



**PRAXIS**

Spinal Cord Institute

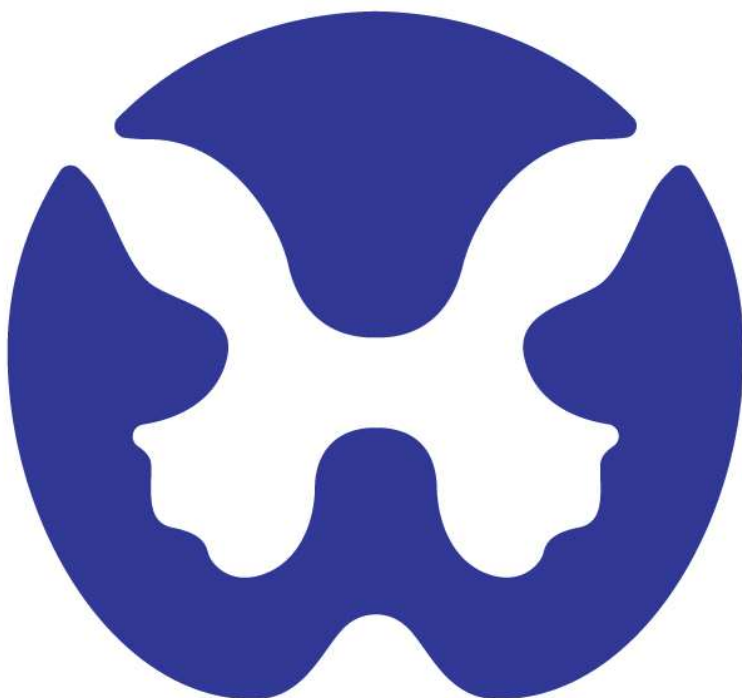
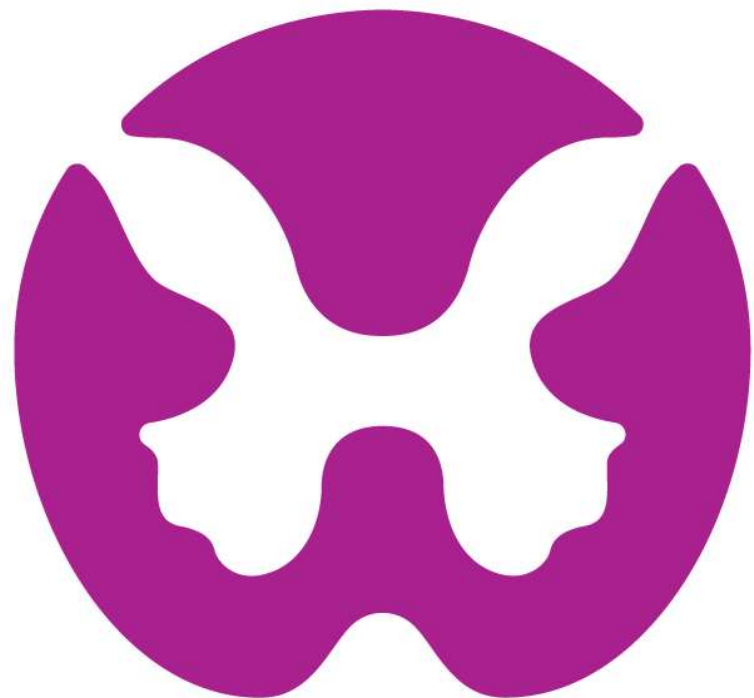
# Health Economics

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## 2021 Results Report

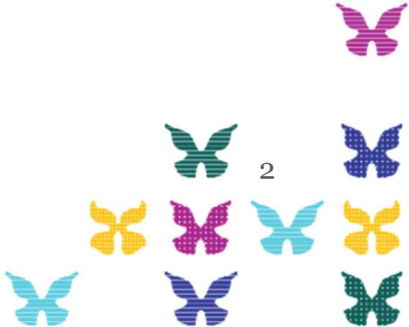
February 1, 2021

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# 1. Introduction

In January 2016, the Praxis Spinal Cord Institute<sup>1</sup> (Praxis) and Ontario Neurotrauma Foundation<sup>2</sup> (ONF) issued a *Health Economics Agenda for SCI Research in Canada* (Agenda)<sup>3</sup>. In support of Praxis' vision and mission, the agenda is directing economic research in SCI to:

- Increase the breadth, quality, and applicability of health economic analyses in the field of SCI;
- Inform and encourage decisions concerning the care of individuals with SCI in Canada; and
- Support Canadian SCI Network initiatives, including initiatives to demonstrate the value and expand the implementation of evidence-informed practices and support health technology and service innovation to prevent excess healthcare costs and protect and promote the well-being of individuals with SCI, their families, and supporters.

