

REVIEW ARTICLE

Breaking the Scope-of-Practice Taboo: Where Multidisciplinary Rhymes with Cost-Efficiency

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INTRODUCTION

In the past century, medical care in the western world has evolved tremendously. While in the early 1900s, healthcare was mostly a private affair, it has now become a major expense for all developed nations. Complex structures have emerged: modern-day healthcare professionals now evolve in highly diverse environments ranging from small private clinics to highly specialized teaching hospitals. With the rising costs of healthcare and the rapidly increasing demand for healthcare services, governments need to find new ways to render the delivery of healthcare services more cost-effective without compromising the quality of care or patient and healthcare worker satisfaction. The challenge is superb; obstacles are numerous and solutions are often complex.

In recent years, many commissions and reports have strived to explore these obstacles and solutions. In Canada, the Final Report on the State of the Healthcare System (1), published in 2004, is one of many sources which support that the rigidity of healthcare structures and scope-of-practice rules—the rules defining which tasks different categories of healthcare professionals are permitted to perform—represents an ominous barrier to increasing productivity in healthcare. Another important Canadian report published in 2002, the Romanow Report (2), also highlights the need for change in the way healthcare services are delivered. By placing a special emphasis on “collaborative teams and networks of providers” the Romanow Report suggests that “traditional scopes of practice need to change [thereby suggesting] new roles for nurses, family physicians, pharmacists, case managers and

a host of new and emerging health professions”. While a certain number of studies have shown that a growing number of physicians (especially primary care doctors) are very receptive to the idea of sharing part of their responsibilities with their fellow healthcare professionals (3, 4, 5), many others, often in fear of losing some of their autonomy, exclusivity and prestige are still reluctant to support initiatives aiming to restrict or redefine the scope of their practice (6).

In order to increase cost-efficiency in healthcare, the taboo surrounding physicians’ rigid scope-of-practice should be broken; this would promote a stronger and more integrated multidisciplinary approach to medicine. The evidence supporting this thesis is growing at a breathtaking pace and revolves around five main themes. First, alterations to scope-of-practice rules fall into the very promising realm of catalytic innovations. Second, the redefinition of roles for healthcare practitioners—with a special emphasis on doctors, nurses and pharmacists—allows for better patient and healthcare practitioner satisfaction and improved healthcare resource utilization. Third, a new generation of physician assistants can successfully help address the issue of rising healthcare costs. Fourth, smartly organized multidisciplinary teams can lead to better outcomes and resource utilization in healthcare. Finally, a certain number of compelling examples from the literature illustrate how multidisciplinary approaches have a high potential for encouraging better cost-effectiveness in healthcare.

CATALYTIC INNOVATIONS AND ALTERATION OF SCOPE-OF-PRACTICE RULES

Thanks to advances in technology, medical research is now able to target such complex issues as heart transplants, gene therapy and robotic microscopic surgery. Because of the impressive

amounts of human and material resources involved in such “high-end, high-tech” innovative techniques, medical innovations tend to increase rather than decrease the costs of medical care (7). In an article published in the Harvard Business Review, Clayton M. Christensen, one of America’s most influential business thinkers and writers, describes such innovations as “sustaining innovation” (7). In his opinion, sustaining innovations are necessary to solve complex medical problems affecting small groups of patients in specialized medical chimneys, but they do not lead to decreases in medical costs. Christensen also goes a step further in affirming that in most developed countries, the omnipresence of sustaining innovations has led to the maintenance of the status quo by way of an excessive amount of resources being allocated to organizations that are “wedded in their current solutions, delivery models and recipients”(8).

In an interview with Mark D. Smith (9), Christensen describes another category of innovations: disruptive innovations. Contrarily to sustaining innovations, disruptive technologies or services are available at much more affordable prices than existing alternatives. They “disrupt” the market by changing the approach to a problem and by bypassing more complex alternate solutions. They also allow the opening of a whole new market formed by purchasers who traditionally could not afford such products and innovations. In the same interview, Christensen depicts a third category of innovations—catalytic innovations—which he describes as being even more beneficial than disruptive innovations in the context of modern day healthcare. This third category of breakthroughs not only lowers the prices of products or services, but also focuses on bringing social change through scaling and replication (9). By making changes to rigid scope-of-practice rules, healthcare systems have the opportunity of creating a great number of catalytic innovations. For example, by allowing nurses or other healthcare practitioners to conduct a certain number of simple and highly reproducible medical acts that were traditionally completed by doctors, clinics can allow patients to be treated at lower costs while avoiding long waits. Yes, this perspective allows for the possibility that patients might receive healthcare services of an inferior quality due to the fact that the healthcare professionals who are providing them do not have the same level of training as physicians. However, in a North American context of limited resources where no less than 25% of doctors willingly affirm that

