ANNUAL REPORT 2021

Surgical Hearing Implant Program

Otolaryngology – Head & Neck Surgery

SHIP Annual Report
Health Sciences Centre
Shared Health Services
Manitoba Health, Seniors and Active Living

PEDIATRIC COCHLEAR IMPLANT RECIPIENT

2021 Annual Report

Surgical Hearing Implant Program

Shared health Soins communs Manitoba

University of Manitoba

REPORT HIGHLIGHTS

Message from the Director

by Dr. Jordan Hochman – SHIP Director

The Sars CoV-2 pandemic continues to impact our health system. The Surgical Hearing Implant Program has been fortunate during this complicated period. Surgical volumes have been able to return to near pre-pandemic levels. While a large backlog remains, the considerable efforts of the Operating Theatre and Leadership at the Health Sciences Centre, and Central Speech team has been instrumental in ensuring patients are treated in as timely a manner as possible.

The situation has recently been further exacerbated by a vendor device recall. There are 64 implanted devices that may be subject to fluid ingress and ultimate device failure. The manufacture was quick to identify the failure and correct the problem. It remains a limited concern. However, our local experience finds over 30 patients with either a soft or hard failure with 7 patients already having been re-implanted. This number is subject to growth. We are aggressively following this cohort of patients, and will present our specific electrodiagnostic testing algorithm for early identification

and patient counselling at an international meeting in Dallas in the spring.

We continue to innovate and make use of virtual technologies to ensure a safe environment for patients and staff. While the transition to virtual care is a generalizable challenge, it is specifically a more demanding effort in addressing those with a hearing impairment. Again, I would like to acknowledge our patients for their understanding and dignity during this trying period. To be hearing impaired in a masked world is very hard. Many of our patients rely of speech-reading in conjunction with their residual hearing to be able to effectively communicate. This has resulted in greater isolation and has limited the richness of interpersonal interaction. This reality drives SHIP to provide superior care.

While the health care environment continues to be tenuous, I am confident that this team will provide excellent patient care in a responsible and cost-effective manner.

Cochlear Implant Summary

A detailed description of cochlear implant surgical production for 2020, including information on program finances, changes in wait times and the current adult waiting list.

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Bone Conduction Device Summary

A detailed description of bone anchored implant surgical production for 2020, including information on program finances, changes in wait times and the current wait list.

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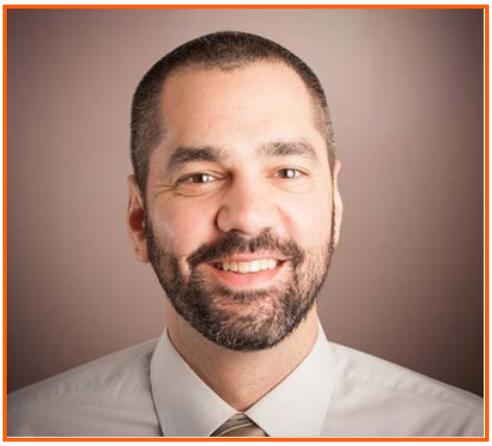
Program Personnel

- Jordan Hochman MD – Adult CI Surgeon
- Darren Leitao MD – Pediatric CI Surgeon
- Les Garber MD – BCHD Surgeon
- Justyn Pisa AuD – Program Coordinator
- Kristy Mackie MSc – Audiologist
- Daniela Stangherlin AuD – Audiologist
- Jacob Sulkers MSc – Audiologist
- Janelle Kent MSc – AV Therapist
- Debbie Brown MSc – AV Therapist
- Kelly Boyd – Clinic Office Manager
- Pam Campbell – ED, Central Speech

CI = Cochlear Implant
BCHD = Bone Conduction Hearing Device
AV = Auditory-Verbal



JUSTYN PISA – PROGRAM COORDINATOR

Justyn Pisa is an implant audiologist and has been the coordinator of SHIP since the program was initiated in 2011.

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Coordinator Program Summary

by Justyn Pisa AuD, Program Coordinator

The following report will outline the current status of the Surgical Hearing Implant Program (SHIP) of the Department of Otolaryngology – Head & Neck Surgery at Health Sciences Centre (HSC) as of December 31, 2021.

Although the impacts of the Covid-19 pandemic on the healthcare system are still being felt into 2022, SHIP has continued to adapt to meet the challenges of cancelled procedures, postponed surgeries, and product recalls to ensure our patients received appropriate treatment in a timely manner.

A streamlined candidacy assessment and pre-operative process enabled SHIP to effectively triage new referrals and prioritize surgeries for implant recipients. Program clinicians worked diligently to convert group information sessions to individualized appointments. This allowed consistent referrals per month despite the added workload and testing procedures. Administrative staff worked cohesively with each case to ensure pre-operative steps were navigated appropriately and quickly. Surgeons strove to expropriate any available operating room time, often to their own detriment.

Our auditory-verbal therapists increased virtual sessions in addition to in-person appointments to provide ample opportunities for implant recipients to receive post-operative rehabilitation.

