



The Global Spine Care Initiative: World Spine Care executive summary on reducing spine-related disability in low- and middle-income communities

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Abstract

Purpose Spinal disorders, including back and neck pain, are major causes of disability, economic hardship, and morbidity, especially in underserved communities and low- and middle-income countries. Currently, there is no model of care to address this issue. This paper provides an overview of the papers from the Global Spine Care Initiative (GSCI), which was convened to develop an evidence-based, practical, and sustainable, spinal healthcare model for communities around the world with various levels of resources.

Methods Leading spine clinicians and scientists around the world were invited to participate. The interprofessional, international team consisted of 68 members from 24 countries, representing most disciplines that study or care for patients with spinal symptoms, including family physicians, spine surgeons, rheumatologists, chiropractors, physical therapists, epidemiologists, research methodologists, and other stakeholders.

Results Literature reviews on the burden of spinal disorders and six categories of evidence-based interventions for spinal disorders (assessment, public health, psychosocial, noninvasive, invasive, and the management of osteoporosis) were completed. In addition, participants developed a stratification system for surgical intervention, a classification system for spinal disorders, an evidence-based care pathway, and lists of resources and recommendations to implement the GSCI model of care.

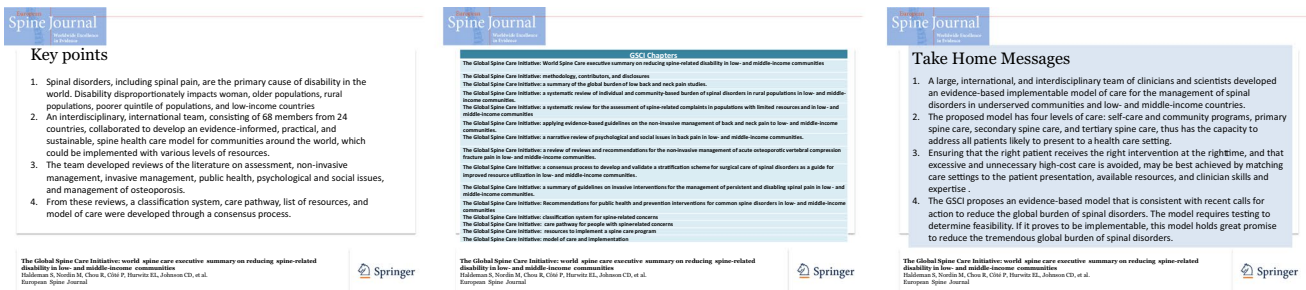
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Conclusion The GSCI proposes an evidence-based model that is consistent with recent calls for action to reduce the global burden of spinal disorders. The model requires testing to determine feasibility. If it proves to be implementable, this model holds great promise to reduce the tremendous global burden of spinal disorders.

Graphical abstract These slides can be retrieved under Electronic Supplementary Material.



Keywords Global burden of disease · Spinal diseases · Quality of health care · Neck pain · Back pain

Introduction

Spinal disorders are a major cause of disability, economic hardship, and morbidity in high-income communities and are of increasing concern in low- and middle-income communities [1, 2]. With an aging worldwide population, the burden of spinal pain is projected to continue to increase [3]. The available data suggest that the burden of spinal disorders is at least as great in low- and middle-income countries as in high-income countries [4]. Disability and costs attributed to spinal pain are projected to increase in coming decades, especially in resource-challenged countries, where health and other systems are often fragile and not equipped to cope with this growing burden [5]. This has led to increasing calls to action to address this burden. Leaders in the spinal care community emphasize that, when considering care of spinal disorders in low- and middle-income countries, it is essential to prevent the use of practices that are ineffective, harmful, or wasteful [6]. Fragmented and outdated models of care have failed to address widespread misconceptions, held by health professionals and the lay public alike, about the causes, prognosis, and effectiveness of the many treatments for spinal pain [6].