In summary, the Agenda describes three steps to address the lack of empirical evidence and inform decisions concerning the care of individuals with SCI in Canada which include to:

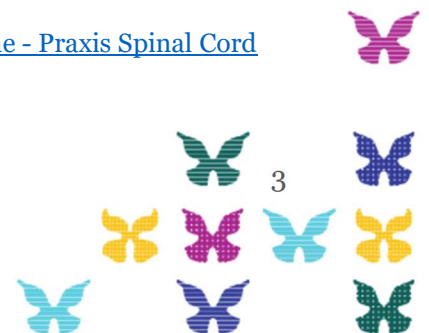
- 1) Establish robust evidence of the burden of secondary health conditions and initiatives aimed at mitigating the burden (Studies);
- 2) Promote the integration of established Canadian standards for health technology assessment (Standards); and
- 3) Support the application of appropriate methodologies for comparative health economic analysis of evidence-informed best practices and innovative health technologies and services with application to SCI (Capacity).

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<sup>1</sup> The Rick Hansen Institute became the Praxis Spinal Cord Institute in 2019. [Home - Praxis Spinal Cord Institute - Moving SCI Knowledge Into Action \(praxisinstitute.org\)](http://praxisinstitute.org)

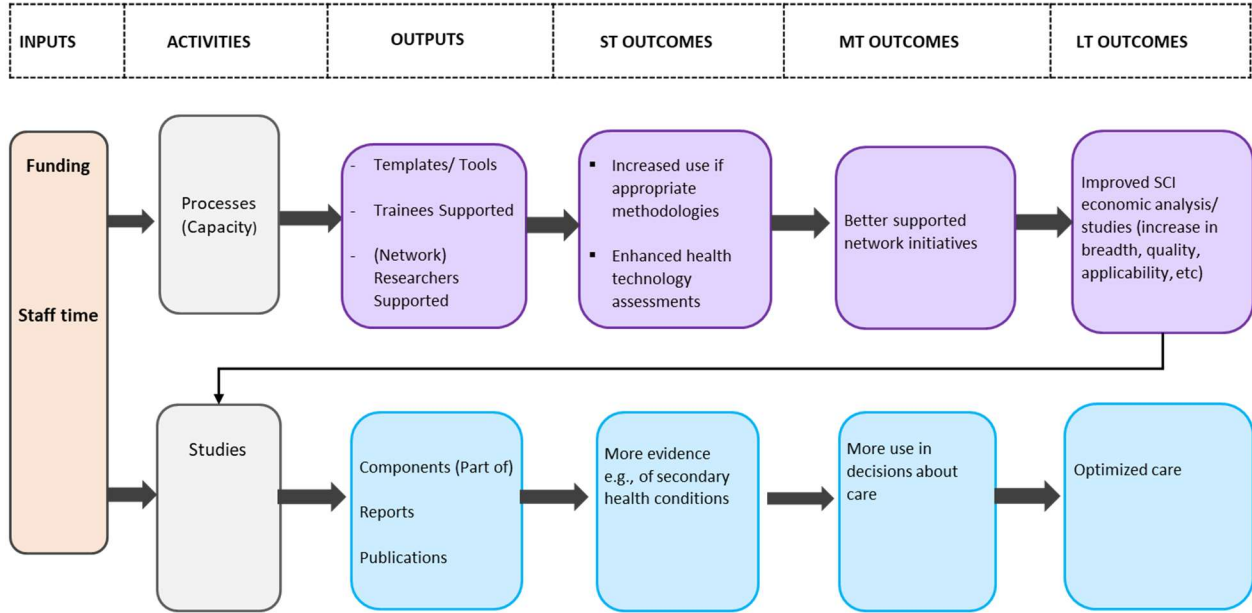
<sup>2</sup> [Ontario Neurotrauma Foundation \(onf.org\)](http://onf.org)