Due to these collective efforts, SHIP had a productive year for both cochlear implants and bone conduction hearing devices, despite the obstacles presented by Covid-19. We are proud to be able to provide this service to patients, even in trying times.

CI Sound Processor Upgrades

In 2021, a total of **12** pediatric patients were granted **12** cochlear implant sound processor upgrades through the provincial cochlear implant replacement program. This program provides 80% of the cost towards processor upgrades for pediatric recipients every 5 years. Since 2013, the program has processed **70** applications for a total of **74** sound processors.

Universal Newborn Screening

Since 2016, Manitoba's universal newborn hearing screening program has identified a total of **23** potential candidates for cochlear implantation with an average of just over **6** infants per year. To date, **22** of these infants have been implanted with an average age at implantation of **1.4** years, representing a significant decrease in age for pre-lingually deafened recipients. We look forward to following the progress of this cohort.

Expanded Candidacy Criteria

Representatives from SHIP have been working collectively with the Canadian Cochlear Implant Centres Alliance to introduce a new treatment option for unilateral hearing loss. Preliminary research has demonstrated tremendous benefit from cochlear implantation for this cohort. We are very excited to offer this option to patients going forward!

Revision Cases

Unfortunately, all implant companies can experience product reliability issues and our primary vendor was no exception in 2021. SHIP has identified a total of **51** implant recipients and **71** devices that may be affected by moisture ingress to the electrode array, resulting in device failure. To date, SHIP has re-implanted **7** patients (**8 devices**) and will continue to closely monitor all affected recipients to ensure revision cases are expedited.

Cochlear Implant Summary

by Justyn Pisa AuD, Program Coordinator

Despite ongoing Covid-19 and associated elective surgery closures, the Cochlear Implant (CI) Program completed **30** surgeries in 2021 (reduced due to OR closures). These surgeries included **24** unilateral procedures and **6** bilateral procedures on **22** adult patients and **8** pediatric patients (**36 devices total**). Since the start of the program, SHIP has implanted a total of **388** cochlear implants on **349** individual patients.

Wait Times

Although slightly reduced due to Covid-19, the cochlear implant program continues to generate an average of approximately **2.72** new surgical candidates per month.

The average wait time is expected to rise to approximately **14.5** months by the end of 2022 due to personnel and resource shortages from the ongoing pandemic.

Revision Cases

A total of **7** patients were re-implanted using **8** implants over the course of 2021. This included 3 pediatric (4 implants) and 4 adult recipients. These patients were affected by the V1 device recall from SHIP's primary vendor. All re-implanted devices were covered under manufacturer warranty with no added cost to the program. A cost recovery for disposables exists within the contract with the vendor.

Program Research

The Surgical Hearing Implant Program is currently undertaking 4 retrospective reviews of previously implanted patient cohorts to better identify potential candidates and more accurately measure outcomes.

One of the studies involves an analysis of patient satisfaction with their implant compared to objective performance on 4-separate speech perception tests.

We hope this research will expand our testing protocol and further inform the program on patient outcomes while taking overall satisfaction into account with current treatment options.

Another study is focused on factors related to poor performance with CI's in hopes to better understand why post-operative outcomes have such high variability, even within fairly similar patient cohorts. We hope this research will help improve patient counseling and manage expectations.

All 4 studies are planned for publication in peer-reviewed journals as well as presentation at national or international conferences.

Program Promotion

Justyn Pisa, program coordinator, was asked to moderate an international virtual conference on cochlear implants by the Canadian Academy of Audiology (CAA) organization in November 2021.

Justyn took this opportunity to highlight new technological advancements within the implant industry as well as the verification and validation process for these recipients. The keynote focused on how cochlear implants can positively impact cognition in older recipients.

The Surgical Hearing Implant Program was also represented at national and international meetings, including the American Academy of Otolaryngology Meeting, the Combined Otolaryngology Spring Meeting and at the Canadian Society of Otolaryngology Meeting, with associated peer-reviewed publications.

See page 7 for more details on this year's presentations and publications.

36

2021 CI Production

Including revision cases, the surgical hearing implant program utilized **36** cochlear implant products on **30** individual patients in the 2021 calendar year. This represents a **64% increase** in surgical output from 2020.

2.7

Adult CI Candidates per Month

SHIP cleared an average of **2.72** new cochlear implant candidates per month in 2021. This is in line with our historical average of 36 new CI candidates per year. The current adult wait list is projected to be 40 patients by the next fiscal year in April, 2022.

Bone Conduction Summary

by Justyn Pisa AuD, Program Coordinator

The Bone Conduction Hearing Device (BCHD) Program completed **11** surgeries in 2021. There were **8** adult cases and **3** pediatric cases, all unilateral. Since the start of the program, SHIP has implanted a total of **124** bone anchored implants on **123** individual patients.

Wait Times

The bone anchored implant program continued to generate an average of **1.1** new surgical candidates per month, essentially stable from previous years.

The average wait time for bone anchored implant surgery is expected to increase **2.5** months from the previous year. Considering BCHD production over the past two years, the overall wait times for adult patients has remained fairly consistent and has not been significantly impacted by the SHIP device budget.

