

McCaig Institute for Bone and Joint Health

External Review

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Thank you for the opportunity to meet with the researchers, staff, trainees, Cumming School of Medicine leadership, and members of the Strategic Advisory Board at the McCaig Institute for Bone and Joint Health. Before the meeting, we reviewed a number of documents, including the 2021-2026 Strategic Plan, the 2023-2024 Annual Report, and the Institute's Research Priority Report. We were asked to meet with researchers from five priority areas to assess strengths, opportunities for improvement or growth, and future directions. The five priority areas were: Bone Health and Osteoporosis, Osteoarthritis, Spine, MSK Oncology, and Rheumatic Diseases. We also met with early career researchers, trainees and staff working across all these areas.

Overarching Themes

In all these meetings, the first question we asked solicited feedback from members on ***the institute and its leadership***. We heard many common themes in the responses, but it was clear that the greatest benefit to being part of McCaig is the collegial environment that supports meaningful collaborations and provides opportunities to interact with researchers from different groups to foster interdisciplinary research. The membership unambiguously credited the McCaig leadership team with facilitating these collaborations and because of this, researchers have the opportunity to learn from each other and work together. It was apparent that the long history of research success at the McCaig is firmly rooted in a culture that values and actively supports transdisciplinary research.

While it was noted that the McCaig Institute is small compared to others at the University of Calgary, members underscored this as a strength since its leaders are transparent in its management, there are no institutional barriers, and no one works in a silo. Members across multiple priority areas felt they are lucky to have resources at McCaig to support the interests of the group and that collegiality is everywhere. Several researchers noted that while they were part of other larger institutes as well, their allegiance was to McCaig because of the culture this institute has cultivated. The McCaig Institute was described as being multidisciplinary by design. The physical location supports spontaneous collaboration and there are opportunities to work with other institutes as well. Groups also have access to expensive equipment that they would not have if not for the institute.

The Impact of Institute-led Initiatives

A close second in the list of benefits underscored by McCaig members was the range and impact of the programs offered by the institute. ***Seed grant funding*** (Ignite) has led to a number of successful projects and collaborations between clinicians and basic scientists that would not have happened otherwise. These transdisciplinary collaborations were enabled by relationships built from the SPARC Ignite Event (Scientists Partnering for Research with Clinicians), which were noted by most groups as impactful opportunities as well as important community-building exercises. Further enabling success with external grants, members pointed to grant submission support from the McCaig as beneficial for their success (e.g., letters of support, grant-reviewing opportunities).

Programming for HQP was highlighted by many as a strength of the institute. This includes direct funding (STOF – Special Training Opportunities Fund) from McCaig to support HQP going to workshops, the existence of the McCaig Trainee Committee (MTC) and HQP groups, and the support provided to these for independent programming and event coordination. These platforms contribute to the overall strong sense of community in the institute, and include not only opportunities for individuals to receive external training, but the requirement to share the information they learned with other institute members upon their return. The training piece is robust with graduate students and the summer student program. Graduate students benefit from different viewpoints and this is undersold as a value. It was also applauded by reviewers that a large focus of current fundraising efforts is the McCaig START fund, which aims to expand current programs to offer undergraduate, graduate, and postdoctoral fellowship funding. This was identified as key to addressing some of the current challenges faced by both trainees and faculty members. Scholarship funding for graduate students, particularly in their first year, was identified as a critical need and it was suggested that a mechanism with trainee co-supervision to expand collaboration could contribute to the right training environment for students to move between disciplines.

In sum, there was strong agreement that there is positive return on investment from the McCaig.

Opportunities to Build Moving Forward

We also asked what challenges each group faced and what was needed to enhance their research.

Most research groups identified gaps in terms of expertise that would benefit from the opportunity for targeted recruitment. Many underscored the desire to see additional clinician-scientists recruited to bolster translational research, as well as strategic growth with Canada Research Chairs. Areas identified by McCaig members for targeted recruitment included clinician scientists in metabolic bone diseases and endocrinology, pediatric radiology, pediatric orthopedics, pathologist with expertise in bone histomorphometry, sports medicine, bioinformatics and data science, machine learning, soft tissue mechanics/mechanobiology, orthopedics and a clinician researcher with a focus on osteoarthritis.