<sup>3</sup> [Health-Economics-report.pdf \(praxisinstitute.org\)](http://praxisinstitute.org/Health-Economics-report.pdf)

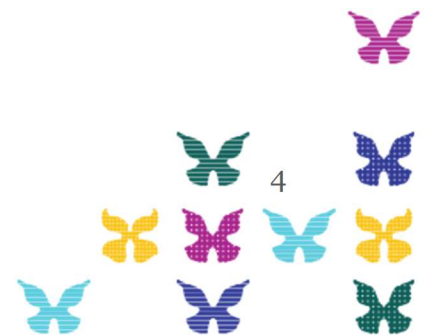


The linkages between Praxis' health economics activities and their intended outcomes as outlined above are illustrated in the logic model in Figure 1.

Figure 1 – Health Economics Logic Model



Note: ST = short-term; MT = medium-term; LT = long-term



## 2. Results – Five Years (Jan 2016-2021)

### 2.1 PRAXIS-WESTERN ECONOMIC DIVERSIFICATION (WD) SCI INITIATIVE

Since the Agenda was published, Praxis has contributed to a wide range of economic research.

Types of research supported include:

- scoping/literature reviews
- cost of illness/economic burden studies
- intervention impact analyses
- willingness to pay explorations
- reimbursement pathway(s) summaries
- market assessments and
- analysis plan(s).

In some instances, the economic research has been a standalone project, with an associated publication. In other instances, economic research has been part of a larger project or survey – one component of it. Praxis' approach has been to incorporate relevant economic analyses into its projects as widely as possible.

The table below lists economic research conducted by calendar year since the Agenda was published. It identifies which of the Agenda's outcomes this research contributed or intends to contribute to. An \* beside the research project indicates a publication is associated with this work. Current (not yet completed) or planned economic research for 2021/22 is also included at the bottom of the table. The full name and a brief description of each research project is reported in Appendix A, along with the Praxis program area(s) it is contributing to.

All the research included in this table was federally funded, primarily under WD<sup>4</sup> One of the projects (Ec Burden Update) also leveraged funding from the Province of British Columbia (+).

Completed studies have addressed the:

- Economic burden of Autonomic Dysreflexia (AD), Urinary Tract Infections (UTIs) and Pressure Injuries<sup>5</sup> (PIs)
- Costs of initial acute hospital stays
- Costs of spinal cord stimulation interventions
- Value of interventions which reduce secondary complications and improve functioning
- Extent to which consumers are willing to pay for (spinal cord stimulation) interventions
- Potential markets for UTI and Respiratory innovations
- Canadian Regulatory and Reimbursement Pathways from a start-up's perspective
- Quality of life and wellbeing outcomes for use in SCI economic evaluations

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<sup>4</sup> A few received earlier federal funding under Health Canada.

<sup>5</sup> Also called Pressure Ulcers (PUs) in some studies/analyses.



They have contributed, or intend to contribute, to the four Agenda outcomes in the table columns.

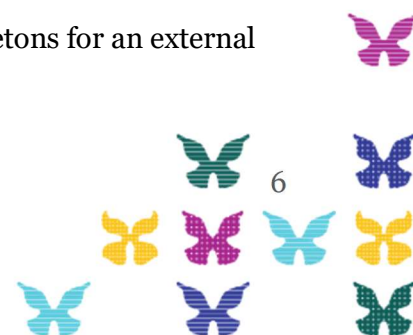
Table 1 – Health Economics Research Studies by Year and Agenda Outcome

<i>* = publication</i>	<b>Increase/ improve HE analyses</b>	<b>Inform care decisions</b>	<b>Support network initiatives</b>	<b>Secondary health conditions</b>
<b>2016</b>				
<i>* Ec Burden of AD</i>	X	X		X
<i>* Preference-Based Instruments</i>	X			
<b>2017</b>				
<i>* Ec Burden of UTIs and PUs</i>	X	X		X
<b>2018</b>				
<i>PU BPI Case Study</i>	X	X	X	X
<i>2018 Biodesign - Market Assessments (2)</i>	X			X
<i>*QOL and HU Scores</i>	X		X	
<i>* Standardized QoFL Instruments</i>	X			
<b>2019</b>				
<i>IAHS Cost Analysis</i>	X		X	
<i>WD MT Eval – Ec Impact Study</i>	X		X	
<i>Physical Activity – Analysis Plan</i>	X	X	X	
<b>2020</b>				
<i>Potential Cdn Reimb Pathways</i>	X	X		X
<i>* PIs in Work-related SCI population</i>	X	X	X	X
<i>Spinal Stim Survey – WTP</i>	X	X	X	
<i>2020 Biodesign – Market Assessment</i>	X			
<i>* ICECAP-A Validity</i>	X			
<b>2021 - Current or Planned Research</b>				
<i>Spinal Stim - Costing Analysis</i>	X	X	X	
<i>+ Ec Burden Update (Cdn and BC)</i>	X		X	
<i>Can-SCIP Guidelines</i>	X	X	X	
<i>Physical Activity</i>	X	X	X	
<i>Value of Biomarkers</i>	X			
<i>Value of SCI Frailty</i>	X			