their scope-of-practice is too wide (5), such catalytic innovations should definitely be considered as a promising avenue for addressing some of the most complex issues in healthcare.

REDEFINING THE ROLES OF HEALTHCARE PRACTITIONERS

In the past few decades, with the progressive lengthening of life expectancies and an ongoing “medicalization” of western societies (10), healthcare practitioners—and especially doctors—have been brought to play wider and wider roles in the lives of individuals. As mentioned above, this has led to important discrepancies between what healthcare professionals think their scope-of-practice should comprise of and what their workload consists of on a day-to-day basis. To illustrate this point, an article which was recently published in the American journal Health Affairs (3), maintains that American doctors, if asked the question: “what percentage of your time do you perform functions that require a medical degree?” would most likely provide a figure neighbouring 50%. Building on this example, let’s now further analyze how scope-of-practice issues specifically impact the work of four groups of key players of the healthcare workforce: physicians, nurses, pharmacists and other healthcare professionals.

DOCTORS

Acknowledging the fact that physicians are highly trained professionals and that they represent one of the most important healthcare expenses for most industrialized nations (11, 12), there is no doubt that their time should be used wisely and that their practice should focus on what they do best. There appears to be a consensus in the medical literature regarding the fact that where physician attention is the most essential is in the treatment, diagnosis and management of complex medical issues (7). Who other than highly trained specialists or experienced family physicians would be able to correctly perform a cardiac bypass surgery or detect a rare congenital disorder bringing subtle changes in a long followed patient’s health?

However, this simplified view of what physicians should be responsible for overlooks the fact that there are many levels of specialization inside the medical profession itself. While general practitioners and medical specialists might at first glance be assumed to work in collaboration—referring patients to one another when issues are either too broad or too specialized for their scope-of-prac-

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tice—recent evidence has shown that confusion often prevails when it comes time to determine who should be taking which role in the management of a patient's illness (5). Before moving on to redefining the scope-of-practice rules for nurses, pharmacists and other healthcare professionals, it is important to keep in mind that the medical profession itself has a highly varied array of members, each possessing different skills and levels of expertise. Thus, the elaboration of a strong stepped-care approach, where the right patients are directed to the right physicians for optimal healthcare, accompanied by the installation of adequate financial incentives for doctors to follow this approach, might very well be the necessary first step to any healthcare reform aiming to address scope-of-practice redefinition (5).

NURSES

While the diagnosis of medical conditions has traditionally been thought of as the most important aspect of a doctor's practice, there is a growing body of evidence showing how simpler illnesses presenting with an easily identifiable pattern and consistent clinical findings can be managed very efficiently by nurses without the need for doctors to intervene directly (13). In fact, healthcare teams in which registered nurses work independently, yet in tight collaboration with practising physicians, have not only been reported to provide adequate healthcare services and diagnoses to patients; they have also been shown to do so with equal or increased levels of patient satisfaction, with no significant differences in clinical outcomes. Most importantly, these teams also yield the promise of improved cost-efficiency allowing for more medical acts to be performed by lower paid professionals (4).

Whereas doctors are often thought of as the ones who treat patients, nurses are often considered as the ones responsible for caring for patients. This observation is usually correct, since over 60% of registered nurses in Canada possess a college-level diploma and focus mostly on providing supportive attention to patients in hospitals and out-patient settings (14).