World Spine Care was established in 2008 with the realization that current models of care in high-income countries should not be reproduced in low- and middle-income countries or in communities with limited resources in high-income countries. World Spine Care is a nonprofit organization with the mission to improve lives in underserved communities by providing sustainable, integrated, and evidence-based spine care. World Spine Care has initiated spinal programs in Botswana, the Dominican Republic, India, and Ghana. These programs are supported by government agencies, university volunteer clinical services, and community education programs and are integrated into existing healthcare systems [7]. Each of

these countries has different levels of resources, cultures, and expectations. These few small programs, although providing care to their communities, were not meeting the World Spine Care's greater vision of "a world in which everyone has access to the highest quality spine care possible." This vision requires: (1) a low-cost and efficient model of care, (2) consistency with the current evidence, (3) the ability to be taught to providers with different levels of education, and (4) the capacity to be integrated into healthcare programs anywhere in the world, especially in underserved communities and low- and middle-income countries.

To work toward this vision, World Spine Care convened the Global Spine Care Initiative (GSCI) to develop an evidence-informed, practical, and sustainable, spinal healthcare model for communities around the world with various levels of resources. Funding was obtained from the Skoll Foundation and the NCMIC Foundation. The Skoll Foundation grant was a matching grant. To receive the grant, the members of the GSCI participated without any remuneration beyond travel expenses. This satisfied the requirement for the matching grant. In 2015, contracts were signed with the University of Ontario Institute of Technology/Canadian Memorial Chiropractic College Centre for the Study of Disability Prevention and Rehabilitation to carry out the literature searches and administrative functions for the GSCI.

Based on experience from World Spine Care programs, patients seeking care from clinicians and community clinics in low-income settings are likely to present with a wide scope of spine-related concerns. These patients have a high incidence of chronic symptoms that interfere with functional ability. In the absence of local secondary medical care, serious systemic diseases (i.e., spinal infections and developmental or congenital spinal deformities) are more commonly seen at a primary care setting in low-income communities than in high-income communities [7].

Experienced clinicians who have knowledge and skills to provide care consistent with current evidence-based spine guidelines are scarce or absent in low- and middle-income communities. To be successful, a model of care should be practical, relevant, and sufficiently simple to be implementable by clinicians with limited training in the care of spinal disorders. At the same time, it should avoid ineffective or harmful treatments or diagnostic procedures that have the potential to waste limited resources.

The primary goal of the GSCI was to develop an evidence-based model of care for the management of spine-related disorders that could be implemented anywhere in the world. The secondary goal was to gather and synthesize information about the most effective assessment, preventive, and therapeutic approaches so that underserved communities with limited resources may benefit from this knowledge.

Methods

The methodology used by the GSCI is described in the summary and in each of the papers [8–21]. Fifteen papers were developed to address the goals of this initiative. Nine papers are foundational. These papers informed the four consensus-based papers that provide detail for the classification, care pathway, resource requirements, and model of care. Requests to participate in the GSCI were sent to leading spine clinicians and scientists around the world. The final interprofessional, international team that contributed to the GSCI consisted of 68 members from 24 countries and included members of most healthcare professions and specialties that study or care for patients with spinal symptoms, including family physicians, spine surgeons, rheumatologists, chiropractors, physical therapists, epidemiologists, research methodologists, and other stakeholders.

Results: summary of foundational papers

Review of the global and community impact of spinal disorders

1. Global burden [18]: A literature review summarized relevant findings and trends related to back and neck pain from studies on the global burden of disease. This review revealed that in 1990, low back pain and neck pain were ranked as the 12th leading cause of disability-adjusted life years globally; in 2005, they rose to be the eighth leading cause, and in 2015, they rose higher to the fourth leading cause, just below ischemic heart disease, cerebrovascular disease, and lower respiratory tract infections. In 2015, over half a billion people worldwide had low back pain and more than a third of a billion had neck pain lasting more than 3 months duration. Low back pain and neck pain are the leading causes of years lived with disability in most countries and in most age-groups.
2. Community burden [14]: The primary targets for the GSCI were underserved communities and low- and middle-income countries. For this reason, a systematic review of the individual and community-based burden of spinal disorders in rural communities in low- and middle-income communities was completed. The literature primarily focused on low back pain. The prevalence of low back pain appears greater among females, in those with less education, the presence of specific psychological factors (stress, anxiety, depression), and in alcohol consumers. Estimates of neck pain prevalence were lower than those of back pain in both rural and urban areas, but the precise magnitude of these differences is uncertain due to the small number of studies and large variability in estimates. Similar to low back pain, neck pain was also greater in females. These findings are consistent with a recent systematic review focusing on chronic pain in low- and middle-income countries, which showed an overall prevalence of low back pain of 21% in the general population and a higher prevalence in the elderly (28%) and in workers (52%). The conclusion from this review was that the prevalence of and disability associated with low back and neck pain is enormous, has increased over the past 25 years, is increasing more rapidly in communities with limited resources, and will likely exact an increasing toll with population aging.