Transcutaneous Options

The traditional design of bone conduction hearing devices involved a 4mm titanium implant coupled to a 9-14mm abutment that would protrude percutaneously through the skin. This served several purposes as it allowed the recipient to attach the sound processor and amplifier to the internal implant but it also ensured a very efficient transfer of sound from the external microphone through the bone of the skull to the auditory nerve within the cochlea.

Although this system worked well as a treatment option for conductive hearing loss, it presented several issues related to wound management since the system relied on a percutaneous connection for sound transfer.

The alternative was to leave the skin closed and transfer sound through hair and soft tissue before contact with the skull.

While relieving issues around wound management, this process lost significant sound energy in the high frequencies due to skin attenuation, as the sound is generated externally and lacks a direct connection to bone.

The development of a transcutaneous option successfully alleviated both issues as this new type of system transmits the amplified signal electromagnetically through skin and soft tissue, without an abutment that protrudes through the skin.

The amplified signal is then transmitted by the internal implant which is osseointegrated directly with the bone of the skull. This means that recipients experience all of the benefits of a traditional abutment-based system without requiring an open wound to manage. It is hopeful that these systems become the new "gold standard" in effective treatment for conductive hearing loss.

Program Promotion

Justyn Pisa, program coordinator, facilitated a discussion with a world-renowned expert on bone conduction hearing devices during a virtual conference on implantable devices for the Canadian Academy of Audiology in November, 2021.

The discussion centered around the potential benefit of bilateral implants, especially for pediatric cases, as well as new technology for verifying the accuracy of the patient fitting using a modified in-situ (or "real-ear" measurement, adapted from conventional amplification technology.

11

2021 BCHD Production

The surgical hearing implant program utilized **11** bone conduction hearing devices on **11** individual patients in the 2021 calendar year. This production represents a **61% increase** in output from 2020.

1.2

BCHD Candidates per Month

SHIP cleared an average of **1.2** new bone conduction surgical candidates per month in 2021. This is in line with our historical average of 15 new BCHD candidates per year. The current wait list is projected to be 12 patients by the next fiscal year in April, 2022.

Clinician's Corner: *Program Research*

by Justyn Pisa AuD, Program Coordinator

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Cochlear Implant Centre Research

As the number of implant recipients continues to grow each year, so does our program's ability to conduct internal research studies for eventual publication. Not only does this type of research help inform our decision making as a team, but it also helps elevate our program status within the implant community at the national and international levels.

Introduction

Post-operative speech understanding and communication ability is highly variable in cochlear implant (CI) recipients. This variability is often ascribed to pre-operative factors such as; age at implantation, duration of profound hearing loss, presence of comorbidities, and duration of hearing aid use prior to implantation. However, standardized speech intelligibility outcome measures differ across implant centres and patient populations, often contributing to the variability seen in post-operative performance.

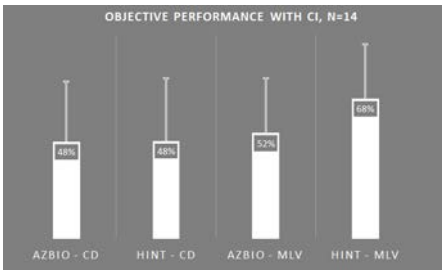
In this study, we evaluate 4 separate post-implant performance measures across multiple cochlear implant recipient cohorts for efficacy, reliability and accuracy in predicting real-world satisfaction with cochlear implantation.

Methods

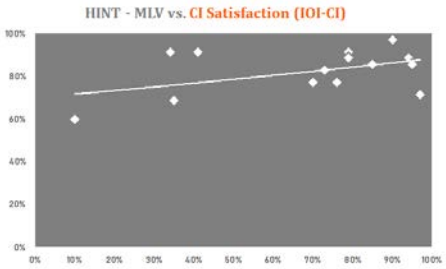
30 adult cochlear implant recipients were tested for open-set sentence recognition at 1-year post implantation using 4 different speech performance measures. These included pre-recorded AzBio sentences, pre-recorded hearing in noise test (HINT) sentences, monitored live voice (MLV) AzBio sentences, and MLV HINT sentences. Participant selection was randomized for age, English language proficiency, pre-operative duration of deafness, presence of comorbidities, pre- and post-operative audiometric thresholds, and duration of pre-operative hearing aid use in order to generate a representative sample of a common adult CI cohort.

Results

ANOVA analysis found a significant difference between the HINT – MLV outcome measure and the 3 other test batteries. There were no significant differences otherwise. Mean performance was greatest for HINT – MLV sentences at 68% (+/- 12%), followed by AzBio - MLV sentences at 52% (+/- 16%), with pre-recorded HINT and AzBio sentences tied in last place at 48% (+/- 17%).



Finally, the HINT - MLV sentence condition was the best predictor for real-world patient satisfaction when compared to subjective outcome measures.



Conclusion

Selection of objective measures in evaluating post-operative cochlear implant performance should consider the variability of pre-operative factors in different patient cohorts. While useful in determining CI benefit and driving clinical decision making, speech performance has an inherent degree of variability that should be weighed against the test methodology employed and subjective impressions of patient satisfaction.

Check out the full article here!