However, increasing numbers of nurses who are trained and recognized as nurse practitioners are leading the way towards a new definition of nurses' roles. Benefiting from a higher level of education, nurse practitioners can be defined as "unique healthcare providers [...] who engage in advanced practices in a variety of specialty areas such as family, adult, paediatric, gerontologic, women's

health, school health, occupational health, emergency, neonatal care and acute care" (13). Due to the great complexity and to the large number of areas where they can be affected, nurse practitioners (also referred to as nurse clinicians) typically complete their training in one of many different medical specialties. In Canada, most nurse practitioners complete a two year graduate university course which allows them to assess and manage a certain number of medical problems. For instance, their training can allow them to prescribe common pharmacological agents, make simple medical diagnoses or take charge of the management of patients with acute and chronic diseases while discussing such essential issues as health promotion and the importance of maintaining a healthy lifestyle (13). Also, taking advantage of their close relation with patients and of the larger amount of time they can spend with them (when compared to doctors) nurse practitioners can develop highly efficient individualized care plans in collaboration with their patients (15).

Unfortunately, even though the early implementation of a new generation of nurse practitioners in healthcare institutions has led to very promising results in most industrialized countries (13), numerous obstacles including financial arguments and considerable opposition from organized medical associations are slowing down the process of training more advanced practice nurses. Some authors have brought the idea that one of the main reasons for the slow speed of development of specialized nursing training programs—which can very well be considered as high-yield catalytic innovations—might be that in the context of limited financial resources, nursing fellowships are not as "glamorous" as, say, the purchase of a new glistening MRI scanner or the development of a new artificial heart (8). Nonetheless, the fact that many governments are still adding more resources in highly specialized medical innovations which only pertain to a limited number of patients indicates that the much higher potential for innovations such as programs reforming nurses' scope-of-practice rules and advanced nursing training programs for decreasing healthcare costs is all too often ignored.

PHARMACISTS

Most North American pharmacists work in the private sector, often owning or co-owning their own pharmacy. For many patients, doctors, nurses and other healthcare practitioners, this has led to the idea that pharmacists are not necessar-

ily considered integral members of multidisciplinary healthcare teams (6). However, a converging body of recent publications has shown that increasing the degree of involvement of pharmacists in patient care yields tremendous potential. Whether they act autonomously as independent outpatient case managers or as part of multidisciplinary inpatient teams, pharmacists can most definitely represent a very valuable resource in an environment where pharmaceutical products are becoming increasingly diverse and more difficult to understand.

When working in tight collaboration with physicians, pharmacists can allow for a much more comprehensive and cost-effective way of prescribing pharmaceutical products. In fact, in settings where pharmacists have successfully been integrated in family healthcare teams, doctors report: "an improved availability of easy-to-interpret [...] drug information, an advantageous access to fresh perspectives regarding new and competing pharmaceutical products, more confidence about prescribing medications and more productive work relationships with pharmacists" (6). Furthermore, from the patient standpoint, this has allowed major improvements in patient education through ways of a facilitated access to high quality drug-related information.

In two separate American studies observing the effects of integrating pharmacists in the care of patients with type 2 diabetes mellitus and chronic hypertension, pharmacists have been shown to lead the way towards better evaluation and modification of pharmacotherapy, better self-management of illness, improved reinforcement of screening for medical complications and better patient follow-up (16, 17). Also, in cases where pharmacists were involved in patient care they have been proven to allow better glycemic control, more sustainable lifestyle modifications and greater decreases in systemic blood pressure than in cases where patients with chronic illnesses were cared for following a traditional physician-managed approach. Once again, as it was the case for nurses, all of these results have been obtained with a high potential for significant cost reductions and improved overall cost-effectiveness.

In light of these benefits, one might wonder why systematic reforms aiming to fully integrate pharmacists in healthcare teams haven't yet been undertaken. Once again, as it was the case for nurses, resistance from physician associations, which hesitate to disrupt the existing status quo, and the lack of appropriate financial incentives seem to be

the major obstacles (6). One of the most commonly mentioned arguments relates to the increased time commitment required for physicians to interact with pharmacists on a regular basis. As one might readily predict, this argument loses much of its significance once a short period of adaptation has been completed.