Evidence-based interventions to address spinal disorders

1. Assessment [17]: In summary, clinicians should: take a clinical history and determine the presence of pathological, psychological, and social flags; perform a physical examination (musculoskeletal and neurological); not routinely obtain diagnostic imaging for spinal pain without pathological flags; and obtain diagnostic imaging and laboratory testing when severe and progressive neurological deficits are present and when serious pathologies are suspected.
2. Noninvasive management [19]: In summary, clinicians should provide education and reassurance, advise patients with spinal pain to remain active, and provide information about self-care options. For acute spinal disorders without serious pathology, clinicians should consider the primary evidence-based treatment options: superficial heat, exercise, manual therapy, and

nonsteroidal anti-inflammatory drugs (NSAIDs). For patients with chronic spinal disorders without serious pathology, primary treatment options are exercise, yoga, cognitive behavioral therapy, acupuncture, biofeedback, progressive relaxation, massage, manual therapy, interdisciplinary rehabilitation, NSAIDs, acetaminophen, and antidepressants. For patients with spinal pain with radiculopathy, clinicians may consider NSAIDs, exercise, or spinal manipulation. The use of other interventions requires extrapolation from evidence regarding effectiveness for non-radicular spinal pain. It was felt to be reasonable to consider guidelines developed for high-resource settings adaptable for use in low-income communities. Decision determinants should be influenced by factors such as costs, availability of interventions, cultural and patient preferences, benefits, harms, and the quality of underlying evidence.

3. Invasive interventions [21]: Elective surgery and interventional procedures have limited availability in low- and middle-income communities due to a lack of resources and trained surgeons. It is necessary for surgical and invasive interventional procedures to be prioritized within these settings. Lower priority surgical interventions include fusion for lumbar/non-radicular neck pain. Higher priority surgical interventions include discectomy and decompressive surgery for cervical or lumbar radiculopathy, cervical myelopathy, and lumbar spinal stenosis.
4. Surgical care stratification [15]: A survey of surgeons from multiple countries was undertaken to provide information on the feasibility of surgery in different settings. This study resulted in a stratification scheme for surgical care of spinal disorders that could serve as a guide for improved resource utilization in low-income communities. The five-level surgical care stratification identified diagnostic and therapeutic procedures that can be safely and effectively performed at each level.
5. Noninvasive management of acute spinal compression fractures [16]: The literature on compression fractures due to osteoporosis was reviewed to provide an example of a systemic disease with spinal symptoms. The review noted that conservative management of acute pain and recovery of function in adults with compression fractures should include calcitonin for analgesic-refractory acute pain, a spinal orthosis for pain relief, early mobilization, and exercise.
6. Psychological and social issues [20]: A literature review of the psychological and social factors that are strong predictors of outcomes for people with back pain was completed. For acute low back pain, intervention options include: reassurance and education of patients; investigation and discussion of irrational or maladaptive beliefs; identification of psychological and social yel-

low flags; and referral for psychological evaluation in the absence of improvement at 4 weeks. When a patient is present in the subacute phase, the goal of intervention selection is to prevent chronicity, and to identify patients at risk through careful medical and psychological evaluation. Other treatment goals during the acute and subacute phases include: improving function; removing or modifying psychological or social barriers to recovery through active supervised exercises, possibly cognitive and behavioral evaluation; and multidisciplinary rehabilitation if available. Clinicians need to engage patients when establishing treatment goals and negotiating a treatment plan. Clinicians need to use careful listening, reassurance, and information to help meet patients' perceived needs.