Clinician's Corner: *Program Research*

by Erika Lee MD, PGY-1 Resident

Introduction

Many patients are successful in achieving open-set word recognition after cochlear implantation (CI). However, audibility and speech understanding vary widely, with a proportion of patients demonstrating limited audiometric outcomes.

While there are some well documented determinants of poor performance, there remains a cohort of patients that do not meet expected outcomes. Pre-operative prognostication is desirable to manage expectations, ensure value of the intervention and reduce risk where possible.

The objective of the study is to evaluate variables associated with the most limited speech outcomes following CI.

Methods

A retrospective analysis of a group of adult patients who gained the least benefit after CI in a single CI program's cohort of patients implanted between 2011 to 2018 was performed. A total of 344 ears were implanted during this time period. Inclusion criteria included those whose post-implantation AzBio speech perception scores at 1-year, fell two standard deviations below the mean.

Exclusion criteria: Skull base pathology, pre/peri-lingual deafness, cochlear anatomic abnormalities, English as an additional language, and limited electrode insertion depth.

Results

The average pre-operative AzBio scores are 12% (+/- 14%). Post-operative scores are 30% (+/- 12%) and net benefit AzBio scores are 18% (+/- 12%). Compared to the general cohort, pre-operative, post-operative, and net benefit AzBio scores were 27% (+/- 20%), 74% (+/- 17%), and 47% (+/- 18%) respectively).

Results

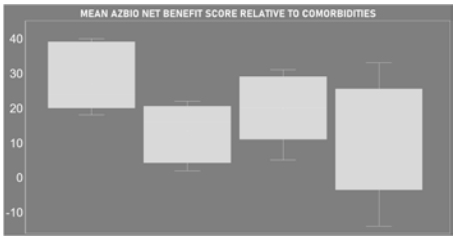


Fig.1. *Number of comorbid conditions compared to net AzBio score.*

This group is older (71.8 vs. 59.0 years, p<.001) with a longer duration of hearing loss (26.4 vs. 18.0 years, p<.01) compared to the general cohort.

Within this poor performer cohort, escalating comorbid status was associated with worse performance (p<.01, Fig 1).

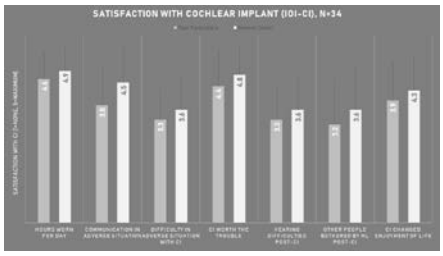


Fig. 2. *Averaged study cohort questionnaire responses compared with general population.*

Contrasting QOL measures between the poor performer and general cohorts, finds similar responses (Fig 2). There was no statistical difference in device use, belief the device is providing benefit and enjoyment in life.

Conclusion

CI users with the poorest post-operative performance were found to be older, with a longer duration of hearing loss. Net benefit scores tended to decrease with increased comorbidity.

Despite the poor performance, Quality of life measures and satisfaction with CI were similar to the entire program.

How have cochlear implants changed the lives of our patients?

Click the video above to find out!

Questions on this report?

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SHIP Research: Conference Presentations

by Justyn Pisa AuD, Program Coordinator

Hochman J., Unger B., Kraut J., Hombach-Klonish S. Gesture-Controlled Three-Dimensional Anatomy: A Novel Teaching Tool in Head and Neck Surgery. American Academy of Otolaryngology Annual Meeting. Washington DC. September 2012.

Kraut J, Hochman JB, and Unger B. 2013. Temporal bone surgical simulation employing a multicore architecture. Proceedings of 2013 26th Annual IEEE Canadian Conference on Electrical and Computer Engineering (CCECE – Regina, SK) pp. 1–6.

Wong D, Hochman J, Unger B, Kraut J. Face and Content Validation of a Rapid Prototyped Temporal Bone Model. Presented at the 2013 Annual Canadian Society of Otolaryngology - Head & Neck Surgery Meeting, June 2-4. Banff, AB.

Wong D, Hochman J, Unger B, Kraut J. Soft Tissue Modeling in Temporal Bone Simulation. Presented at the 2013 Annual Canadian Society of Otolaryngology - Head & Neck Surgery Meeting, June 2-4. Banff, AB.

Wong D, Hochman J, Unger B, Kraut J. Controlled Interactive Three-Dimensional Anatomy: A Novel Teaching Tool in Head and Neck Surgery. Presented at the 2013 Annual Canadian Society of Otolaryngology - Head & Neck Surgery Meeting, June 2-4. Banff, AB.

Le T., Leitao D., Hochman J. Hair Barrette Induced Cochlear Implant Receiver Stimulator Site Infection with Extrusion. Canadian Society of Otolaryngology, Banff Ab, June 2013.

Kraut J., Unger B., Hochman J. Temporal Bone Surgical Simulation Employing A Multicore Architecture. Canadian Conference on Electrical and Computer Engineering, Regina SK, June 2013.

Unger B, Kraut J, Hochman JB. A Novel Rapid Prototyped Temporal Bone Model for Surgical Dissection. American Academy of Otolaryngology Annual Meeting. Vancouver BC. Sept. 2013.

