



The Need for a National Strategy for Sickle Cell Disease (SCD) in Canada

SCDAC/AAFC believes that a national strategy will reduce the health care cost associated with sickle cell disease and improve the quality of care received by the approximately 5 000 individuals living with the disease in Canada. As such, our Medical Advisory Board is willing to lend technical expertise to the federal, provincial and the territorial ministries of health in moving forward with the planning and implementation of a national strategy and has provided an extensive report on the need for this strategy based on SCDAC/AAFC's three "Asks" identified in this document.

SCDAC/AAFC is seeking federal leadership and funding in cooperation with the provinces and territories for the three key asks to bring about:

1. Implementation of universal newborn screening program for haemoglobin disorder in all provinces and territories
2. Establishment of a Canadian network of Comprehensive treatment centres, and
3. Creation of a national patient registry.

Similar to Cystic Fibrosis Canada, SCDAC/AAFC is willing to run the patient registry or partner with others to do so once funding is allotted for this initiative.

It is our hope that Minister Rona Ambrose and Health Canada would consider the increasing number of sickle cell patients in Canada and champion the creation of a national strategy for sickle cell disease. The Health Canada's lead will encourage "buy in" of the provinces and territories

Sincerely,
Lanre Tunji-Ajayi,
President/Executive Director, SCDAC/AAFC

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Advocacy for federal support for Sickle Cell Disease

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Hemoglobin disorders such as sickle cell disease (SCD) and thalassemia are **the most frequent genetic disorders worldwide**. 300 000 babies are currently born every year with sickle cell disease, and millions of individuals are affected around the globe, but epidemiologic models predict that such numbers may increase by at least 25%, and reach 400 000 SCD babies born yearly by 2050 [1, 2]. Recognizing SCD a global health issue, the World Health Organization adopted two resolutions in 2006 and 2010, calling countries to strengthen their responses to these conditions [3]. Although SCD is more prevalent in African countries, India and South America, it should clearly be recognized as an extremely important health issue in Canada too. Although good epidemiological data are still lacking in Canada, it is believed that at least 3000 to 5000 individuals live with this devastating condition in our country.

Sickle cell disease is considered a severe blood disorder. Red blood cells of SCD patients are deformed in hypoxic conditions [4, 5]. The so-called sickle cell can disrupt normal blood flow, lead to blood vessel occlusion and devastating consequences such as severe pain episodes, increased risk of severe infection and death [5], up to 300 fold increase risk of stroke [6, 7], and damage to almost any body organ. Individual with such disease are at increased risk of sudden death.

SCDAC is calling for a national strategy to improve the health of all affected individuals. Of importance, while SCD can be detected at birth by simple diagnostic methods readily available throughout Canada [8], too few provinces have currently adopted such strategy. This is in striking contrast with many countries around the globe, including United States, United Kingdom, Brazil who all have adopted national newborn screening strategies. **Early interventions**, such as the use of **penicillin prophylaxis** in infants and young children has allowed a significant reduction in early childhood death, along with **enhanced vaccination**. **Use of hydroxyurea**, the currently only available medication for sickle cell disease **can significantly optimize health cost, by reducing hospitalization rate and significantly reducing severe sickle cell complications** [9]. For patients hydroxyurea means improvement of quality of life, reduction of disease burden and an overall improved life expectancy [10-13]. Yet hydroxyurea is not sufficiently used, and worse, not completely reimbursed in many provinces, therefore hampering its proper use in many patients. In addition, the absence of adequate newborn screening result in late diagnosis in too many children who may have already developed significant disease sequelae, some of which could have been prevented by early administration of hydroxyurea. Chronic blood transfusion has also been shown to significantly reduce risk of stroke in individuals with abnormalities in specific diagnostic tools, such as transcranial Doppler ultrasound. **In order to be the**



most effective, such measures need to be implemented early in life. It is therefore likely that newborn screening program will affect quality of life and life expectancy of individuals with SCD. In 1988, a study on newborn screening program by Vichinsky et al concluded that “newborn screening, coupled with extensive follow-up and education, will significantly decrease patient mortality” [14]. As a result of early diagnosis in conjunction with adequately funded and dedicated sickle cell centers, the overall incidence of stroke in children in the state of California dropped by more than 80% [15]. Similarly, total hospital days and charges of stroke in children across the United States dropped by 45 and 24% respectively over a 20 years period following the implementation of the stroke prevention program in sickle cell disease children [16].