Many of these positions would leverage existing investments in infrastructure and contribute complementary strengths to priority areas of research. There was a strong desire to work collaboratively with leadership at the University to integrate the institute's strategic vision with that of the Cumming School of Medicine and align research supports and services.

Both institute members and leadership expressed a strong desire to better partner with University administration (i.e. Department Chairs, Deans) to contribute to supports and mentorship for early career researchers, provide balanced conversations around faculty workload, support curricular development for graduate students led by the institute, etc.

Another issue that was raised was the need for funding support. Bridge funding (top up grants) was seen as vital for the gap between grants (support for graduate student salaries, personnel, and start up funds) and to continue projects. To help with costs associated with maintaining research programs and infrastructure, there is a need for collective hires such as administrative support and shared staff like Research Coordinators and lab techs.

It is helpful that the Biomechanics lab has a full time staff member but there are logistical challenges of Brent Edwards not being at McCaig 100% of the time. A few groups noted this. There is a need for more opportunities to outsource with industry or other departments through a user fee model. There is also need of a laser strain gauge in the lab.

Bone Health & Osteoporosis

Overall, this priority research area is well established, and benefits from the impressive organization and infrastructure within the MoJo facility. Members raised concerns over funding sustainability. The ongoing costs for the facility are the biggest challenge, as well as maintenance of equipment. It was acknowledged by researchers that the group could generate revenue to help with costs by implementing fee-for-service models, but funds for staffing would still be an issue/limiting factor. Continued investment with the CFI envelope in the McCaig is instrumental to its continued success. An example of this is the need for a 3T extremity in the MoJo, and the opportunity to upgrade the current clinical CT with a photon counting CT. Adding this equipment is necessary to keep the MoJo competitive on a national and international level. This research area could benefit from the clinical and translational expertise of an endocrinologist and/or a metabolic bone disease expert.

Osteoarthritis

This group has a strong record of accomplishment in basic cartilage biology research, stem cell biology, and preclinical studies. The integration with veterinarian medicine is a strength with the access to the large animal models. The group identified the need to build stronger ties to clinical colleagues in rheumatology and orthopedics for access to human patient samples and to enrich their study questions. They identified that a platform for biobanking in this patient population would be an asset. The group also identified the integration of sports medicine and OA prevention as an opportunity for strategic growth. In terms of institute initiatives, this group underscored the strong commitment to patient engagement in many projects which benefits from the multiple annual events hosted by the institute for public engagement and outreach. Expansion to clinical and epidemiologic osteoarthritis research as well as clinical trials could be an area for growth.

Spine Health

Identified as the newest of the institute's priority research areas, this research group has already established a strong track record in clinically focused research. The team underscored that direct facilitation by the McCaig leadership team (specifically its Director) has been instrumental in establishing collaborations, building partnerships, and helping to move research projects forward. This team is building an impressive Spine Scientific Repository, including tissue banking and innovative clinical imaging, which will serve as the framework for research moving forward. They would like to see increased protected time for clinician scientists to facilitate more opportunities to actively engage with research.

MSK Oncology

Another emerging research priority in the institute, the MSK Oncology group is leading impactful clinical research. Driven primarily by early and mid-career orthopedic surgeons this group was a clear example of the institute strategically building the program with clear goals and expertise, and putting key pieces together. There is room to grow clinically but that depends on resources and infrastructure. McCaig has always supported the orthopedic surgeons but there may be additional opportunity from the bone oncology standpoint to grow in that space.

Rheumatic Diseases

The Rheumatic Diseases group was a large, multidisciplinary group with strong representation from the basic and clinical research areas that have benefited from the collaborative environment that the

McCaig offers. Expertise was highlighted in translational research, care delivery innovation, basic science and clinical research.

In terms of both basic and clinical research, a number of areas were identified that would benefit from strategic recruitment and growth, including a vascular biologist, particularly for antiphospholipid syndrome and connective tissue diseases like lupus, inflammatory myositis, osteoarthritis, and autoinflammatory diseases. There is a shortage of clinical staff to cover the current clinical load. The group identified that fostering better connections with the OA research group, as well as researchers in sports medicine on main campus were areas of interest for the long term. Further efforts to expand clinical trial work both in inflammatory arthritis and in connective tissue diseases is another potential area for growth.