+ With leveraged funding from the Province of British Columbia.

In addition to these studies, Praxis has been integrating health economics into its activities in other ways. For example, through:

- Incorporating cost implications into the Rick Hansen Spinal Cord Injury Registry (RHSCIR) reporting
- Inviting an economist to the ABT Summit and having a focus on the health economic implications/perspective
- Providing input on the health economic considerations for exoskeletons for an external business plan and,



- Including health economics in relevant Requests for Applications (RFAs) such as a Health Services one in 2020 to encourage this kind of work.

From 2016-2018 Praxis retained an economist on staff who worked on internal projects as well as with other/external health economists on specific projects.

Since 2018, Praxis has been working with external health economists and research teams on Praxis' SCI priorities to build broader capacity both within and outside the organization. The approach which Praxis is currently using (2020) for its health economics program is presented in Appendix B.

## 2.2 ONTARIO SCI INITIATIVE

In addition, Praxis has supported SCI health economics research in Ontario with the Province of Ontario and the Ontario Neurotrauma Foundation.

It has supported the Spinal Cord Injury Research Evidence (SCIRE) Professional website through WD funding as well as Province of Ontario funding. Of particular note, is the summary of *Economic evaluation of spinal cord injury* (2019, V7) published on the SCIRE Professional website and authored by Dr. Brian Chan and others. This summary covers intervention impact and cost of illness studies completed in Canada and elsewhere with a focus on rehabilitation.

Dr. Brian Chan, who was recipient of ONF-Praxis support through his doctoral studies, was also supported as a Post-Doctoral Fellow from Jan 2017 through Spring 2019. He has now completed his studies and has successfully obtained a faculty position within the University of Toronto's Institute of Health Policy, Management and Evaluation as well as at Toronto Rehabilitation Institute. This appointment is also partially supported by the Ontario SCI Initiative's capacity building endeavours. Since Jan 2017, Dr Chan has completed studies in areas including the following:

- Costs of neuropathic pain and fractures for individuals with SCI
- Virtual Care platform for individuals with SCI
- Home care use in SCI
- Scoping review of economic studies in spine trauma
- Rehabilitation Continuum Collaborative
- The cost of attendant care for individuals with SCI
- The cost of chronic conditions in Ontario
- Post-rehabilitation health system surveillance in Ontario

In 2020, Dr. Chan was in the process of selecting and supervising graduate students to contribute further to capacity building in this domain as well as to conduct economic studies relevant to the Ontario SCI Initiative. He continues to consult on a number of the Ontario SCI Initiative activities.



### 3. Use of Research Completed

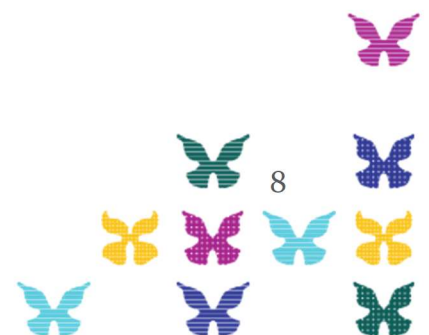
As noted above, in some instances the economic research has been incorporated into larger research projects and used in their reports and publications. Some of these reports have been used to:

- *Demonstrate value* e.g., the potential for projects to reduce health care costs in the Praxis-WD mid-term evaluation and
- *Provide information for decisions and changes* e.g., whether to continue with further work on commercializing biodesign prototypes.

The four publications published from 2016 to 2018 have been cited from two to 28 times each according to three citation databases. These citations are summarized in the table below.

