

World Spine Care: providing sustainable, integrated, evidence-based spine care in underserved communities around the world

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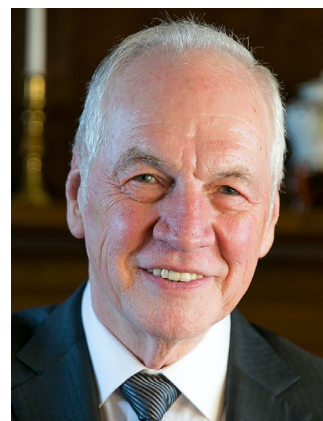
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Introduction

World Spine Care (WSC) is a not-for-profit organization with the mission to bring *sustainable, integrated, evidence-based spine care to underserved communities around the world*. It was founded by Dr. Scott Haldeman who recognized the global burden of spinal disorders and the lack of access to adequate care in low and middle-income countries (LMICs). In 2008, he launched this ambitious project to address the enormous gap in spine care delivery around the world.

Spinal disorders are a significant contributor to the global burden of disease in both high income and low-income countries. In fact, back pain and neck pain are the leading and fourth leading causes of disability worldwide, respectively.¹ Back pain and neck pain combined contribute more to the global burden of disease than HIV/AIDs, malaria, Alzheimer's, diabetes, depression, lower respiratory infections, lung and breast cancer combined, and traffic injuries.¹ The impact of spinal disorders has increased since 1990 and global disease burden has shifted away from communicable diseases toward non-communicable diseases.¹ In addition, a recent systematic review by Jackson *et al.* suggests that back and neck pain have a higher prevalence in sub-Saharan Africa and LMICs when compared to higher income countries.² Additionally, global disability (with back pain being the greatest contributor) disproportionately impacts women, the elderly, rural communities and the poorest quintile of the population.³ Disability is also greater in low income countries.³

Although there are some regions worldwide with local traditional healers who treat spinal pain, there are often little or no biomedical spine care resources or expertise available in LMICs. Most do not have access to health care providers with training in spinal disorders such as rheumatologists, physiatrists, surgeons, neurologists or psychologists, and there is a lack of primary care providers for spinal disorders. Nurses, nurse practitioners, and family physicians typically lack training in management and prevention of spinal disorders and there are often no chiropractors, osteopaths, physiotherapists or other practitioners who have suitable training to provide evidence-based care for such disorders. In such settings, spinal pain is almost always treated with medication, if even that is available. The observed lack of resources in many LMICs is further compounded by the fact that there is generally little to no interest expressed by inter-

national charitable organizations to fund projects aimed at reducing the impact of spinal disorders.⁴

It became clear to Dr. Haldeman that it was necessary to create an organization such as World Spine Care to develop programs aimed at reducing the burden of spinal disorders in LMICs. Since 2008 WSC has attracted clinicians and researchers from around the world including more than 15 researchers, over 50 clinicians, and over 15 specialists including surgeons, radiologists, and neurologists. WSC is now providing evidence-based, integrated, sustainable and scalable spine care programs in 4 countries with the goal of expanding the programs to more countries in the future. It is the goal of WSC to reduce the burden of spinal disorders by building local capacity so that in the future, countries will have high quality spine care programs that are entirely local and embedded into the existing health care systems. This article will outline the way in which WSC is achieving these goals and how it hopes to expand its programs to more countries.

The World Spine Care model

The mission of World Spine Care is "*To improve lives in underserved communities through sustainable, integrated, evidence-based, spine care.*" Its vision is "*A world in which everyone has access to the highest quality spine care possible.*"⁵

All principles of the WSC model are a direct expansion of the mission statement and all decisions made within WSC must fit within the elements of sustainability (and scalability), integration and evidence-based practice. The WSC model also follows the priorities set out by the World Health Organization (WHO): attainment of the highest available standard of health, improving access to care (with a target of universal health care), provision of evidence-based care and care provision that is people-centered and integrated with other health services. The WHO recognized WSC as a promising practice in 2016 and included it on the web platform for others to review, learn from, and potentially collaborate with. The WSC practice example on the WHO Integrated People Centered Health Services web platform may be found at: (<http://www.integratedcare4people.org/practices/315/creating-a-sustainable-model-of-spine-care-in-underserved-communities-in-botswana/>).

