

Task sharing to increase global neurotrauma capacity: Lessons learned from Children's Healthcare of Atlanta Concussion Program

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**"You want to be the pebble in the pond that creates the ripple for change."
–Tim Cook, CEO Apple**

Although much remains to be accomplished in the field of neurotrauma, progress has been made over the last few decades, such as the development and implementation of evidence-based and resource-based guidelines and multinational clinical and bench research efforts. Perhaps most strikingly, we now have ample data to support the enormity of traumatic brain injury (TBI) worldwide.¹

While neurosurgery was once considered a "luxury subspecialty",² the rising global burden of conditions requiring neurosurgical interventions means that there is urgent need to expand provider capacity in all settings.^{3,4}

There are an estimated 50,000 neurosurgeons worldwide, but there is unequal global distribution of the burden of disease and providers,² meaning that many low-middle-income countries (LMICs) have a neurosurgical capacity less than one-tenth of the minimum recommended neurosurgeon ratio per population of 0.01 to 0.1 neurosurgeons per 100,000 population.⁵

Annually, there are an estimated 13.8 million potential neurosurgical cases worldwide, with more than 80% occurring in LMIC.⁶ It is estimated that nearly 45% of the total neurosurgical cases are related to TBI.⁷ This imbalance between disease burden and insufficient provider capacity creates the need for more than 23,000 new

neurosurgeons in LMICs to address the 5 million essential neurosurgical cases, primarily TBI, that go untreated each year.⁶

Formal neurotrauma fellowship programs are concentrated in high-income countries (HICs), but a scoping review shows that the number of “twinning” partnerships and other capacity-building global neurosurgery initiatives are growing, including those that combine surgery camps, local training and education, and research-based interventions.²

One such noted program is the Global Neurotrauma Fellowship program that began in 2015 as a partnership between of the Barrow Neurological Institute at Phoenix Children’s Hospital (USA) and the Meditech Foundation (Colombia), which has since expanded to also include the Global Health Research in Neurotrauma Project at the University of Cambridge (United Kingdom).⁸ Its success shows that it is possible to establish a neurotrauma fellowship program in an LMIC based on the established criteria for neurotrauma training in HIC programs. The 12-month program integrates international competencies and exposure to different systems of care in high-income and low-income environments, creating a unique training opportunity within a global neurosurgery framework. By adapting international competencies with a focus on neurotrauma care in low resource settings and by maintaining international mentoring and academic support post-fellowship, the program enhances the likelihood that the fellow will return to clinical and academic practice in their home countries, thereby expanding neurosurgery capacity in LMICs.

The success of such partnerships is one way to train more neurosurgeons. But the COVID-

19 pandemic raised greater awareness of the need for both task shifting and task sharing within neurosurgery as a way to expand existing capacity.⁹ Task shifting involves employing trained, but less qualified individuals, while task sharing is a similar transference of responsibility within a tiered system with clear communication within the team.⁹ In low-resource settings, it has been shown that task sharing allows better communication and improved outcomes than task shifting.³

Neurosurgical attention has traditionally focused on the more severe end of the TBI spectrum. Until recently, patients who sustained milder TBIs, including concussions, did not receive the full and comprehensive attention that we now know is warranted. Greater attention to mild cases is the result of greater appreciation that mild TBI is not always a benign injury. Yet, with this awareness among the public and community-practicing physicians, the volume of mild TBI cases can overload even well-resourced neurosurgical systems. This occurred in the Atlanta, GA community in 2014 and 2015 where a heightened awareness of the potential consequences of concussion in the community was fueled by well publicized celebrity cases of chronic traumatic encephalopathy, state mandated concussion legislation management, reports of children having significant post-concussive problems and the popularity of the movie “Concussion”. The neurosurgery, neurology, and sports medicine divisions of the largest tertiary pediatric healthcare system in Georgia, Children’s Healthcare of Atlanta (USA) was overwhelmed and could not meet the massive and sudden community-based need.

To address this problem the Concussion Program at Children's Healthcare of Atlanta (USA) was established.⁹ A key feature was task sharing with our pediatric and primary care colleagues who were actively engaged from the outset and participated in the development of this program. A central element of the program was to provide concussion-specific decision support tools for pediatric care providers in the community who had been largely unaccustomed to routinely treating concussion patients. This education included how to take care of concussed youth, when to refer, and more importantly, when not to refer to the neurosurgeon, emergency department, or for CT scans. Educational efforts directed at the pediatric community included the posting of on-line video lessons and a "how-to" toolkit on concussion prevention, diagnosis, and treatment. The toolkit included case scenarios, assessment tools, criteria for emergency department and CT scan referral, "red flags" that the child may have a more severe TBI, and advice about cognitive rest.¹⁰

Other elements include tailored materials and fact sheets for coaches, patients, and parents that were available in both English and Spanish. To ensure continued support, a dedicated concussion nurse coordinator was trained and employed in an integrated, task-sharing manner to act as a resource for both parents and health care professionals on a "concussion hotline." In short, the community-practicing pediatricians were made central to contemporary concussion care such that community needs were met.¹⁰ It is important to note that task sharing is not task offloading. Neurosurgeons not only took the lead in educating and training our pediatric colleagues so that appropriate concussion care was delivered, but remained

available for guidance, support and if needed, evaluation of the more complex cases.