Table 2 – Citations for SCI Health Economics Publications by Source

	<i>Google Scholar</i>	<i>ResearchGate</i>	<i>PubMed</i>
<b>2016</b>			
* <i>Ec Burden of AD</i>	6	4	2
* <i>Preference-Based Instruments</i>	13	10	5
<b>2017</b>			
* <i>Ec Burden of UTIs and PUs</i>	28	24	13
<b>2018</b>			
* <i>QOL and HU Scores</i>	5	4	0
* <i>Standardized QofL Instruments</i>	8	4	2
<b>2020</b>			
* <i>PIs in Work-related SCI population</i>	n/a	n/a	n/a
* <i>ICECAP-A Validity</i>	n/a	n/a	n/a





## 4. Conclusions and Future Directions

Progress has been made on the Agenda's intended outcomes in the five years since it was published.

In particular, progress has been made on increasing health economic analyses in the field of SCI. There have been multiple studies intended to contribute to providing information for care decisions, supporting Canadian SCI network initiatives and secondary complications. Work in other areas has been completed less often – on health technology assessments and appropriate methodologies (except in the area of preference-based/Quality of Life instruments).

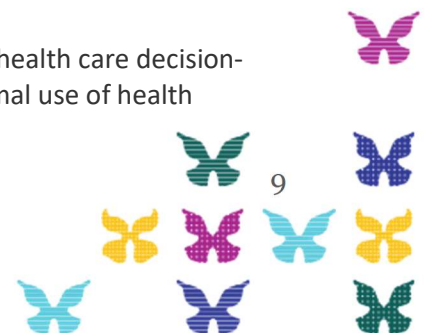
There is some evidence to support use of this research in terms of publications, but more could be gathered on the translation of this knowledge.

Praxis' intended future directions with respect to implementing the Agenda include:

- To continue to undertake studies and other activities which are intended to contribute to Agenda outcomes. The existing health economics workplan includes current or planned research intended to inform care decisions and support network initiatives, for example.
- To continue to build relationships with health economists across Canada and look for opportunities to collaborate with them – including new relationships with graduate students
- To add a focus on the evidence needed for reimbursement for payment (e.g. engaging CADTH<sup>6</sup>). This could require doing more cost effectiveness research to compare treatments.

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<sup>6</sup> CADTH is an independent, not-for-profit organization responsible for providing health care decision-makers with objective evidence to help make informed decisions about the optimal use of health technologies.



## APPENDIX A: DESCRIPTION OF PRAXIS ECONOMIC RESEARCH PROJECTS

Brief descriptions of each project are presented below along with the Praxis programs they relate/contribute to: CURE, CARE, CONSUMER and/or COMMERCIALIZATION.

2016

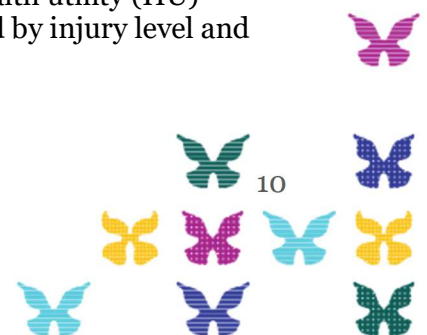
- ***Ec Burden of AD – The Economic Burden of Autonomic Dysreflexia during Hospitalization for Individuals with Spinal Cord Injury*** - a determination of the economic burden of autonomic dysreflexia (AD) from the perspective of the Canadian healthcare system in a case series of individuals with spinal cord injury (SCI) presenting to emergency care. **CARE**
- ***Preference-Based Instruments – Health State Descriptions, Valuations And Individuals' Capacity To Walk: A Comparative Evaluation Of Preference-Based Instruments In The Context Of Spinal Cord Injury*** - exploring variation in health state descriptions and valuations derived from preference-based health-related quality of life instruments in the context of spinal cord injury (SCI). **CARE, CURE, CONSUMER**

2017

- ***Ec Burden of UTIs and PUs - The Economic Burden of Urinary Tract Infection and Pressure Ulceration in Acute Traumatic Spinal Cord Injury Admissions: Evidence for Comparative Economics and Decision. Analytics from a Matched Case-Control Study*** - evidence of the excess or incremental costs of urinary tract infection (UTI) and pressure ulceration (PU) in acute traumatic SCI from an exploratory case series analysis of admissions to a Level I specialized Canadian spine facility (2008-2013). **CARE**