Spinal disorders are mostly chronic, recurrent conditions so any attempt to provide care must include a

long-term presence rather than short-term interventions. To establish a long-term presence that is sustainable and scalable, local government or institutional support is required and the programs must be integrated into existing health care systems rather than operating in a silo or providing a single intervention. WSC's contention is that any program initiated by a foreign non-governmental organization (NGO) would have limited impact or chance for survival unless it ultimately built adequate local capacity to ensure full local control and management and the capacity to expand across the country. This program would have to include education at all levels from patient to health care providers, prevention programs, and cooperation and integration of local health care providers.

The WSC model is adaptable to different countries, cultures, customs, beliefs, and traditions. Providing care in multiple countries also requires the delivery of evidence-based care, standardized clinical protocols and policies, and methods for collecting, analyzing and sharing data between clinics. It is finding a balance between these requirements that necessitates ongoing dialogue amongst all stakeholders and innovative solutions that are constantly re-evaluated as the projects evolve.

Partnering with local health care or academic institutions has allowed full integration of the WSC program, which includes access to all imaging and laboratory tests, direct referral to all specialists and facilitated communication amongst health care professionals. This collaboration and access optimizes and expedites effective patient care. The two-way communication and collaboration has impressed upon the health care communities the quality of care that the WSC team offers, and created advocates within the institutions who have helped facilitate the expansion of the WSC spine care programs within, and to other communities.

Evidence-based care

The model of evidence-based care in the WSC clinics is a two-way model that uses evidence to inform the care, and collects data to measure its efficacy and support further improvement. WSC uses the most current clinical practice guidelines and best available evidence to inform the clinical examination, treatment and education of patients in a shared decision-making process with patients.

To facilitate continuity of care for the patient and communication between health providers and collaborating

clinical facilities, WSC has developed documentation and outcome instruments for use in all clinic settings, adapted to cultural nuances and integrated with local spine care needs. Each clinician who participates in the program is trained in the documentation, which facilitates ease of transfer of information between clinicians. The WSC toolkit includes intake, examination, treatment forms, informed consent, summary pages and re-assessment forms. Conceptually, these are the same for all clinics with only minor modifications to fit local cultures or norms. This toolkit makes it possible to extract information and create a patient database and allows for comparison between clinics. The information in the database includes such information as patient demographics, presenting complaints, comorbid factors, and patient outcomes.

Integrated

The central clinician in the spine care team is the Primary Spine Provider (PSP), the first contact for spinal disorders and who has the training to diagnose (including ruling out red flags and identifying yellow flags), refer when appropriate, apply the appropriate use and interpretation of imaging, perform spinal manipulation and other manual therapies, educate patients on the prevention and management of spinal disorders, develop rehabilitation programs for spinal disorders, and provide ongoing and long term follow-up, along with coordination of providers. Dr. Haldeman first introduced the concept of a Primary Spine Provider in 2001⁶ and the WSC Clinic Supervisors have taken on this role at all WSC locations.

One of the early goals in setting up a WSC clinic is to identify and get to know other health care providers and establish expedited lines of referral to facilitate optimal patient care. If there are gaps within the spine care team (eg. an absence of spine surgeons in the country), WSC will work to provide training, scholarships or fellowships to local health care providers to help build local capacity. Across the WSC clinics there is an approximately 10% referral rate which illustrates the need for these efficient referral networks.

