“A Vision of Lifelong Mobility through Musculoskeletal Health”
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Section 1.0: Introduction

1.1: The Challenge and the BJI Advantage

Western University is committed to advancing collaborative, transdisciplinary research required to address complex issues of societal importance like musculoskeletal (MSK) conditions. “To take full advantage of university-wide MSK research expertise... (i.e. orthopaedics, skeletal biology, rheumatology, physical therapy, imaging, biomedical engineering), a formal structure [Institute] was required to catalyze synergy across Faculties and Departments.”  ~ David Holdsworth, Scientific Director

The Institute has become a focal point for MSK research locally, regionally, and nationally. From transdisciplinary research, to training and education, to community outreach and industry engagement, the BJI is well on its way to becoming recognised as a leading centre that inspires MSK research discoveries, develops innovations, and takes them all the way to clinical application. It is now crucial to sustain and grow the work of the BJI because: “MSK conditions are a lower priority for many sectors. People learn to cope or modify their lifestyle or just learn to ‘live with the pain’... [resulting in] a big burden for individuals and systems.”  ~ Cathie Hofstetter (BJI Research & Business Advisory Committee - Consumer Rep).

But, having different types of scientists is not enough. “The Bone and Joint Institute has recognized the severity and impact of MSK conditions on people’s general well-being and quality of life. This organization is investing time and effort to bringing stakeholders together in a new way so that we can find solutions. They have made great progress in breaking down academic silos and have recognized the need to go outside of academia to include other sectors in their governance structure and events like the seminars, research retreats, and conferences.”  ~ Anne Lyddiatt (BJI Governing Board - Consumer Representative).

The emphasis of the BJI on facilitating a transdisciplinary research environment accelerates discoveries and the translation of successful innovations.

1.2: BJI Membership

BJI membership grew from 259 people to 266 in 2018 including 110 faculty, 102 CMHR trainees, 15 non-CMHR trainees, and 39 partner/collaborator/staff members. Members hold prestigious awards including: 14 Research Chairs (6 Endowed/Industry-funded), 2 Fellows of the Royal Society of Canada, 3 Fellows of the Canadian Academy of Health Sciences, 1 NSERC Fellow, 4 Distinguished University Professors, and 4 current Faculty Scholars.
Section 2.0: Operations Report

2.1: Transdisciplinary Collaboration

The activities of the BJI, including think tanks, events, funding programs, training activities, and special initiatives have expanded transdisciplinary MSK research at Western. The growth in the degree of internal collaboration is evidenced by co-authored MSK research articles. The node plot graphics herein demonstrate that from 2016 to 2018, the collaboration among Western BJI member authors has increased (co-authored publications – lines between the dots) and the number of independent publications has decreased. (Note: This analysis was prepared using the Science of Science Tool (Sci2), Indiana University and SciTech Strategies - https://sci2.cns.iu.edu.)
2.2: The Seminar & Workshop Series

The Seminar Committee invited seven internationally recognized MSK experts to deliver seminars that would inspire the exchange of ideas and new collaborative initiatives. MSK Focused Think Tanks were launched in 2018 to engage our researchers in a variety of topics that can increase cross discipline knowledge, enhance research, and expand transdisciplinary collaborations. Initially centred on a grand MSK challenge, experts with a broad range of expertise (typically include 10-15 outstanding local, national, or international experts) come together to explore ideas that may spin off into smaller project related groups. Active Think Tanks in 2018 included:

- **Common Spine Disorders** - Phenotyping led by Michele Battié
- Improving Treatment with **MSK Biomaterials** led by Beth Gillies
- Tackling **Orthopaedic Infections** led by Emil Schemitsch & David O’Gorman

2.3: The Catalyst Grant Program

The Catalyst Grant Program supports the initiation of innovative, high-impact, and early-stage projects and enables the leveraging of external funding. A status update of funded applications from 2016 and 2017 is included below. For a more detailed description of the program and results please visit: [https://boneandjoint.uwo.ca/research/catalyst_grants_program/index.html](https://boneandjoint.uwo.ca/research/catalyst_grants_program/index.html). Note that due to changes to the program structure and competing demands, the 2018 competition was delayed to the spring of 2019.