2018

- ***PU BPI Case Study - Pressure Ulcer Best Practice Implementation Case Study*** - a speculative budgetary impact analysis based on preliminary evidence from a project about the effect of “intervention” or incremental efforts at participating SCI rehabilitation centres on the incidence of pressure ulcers presenting in rehabilitation. **CARE**
- ***2018 Biodesign Market Assessments – 2017-18 Biodesign-based Development of Innovative Solutions for Spinal Cord Injuries – Market Assessment*** - preliminary market analyses for two 2017-18 biodesign projects covering estimates of incidence, prevalence and total market expenditures. **COMMERCIALIZATION, CARE, CONSUMER**
- ***QOL and HU Scores - Quality of Life and Health Utility Scores Among Canadians Living With Traumatic Spinal Cord Injury - A National Cross-Sectional Study*** – to provide overall quality of life (QOL) and health utility (HU) values for patients with traumatic spinal cord injury (SCI) stratified by injury level and neurological status.



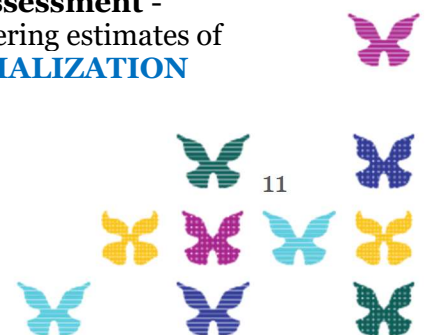
- **Standardized QoL Instruments - Using Path Analysis To Investigate The Relationships Between Standardized Instruments That Measure Health-Related Quality Of Life, Capability Wellbeing And Subjective Wellbeing: An Application In The Context Of Spinal Cord Injury** - to investigate the relationships between health-related quality of life (HRQoL), capability wellbeing and subjective wellbeing (SWB) to inform outcomes that could be used in economic evaluation. **CARE, CURE, CONSUMER**

2019

- **IAHS Cost Analysis – Initial Acute Hospital Stay Cost Analysis** - analysis of the costs of admissions from 2009/10 to 2016/17 using Resource Intensity Weight (RIW) values. The analysis used initial acute in-patient admissions for traumatic SCI in Canada, excluding Quebec, obtained from the Canadian Institute for Health Information trauma datasets. **CARE**
- **WD MT Eval – Ec Impact Study – WD Mid-term Evaluation Economic Impact Study** - a study covering four key performance indicators related to: pressure injuries, physical activity, biomarkers and accreditation. The study identified associated potential economic impacts for each indicator using existing literature. **CARE, CURE**
- **Physical Activity – Analysis Plan - Physical Activity Coaching Model of Care - Economic Analysis Plan** - a plan for analysing the cost-utility of an SCI physical activity intervention - an SCI physical activity toolkit adapted to a local setting, with peer coaching. **CARE, CONSUMER**

2020

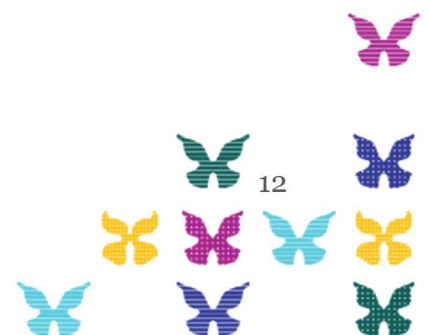
- **Potential Cdn Reimb Pathways – Praxis SCI Accelerate Program - Potential Canadian Reimbursement Pathways** - a brief overview of who pays for SCI rehabilitation services in Canada, those likely to pay for medical devices or non-prescription products in three provinces (BC, Alberta and Ontario) and information that would be helpful pitching to these organizations. **COMMERCIALIZATION, CARE, CURE**
- **PIs in Work-related SCI population – Community Acquired Pressure Injuries in a Work-Related Spinal Cord Injury Population: Problem Characterization and Assessment of a Working Solution** - evidence characterizing the problem of community-acquired pressure injuries (CAPIs) in a work-related spinal cord injury (SCI) population in Canada and assess the benefits of a person-centered solution. **CARE**
- **Spinal Stim Survey – WTP – Willingness to Pay for Spinal Cord Stimulation – Survey Responses Summary** - an analysis of survey responses by adults living with an SCI and their primary caregivers to a question about willingness to pay for spinal cord stimulation. **CURE, CONSUMER**
- **2020 Biodesign Market Assessment – 2019-20 Biodesign-based Development of Innovative Solutions for Spinal Cord Injuries – Market Assessment** - preliminary market analysis for one 2019-20 biodesign project covering estimates of incidence, prevalence and total market expenditures. **COMMERCIALIZATION**