Unger B., Kraut J., Hochman J. Comparison of Isomorphic 3D Printed and Virtual Haptic Temporal Bone Simulation in Education. Simulation Summit, RCPSC, Vancouver BC, Nov. 2013.

Wong D., Kraut J., Unger B., Hochman JB. Comparison of Isomorphic 3D printed and Virtual Haptic Temporal Bone Simulation. Canadian Society of Otolaryngology (CSO), Ottawa ON, May 2014.

Wong D, Unger B, Kraut J, Hochman J. Comparison of Cadaveric and Isomorphic Virtual Haptic Simulation in Temporal Bone Education. Presented at the 2014 Annual Canadian Society of Otolaryngology - Head & Neck Surgery Meeting, May 11-13. Ottawa, ON.

Bertram J. Unger, Kraut J, Hochman J. Design and Validation of 3D Printed Complex Models with Internal Anatomic Fidelity for Training and Rehearsal. Medicine Meets Virtual Reality. Manhattan Beach CA. Feb 2014.

Hochman J, Rampersad V, Sepehri N, Kraut J, Pisa J, Unger B. Import of Haptic Manipulandum & Device Fidelity on Expert User Perception in Virtual Temporal Bone Surgery. Presented at 2015 Annual Combined Otolaryngology Spring Meetings (COSM) April 22-25; Boston, MA.

Hochman J,. Kraut J., Pisa J., Rhodes C., Unger B. Comparison of Anatomically Matched 3D Printed and Virtual Haptic Temporal Bone Simulation. Combined Otolaryngology Spring Meeting COSM, May 2014, Las Vegas, NV.

Hochman J, Tordon B, Unger B, Pisa J. Importance of Stereoscopy in Haptic Simulation for Temporal Bone Surgical Training. Presented at the 2015 Annual Canadian Society of Otolaryngology - Head & Neck Surgery Meeting, June 6-9. Winnipeg, MB.

Hochman J, Rampersad V, Sepehri N, Unger B, Pisa J. Import of Haptic Manipulandum and Device Fidelity on Expert User Perception in Virtual Temporal Bone Surgery. Presented at the 2015 Annual Canadian Society of Otolaryngology - Head & Neck Surgery Meeting, June 6-9. Winnipeg, MB.

Moore P., Hochman J., Blakley B. Vestibular Hypofunction as an Indicator of Lateral Skullbase Pathology. Canadian Society of Otolaryngology (CSO), Winnipeg Canada, June 2015.

Pisa J, Sulkers J, Butler J, West M, Hochman J. Impact of Stereotactic Radiosurgery on Cochlear Implant Performance in Patients with Neurofibromatosis Type II. Presented at the 2016 Annual American Cochlear Implant Alliance Conference. May 11-14, Toronto, ON.

Hochman J, Unger B, Pisa J, Fliker A. Mixed Reality Simulation. Presented at 2017 Annual AAO – HNSF Meeting & OTO Experience. September. Chicago, IL.

Kazmerik K, Unger B, Pisa J, Hochman J. Evaluation of Trainee Drill Motion Patterns during Temporal Bone Simulation with 3D Printed Models. Presented at 2017 Annual Combined Otolaryngology Spring Meetings (COSM) April 26-30; San Diego, CA.

Unger, B. Tordon, B., Pisa J., Hochman J. Importance of Stereoscopy in Haptic Training of Novice Temporal Bone Surgery. Medicine Meets Virtual Reality. Los Angeles CA, April 2016.

Kazmerick K, Pisa J, Gentile L, Unger B, Hochman J. Comparison of Drill Technique; Cadaveric and Printed Temporal Bone. Presented at 2017 Annual Combined Otolaryngology Spring Meetings (COSM) April 26-30; San Diego, CA.

Gousseau M, Unger B, Pisa J, Mowat S, Westerberg B, Hochman J. Validation of Novel Temporal Bone Dissection Scale. Presented at 2017 Annual Combined Otolaryngology Spring Meetings (COSM) April 26-30; San Diego, CA.

Sulkers J., Mackie K., Stangherlin D., Pisa J., Hochman J. Cochlear Implant Benefit by Age: Comparing Speech Perception Outcomes in Adults Implanted Prior to and After Seventy. ACI International Cochlear Implant Conference, Toronto ON, May 2016.

Hochman J., Pisa J., Rampersad V., Unger B., Sepheri N. The Effect of Haptic Force Resolution in Virtual Temporal Bone Surgery. American Academy of Otolaryngology Annual Meeting. San Diego. Sept. 2016.

Kazmerick K, Pisa J, Gentile L, Unger B, Hochman J. Printed Bone Hand Motion Analysis. Presented at 2017 Annual National Medical Students Research Forum. April. Galveston, TX.

Dolatabdi A.D., Hochman J., Mousavi Z., Unger B. Automated Assessment of Temporal Bone Surgical Simulation Employing an Improved Model of Bone-Drilling Force Feed Back. Euro Haptics. Pisa Italy. May 2018.

