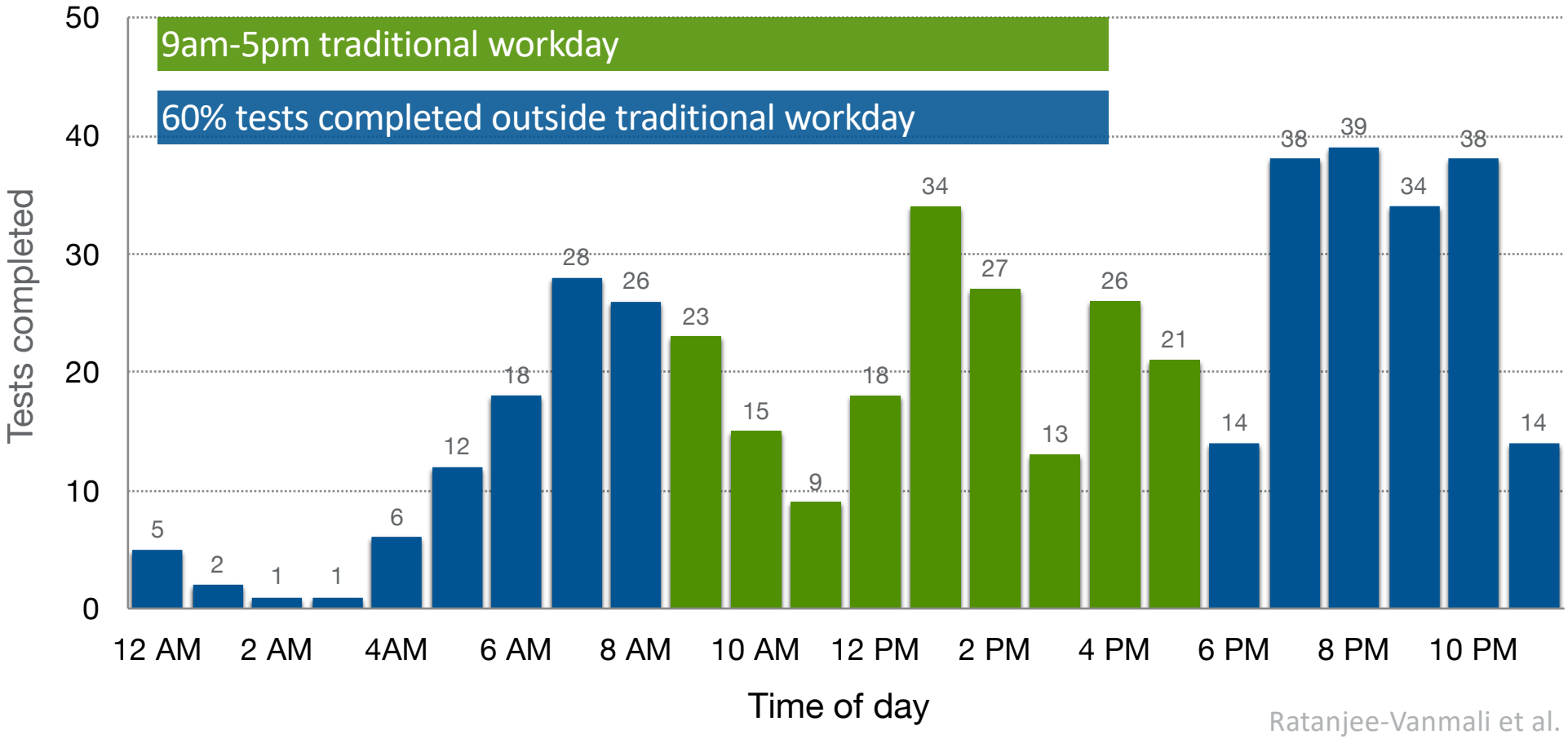


De Sousa et al. (2020). Ear and Hearing

ONLINE HEARING SCREENING

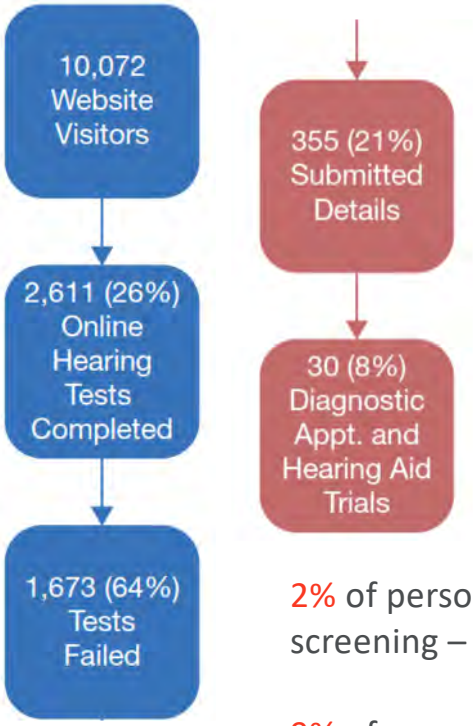


ONLINE HEARING SCREENING



Ratanjee-Vanmali et al. 2020

ONLINE HEARING SCREENING



2% of persons who fail screening – HA trial

9% of persons who submit details – HA trial

Table 1. Characteristics of Website Visitors and Web Sessions over a 12-month Period

Website visitors (12-month period)	10,072 visitors 88% new visitors
Web sessions	1.25 average sessions 1:30 min per session; 1.97 page views per session
Devices accessing website	83% mobile phones 76% Android; 17% iOS; 7% other 10% tablets 7% computers
Gender	35% female 17% male 48% unknown

Ratanjee-Vanmali et al. 2020

CONCLUSION

- Telehealth is about provision of care at a distance
- Potential to increase access, convenience & efficiency
- Due to COVID-19 tele-audiology is now about safety first – major increase in acceptance and usage
- No- and low-touch care can mitigate risk, improve safety and optimise care
- Online screening can support audiologists to reach more patients efficiently and conveniently

dewet.swanepoel@up.ac.za @dewetswanepoel