- **ICECAP-A Validity - Empirical Validity Of A Generic, Preference-Based Capability Wellbeing Instrument (ICECAP-A) In The Context Of Spinal Cord Injury** - examining the empirical validity of a generic, preference-based capability wellbeing instrument (ICECAP-A) in the context of spinal cord injury. **CARE, CURE, CONSUMER**

2021 - Current/Planned

- **Spinal Stim - Costing Analysis – Spinal Stimulation Costing Analysis** - an analysis of the kinds and extent of costs incurred when providing spinal cord stimulation as a therapy. **CURE, CONSUMER**
- **Ec Burden Update – Economic Burden of Traumatic Spinal Cord Injury in Canada and British Columbia** - to use an enhanced data set to revise and update the previous estimate of the lifetime economic burden attributable to tSCI in Canada and to estimate the current lifetime economic burden attributable to tSCI in British Columbia (BC). **CARE**
- **Can-SCIP Guidelines – Economic Evaluation of the Canadian Spinal Cord Injury Practice Guidelines (Can-SCIP)** - a systematic review of economic evaluations of (living) guidelines and subsequent economic evaluation of selected care domains. **CARE**
- **Physical Activity – Physical Activity Peer Coaching Model of Care - Analysis** - to explore the relative costs associated with the implementation of a ProACTIVE toolkit and peer coaching pilot. **CARE, CONSUMER**
- **Value of Biomarkers – The Value of Biomarkers for SCI Clinical Trials** - to estimate the cost savings to SCI clinical trials of using biomarkers during eligibility assessments. **CURE**
- **Value of Measuring SCI Frailty – Quantifying the Impact of SCI Multi-Morbidities: A Measure of SCI Frailty** - to explore whether and how SCI frailty outcomes are related to costs avoided. **CURE**



## APPENDIX B: PRAXIS HEALTH ECONOMICS APPROACH

A standing call for proposals to contract for Health Economics services to be provided to Praxis Spinal Cord Institute through March 31, 2022 is posted on Praxis' website under Funding Opportunities.

The services and budgets for each study being requested are in attached Scopes of Work drafted internally by Praxis staff. Proponents may also propose health economics studies which contribute to Praxis' priorities separately under the standing call for proposals.

Intent to Bid notices are requested in advance of full proposals. Internal review committees are created for each full proposal received. Committee members rate proposals individually using a rating sheet template and then meet to discuss the proposal and ratings. Committee members rate proposals on:

- Proposed Approach to Scope of Work (out of 25 points)
- (Offerer) Experience (15)
- Staff Experience and Qualifications (20)
- Price (10)
- Value In-Kind (5)
- Other (Confidentiality, Independence) (5)
- Interviews (if conducted) (20)

Proposals must achieve a minimum average of 75% across raters to be accepted. Reference checks are completed for accepted proposals.

Contractors or grant recipients work with internal Praxis staff with expertise in the area of the study, including those with lived experience. They provide regular progress updates and submit deliverables. Deliverables may comprise technical reports, summary reports and publications.

A list of references by domain/program type is maintained for use by Praxis staff and external researchers. Templates for cost outcome chains, scopes of work and business cases are also available for use.



## APPENDIX C: LIST OF REFERENCES

White, Barry A. B. **Health Economics – Agenda for SCI Research in Canada**, January 2016.

### 2016

Squair, Jordan W., White, Barry A. B., Bravo, Grace I., Martin Ginis, Kathleen A., and Krassioukov, Andrei V. **The Economic Burden of Autonomic Dysreflexia during Hospitalization for Individuals with Spinal Cord Injury**. *Journal of Neurotrauma* X:1–6 (2016) DOI: 10.1089/neu.2015.4370

Whitehurst DGT, Mittmann N, Noonan VK, Dvorak MF, Bryan S. **Health state descriptions, valuations and individuals' capacity to walk: a comparative evaluation of preference-based instruments in the context of spinal cord injury**. *Qual Life Res.* 2016 Oct;25(10):2481-2496. doi: 10.1007/s11136-016-1297-3. Epub 2016 Apr 20. PubMed PMID: 27098235.