Wong V., Pisa J., Unger B., Hochman J. Construct Validation of a Printed Bone Substitute in Otologic Education. Canadian Society of Otolaryngology Meeting, Quebec City Quebec. June 2018.

Gigiotti D., Blakley B., Moore P., Hochman J. MRI is not Indicated in the Management of Isolated Vestibular Weakness. Canadian Society of Otolaryngology Meeting, Quebec City Quebec. June 2018.

Wong V., Pisa J., Unger B., Hochman J. Appraisal of a Printed Bone Substitute. American Academy of Otolaryngology Annual Meeting. Atlanta. Sept. 2018.

Pisa J. Hearing Health Care: An Investment in the Future. Presented for the Faculty of Medicine, University of Manitoba. Winnipeg, Manitoba. October, 2018.

SHIP Research: Conference Presentations

by Justyn Pisa AuD, Program Coordinator

Singh S, Pisa J, Unger B, Hochman J. Distinct Temporal Bone Dissection Scales Demonstrate Equivalence in Distinguishing Trainee Performance. Presented at 2019 Annual COSM Spring Meetings. May 1-5; Austin, TX.

Wong, V, Pisa J, Hochman J. Construct Validation of a Printed Bone Substitute in Otologic Education. Presented at 2019 Annual COSM Spring Meetings May 1-5; Austin, TX.

Pisa J. Bone Conduction Hearing Devices – Practice and Pitfalls from a Canadian Implant Centre. Presented at 2019 Annual Conference for the Canadian Academy of Audiology (CAA). October 26-30; Halifax NS.

Davari, A. Automated Assessment of Trainee Temporal Bone Surgical Skill Employing Simulated Surgery. Presented for Thesis Defense, Faculty of Medicine, University of Manitoba. November 2019; Winnipeg, MB.

Singh S, Pisa J, Unger B, Blakley B, Leitao D, Jones J, Hochman J. Comparison of Summative Temporal Bone Dissection Scales Demonstrate Equivalence. Presented at AAO-HNSF 2019 Annual Meeting & OTO Experience, September 15-18; New Orleans, LA.

Andrews C, Hochman J, Pisa J. Rationing Rotational Magnet Cochlear Implant Technology in a Single Payer Healthcare System. Presented at the Combined Sections Meetings, Tri-logical Society. January 2020; Coronado, CA.

Andrews C, Pisa J, Andrews C. Imaging Needs in Cochlear Implant Recipients. Canadian Society of Otolaryngology Head and Neck Surgery, Fredericton NB, 2020

Hochman J. Cannabinoids in Management of Tinnitus. Canadian Society of Otolaryngology Head and Neck Surgery, Fredericton NB, 2020

Pisa J. Cochlear Implantation in Canada: Current Status and Future Outlook. Presented at 2020 Annual Conference for Speech-Language and Audiology Canada (SAC). December 2020 - Virtual

Hochman JB., Pisa J., Unger B., Singh S. Summative Temporal Bone Grading Schema. Canadian Society of Otolaryngology Head and Neck Surgery, Fredericton NB, 2020

Pisa J. Implantable Hearing Technologies. Presented at 2021 Annual Conference for the Canadian Academy of Audiology (CAA). November 2021 - Virtual

Hochman JB, Pisa J Lee E. Factors Associated with Limited Auditory Outcomes following Adult Cochlear Implantation. American Academy of Otolaryngology Annual Meeting. Las Angeles. Oct. 2021

Hochman JB, Pisa J, Lee E. Comorbid Implications to Device Function [poster]. Canadian Society of Otolaryngology Head and Neck Surgery, Virtual 2021

Hochman JB, Al-Mutairi W, Pisa J. Cochlear Implants: When Hardware Fails. Canadian Society of Otolaryngology Head and Neck Surgery, Virtual 2021

Hochman JB, Pisa J, Davari M, Unger B. Development of a Hand-Stroke Detection Algorithm in Virtual Temporal Bone Simulated Surgery. American Academy of Otolaryngology Annual Meeting. Las Angeles. Oct. 2021

Hochman JB., Al-Mutairi W., Pisa J. Electrical Signaling of Device Failure. Combined Otolaryngology Spring Meeting. Dallas Tx, May 2022

SHIP Research: Peer-Reviewed Publications

by Justyn Pisa AuD, Program Coordinator

Forzley B, Chen J, Nedzelski J, Lin V, Shipp D, Godlovitch G, Hebert P, Hochman J. Considerations of Candidacy for Bilateral Cochlear Single Payer Universal Health Care System. Laryngoscope. 2013 Dec;123(12):3137-40.

Kraut J., Unger B., Hochman J. Temporal Bone Surgical Simulation Employing A Multicore Architecture. Electrical and Computer Engineering, 2013 26th Annual IEEE Conference. 10.1109/CCECE.2013.6567771, Page1-6.

Unger B., Kraut J., Hochman JB. Method and System for Rapid Prototyping of Complex Structures. United States Patent and Trademark

Unger BJ, Kraut J, Rhodes C, Hochman J. Design and Validation of 3D Printed Complex Bone Models with Internal Anatomic Fidelity for Surgical Training and Rehearsal. Stud Health Technol Inform. 2014; 196:439-45.

