

## Institute for Reconstructive Sciences in Medicine (iRSM)

iRSM is an internationally-renowned, specialized clinic and research institute focused on medical reconstructive sciences, rehabilitation and regeneration with the vision to heal through compassion and science, one patient at a time. The institute operates as a partnership between Covenant Health, Alberta Health Services and the University of Alberta.



iRSM is an exceptional interdisciplinary institute, not only delivering excellence in the treatment of facial defects, trauma and cancer but also advancing the frontiers of healthcare. Interdisciplinary teams of surgeons and medical specialists, engineers, designers and materials experts work together to develop highly-specialized, biomechanical research innovations. It is recognized for advancing digital design of surgery and additive manufacturing (3D printing) of medical devices.

### Research highlights

Over the past year, iRSM has supported 24 clinical studies that span work across four platforms of research.

#### Advanced technologies for surgical intervention

In the advanced technologies for surgical intervention platform, we are studying new and different ways to plan surgeries. One line of research that we are pursuing is to find ways to map functions, like speech, chewing and swallowing onto our 3D surgical planning platform. The intent is to see how surgeries will affect function before we do them. We are pursuing this work in collaboration with the University of British Columbia in Vancouver and Peking University in Beijing. A Collaborative Health Research Project grant from the Canadian Institutes of Health Research and the Natural Sciences and Engineering Research Council of Canada is funding it.

#### Outcomes and analytics

The Mickleborough Interfacial Bioscience Research Program through the Alberta Cancer Foundation funded research in the area of outcomes and analytics. Specifically, an international network of clinicians and researchers is assessing speech, chewing and swallowing outcomes after treatment for head and neck cancer. The Head and Neck Research Network, which is headquartered in Edmonton and has centres in the USA and Finland, will use this funding to expand its projects to other centres globally.

#### Reconstructive and bioimplantable materials

The Regeneration of Nasal Cartilage Project is a collaborative research initiative between iRSM, the Department of Surgery in the Faculty of Medicine and Dentistry and the Ingenuity Lab at the University of Alberta. In this project researchers are studying new ways to grow and seed 3D-printed scaffolds to use in facial reconstruction after surgery for head and neck cancer. The Mickleborough Interfacial Bioscience Research Program through the Alberta Cancer Foundation funded this research.

#### Implantable hearing solutions

The Oticon Foundation has funded research into completely implantable bone conduction hearing aids intended for patients with outer or middle ear diseases or disorders. This research will assess the feasibility of new implantable devices and how to maximize the benefits of patients using them.

## Research projects

### Advanced technologies for surgical intervention

- 3D modelling of swallowing behaviour
- custom external breast prosthesis for patients with partial or full mastectomies using a digital pathway
- comparison between digital and traditional tooth arrangement
- technical transfer combining digital and traditional fabrication methods
- evaluation of an automatic method to create digital models of mandible for surgical planning and computational simulation of the oral functions based on a retrospective analysis of oral cancer patients
- 3D modelled, custom-made non-invasive positive pressure ventilation mask in children
- maxilla reconstruction: the impact of surgical planning and reconstruction guides on speech and swallowing outcomes in head and neck cancer
- developing a non-contact optical impression technique that could replace the current impression technique that uses dental impression materials

### Implantable hearing solutions

- nondestructive mechanical evaluation of osseointegrated implants
- evaluation of the effectiveness of active bone conduction implants in adults with mixed conductive hearing loss in comparison to current technology

### Outcomes and analytics

- patient-centered outcomes in head and neck cancer patients
- functional outcomes of patients treated with osseointegrated implant-retained thumb prosthesis
- comparing the accuracy of swallow detection of two different muscle activity acquisition methods
- functional outcome after different treatment of cancer of the head and neck: a prospective study of the Head and Neck Research Network (HNRN)
- head and neck cancer cultural probe
- determinants for adherence to home swallowing therapy in patients with dysphagia following head and neck cancer - a patient preference for visual biofeedback
- long-term follow-up of osseointegrated orbital reconstruction
- determining functional outcome criteria for waiting list assessment in head and neck cancer
- predicting acoustic changes in vowel productions of patients undergoing surgical treatment for oral cancer: a longitudinal study of the HNRN
- see me, hear me, heal me...: transforming understandings of patients' experiences of head and neck cancer
- glossectomy spoon: patient interviews for design validation

### Reconstructive and bioimplantable materials

- manufacturing of scaffolds and bone plates using 3D bioplotter technology
- a novel technique for reconstruction of donor facial allograft patients
- knee meniscus reconstruction using mesenchymal stem cells

### Our research has been made possible through funding from:

- Alberta Cancer Foundation
- Alberta Innovates Health Solutions
- Canadian Institutes of Health Research
- Covenant Health Research Centre
- Natural Sciences and Engineering Research Council of Canada
- Oticon Foundation



### Contact us

P. 780.735.2660  
F. 780.735.2658  
E. [irsm@albertahealthservices.ca](mailto:irsm@albertahealthservices.ca)

Address  
1W-02, 16940 87 Avenue  
Misericordia Community Hospital  
Edmonton Alberta T5R 4H5 Canada