NeoBrainNetwork: A pancanadian neonatal neurocritical care platform
of research, quality improvement, teaching and clinical excellence
to improve the neurodevelopmental outcomes of critically ill neonates with brain injury

Summary

- Provide a summary description of the platform and how it will be used to advance research in neuroscience, and the impact of the platform on the field; include an explanation of the special services, capabilities, or expertise that the platform will offer to researchers and the scope of the platform (local, regional, national, or international). Explain how the data or materials acquired, curated or analyzed by the platform will be made available to other qualified researchers (with appropriate safeguards in the case of human data). (**maximum 500 words**).

- All attached documents will need to be formatted using **11-point Arial** or Georgia font, **single-spaced**, on a letter-size page with 1" minimum margins. The font size for figures and legends must be a minimum of 10 points. Use of a condensed font and spacing is not permitted. Applications received in any other format, exceeding the page limits, incomplete, or late, will be rejected. All attached documents must be uploaded in PDF with the exception of the budget template, which should be uploaded in Excel and PDF format.

Every year in Canada, over 450 term and near-term neonates are admitted to one of the tertiary-levels neonatal intensive care units after suffering from birth asphyxia. Neonatal brain injury is the leading cause of childhood neurodevelopment impairments. Optimizing management to prevent or repair these injuries and developing novel therapeutic interventions for these neonates are public health priorities. Despite some breakthrough treatments such as therapeutic hypothermia, these neonates remain at high risk of developing severe brain injury. Our team demonstrated that management during the neonatal intensive care stay is influencing the incidence and extent of these injuries. We also demonstrated significant variability in treatments and outcomes between sites. Current gaps in knowledge to improve the care of these neonates are lack of harmonized benchmarking, follow-up, and lack of evidence for best treatments through clinical trials.

We are proposing here to build a pancanadian platform dedicated to neonatal neurocritical care to improve outcomes of these critically ill neonates at risk of brain injury.

This interdisciplinary platform will include a national database of these critically ill neonates at risk of brain injury to better understand the cause of their injury and optimize their management. Beyond the neonatal data, we will systematically collect data on supportive care treatments and data on follow-up up to school age. Such a rich dataset will facilitate identification of disease phenotypes, will characterize their natural history and short- and long-term outcomes, and will leverage site variations in practices to design comparative effectiveness trials and to identify best management practices. Such a systematic approach will permit to improve prognostic tools, tailor treatment strategies to disease phenotypes, and optimize outcomes and resource allocation.

This platform will also include a national neonatal clinical trial network to run phase 1 to 3 trials of adjunct neuroprotective and neurorestorative therapies in these critically ill neonates. One such example is sildenafil for prevention and repair of brain injury following term neonatal encephalopathy. Results of phase Ib studies demonstrated feasibility, safety and optimal dose of this drug; the next logical step is a multicenter phase 2 and then 3 studies to demonstrate efficacy of this drug on reducing brain injury and improving outcome. Such platform may thus ultimately revolutionize treatment of neonatal brain injuries.

Finally, this platform will create a rich infrastructure and environment through research, quality improvement, and clinical excellence for neonatal neurocritical care training programs to train

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the next generation of clinicians and scientists taking care of the critically ill neonates and empower them to improve the outcomes of these neonates.

This platform has emerged from a critical mass of experts in neonatal neurocritical care throughout Canada, who are thus ideally positioned to build successfully and sustainably this platform.

In summary, creating such a platform will thus have a tremendous impact on the care of critically ill neonates with NE at risk of brain injury in Canada, and maximize their potential outcome during childhood.

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