OTHER HEALTHCARE PROFESSIONALS

While a great number of authors focusing on the effectiveness of multidisciplinary teams in healthcare have strived to describe the importance of programs involving such healthcare professionals as dietitians, physical therapists, occupational therapists, psychotherapists and social workers in teams affected to direct patient management, there is still a lack of evidence regarding the cost-effectiveness and the changes in clinical outcomes related to the implementation of such programs (18). However, there is no doubt that these highly trained professionals can play an important role in the management of patients in situations concerning their field of expertise. For instance, how often are family physicians required to provide nutritional, psychological or social counselling to patients in a setting where they have very little time to do so? How often are patients given a note to consult a dietitian, a psychotherapist or an occupational therapist without there being adequate—if any—follow-up from their family physician? If patient access to the healthcare professionals who are best able to help them is facilitated and if adequate financial incentives to stimulate collaboration are created, there is a high potential for successfully decreasing the often overwhelming burden assumed by family doctors.

Finally, although the medical literature very seldom mentions the importance of well-trained and efficient administrative staff in assuring the effective functioning of healthcare institutions, these actors can also contribute enormously to making their workplaces much more cost-effective. Taking care of responsibilities which can otherwise be perceived as very cumbersome tasks for other healthcare professionals (3), they should be more readily considered by their peers as essential members of a well-oiled medical team.

A NEW GENERATION OF PHYSICIAN ASSISTANTS

In the US and in an increasing number of OECD countries, a new generation of healthcare professionals has recently made its entrance on

the healthcare market and is being considered by many as a very appealing solution for addressing cost-efficiency issues in healthcare in the context of limited financial resources. These professionals, most commonly referred to as physician assistants, first entered the American medical system in the late 1960s.

Physician assistants, with their intermediate status, which places them somewhere in between doctors and nurses, have many advantages. Mainly, they allow palliating for an increased need for healthcare resources by taking over some of the tasks that were traditionally performed by sleepy-eyed junior doctors, overwhelmed primary care physicians or overworked nurses (19). In the early 2000s, there were close to 50 000 fully trained physician assistants in the US. Thanks to favourable governmental incentives and to the emergence of more and more specialized education programs across the country, this number is rising consistently from year to year.

Most commonly, physician assistant degrees consist of 2 years of graduate university education training following a previous degree, most commonly in the area of biomedical sciences, physiotherapy or occupational therapy. Students usually enter the program with a strong GPA, certain amounts of clinical work experience and strong interpersonal skills (20). In 2007, there were 136 state-recognized physician assistant programs in the US; 76% of them were at the master's level and offered what is often considered a broad-based "condensed medical degree" while the remaining 24% of the programs offered doctoral or physician assistant training specializing in a certain medical domain.

In the US, physician assistants usually work under the close supervision of fully certified physicians. While many of their tasks can overlap with nurses' job descriptions, they are usually not assigned to continuous patient care on hospital wards. Rather, their tasks are primarily directed toward outpatient groups or short interventions and most commonly include: taking patient histories, completing full physical examinations, making simple clinical diagnoses, ordering laboratory tests, prescribing specific medications, suturing, applying casts, providing comprehensive patient education and doing rounds in nursing homes (20).

The results of physician assistant implementation in healthcare teams have been extremely promising throughout the world in all or most countries where they are present (19). In the UK, a

small team of physician assistants has successfully provided a large number of patients with similar quality healthcare services as residents and doctors. When asked, patients reported that they were highly satisfied with the attention they had received and were impressed by the empathy with which their healthcare providers had treated them. In addition, the doctors working with the team of physician assistants reported excellent professional interactions with their new staff members, showed no resistance to the prolongation of their contract and were very appreciative of the help that they were providing them. Hence, by borrowing some of the simpler elements of physicians' scope-of-practice, the wide scale implementation of physician assistants worldwide might be one of the well-needed catalytic innovations which will allow a shift towards more cost-effective healthcare.

ADVANTAGES AND POTENTIAL HURDLES OF THE MULTIDISCIPLINARY APPROACH

ADVANTAGES

Once all the players of a well-designed healthcare team have had a chance to collaborate in providing services for a certain period of time, the advantages of a multidisciplinary approach to healthcare are tremendous. However, achieving such a feat as the establishment of a well-functioning multidisciplinary team is all but a simple walk in the park. According to Regina E. Herzlinger, professor of Business Administration at Harvard, healthcare is still a tremendously fragmented industry (21). Nevertheless, Herzlinger writes that in the cases where successful horizontal integration of independent players is achieved, multidisciplinary care can generate economies of scale by considerably increasing efficiency while at the same time improving quality of care.