EDIA & Indigenous Health

The reviewers were unanimous in the opinion that the McCaig Institute is a model leader in Indigenous health. The institute is also broadly supportive of advancing diversity, equity, inclusion and accessibility. The opportunity to bring in summer students each year from a minoritized group is a tangible way that McCaig has been involved in this domain. The institute has a track record of patient engagement in the development of research questions and has been especially focused on issues related to disability and accessibility, as it aligns directly with the priority areas of McCaig. Particularly noteworthy was Dr. Barnabe's work, advocacy and patient engagement within Indigenous communities as well as her contributions to creating learning modules that are currently being implemented in the clinical arena and will soon be accessible to basic researchers and trainees. There is room to expand representation of indigenous patients in the governing structure (Alberta Arthritis Research Community Network) and in greater research engagement in the future.

Early Career Researchers (ECRs)

The McCaig environment is home to an impressive number of early career researchers. There was strong consensus that the institute was extremely supportive, enabling them to establish their research programs. This group underscored the benefits of the collaborative environment, highlighting specifically the role played by the Director as a mentor, and as a connector, and the faculty's open door policy for Early Career Researchers. The benefits of being part of the McCaig were detailed as numerous, including the special training opportunity fund, funds to cover open access fees, Blue Sky sessions used to pitch ideas, and mentorship in grant writing. The ECR group also noted that the leadership is democratic when sorting out issues and that ECRs were well represented in their committee structure, and their input is genuinely valued. The group noted that the infrastructure is exceptional, the institute is a destination of choice for exceptional graduate student training, and that there is great social aspect to being part of the McCaig.

In terms of opportunities for further development, the group agreed that a new investigator 'boot camp' or onboarding resources to consolidate information would be beneficial. Resources could include training requirements for labs, how to order supplies, hiring support, etc. They would like to see a more centralized source of information as McCaig members. They also felt more formal mentorship would be beneficial, especially when moving from early career faculty to mid-level faculty. It would be helpful if the mentee had a say on who is on their mentorship committee. This would provide ways to facilitate their career progression. Following a robust and engaged conversation, the group noted that ECR focused group events would be beneficial to allow this large group to exchange ideas and network among themselves. This would provide opportunities for ECRs to connect and cross-pollinate, learning

what their colleagues' needs are and how they can collaborate. Mention was also made about additional coordination between the University and the institute, for example regarding protected time and "credit" for teaching responsibilities at either place.

Trainees and Staff

Members of the McCaig Trainee Committee and Highly Qualified Personnel groups provided their perspectives on the institute's research environment. Both groups highlighted that the McCaig leadership are responsive to their needs and provide multiple opportunities to meet (seminar series, monthly events, etc.) and to work with technology and with the McCaig faculty.

The trainee group referred to themselves as a tight knit community and felt they had a strong sense of belonging – describing the institute as their research 'home'.

The trainees identified a gap between main campus and McCaig and they wondered about strategies to bridge this gap. The group identified the formal committee structure for the MTC as a strength, including the dedicated budget that exists to fund their events. They did note that an increase in these funds would enable them to operationalize additional events around mentorship and collaboration, noting that the seminar series alone was 50% of the current budget. Similar to faculty members, the trainees underscored that a significant limitation in the current institute programs was the lack of training awards (stipends, scholarship awards, etc.) which exist in some institutes but not all.

The HQP staff group also spoke to the collaborative and collegial environment at the institute. They however noted that the exclusion of conference support within the Special Training Opportunity Fund was a limitation as the increased cost of conference travel and limited grant funding is a barrier to their participation in these key research events. An area of growth would be additional funding allocated for special opportunities for staff.