As proud Canadian residents, SCDAC members clearly believe in the Canadian health system, which favours universal access to hospital services. We also recognize the high value of the *Health care Act*, which is “to protect, promote and restore the physical and mental well-being of residents of Canada and to facilitate reasonable access to health services without financial or other barriers”. We are however concerned that individuals with sickle cell disease lag behind in our health system. We frankly fear that many individuals are left aside, and may even suffer from discrimination and inequitable care. While we understand that improvement of quality of care of sickle cell disease may require some investment, we strongly believe that such investment will eventually save millions, and contribute to improving Canadian society as it helps individuals with the most common genetic disorder live healthier and more active lives.

Given the federal responsibility in setting and administering national principles for the health care system, in assisting in the financing of provincial health care services, delivering health care services to specific groups, and providing funding for other health-related functions, **SCDAC therefore implore the adoption of a national strategy:**

- **Supporting each Canadian provinces in the development of universal newborn screening program**
- **Supporting the establishment a Canadian network of Comprehensive treatment centres**
- **Helping the establishment of national SCD registry.**

To learn more about how a newborn screening can effectively and efficiently detect affected individuals at birth, and why and how creating a Canadian network of comprehensive care facilities may improve outcomes and decrease costs, please read the briefing notes developed by Dr. Moorehead and Dr. Pendergrast articles, as well as our vision of partnership (use of registry and health “economic”, by Drs. Stoffman and Pastore).



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Universal screening for Sickle Cell Disease across Canada: An urgent need

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Universal newborn screening is an invaluable tool that allows for the early diagnosis of a number of serious genetic disorders, including sickle cell disease (SCD). Newborn screening is most appropriate when the screening test is highly sensitive, when a positive screening test result can be reliably confirmed with further testing, and when early identification of affected persons can be used to improve outcomes and avoid complications.

All of these conditions are met when considering newborn screening for SCD.

The tests used for newborn screening for SCD – isoelectric focusing, hemoglobin electrophoresis, and high-performance liquid chromatography – are all very sensitive, so that few affected newborns are missed by these tests. The results of one of these tests can be confirmed with any of the others or with DNA testing for the SCD gene, meaning that affected newborns are reliably and correctly diagnosed.

Most importantly, early diagnosis of SCD improves outcomes for patients with SCD, by allowing monitoring and preventative treatment to begin before patients start to have serious problems. For example:

- Daily penicillin reduces fatal infections in young children with SCD(1).
- Another medication, hydroxyurea, can be given to young children with SCD to reduce the frequency of pain crises and may reduce the frequencies of hospitalization and of life-threatening chest crises(2).
- A special ultrasound test can identify patients with SCD who are at high risk of having strokes(3), and treatment with chronic blood transfusions can lower this risk once identified(4).

None of this care can be given to children whose SCD is not yet diagnosed. Newborn screening allows such proven effective care to begin as early as possible.

Universal newborn screening is preferred. Targeted or limited screening programs can miss affected persons(5,6), sometimes with fatal results(6). Universal newborn screening, on the other hand, is proven to reduce mortality among children with SCD(6,7).

Early diagnosis is an essential and effective part of the care of children with SCD, and universal newborn screening is the most reliable and most equitable way to achieve early diagnosis. The Sick Cell Disease Association of Canada urges the federal government to support and facilitate the implementation of universal newborn screening for SCD in all Canadian provinces and territories.