Multidisciplinary care has been shown to allow a stronger emphasis on preventative healthcare, patient education and patient self-care. For example, the efficient management of chronic illnesses such as diabetes mellitus type II and hypertension requires an important component of patient education, which is considerably time and labour-intensive. When physicians are forced to deal with such complex issues as lifestyle changes and ensuring patient compliance to medical treatment without the help of other healthcare professionals, the costs of adequate disease management are quite astounding (4). In cases like these, the benefits of a strong collective approach to chronic

disease management not only diminishes physicians' workload; it has also been proven repeatedly to bring comparable or superior clinical outcomes such as lower levels of glycosylated haemoglobin A1C—the main laboratory indicator used for long-term monitoring of blood sugar control in diabetic patients (15, 17).

Another reason for why improved healthcare outcomes can be reached when multidisciplinary approaches are used comes from the fact that teams comprising nurses, social workers and dietitians allow for patients to meet with healthcare professionals in a different setting than in a doctor's office, where they are more likely to understand and initiate meaningful lifestyle changes essential to the management of their medical conditions. This will often allow them to manage their illness without needing to consult a doctor on a regular basis, thus avoiding considerable healthcare expenses (9).

Finally, one of the most important aspects of multidisciplinary care comes from the fact that it allows the elaboration of more comprehensive and efficient case management plans for patients. By definition, case management represents a "collaborative process that assesses, plans, implements, coordinates, monitors, and evaluates the options and services required to meet an individual's health needs, using communications and available resources to promote quality and cost-effective outcomes" (17). For instance, these "communications and available resources", sometimes referred to as telemedicine, comprise such practices as telephone counselling, email exchanges and web-based health services, all of which can be delivered effectively by more than one member of healthcare teams. The number of studies assessing the cost-effectiveness of intensive case management is still very limited. Nevertheless, a fair number of trials have suggested that when patients are taken in charge by a multi-tiered team, they are much more likely to stay away from acute medical situations, thus saving the medical system considerable amounts of healthcare resources (4, 18).

POTENTIAL HURDLES

Multidisciplinary approaches to healthcare can also come with significant drawbacks, a large number of which have been reported on many occasions in the medical literature and the object of which is beyond the scope of this article. In fact, all of the above-mentioned advantages of team-based practice cannot be obtained without overcoming a significant number of hurdles. Most importantly,

individual physician and physician association approval needs to be obtained before any major changes to healthcare systems and organizations can be made. When it comes to changes of this nature, doctors have traditionally adopted a very conservative mentality and usually request considerable amounts of "rock-hard" data before even envisioning undertaking major shifts in their practices (22). Furthermore, the risks of obtaining sub-optimal results in early stages of multidisciplinary care program implementation and in the period of time following scope-of-practice changes are often considered as an unbearable short-term gamble which healthcare authorities are not always ready to take, especially without the presence of solid evidence. Thus, even though very promising trials and initiatives are starting to trace a clear path towards the advancement of multidisciplinary healthcare, there is still a pressing need for more credible and unbiased evidence comparing the two sides of the medal in order for industrialized nations to move ahead with ambitious multidisciplinary healthcare reforms.

PROMISING EXAMPLES FROM THE MEDICAL LITERATURE

More and more healthcare practitioners and entrepreneurs are starting to acknowledge the potential of catalytic multidisciplinary healthcare reforms and innovations. In North America alone, many states and provinces have made clear mention of their intention of embracing new multidisciplinary paths or have clearly underlined the need for a redefinition of scope-of-practice rules (1, 2). Here are three examples of promising Canadian and American initiatives which have recently made their way into the medical literature.

ONTARIO FAMILY HEALTH TEAMS

In 2009, almost 2 million Ontarians had access to comprehensive family healthcare through an extending network of Family Health Teams (23). These teams, created by independent groups of healthcare practitioners since the beginning of the years 2000, have received numerous incentives and generous support from their provincial government. In fact, seeking to improve accessibility to primary healthcare for its citizens, the Ministry of Health of Ontario has created a vision allowing physicians, nurse practitioners and other members of the team to practice in a productive working environment where cooperation and knowledge exchange are extremely important. Among other roles, Family

Health Teams are meant to promote disease management programs for chronic illnesses, self-care programs, health promotion, patient-centered care and facilitated navigation and care coordination for patients seeking services in multiple healthcare institutions.