Hochman JB, Kraut J, Kazmerik K, Unger BJ. Mixed reality temporal bone surgical dissector: mechanical design. Otolaryngol Head Neck Surg. 2014 Mar;150(3):448-54.

Wong D, Unger B, Kraut J, Pisa J, Rhodes C, Hochman JB. Comparison of cadaveric and isomorphic virtual haptic simulation in temporal bone training. J Otolaryngol Head Neck Surg. 2014 Oct 13; 43:31.

Hochman JB, Sepehri N, Rampersad V, Kraut J, Khazraee M, Pisa J, Unger B. Mixed reality temporal bone surgical dissector: mechanical design. J. Otolaryngol. - Head Neck Surg. J. 2014; 43:20-23.

Hochman JB, Kraut J, Kazmerik K, Unger BJ. Generation of a 3D printed temporal bone model with internal fidelity and validation of the mechanical construct. Otolaryngol Head Neck Surg. 2014 Mar;150(3):448-54.

Hochman JB, Unger B, Kraut J, Pisa J, Hombach-Klonisch S. Gesture-controlled interactive three-dimensional anatomy: a novel teaching tool in head and neck surgery. J Otolaryngol Head Neck Surg. 2014; Oct 7; 43:38.

Le T., Leitao D., Hochman JB. Hair Barrette Induced Cochlear Implant Receiver Stimulator Site Infection with Extrusion Case. Rep Otolaryngol. 2015; 51074.

Hochman JB, Rhodes C, Kraut J, Pisa J, Unger B. End User Comparison of Anatomically Matched 3-Dimensional Printed and Virtual Haptic Temporal Bone Simulation: A Pilot Study. Otolaryngol-Head Neck Surg. 2015; 153:263–268.

Szturm T., Reimer K., Hochman J. Home-Based Computer Gaming in Vestibular Rehabilitation of Gaze and Balance Impairment. Games for Health J. 2015 Jun;4(3):211-20.

Hochman JB, Rhodes C, Kraut J, Pisa J, Unger B. Design and Validation of 3D Printed Complex Bone Models with Internal Anatomic Fidelity for Surgical Training and Rehearsal. Otolaryngol Head Neck Surg. 2015; Aug;153(2):263-8.

Szturm T, Hochman J, Wu C, Lisa L, Reimer K, Wonneck B, Giacobbo A. Games and Tele-rehabilitation for Balance Impairments and Gaze Dysfunction: Protocol of a Randomized Controlled Trial. JMIR Res Protoc. 2015 Oct 21;4(4): e118.

Hochman JB, Rhodes C, Wong D, Kraut J, Pisa J, Unger B. Comparison of cadaveric and isomorphic three-dimensional printed models in temporal bone education. Laryngoscope. 2015 Oct;125(10):2353-7.

Unger B., Torodon B., Pisa J., Hochman J. Importance of Stereoscopy in Haptic Training of Novice Temporal Bone Surgery. Stud Health Technol Inform. 2016; 220:439-45.

Unger B, Sepehri N, Rampersad V, Pisa J, Gousseau M, Hochman J. Elements of Virtual Temporal Bone Surgery: Manipulandum Format may be More Important to Surgeons than Haptic Device Force Capabilities. Laryngoscope Investig Otolaryngol. 2017. Oct 2:29

Pisa J, Gousseau M, Mowat S, Westerberg B, Unger B, Hochman JB. Simplified Summative Temporal Bone Dissection Scale Demonstrates Equivalence to Existing Measures. Ann Otol Rhinol Laryngol. 2017 Nov 1:348.

Hochman JB, Pisa J, and Cham, B. Prioritization of Re-implantation in Previously Successful Cochlear Implantation Following Natural Device Failure. Otology & Neurotology, 2018, Vol.39(8), p.651-653.

Wong, V, Unger B, Pisa J, Gousseau M, Westerberg B, Hochman J. Construct Validation of a Printed Bone Substitute in Otologic Education. Otology & Neurotology, 2019, Vol.40(7), pp. e698-e703.

Singh S, Pisa J, Unger B, Leitao D, Jones J, Blakley B, Hochman J. Comparison of Summative Temporal Bone Dissection Scales Demonstrate Equivalence. Otolaryngol Head Neck Surg. 2019

Pisa J, Andrews C, Hochman J. Rationing Rotational Magnet Cochlear Implant Technology in a Single Payer Healthcare System. Annals of otology, rhinology & laryngology, 2020-07-22, p.3489-3492

Pisa J, Sulkers J, Butler J, West M, Hochman J. Stereotactic Radiosurgery does not appear to Impact Cochlear Implant Performance in Patients with Neurofibromatosis Type II. Journal of Radiosurgery & SBRT. 2017. July.

Unger B, Sepehri N, Rampersad V, Pisa J, Gousseau M, Hochman J. Elements of Virtual Temporal Bone Surgery: Manipulandum Format may be More Important to Surgeons than Haptic Device Force Capabilities. Laryngoscope Investig Otolaryngol. 2017. Oct 2:29.