We noted with appreciation that as of May 5th 2015, the provinces of Ontario, British Columbia, Nova Scotia, New Brunswick, Prince Edward Island, Yukon and progressively Quebec have included sickle cell



disease in their newborn screening programs. Only four provinces and two territories remain until the goal of universal newborn screening for SCD throughout Canada is achieved.

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Creating a Canadian Network of Comprehensive Care Facilities for Patients with Sickle Cell Disease: Improving Outcomes, Decreasing Costs

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Sickle cell disease, an inherited disorder of red blood cells resulting from a single amino acid change in the haemoglobin molecule, is the most common genetic disease in the world and the quintessential multisystem disease: due to the effects of chronic vascular damage and haemolytic anemia, patients may develop complications in almost any organ. In addition to the intermittent episodes of severe pain which in many ways characterize the condition, patients with sickle cell disease are also prone to stroke, blindness, life-threatening infections, respiratory failure, heart disease, blood clots, kidney failure, infertility, pregnancy loss, skin ulcers, liver disease, osteoarthritis and osteoporosis. Living with a chronic and debilitating disease in turn increases the risk of psychological and social dysfunction. All told, it has been estimated that the **lifetime costs of providing care to a patient with sickle cell disease approaches \$9 million**,¹ and this figure excludes the societal costs of unemployment and decreased work productivity. As the number of patients with sickle cell disease in Canada continues to grow, the associated burden on the medical system is becoming considerable.

However, **there is also an enormous opportunity to decrease the health care costs of patients with sickle cell disease while simultaneously improving clinical outcomes.** Multiple studies have shown that patients with sickle cell disease rely heavily on acute care medical services such as emergency room visits and inpatient hospitalization.²⁻¹³ Inpatient hospitalizations are particularly expensive: a recent study, for example, found that the median cost of a hospital admission for a child with sickle cell disease is approximately \$10,000, with a 90% percentile cut point of approximately \$32,000; moreover, hospitalization costs steadily increase with patient age.¹⁴ **Shifting the care of patients with sickle cell disease from an inpatient to outpatient setting, primarily through the provision of basic preventative health maintenance and the use of hydroxyurea, can reduce total healthcare costs by 20%.**¹⁵

Similarly, providing a specialized outpatient treatment facility for sickle cell patients experiencing painful vaso-occlusive episodes can decrease the burden on already over-crowded emergency departments as well as the inpatient wards. The establishment of a day treatment program at the Bronx Comprehensive Sickle Cell Center, for example, resulted in 40% fewer emergency room visits, and patients seen in the day-clinic were five-times less likely to be admitted to a hospital ward. Moreover, the increased expertise of the day-centre clinic allowed them to provide consultative assistance to staff caring for inpatients admitted with sickle cell crises, which resulted in a 1.5 day decrease in average length of stay.¹⁶ The scale of financial benefit following the establishment of sickle day-hospitals has since been confirmed by centres in Boston¹⁷, Birmingham, UK¹⁸ and Houston.¹⁹

Given its complexity and multisystem manifestations, **the provision of preventative and specialized care for sickle cell patients necessary to allow such gains requires the establishment of comprehensive treatment centres**, in which patients have ready access to a multidisciplinary care



team, which may include specialized nursing expertise, social work, psychological counselling, and various medical and surgical specialists including hematology, nephrology, cardiology, orthopaedic and general surgery, obstetrics, and ophthalmology. Such was the conclusion of the United States government in 1972, when it passed the National Sickle Cell Anemia Control Act with the goal of creating comprehensive treatment centres in that country, and in 2004 when it sought to expand and provide national coordination of this network through passage of the Sickle Cell Treatment Act.²⁰ The need for comprehensive care has also been echoed by the American Academy of Pediatrics,²¹ the United Kingdom's National Health Service^{23,24} and the World Health Organization.²⁴ Evidence continues to accumulate that provision of comprehensive care for sickle cell disease reduces costs as well as improves clinical outcomes.²⁵⁻²⁸ **As an example, the establishment of a comprehensive sickle cell clinic in 1999 at St. Thomas' Hospital in London, England, was followed by an approximate 60% reduction in hospital admissions, with average length of stay amongst those who were still hospitalized reduced on average by nearly one week.**²⁶ Similarly, provision of care to pediatric sickle cell patients in Texas via a Patient-Centred Medical Home (which may be considered another vehicle for the provision of comprehensive, multidisciplinary care) decreased both individual patient emergency room visits and inpatient hospitalizations by 50%.²⁶