Sustainability and scalability

A primary concern on setting up a WSC program is whether it can be sustainable over the long term and will continue functioning independent of external aid. From the moment that WSC considers establishing a program

Table 1.
Elements of sustainability

Local cooperation	Each WSC project is endorsed, supported and integrated into the local health care system or a well-established academic institution. The ultimate goal is to eventually hand the entire project over to local management. The elements of this collaboration are laid out in a Memorandum of Understanding (MOU) between WSC and the local institutions.
Interim foreign volunteers	A Clinic Supervisor (CS) with the training and skills to act as the PSP initially establishes each clinic. When there is no local clinician who can provide spine care, a volunteer CS is recruited to manage the clinic and assume the role of PSP. A volunteer CS remains in this position until the local supporting health care system is able to provide a locally trained CS to take over the PSP position. Once the clinic is under local management, WSC maintains a quality control, consultative, and educational role.
Local capacity building	Local capacity building involves education at all levels. <ol style="list-style-type: none"> 1. Patient education includes prevention and self-management, as well as physical and psychosocial risk factors for spine related disability. 2. Community education programs include the WHO <i>Straighten Up</i> program, adolescent scoliosis screening and a yoga teacher training program developed around training local residents to teach yoga to patients with pain and reduced mobility. 3. Local health provider education programs include one-day workshops on spine related topics and techniques for the conservative management of spine pain. WSC also coordinates one or two-day conferences which bring in experts from the fields of surgery, conservative care, radiology, epidemiology, and evidence-based care. The latter have been supported by many of the major spine societies including the North American Spine Society (NASS), EUROSPINE and the International Society for the Study of the Lumbar Spine (ISSLS).
Spine specialist training	Building sustainability also includes training specialists from primary to tertiary care. <ol style="list-style-type: none"> 1. Primary spine care: WSC has arranged full scholarships through participating institutions for local students to train in primary spine care and eventually take over the management of the clinics. Scholarships have been arranged at the Canadian Memorial Chiropractic College, Palmer College, National University of Health Sciences, and Anglo European Chiropractic College. Local governments cover living and travel expenses and ensure that the candidate is committed to return and assume the responsibility to maintain and continue with the WSC program. 2. Surgical specialties: WSC has also established relationships with a number of spine surgical centers of excellence that will host surgeons to complete fellowship training in spine surgery.

in a community, there must be a clear pathway to a locally supported sustainable and scalable status. This is achieved through several steps; each of which must be considered before a program is initiated (Table 1).

WSC clinics as research environments

In the early stages of development, WSC recognized that the body of spine care research in low and middle-income countries is lacking⁶ and there is enormous opportunity for research. The pioneering work that is being done by WSC must be rigorously monitored to ensure that the ef-

forts are fruitful and that no harm is occurring. Multiple institutions have joined WSC in supporting the research initiatives including Canadian Memorial Chiropractic College, Palmer College of Chiropractic, Oregon Health and Science University, the University of South Florida, the Mahatma Gandhi Mission Institute of Health Sciences, the University of Ontario Institute of Technology, the University of Southern Denmark, and the University of Hawaii School of Medicine, and Durban Institute of Technology.

Recognizing the need and potential for research at

Table 2.
Statistics from 3 World Spine Care programs ending June 2017.

	Shoshong (Rural)	Mahalapye (Urban)	Moca (Urban)
Opening date	2012/08	2011/12	2014/11
# new patients from clinic opening	709 (250 used for statistics below)	961 (320 used for statistics below)	420
# patient visits	7300	8500	4562
Sex	69% female	78% female	55% female
Mean age (years)	51	48	46
Primary pain location	Low back 41% Upper back 14% Neck 5% Knee 16% Thigh 4% Ankle/foot 4% Elbow 2%	Low back 58% Upper back 17% Neck 3% Knee 6%	Low back 53% Upper back 11% Neck 11% Shoulder 6% Knee 5% Ankle/foot 3%
Secondary or higher education	49%	69%	81%
Prior spinal pain	14%	25%	55%
Secondary complaints	75%	70%	57%
Interfering pain	69%	51%	77%
Chronic pain (>3 months)	74%	87%	68%
Belief in recovery (% positive)	91%	89%	97%
Work injury	5%	5%	18%
MVA	6%	6%	4%
Primary contact	15%	14%	26%
Average # treatments to discharge	5	5	8
Non-specific/mechanical pain	83%	83%	68%
Serious red flag pathology	10%	9%	12%

the WSC clinics, a research committee was established that supports collaborative projects with local researchers, institutions and governments. Research, including the longitudinal data collection in the clinics, is written into each Memorandum of Understanding (MOU) that is signed with local governments and institutions. Through these partnerships and collaborations, the research committee hopes to engage researchers interested in spinal disorders from low and middle-income communities.