Overall Impressions

The McCaig is highly regarded as a leader in musculoskeletal research in both Canada and in the international research community leading to its success in recruiting top talent. It is very clear that the institute name is recognized for its excellence and specifically draws researchers to the university. The level of external grant funding and research outputs generated by institute members was viewed as extremely strong. External reviewers were very impressed by the facilities, infrastructure, environment, and impact of the institute's research and outreach initiatives. The number of clinician-scientists and the diversity of their research areas was also commended. Genuine, interdisciplinary collaboration is not typical in academic settings, but at the McCaig, it is organic yet intentional and clearly guided by the institute's excellent leadership. Researchers, students, and staff were consistently proud of the environment and it was clear that they enjoy their work and their colleagues. The institute has fostered a supportive community that goes beyond collaboration, and faculty, staff and students want to stay actively involved. We were impressed with the breadth and depth of the research, with the enthusiasm with which researchers presented their work, and with their spirit of collaboration across fields and academic ranks. Leadership invests in team building and mentorship and both are apparent. Given their many successes and common goals, an opportunity exists for better integration of institute leadership within the senior leadership structure of the research enterprise of the University. The relationship with the Cumming School of Medicine is important and the McCaig Institute and its Director have been working to grow linkages with main campus.

The institute's Strategic Advisory Board is deeply invested in the institute's success, with genuine interest and involvement, which also promotes accountability. Community investment, engagement and dissemination of educational information has been intentional and successful.

McCaig has benefited from a hybrid approach in terms of funding. Community partnerships are critical and key donors are involved in the direction. Further efforts to foster this and facilitating more exposure to the work of investigators and trainees would help keep them connected.

A key aspect of the institute's success is linked to their ability to build cutting edge facilities equipped to support their research goals. Continued investment, from University-based priority access to CFI infrastructure funding opportunities as well as fund-raising, will be instrumental in their continued success.

Dr. Barnabe's work with Indigenous partnerships is unique and impressive with a mix of research, community engagement, advocacy and clinical care and should serve as a model for other institutions both nationally and internationally. Elevating awareness of this work would facilitate expansion of these efforts. In the EDIA space, McCaig could mobilize the modules developed by Dr. Barnabe during her sabbatical and create an EDI certificate, which would be a great opportunity to expand skills for trainees. The emphasis on ableism throughout the institute is particularly unique and relevant to the priorities of a joint and arthritis centre. The investment the institute has shown in equity-related issues is clear, feels both natural and purposeful at the same time and could serve to be replicated beyond the walls of the institute.

There is also a very strong culture of inclusivity, safety and support. It was clear that trainees and staff feel like they belong in the institute. The impressive degree of mentoring of faculty and fostering collaborations comes from a strong commitment from the institute's senior leadership and their hands-on efforts. They have created an environment in which there is support yet autonomy and accountability. People can define their own priorities, work within an environment where creativity is fostered, and contribute beyond the strategic plan.

The engagement of trainees as leaders in the institute is a strategic decision that has greatly contributed to their degree of engagement. The institute has intentionally granted an impressive degree of autonomy to trainees, enabling them to manage a budget, identify and implement initiatives, and contribute to decision-making institute committees. We commend McCaig for creating such a unique training environment fostering transdisciplinary research and leadership. Efforts towards the creation and fundraising goal to support the McCaig START fund are perfectly aligned with the needs of faculty and students alike. Further building on their engaged and collaborative environment, institute leadership could also consider expanding opportunities for recognition and highlighting the work of institute members, including the creation of annual award(s) with nominations as a way to show appreciation or spearheading the nomination of members to prestigious external awards.

The institute has a strong focus on basic and translational research. Further growth of patient reported outcomes research, patient engaged research, epidemiologic studies, clinical trials, and community-based research would facilitate greater expansion of reach and a "bench-to bedside" philosophy. Additional clinical linkages (e.g., in endocrinology, osteoarthritis and in pediatrics) would also help facilitate this. Expansion of artificial intelligence and bioinformatics was also cited as a key area for growth, especially with changing research priorities, funding structures and needs. Additional prevention-related studies also would follow from greater clinical partnerships.

In conclusion, the excellently coordinated talks and our ability to engage with many members of the institute showcased the truly unusual collaborative environment that has resulted in research excellence. McCaig is clearly a leader in exceptional musculoskeletal research, while prioritizing multidisciplinary collaboration, mentorship and career advancement, and a culture of inclusion and community-engagement. Further efforts to showcase the work of this institute nationally and internationally will result in the recognition its leaders and members deserve.

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