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<th>Teams</th>
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<th>Title</th>
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<tr>
<td>Athwal, George</td>
<td>Schulich</td>
<td>Long-term healthcare consequences of upper extremity fractures: A population perspective</td>
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<td>Doherty, Chris</td>
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<td>Cost of implementation and patient resource use associated with a community-based targeted education and exercise program to limit the burden of hip and knee osteoarthritis (OA)</td>
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<td>Walton, Dave</td>
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## 2.4: National Initiatives

“In the last year, we made important steps to build our teams beyond Western, by leading the establishment of the Canadian MSK Rehab Research Network and the Canadian Consortium of MSK Research Groups and co-hosting a national conference attended by over 300 delegates.” ~ Trevor Birmingham, Director of Training and Education

In May 2018, BJI partnered with the Canadian MSK Rehab Research Network to welcome over 300 attendees from around the world to the 3rd Biennial Canadian Bone and Joint Conference (https://boneandjoint.uwo.ca/events/cbjc/index.html). More than double the attendance of previous years, the conference included plenary and invited podium talks, oral and poster presentations (160+ submitted abstracts), concurrent workshops, and panel presentations. The conference included focused breakout workshops on wearable technologies, running injuries and biomechanics, regenerative medicine, and journal writing with editors from the top international MSK journals. The Gala featured an inspiring discussion of human mobility by special guest Robert Buren (paraplegic Ironman triathlete). Conference activities were aligned with pre-conference events, which included the first Canadian Bone and Joint Young Investigator Forum (a preconference event planned by and for trainees with podium presentations and interactive career building workshops), the Annual Suzanne Bernier Memorial Lecture, and a Canadian Institutes of Health Research (CIHR) Institute of Musculoskeletal Health and Arthritis (IMHA) Town Hall meeting with incoming Scientific Director, Dr. Karim Khan. Visit the video series here to learn more about what attendees had to say in short one-min videos: http://bit.ly/Youtube_BJI_MSKResearch.

Beyond co-hosting the Canadian Bone & Joint Conference with the BJI in 2018, the Canadian MSK Rehab Research Network invested $50K in funding to early stage high-impact research projects. Over $15,000 in funding was provided for trainees to attend and present at national rehabilitation conferences. With the guidance of BJI staff and members, the network hosted a normative group priority setting exercise throughout the year that allowed members to provide input on the network’s research priorities. Wearable
technologies emerged as an important aspect of rehabilitation research. Accordingly, a second pilot grant competition specifically focused on wearable, web and mobile technology was launched. Three successful projects were awarded funds to start their work in 2019.

2.5: Collaborative MSK Training

The BJI collaborative training program had its highest ever enrolment this year with a total of 102 trainees (8 undergraduate students, 42 master’s students, 44 doctoral students, 8 postdoctoral fellows). Since the first enrolment in 2015, 48 trainees graduated from their home program (master’s and/or doctoral) with an “in MSK Health Research” degree designation. A number of trainees, transferred directly into a doctoral program, which extended their home program studies.

Of the graduates, many continue to work in academic or health-related fields. In 2018 alone, trainees attracted over 30 external scholarships (e.g. NSERC, CIHR, OGS) totaling over $1.1 M in multi-year funding and published 30+ MSK peer-reviewed articles. Ten new Transdisciplinary Bone and Joint Training Awards were granted based on academic achievements, the quality and novelty of the transdisciplinary research project, and the mentorship and resources available in their training environment (30 multi-year awards are ongoing). The Undergraduate Summer Program engaged a total of 18 students and 6 received a Summer Studentship ($3K from the training program matched 50:50 by their supervisor or external sources totaling $6000 over 14 weeks).

2.6: Research Funding

In 2018, Western University reporting indicated that BJI investigators held over 330 external grants and over 200 internal grants (see table below) totaling 570+ grants (90 of which were industry contracts or donations held at Western = 3M+). These totaled over $110 M in multi-year funding, with over $95 M in external funds and over $15 M in internal funds. This represents a growth of more than $10 M held by BJI members compared to 2017 (includes corrections to amounts reported in 2017). These data do not include grants located at or shared with other institutions or Institutes.
2.7: Knowledge Exchange & Impact

Publications

In 2018, BJI members published over 420 MSK-related papers. The expertise of BJI members is often applied to other fields, such as cardiovascular disease, respiratory disease, and cancer, but these papers were not included in the list herein. Because the goal of the Institute is to increase collaborative work, a large portion of publications include multiple members as co-authors, but each paper was only counted once in the sum.