7. Prevention and public health [8, 22]: This study found 41 risk factors and 39 comorbidities related to 12 common spine-related disorders. The high incidence of these factors demonstrated that spinal disorders are not isolated health concerns but are complex biopsychosocial components of health. Clinicians should assess and track individuals for risk factors and comorbidities associated with spinal concerns and intervene if necessary. A range of possible interventions to reduce the impact of spinal disorders include: prevention of the first occurrence of a spine-related disorder, preventing worsening of a spine condition that has already occurred, and reducing the disability of an ongoing spinal disorder. Prevention interventions should be targeted at modifiable risk factors and comorbidities found during the patient assessment. Clinicians who are providing care for a patient presenting with spine-related symptoms should educate individuals on how to reduce risks and manage any associated comorbidities. Clinicians should recommend how individuals and caregivers may act autonomously to prevent or decrease future severity and disability. It is important for clinicians to refer or co-manage patients with advanced or comorbid conditions to prevent worsening of a spinal disorder. Clinicians should be involved in community spinal health programs by collecting community and population health information about spine-related risk factors and comorbidities and by participating in or reinforcing community education programs aimed at preventing or reducing the burden of spinal disorders.

Summary of GSCI classification, care pathway, resources, and model of care papers

1. Classification of spinal disorders [9]: Categorization of individuals who present with spinal concerns into classes can assist with more efficient and effective triage, clinical decision making, and management. A review

of the literature identified ten classification systems for spinal disorders. However, none satisfied the criteria that they could be used in a comprehensive intervention-based spine care pathway. Therefore, a GSCI classification system of spinal disorders was developed which incorporated the principles of and would be consistent with existing classification systems. The six components of the GSCI classification system include: no or minimal symptoms (class 0); mild symptoms but minimal interference with activities (class I); moderate or severe symptoms with interference of activities (class II); spine-related neurological symptoms or signs (class III); severe bony deformity, trauma or pathology (class IV); and spine-related symptoms, destructive lesions related to systemic pathology, or other non-related spinal pathology (class V). Subclasses include chronicity, severity, and other factors to allow for different interventions or recommendations. If a person has multiple complaints, each spinal region is classified separately. The GSCI classification can accommodate all spinal disorders and was developed to link to the care pathway.

2. Care pathway [11]: A care pathway links evidence-based interventions to the presenting symptoms and pathology, as described in the GSCI classification system. This process ensures that interventions are appropriate and that people receive the necessary care while at the same time reducing the cost and morbidity of excessive or inappropriate interventions. The GSCI care pathway was created to be simple, adaptable to clinicians with different levels of training and skills, and implementable in communities with limited resources. The GSCI care pathway has five decision steps: (1) awareness, (2) initial triage, (3) provider assessment, (4) intervention, and (5) outcomes. The pathway was developed to guide the management of patients after their concern has been classified. The care pathway was written to be sufficiently simple so it could be included as a prompt or in the development of educational tools such as pocket or flashcards, a wall chart, or in electronic media. This has the potential of facilitating the education of clinicians with limited experience or training in the management of spinal disorders and helping guide interprofessional communication between providers of spinal care. The proposed steps in the pathway are person-centered, evidence-based and can be integrated into a continuum of services.
3. Resources [13]: It is necessary to identify resources that are essential to the implementation of a care pathway; thus, a framework of resources was developed to match the care pathway. The resource list was structured to start with the least invasive interventions self-care and community-based prevention programs followed by primary spine care, secondary spine care, and tertiary spine care. The resources, education, skills, and competencies necessary to provide population-based spine care, primary spine care, secondary spine care, and tertiary spine care as noted in the care pathway at each of these levels were then described. The checklist of resources was organized into the following categories: healthcare provider knowledge and skills, materials and equipment, human resources, facilities, and infrastructure. The list identifies resources needed to implement a spine care program in any community based upon community needs.
4. Model of Care and Implementation [12]: The GSCI model of care includes eight core principles: person-centered, people-centered, biopsychosocial, proactive, evidence-based practices, integrative, collaborative, and self-sustaining. These principles were included in the model of care and a series of steps to implement the model. The model of care has six proposed action steps.
 - Step 1: Project initiation and initial preparations: The decision to implement a spine care program begins when an individual or community recognizes a need, such as when a government agency, employer, clinic, or organization recognizes an endemic spinal problem they wish to address. This step includes the assessment of whether stakeholders in the community and decision leaders are interested and able to establish a spine care program.
 - Step 2: Assessment of the current situation: Assessment includes evaluation of the current healthcare system (e.g., infrastructure, resources, funding, processes, and personnel). The assessment should identify the needs and resources of a community. As each healthcare system is unique, the infrastructure, resources, workforce, and processes must be evaluated at each location to determine what is available and what needs to be further developed or obtained in order to implement a spine care program.
 - Step 3: Planning and designing solutions: An implementation plan should be developed based on information from the assessment step. Preparations should be made to implement the model, including training or recruiting healthcare providers who can apply the care pathway. Resources are then identified and secured.
 - Step 4: Implementation: Once the plan has been approved by stakeholders, a pilot implementation step should be considered to test the system and to demonstrate effectiveness and feasibility. This initial implementation step should build confidence and inform the planners and stakeholders as to whether the system is ready for larger scale implementation. Once implementation has been shown to be feasible,