### 2017

White, Barry A.B., Dea, Nicolas, Street, John T., Cheng, Christiana L., Rivers, Carly S., Attabib, Najmedden, Kwon, Brian K., Fisher, Charles G., and Dvorak, Marcel F. **The Economic Burden of Urinary Tract Infection and Pressure Ulceration in Acute Traumatic Spinal Cord Injury Admissions: Evidence for Comparative Economics and Decision. Analytics from a Matched Case-Control Study**. *Journal of Neurotrauma*. Oct 2017.

### 2018

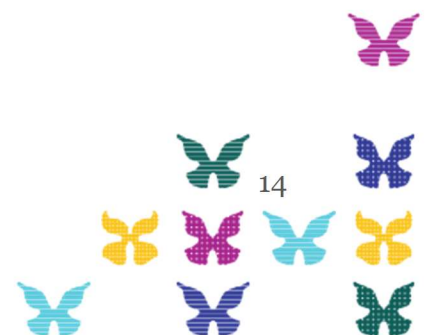
Iorio-Morin, C, Noonan, V. K., White, A.B., Noreau, L., Leblond, J., Dumont, F. S., Kwon, B. K., Dvorak, M., Dea, N. **Quality of Life and Health Utility Scores Among Canadians Living With Traumatic Spinal Cord Injury - A National Cross-Sectional Study**. *Spine*: July 15, 2018 - Volume 43 - Issue 14 - p 999-1006. doi:10.1097/BRS.0000000000002492

Engel L, Bryan S, Noonan VK, Whitehurst DGT. **Using path analysis to investigate the relationships between standardized instruments that measure health-related quality of life, capability wellbeing and subjective wellbeing: An application in the context of spinal cord injury**. *Soc Sci Med.* 2018 Sep;213:154-164. doi: 10.1016/j.socscimed.2018.07.041. Epub 2018 Jul 29. PubMed PMID: 30081357.

### 2020

White, Barry A. B., Rivers, Carly S., Chisholm, Jo-Anne, Willms, Rhonda, Papp, Anthony, Sproule, Shannon and McMurtry, Heather. **Community Acquired Pressure Injuries in a Work-Related Spinal Cord Injury Population: Problem Characterization and Assessment of a Working Solution**. *Journal of Tissue Viability*. Available online 27 July 2020. doi: 10.1016/j.jtv.2020.07.004

Whitehurst DGT et al. **Empirical validity of a generic, preference-based capability wellbeing instrument (ICECAP-A) in the context of spinal cord injury** – in 2020 accepted for publication in *The Patient - Patient-Centered Outcomes Research*.



### ***Other/Related***

Chan B, Benton B, McIntyre A, Mittmann N, Teasell RW, Wolfe DL. **Economic evaluation of spinal cord injury.** In Eng JJ, Teasell RW, Miller WC, Wolfe DL, Townson AF, Hsieh JTC, Connolly SJ, Noonan VK, Loh E, McIntyre A, editors. Spinal Cord Injury Rehabilitation Evidence. Version 7.0: p 1-34. 2019.

Rivers CS, Fallah N, Noonan VK, Whitehurst DG, Schwartz CE, Finkelstein JA, Craven BC, Ethans K, O'Connell C, Truchon BC, Ho C, Linassi AG, Short C, Tsai E, Drew B, Ahn H, Dvorak MF, Paquet J, Fehlings MG, Noreau L. **Health Conditions: Effect on Function, Health-Related Quality of Life, and Life Satisfaction After Traumatic Spinal Cord Injury. A Prospective Observational Registry Cohort Study.** Arch Phys Med Rehabil. 2018 Mar;99(3):443-451. doi: 10.1016/j.apmr.2017.06.012. Epub 2017 Jul 19. PubMed PMID: 28732686.





Blusson Spinal Cord Centre  
6400 - 818 West 10th Avenue  
Vancouver BC, V5Z 1M9 CANADA

Phone: 604.827.2421  
Email: [info@praxisinstitute.org](mailto:info@praxisinstitute.org)  
Website: [praxisinstitute.org](http://praxisinstitute.org)



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