Pisa J, Gousseau M, Mowat S, Westerberg B, Unger B, Hochman JB. Simplified Summative Temporal Bone Dissection Scale Demonstrates Equivalence to Existing Measures. Ann Otol Rhinol Laryngol. 2017 Nov 1:348.

Hochman JB, Pisa J, and Cham, B. Prioritization of Re-implantation in Previously Successful Cochlear Implantation Following Natural Device Failure. Otology & Neurotology, 2018, Vol.39(8), p.651-653.

Wong, V, Unger B, Pisa J, Gousseau M, Westerberg B, Hochman J. Construct Validation of a Printed Bone Substitute in Otologic Education. Otology & Neurotology, 2019, Vol.40(7), pp. e698-e703.

Singh S, Pisa J, Unger B, Leitao D, Jones J, Blakley B, Hochman J. Comparison of Summative Temporal Bone Dissection Scales Demonstrate Equivalence. Otolaryngol Head Neck Surg. 2019

Pisa J, Andrews C, Hochman J. Rationing Rotational Magnet Cochlear Implant Technology in a Single Payer Healthcare System. Ann Otol Rhinol Laryngol, 2020-07-22, p.3489-3492

Mowry S, Jabbour N, Rose A, Wiet G, Svrakic M, A Zopf D, Vankoevering K, Powell A, Freiser M., Hochman JB, Smith R. Multi-institutional Comparison of Temporal Bone Models: A Collaboration of the AAO-HNSF 3D-Printed Temporal Bone Working Group. Otolaryngol Head Neck Surg. 2021 May;164(5):1077-1084

Hochman JB, Pisa J, Kazmerik K, Unger B. Hand Motion Analysis Illustrates Differences When Drilling Cadaveric and Printed Temporal Bone. Ann Otol Rhinol Laryngol, 2021 Dec 7;34-38.

Hochman JB, Pisa J, Singh S, Gousseau M, Unger B. Comparison of Summative Temporal Bone Dissection Scales Demonstrate Equivalence. Int. Arch. Otorhinolaryngol., 2021 Dec.

Lee E., Pisa J., Sulkers J., Hochman JB. Factors Associated with Limited Auditory Outcomes Following Adult Cochlear Implantation J Otolaryngol Head Neck Surg. Submitted 2021

SHIP Research: Grant Funding

by Justyn Pisa AuD, Program Coordinator

National/International Funding

2011 - Printed Temporal Bone Modeling. Principle Investigator Stryker.
$36,000.00 Component Value

2011 - Design of Haptic Interface for Mixed-Reality Surgical Simulation. Co-Investigator Quanser Consulting Incorporated.
$20,000.00

2011 - Simulated Temporal Bone Surgery. Principle Investigator Medtronic.
$40,000.00 Component Value

2012 - Design of Haptic Interface for Mixed-Reality Surgical Simulation. Co-Investigator Engage Grant, Natural Sciences & Engineering Research Council [NSERC].
$25,000.00

2015 - Tele-rehabilitation of Balance Impairments and Gaze Dysfunction. Co-Investigator Canadian Institute of Health Research (CIHR– 316813).
$66,461.00

2015 - Printed Temporal Bone Model Validation. Principle Investigator, Stryker Corporation.
$22,000.00 Component Value

2016 - Chimeric Temporal Bone. Co-Investigator Sonova Corporation.
$136,000.00

2018 - Virtual Temporal Bone Classifier. Principle Investigator Mathematics of Information Technology & Complex Systems (Mitacs) Grant.
$100,000.00

Provincial Research Funding

2009 - Three-Dimensional Imaging Library for a Virtual Human. Primary Collaborator Industrial Technology Center.
$48,000.00

2010 - Three Dimensional Anatomic Modeling and Simulation. Co-Investigator Health Sciences Centre Foundation.
$9,590.00

2010 - Virtual 3D Anatomic Models in Medical Education and Simulation. Co-Investigator Deans Strategic Research Fund (DSRF), University of Manitoba.
$220,000.00

2011- The Laboratory for Surgical Modeling Simulation and Robotics Health Sciences Centre Foundation. Provision of Physical Lab Space

Provincial Research Funding

2011 - Patient Specific Rapid Prototyped Temporal Bones in Surgical Planning. Principle Investigator Manitoba Medical Services Foundation.
$22,500.00

2013 - Rapid Prototyping of the Hyoid Bone: A novel classification. Principle Investigator Department of Otolaryngology Head and Neck Surgery.
$1000.00

2013 - Does Stereoscopy Improve Surgical Skill Learning in Novice Operators Using a multimodal Temporal Bone Surgical Dissector? Principle Investigator Department of Otolaryngology Head and Neck Surgery.
$1000.00

2013 - Rapid Prototyped Temporal Bones in Training. Principle Investigator Department of Otolaryngology Head and Neck Surgery.
$1000.00

2015 - Printed Bone Model Construct Analysis. Principle Investigator Department of Otolaryngology Head and Neck Surgery.
$2,000.00

2015 - Mixed Reality Temporal Bone Surgical Simulation. Principle Investigator Health Sciences Centre Foundation.
$75,000.00