The WSC research committee includes a mixture of researchers and clinicians from diverse disciplines in-

cluding chiropractic, epidemiology, medicine, physical therapy, qualitative health sciences, and public health. It is one of those rare opportunities for researchers and clinicians to regularly work together and solve problems that are both supported by data and practical in application.

Current and past research projects

Along with the longitudinal data collection which occurs in all of the clinics (some preliminary data is presented in tables 2 and 3), there are various published papers and ongoing research.

Table 3.
A list of serious pathology and bony deformity presenting to the WSC clinics from 2012 to 2017.

<ul style="list-style-type: none"> • Situs inversus • Cervical fracture • Rheumatoid arthritis • Polyneuropathy • Fractured dens • Sprengel's deformity • Klippel Fiel syndrome • Tuberculosis of the spine • Scoliosis • Traumatic coccydynia • Peroneal nerve entrapment • Hydroseal • Metastatic bone tumor • Kaposi sarcoma • Peptic ulcer • Cerebral Palsy • Traumatic paraplegia • Traumatic hemiparesis • Gout • Rib fracture • Myositis • HIV • Stroke • Jaw fracture • Paget's disease • Type II diabetes • Blount's disease 	<ul style="list-style-type: none"> • Cauda equina syndrome • Cervical stenosis with radiculopathy • Cervical disc herniation with radiculopathy • Vertebral body compression fracture • T7 myelopathy secondary to burst fracture • Organic referred – multiple locations • Lumbar disc herniation with radiculopathy • Lumbar stenosis with radiculopathy • Diffuse Idiopathic Skeletal Hyperostosis • Congenital interspinous pseudoarthrosis • Peripheral nerve entrapment • Hemorrhagic ovarian cyst • Rheumatoid arthritis • Malignant GI tumor • Reflex sympathetic dystrophy • Diabetic polyneuropathy • Facial nerve palsy • Polymyalgia rheumatica • Arthritis secondary to infection • Friedrich's ataxia • Motor delay due to in utero hypoxia • Neurofibromatosis with IVF stenosis secondary to dumbbell neurofibroma • Legg–Calvé–Perthes disease • Benign paroxysmal positional vertigo • Cervical spondylotic myelopathy • Non-union of shoulder fracture • Uterine fibroid causing pelvic nerve compression • Ankylosing spondylitis
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Past research projects include qualitative studies to better understand the meaning and impact of spine and musculoskeletal disorders.⁷⁻⁹ A paper published in the *Journal of Bone and Joint Surgery* describes the aims, challenges, facilitators, and successes of four of these training and research projects.¹⁰ Ongoing research projects include: a case series of patients seeking care at WSC clinics, a demographic and disease profile of WSC patients, and the perception of selected stakeholders on the integration of WSC into the local health care system. After the opening of the flagship clinic in Botswana, it became clear that

existing Patient Reported Outcome Measures (PROMS) were not appropriate in these communities and WSC launched into the creation of a culturally relevant PROM for low literacy populations¹¹ that is currently in the validation stage.

The World Spine Care programs

There are currently six WSC clinics in four countries: three in Botswana, one in each in Ghana, India and the Dominican Republic. Each location is unique with respect to language, culture, and political climate. While



Figure 1.

Dr. Outerbridge announcing the opening of the Shoshong clinic at the Kgotla (village meeting) in 2012.



Figure 2.

Shoshong clinic image – Marcia Ntebe (Health Care Assistant), Carmen Pajuelo (volunteer), Kabelo Sebati (Health Care Assistant) and Nadine Harrison (Clinic Supervisor) in front of the Shoshong clinic in Botswana.

these differences must be considered and the programs adapted, WSC must at the same time maintain the principles and elements of the model that are crucial to effective spine care delivery and project sustainability.