Technology Transfer & Commercialization

The total number of technologies submitted by BJI members account for an average of 20% of all technologies submitted to WORLDiscovers® at Western over the past 4 years. The total number of technology submissions and patent applications filed by BJI members has fluctuated, but since fiscal year 2015, there has been a total of 47 and 27 respectively. These data do not include applications filed independently of Western.

Media & Communications

To help increase our brand recognition, priority workshops were identified and implemented: 1) Smart Social Media - how researchers can get involved? What is the benefit? When to self-promote using personal account versus when to use the university account and 2) Engaging with Media - building your communications skills as an expert/champion contact. Member success & accomplishments articles can be viewed https://boneandjoint.uwo.ca/about_us/index.html and https://boneandjoint.uwo.ca/about_us/BJI%20News.html.
In 2018, Institute and Cluster surplus was approximately $480 K of the annual allocation (i.e. back flow of funds in Year 1 and carry-over from previous programs as well as a hold on the catalyst program due to external review and strategic planning process) which is being strategically allocated to enhance Institute and Cluster activities and to sustain programs beyond Year 5 (see projections in section 4.2). Until the end of Year 5, there is no budgetary overlap between the Institute and Cluster. Sustainability strategies continue to be explored and discussed with our Board and the Vice-President (Research) and team. We look to the future and envision the Institute as an integral and standard component of the University. Dedicated long-term partners, committed to various levels of support will be crucial to the sustainability of the Institute and ongoing world-class achievement in the area of MSK health at Western.
Section 3.0: Strategic Direction

BJI’s detailed strategic plan includes relevance and feasibility statements for each strategic objective as well as mechanisms, predictive timelines, and measures of success for each strategic goal (https://boneandjoint.uwo.ca/documents/Strategic%20Plan%20July%2031-%202019.pdf). Below is a brief overview of the strategic priorities.

Accelerated Research Success & Innovation

BJI will continue to streamline efforts by mobilizing key members to champion strategic projects that will accelerate research and increase potential for impact. Activities will include:

• conducting rigorously designed research studies that incorporate the best tools, advanced technologies, and measures to investigate clinical and cost effectiveness of: 1) less invasive and joint-preserving treatments; 2) strategies to decrease surgical infection; 3) tools that support self-management and rehabilitation.

• identifying new relevant and timely priority research questions/projects as they arise, enhancing the sharing of data and/or samples, promoting the use of standardized research tools/protocols as part of usual clinical care (increase available data, decrease research costs, and reduce participant burden) and facilitating major grant submissions (e.g. NF, CFI, NIH) to enable high-impact research and publications.

• establishing a stakeholder consultation mechanism with the support of our Board to obtain feedback (e.g. research ideas, designs, relevance, and feasibility) and increase research contracts with industry.

Note: Working with and supporting partner Faculties and Western Leadership will be prioritized to facilitate the recruitment of the Western Research Chair (WRC) in Biomedical Engineering and the WRC in MSK Health.

Enhance Education

Our collaborative training program enhances home programs of 14 departments in 5 Faculties by offering transdisciplinary training (i.e. courses, seminars, workshops, outreach and internship opportunities, mentorship, etc.) that integrates technology, mechanistic research, and clinical applications for a unique experience. BJI will sustain and enhance efforts to: 1) recruit top doctoral and post-doctoral trainees through an enhanced communication plan and targeted awards; 2) accelerate trainee career progression post-graduation by building in more career focused sessions (within and outside academia); and 3) work with the School of Graduate and Postdoctoral (SGPS) to create MSK-specific content within the Graduate Student Internship Program to enable trainees to explore various career options.
Improve Knowledge Translation

BJI will support its members by enhancing the interconnectedness of the MSK community locally, regionally, nationally and internationally. This will include dedicating resources to partnered events that enable BJI members to showcase their work, link with key stakeholders, and enhance opportunities to be recognised as recipients of prestigious awards. By leading provincial and national networks, we will participate in work that will attract funding for large multi-centre initiatives.