Although the implementation of Family Health Teams in Ontario has been welcomed almost unanimously by citizens and healthcare practitioners, there still exists an important gap between the reality of practising in a team-based setting and what is taught to medical and nursing students in Ontarian medical and nursing schools (24). Hence, even though they are extremely promising, multidisciplinary approaches to medicine need not only be implemented on the field; they also need to be accompanied by pertinent reforms in healthcare education in order to ensure that the new generation of workers will be better equipped to deal with the new challenges of team-based practice.

MINUTE CLINICS

In the US, a very popular example of how scope-of-practice rules have been changed in order to provide patients with more affordable and convenient healthcare services is the advent of so-called "Minute Clinics" (21). These clinics are run entirely by nurse practitioners who use software-based protocols in order to offer vaccinations and basic medical attention for a limited set of health problems. If a patient presents with an illness that is beyond the scope of the nurse's expertise, he or she is immediately referred to a doctor's office or emergency room.

Many factors can explain the booming success of this catalytic innovation which has successfully reformed scope-of-practice rules for nurses in the US. First, Minute Clinics offer cheaper, quicker and more accessible healthcare for a great number of illnesses allowing patients to avoid more costly and inconvenient visits to the hospital. Second, these clinics have not met any significant resistance from physicians, simply because they are not seen as a threat to their practice; rather, they allow for the shortening of waiting lists and allow doctors to focus on more complex cases requiring more of their competencies and skills. Third, minute clinics are often used by uninsured, underserved populations who otherwise would not have access to other healthcare resources. Finally, according to surveys, patients are equally if not superiorly satisfied with the quality of care they receive in Minute Clinics. (8).

KAYSER PERMANENTE

A recent article published in *The Economist*, entitled *Another American Way*, draws an extremely flattering picture of Kaiser Permanente, an integrated American healthcare firm which offers managed care packages to 8.6 million Americans via highly efficient primary healthcare teams (25). Each team follows a group-practice model composed of 3 to 5 clinicians (physicians, nurse practitioners or physician assistants), 2 registered nurses, 1 to 2 receptionists or clerks and 6 to 7 registered practical nurses or medical assistants that provide care to a sample of 8000 to 15 000 patients (22). One of Kayser Permanente's biggest strengths is that it offers all of its employees a comprehensive training in team-oriented care prior to their first day of work. Also, teams have the freedom to adapt to the needs and conditions of their patient population. For instance, a team can decide to hire more or less physicians, more non-physician clinicians or more support staff depending on the patterns of illness contracted by the population it serves. In addition, each primary healthcare team receives a thorough report of its activities every three months, outlining patient and staff satisfaction as well as clinical outcomes. Monetary incentives and feedback are then provided by Kayser Permanente's headquarters with the effect of promoting constant progress and improvement among healthcare teams.

CONCLUSION

Considering the size of the challenge of controlling healthcare expenses in a context of growing healthcare needs and aging demographics, the application of new ways to improve the cost-effectiveness of healthcare systems is essential. One of the most promising avenues suggests that doctors should be encouraged to review the rules regulating the scope of their practice in order to promote a stronger multidisciplinary approach to healthcare. In order for this solution to yield the most effective results, healthcare institutions should strive to follow the model of catalytic innovations, a model encouraging both simpler and more affordable solutions with a special emphasis on social change. In addition, scope-of-practice reforms should not be limited to physicians; rather, they should extend to all healthcare practitioners. Also, the potential benefits of training a new generation of physician assistants should be acknowledged. All of these elements have the potential of giving rise to an efficient and visionary multidisciplinary approach to healthcare. Based on the large

number of positive accounts taken from the medical literature, reforms that follow the idea of multidisciplinary approaches to healthcare should definitely be undertaken: the benefits of such enterprises seem to widely out-measure the potential obstacles and hurdles which might affect their implementation.

At this point on the road, one might wonder: Where to start? What should be the next big step? While governments are striving to adapt their healthcare systems to the realities of the 21st century, the answer to these questions might very well lie in the hands of those who are in the best position to implement change in the years to come: students. If medical and nursing students become aware of the potential benefits of redefining the scope of their practice and breaking the taboo which has traditionally surrounded the matter, they might just become the much needed vectors of change capable of increasing the cost-efficiency of 21st century healthcare.