None of the projects listed would have been possible without the support of an enormous team of volunteers who have dedicated time to help run and develop the programs. There have been 13 Clinic Supervisors, who run the clinics for a year, and 35 short-term volunteers who spend anywhere from one month to three months at the clinics. The following is a brief overview of the clinics in the four countries.

Botswana

In 2011, the Botswana Ministry of Health and Wellness and WSC signed a MOU that outlined the roles and responsibilities of the two organizations in establishing the first WSC program. WSC was looking for a geographically distinct community with a treatment naive population of about 7000 to 10000 that was within a short distance of a district hospital. This would allow primary

spine care delivery at the village level while having reasonable access to services such as imaging, laboratory, and emergency medical and surgical care. It was decided that the village of Shoshong and the Mahalapye District Hospital (40 km apart) satisfied these requirements.

The WSC clinic at the Mahalapye District Hospital opened by Geoff Outerbridge in December 2011. Dr. Outerbridge worked to establish the second clinic in Shoshong (Figure 1) in a government-funded porta cabin on the grounds of the Shoshong village clinic. This second clinic opened in August 2012. Both clinics have run continuously since their opening (Figure 2). The third clinic was opened by Dr. Stefan Eberspaecher at Princess Marina Hospital, the main referral hospital in Gaborone, in December 2017. The clinic is housed in a portacabin on the hospital grounds.

This project has seen tremendous support from the Botswana Ministry of Health and Wellness, enabling WSC to fulfill all the elements of its mission statement, including education and capacity building, ahead of schedule. Aside from patient, community and health care worker training,



Figure 3.

Dr. Vincent Stelhare, Director of University of Botswana family medicine, presenting at the 2016 WSC spine care conference in Mahalapye, Botswana.



Figure 4.

Patricia Tavares, Stefan Eberspaecher and Geoff Outerbridge on the steps of the rehabilitation center where the WSC clinic is located in Moca, Dominican Republic.

two spine care conferences have been hosted in Botswana in 2013 and 2016 (Figure 3) and a third is scheduled for May 2018. A local Motswana orthopedic surgeon, who completed his spine surgical fellowship at the Ankara Spine Institute, Ankara, Turkey, has now returned to begin surgical interventions in Botswana. The two chiropractic scholarship recipients from Botswana (one at the Canadian Memorial Chiropractic College and the other at Palmer College of Chiropractic) are scheduled to return to take over some of the clinical positions in 2018.

Dominican Republic

In March 2016 WSC, the provincial director of the public health care system, the director of the public hospital, and two local partner charities signed a MOU. One of the local partner charities agreed to provide physical premises for the clinic and logistical support. The clinic was located on the grounds of the public hospital in Moca (Figure 4). The hospital and local private institutions also provided access to basic diagnostic services for the WSC program.

Local healthcare practitioners have been tremendous-

ly generous in accepting and providing assistance to the WSC program which was initially spearheaded by Dr. Patricia Tavares and local MD, Dr. Ramon Lopez. Two local medical physicians have assisted with patient evaluations on occasion and make recommendations for referral to medical specialists or facilities not within the district hospital. The clinic has been very well accepted and welcomed by local healthcare practitioners who have been happy to assist at every turn.

Ghana

Dr. Afua Adjei-Kwayisi, a medical doctor from Ghana who trained as a chiropractor at Palmer College of Chiropractic, initiated this program. Upon completion of her chiropractic degree, she returned to Ghana with the vision of establishing an evidence-based, scalable spine care program within Ghana Health Services (GHS) at the Ridge Hospital in Accra (now the Greater Accra Regional Hospital).

Dr. Adjei-Kwayisi approached WSC to assist her in establishing a spine care program at Ridge Hospital. She



Figure 5.

Dr. Afua Adjei-Kwayisi in the WSC treatment room at Ridge Hospital, Accra, Ghana.



Figure 6.