Despite its clear benefits, both to patients and to the health care system as a whole, many patients with sickle cell disease continue to lack comprehensive care. A 2007 summit on sickle cell disease organized by the American Society of Pediatric Hematology/Oncology noted that “despite the substantial advances in the treatment of SCD [sickle cell disease] which have occurred in the last 30 years, there is a lack of equity in the quality of clinical care provided to patients with SCD as evidenced by a failure to apply knowledge obtained from research to much of the at-risk population.”²⁹ A similar conclusion was reached by L Smith *et al* in a 2006 publication in *Pediatrics*, in which they state “It is the minority of sickle cell patients who receive care in one of the comprehensive sickle cell centers... **There is also a crucial need to increase the workforce capacity to care for adult patients with SCD to provide appropriate continuity of care for adolescents transitioning to adult care.**”²⁰ The situation, unfortunately, is no better in Canada. In 2003, for example, a study by the Toronto District Health Council confirmed that the majority of Canadian patients with sickle cell disease reside in Ontario, and of those most lived within the Greater Toronto Area. However, only 41% of hospital visits by these patients were at one of the two existing comprehensive treatment centres (the Hospital for Sick Children and the Toronto General Hospital), with the difference scattered between a large number of community hospitals where treatment was limited to the management of acute care issues.³⁰ Twelve years later, **with approximately 100 children with sickle cell disease born in Canada every year and an untold number of additional patients arriving through immigration, progress has been frustratingly slow.** While the number of hospitals providing dedicated treatment to patients with sickle cell disease has increased, it is unclear how many of them meet the standard of comprehensive care and, more importantly, Canada remains without a national strategy to ensure equitable, coordinated and effective care for all patients.³¹

In creating a national network of sickle cell disease comprehensive care facilities, Canada already has an established model to draw upon: that which has been provided since the 1970s to patients with haemophilia and other inherited bleeding disorders. Currently, there are 25 comprehensive treatment centres in place across the country for patients with these conditions, each staffed by a haematologist,



nurse coordinator, physiotherapist, psychologist or social worker, a data manager, and other specialists as required.³² The effect over time on health care utilization has been dramatic: patient visits to the emergency department are now a rarity for patients with hemophilia, and increased patient visits to the comprehensive treatment centres has itself been offset by increased self-care, with supervision provided through telephone, internet and tele-health communications. **A similar program can and should be out in place for patients with sickle cell disease.**

In many cases, it would be most efficient to incorporate the coordinated care of patients with sickle cell disease with that of patients with thalassemia, another inherited disorder of haemoglobin with multisystem complications (due in this case primary to iron overload). A comprehensive care program for patients with hemoglobinopathies could also be expanded, depending upon local demographics, to patients with other rare blood disorders requiring comprehensive care, such as Diamond-Blackfan anemia, hereditary angioedema and primary immunodeficiency.³³ However, **it is important to recognize that sickle cell disease is not, itself, a rare disorder:** it has been estimated that there are over 100 million affected individuals world-wide, with another 275 000 children born with the condition every year.³⁴ While the prevalence in Canada continues to increase, the more important change has been in the attitudes of the medical profession and policy-makers, who increasingly recognize how much room for improvement in the care provided for this population. **Creating a network of comprehensive treatment care facilities would be an important step in closing this gap and aligning Canada with other countries, such as the United States and United Kingdom, who face similar challenges.**



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