Adoption of a multifaceted, evidence-based, education program translated into a positive modification of self-reported practice behavior for youth concussion case management. Program success was measured by an increase in the comfort level of pediatricians to manage concussions and more appropriate referrals for emergency department evaluation and CT scan.¹¹

Given the huge demand for TBI care worldwide, this program can serve as a model of task sharing for improving access to quality TBI management. Neurosurgeons took the lead in arming allied (surgical and nonsurgical) medical colleagues and nurse providers to appropriately manage TBI patients.

Following the example of the Global Neurotrauma Fellowship program established by neurosurgeons at the Barrow Neurological Institute (USA), Meditech Foundation (Colombia), and Cambridge (UK), Children's Healthcare of Atlanta (USA) just completed training for the first participant in its International Neurotrauma Nurse Fellowship.⁸ The fellow was from Colombia and was already fully trained as an emergency medical services provider. The three-week fellowship was designed to build clinical nurse leaders in neurotrauma care, with emphasis on LMIC settings. The unique global health training experience fills gaps in specialized medical training and provides the fellow the ability to obtain expertise in the management of pediatric neurotrauma patients. The program includes supervised shadowing experience in surgical, medical, and research areas, covers emergency care,

surgical care, intensive care, and rehabilitation support of pediatric neurotrauma.

Additionally, the fellowship provides a deliberate focus on comprehensive and multidisciplinary concussion management. The expectation is that the fellow will be able to replicate key parts of the Concussion Program at Children's Healthcare of Atlanta¹¹ when she returns to her home country.

Children's Healthcare of Atlanta's International Neurotrauma Nurse Fellowships is planned to be a sustainable training partnership between neurosurgery departments in HICs and LMICs. It is hoped that this, and other innovative strategies to connect neurosurgeons with the broader medical community will expand access to TBI patients in need, particularly in LMICs.

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References

1. Maas AI, Menon DK, Manley GT, Abrams M, Åkerlund C, Andelic N, Aries M, Bashford T, Bell MJ, Bodien YG, Brett BL. Traumatic brain injury: progress and challenges in prevention, clinical care, and research. *The Lancet Neurology*. 2022 Nov 1;21(11):1004-60.
2. Fuller AT, Barkley A, Du R, Elahi C, Tafreshi AR, Von Isenburg M, Haglund MM. Global neurosurgery: a scoping review detailing the current state of international neurosurgical outreach. *Journal of neurosurgery*. 2020 May 8;134(4):1316-24.
3. Meara JG, Leather AJ, Hagander L, Alkire BC, Alonso N, Ameh EA, Bickler SW, Conteh L, Dare AJ, Davies J, Mérésier ED. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *The lancet*. 2015 Aug 8;386(9993):569-624.
4. Park KB, Johnson WD, Dempsey RJ. Global neurosurgery: the unmet need. *World neurosurgery*. 2016 Apr 1;88:32-5.
5. Mukhopadhyay S, Punchak M, Rattani A, Hung YC, Dahm J, Faruque S, Dewan MC, Peeters S, Sachdev S, Park KB. The global neurosurgical workforce: a mixed-methods assessment of density and growth. *Journal of neurosurgery*. 2019 Jan 4;130(4):1142-8.
6. Dewan MC, Rattani A, Fieggen G, Arraez MA, Servadei F, Boop FA, Johnson WD, Warf BC, Park KB. Global neurosurgery: the current capacity and deficit in the provision of essential neurosurgical care. Executive Summary of the Global Neurosurgery Initiative at the Program in Global Surgery and Social Change. *Journal of neurosurgery*. 2018 Apr 27;130(4):1055-64.
7. Dewan MC, Rattani A, Gupta S, Baticulon RE, Hung YC, Punchak M, Agrawal A, Adeleye AO, Shrimme MG, Rubiano AM, Rosenfeld JV. Estimating the global incidence of traumatic brain injury. *Journal of neurosurgery*. 2018 Apr 27;130(4):1080-97.
8. Rubiano AM, Griswold DP, Adelson PD, Echeverri RA, Khan AA, Morales S, Sánchez DM, Amorim R, Soto AR, Paiva W, Paranhos J. International neurotrauma training based on north-south collaborations: results of an inter-institutional program in the era of global neurosurgery. *Frontiers in Surgery*. 2021 Jul 29;8:633774.
9. Robertson FC, Lippa L, Broekman ML. Task shifting and task sharing for neurosurgeons amidst the COVID-19 pandemic. *Journal of neurosurgery*. 2020 Apr 17;133(1):5-7.
10. Reisner A, Popoli DM, Burns TG, Marshall DL, Jain S, Hall LB, Vova JA, Kroll S, Weselman BC, Palasis S, Hayes LL. The central role of community-practicing pediatricians in contemporary concussion care: a case study of children's healthcare of Atlanta's Concussion Program. *Clinical pediatrics*. 2015 Oct;54(11):1031-7.
11. Reisner A, Burns TG, Hall LB, Jain S, Weselman BC, De Grauw TJ, Ono KE, Blackwell LS, Chern JJ. Quality improvement in concussion care: influence of guideline-based education. *The Journal of Pediatrics*. 2017 May 1;184:26-31.