Geoff Outerbridge, Adam Wilkie, Margareta Nordin and Rajani Mullerpatan in front of the Mahatma Gandhi Mission Hospital, site of the WSC clinic.

worked with WSC to solicit the necessary support within GHS to establish a WSC/GHS collaboration agreement. The GHS/WSC spine care program launched in March 2016 (Figure 5) and is fully supported and funded by GHS. In 2017, the first phase of the New Ridge Hospital will be completed allowing the WSC clinic additional space for treatment and rehabilitation.

As with the other WSC projects, a scholarship has been offered to a local Ghanaian student to travel to the United Kingdom to study chiropractic at the Anglo European Chiropractic College. WSC also provides ongoing clinical supervision and assistance in further expansion of the services within Ghana.

India

The inception of the program in India was different from the other three countries in that it was established without direct contact with the government health care system. The project in India is a collaborative effort between WSC and the Mahatma Gandhi Mission University of Health Sciences (MGMUHS) Department of Physical Therapy

in Navi, Mumbai. Negotiations began with discussions between Professor Margareta Nordin and Dr. Rajani Mullerpatan in 2014, and the MOU was signed and the project launched in November 2016 (Figure 6). This project is a break from the traditional approach of WSC as it is incorporated within an academic institution and located in the University hospital department of physical therapy. The clinicians at the MGM/WSC clinic have full access to imaging and referral to medical professionals and specialists. Given its location within the hospital, inter-professional collaboration is easily achieved.

A second clinic is under construction in the rural village of Tara, located in Maharashtra where MGMUHS operates its rural health center. This rural clinic will satisfy the WSC mission of helping those in greatest need by bringing the services closer to the patients.

Preliminary clinic statistics

Table 2 lists the patient statistics from three of the WSC clinics. The data collection documentation and database were developed between 2011 and 2012, hence, although

the table does give the overall attendance numbers, the patient statistics listed are from the most recent 320 patients in Mahalapye and 250 patients in Shoshong.

The data from Table 2 raises several interesting points. The majority of patients primarily seek care for spinal pain, the majority complaining of chronic, non-specific low back pain, followed by upper/mid-back, and then neck pain. In the majority of cases, this pain is enough to interfere with activities of daily living, and the majority of patients present with a secondary musculoskeletal complaint. In the rural setting of Shoshong, where there is no access to other services for musculoskeletal complaints, a larger proportion of the patients present with extra-spinal complaints. Regardless of the region of complaint, patients are discharged from care for their chief complaint with just a short course of care (five to eight treatments on average). Greater than 10% of patients presented with red flags for serious pathology, and this is considerably greater than that noted in high income countries.

Future directions

Looking forward, WSC will continue to expand its clinical and research toolkit and develop projects in other countries using this model of care. As these projects expand, data will be available from more locations, each with unique cultures, customs, patient demographics and outcomes, clinical and logistical challenges and successes. These clinics will provide opportunities for research, which will be facilitated by the detailed data collection facilitated by the WSC toolkit.

The success of WSC is dependent on adequate funding. It is clear that large funding organizations are more likely to support WSC if support from the spine care community is strong. Although there has been support from spine care organizations, more support is required to sustain and advance WSC's mission, and attract larger funders.

Conclusion

The information gathered during the first six years of active WSC projects, and the plethora of research on the global burden of spinal disorders has clearly established that there is a need for evidence-based, integrated and sustainable spine care programs around the world. The success of the WSC clinical and research programs has demonstrated that it is possible to deliver these services effectively in underserved regions with varied cultures

and customs. It is also apparent that these services are appreciated as each of the WSC projects have full local endorsement and support.

The WSC program is not only of interest to those suffering from spinal pain and health care institutions. The magnitude of the volunteer support from clinicians, administrators and researchers is a testament to the interest of spine care professionals around the world in helping provide care for those in need who would otherwise have no access to care. WSC is excited to see the expansion of these programs around the world and the concomitant expansion and deepening of the research initiatives that have also proven viable within these communities. Further support and funding from the spine care community will help ensure the success of these programs.

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