the implementation plan commences. Each location is unique. Therefore, successful implementation requires flexibility.

- **Step 5: Assessment and evaluation:** After implementation, assessment outcomes are evaluated to identify areas of potential improvement, to see whether program goals are being met, to identify what course corrections are needed, and whether any new goals need to be introduced. Key performance indicators are evaluated at regular intervals and used to inform the direction of change.
- **Step 6: Sustain program and scale up:** Once it is determined that the program has achieved its goals, it should be sustained. The program should be monitored to ensure that support, resources, communications, and ongoing training will continue. Once the program has demonstrated success at a local level, scaling up should be considered to include larger communities, all levels of care, and even to a national level.

Discussion

The GSCI has completed the steps necessary to recommend a classification system, a care pathway, required resources, and implementation recommendations for a spine model of care. These steps have been developed by an interprofessional, international panel of scientists and clinicians. The proposed model of care can be considered by any government, private entity, or clinician in any setting irrespective of the available resources, with the goal of reducing the burden of spinal disorders in their communities.

The GSCI aims to ensure people get the right care, at the right time, by the right team, and in the right place. For an individual in the community presenting with a spine-related concern, the care pathway allows for symptoms to be described in terms of spine location, severity, chronicity, interference with activities, the presence of neurological deficits, serious trauma or deformity, and red flags suggesting serious systemic disease. This presentation is linked to current evidence for assessment and management (i.e., noninvasive, invasive, psychological, and complex medical or surgical interventions) as described in the care pathway.

This model proposes a new approach to spinal disorders, and we believe that this is the first attempt to suggest a comprehensive care pathway for underserved communities and low- and middle-income countries. This model satisfies WHO criteria for integrated people-centered health services by putting the comprehensive needs of individuals and communities at the center of the healthcare system and

empowers people to take an active role in their health. It also satisfies the criteria set out by WHO in its “Framework for Action on Interprofessional Education & Collaborative Practice” in that it presents a means of educating clinicians in the principles of evidence-based spinal care that is not specific to any healthcare profession and can easily be taught and utilized [23].

This proposed GSCI model answers a call to action made by an international panel of low back pain authorities [6]. Although we cannot claim that the proposed model of care is the only solution, our recommendations attempt to address many of the problems that were presented in the call for action. [5]. The GSCI recommendations are consistent with the proposed approach to low back pain in this call for action. The recommendations rely on current evidence that should guide practice [24] and focusses on the importance of public health policy, self-care, and education of the general population. They also take into account patient and clinician concerns, prevention strategies, and expectation from interventions [6]. However, based on our experience at the World Spine Care programs, it is insufficient for a model to focus only on low back pain. To properly address spine-related disorders, all spinal regions must be considered, including the upper back and neck. A functional model must also go beyond only pain and include other spine-related conditions, especially since there is a higher incidence of untreated serious pathology that presents to spine care clinicians in underserved communities [1, 2].

Conclusion

The GSCI proposes an evidence-based model that is consistent with recent calls for action to reduce the global burden of spinal disorders. The GSCI offers a framework to implement an evidence-based model of spine care. Each component of this model needs to be tested. Further research, especially in underserved communities and low- and middle-income countries, should be a priority if the global burden of spinal disorders is to be addressed. The GSCI model requires testing in clinical settings with different resources to determine feasibility and whether it has the desired impact on the burden of spinal disorders in these communities. If the GSCI model of care proves to be implementable and effective, it holds promise in addressing and reducing the tremendous global burden of spinal disorders.

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Compliance with ethical standards

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