REFERENCES

1. Kirby MJL. The Health of Canadians - The Federal Role, Final Report on the State of the Healthcare System in Canada, October 2002. URL: <http://www.parl.gc.ca/37/2/parlbus/commbus/senate/Com-e/soci-e/rep-e/repoct02vol6-e.pdf>
2. Romanow Q.C. R.J. Building on Values: The Future of Healthcare in Canada - Final Report. Saskatoon: Commission on the Future of Healthcare in Canada, November 2002. URL: <http://dsp-psd.pwgsc.gc.ca/Collection/CP32-85-2002E.pdf>
3. Margolius D, Bodenheimer T. Transforming Primary Care: From Past Practice To The Practice Of The Future. *Health Aff.* May 1, 2010;29(5):779-84. URL: <http://content.healthaffairs.org/cgi/content/abstract/29/5/779>
4. Litaker D. Physician nurse practitioner teams in chronic disease management: the impact on costs, clinical effectiveness, and patients' perception of care. *Journal of Interprofessional Care.* 2003;17(3):223. URL: <http://www.ncbi.nlm.nih.gov/pubmed/12850874>
5. Katon W, Von Korff M, Lin E, Simon G. Rethinking practitioner roles in chronic illness: the specialist, primary care physician, and the practice nurse. *General Hospital Psychiatry.* 2001;23:138-44. URL: http://www.sciencedirect.com/science?_ob=MIimg&_imagekey=B6T70-439VBXW-5-1&_cdi=5044&_user=458507&_pii=S0163834301001360&_orig=search&_coverDate=06%2F30%2F2001&_sk=999769996&view=c&wchp=dGLbVzW-zSkzS&md5=05d2b705d87abfd98a1b751a965f129d&ie=/sdarticle.pdf
6. Pottie K, Farrell B, Haydt S, Dolovich L, Sellors C, Kennie N, et al. Integrating pharmacists into family practice teams: Physicians' perspectives on collaborative care. *Can Fam Physician.* December 1, 2008;54(12):1714-1717. URL: <http://cfp.highwire.org/cgi/content/abstract/54/12/1714>
7. Christensen CM. Will disruptive innovations cure healthcare? *Harvard business review.* 2000;78(5):102. URL: <http://nyc.indymedia.org/media/application/disruptivechangeinhealthcare-thumb.pdf>
8. Christensen CM. Disruptive innovation for social change. *Harvard business review.* 2006;84(12):94. URL: http://faculty.mis.edu/~levinger/disruptive_innovation.pdf
9. Smith MD. Disruptive innovation: Can healthcare learn from other industries? A conversation with Clayton M. Christensen. *Health Affairs.* 2007;26(3):w288. URL: <http://content.healthaffairs.org/cgi/content/full/26/3/w288?ikey=nWmsfqu4ihfVo&keytype=ref&siteid=healthaff>
10. Conrad P. Medicalization and Social Control. *Annual Review of Sociology.* 1992;18(1):209-32. URL: <http://arjournals.annualreviews.org/doi/pdf/10.1146/annurev.so.18.080192.001233?cookieSet=1>
11. Burton, Rachel and Peterson, Chris L. U.S. Healthcare Spending: Comparison with Other OECD Countries. Congressional Research Group, September 17, 2007. URL: http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1316&context=key_workplace
12. Pearson, Mark. Disparities in health expenditure across OECD countries: Why does the United States spend so much more than other countries. Written Statement to Senate Special Committee on Aging, Health Division, OECD, 30th September 2009. URL: http://www.oecdwash.org/PD-FILES/Pearson_Testimony_30Sept2009.pdf
13. Buchan J. Skill-mix and policy change in the health workforce: nurses in advanced roles, OECD Health Working Papers, 2005. URL: <http://www.oecd.org/dataoecd/30/28/33857785.pdf>
14. Association CN. 2007 Workforce profile of Registered Nurses in Canada: Canadian Institute for Health Information, July 2009. URL: http://www.cna-aicc.ca/CNA/documents/pdf/publications/2007_RN_Snapshot_e.pdf
15. Hogg W. Randomized controlled trial of Anticipatory and Preventive multidisciplinary Team Care: For complex patients in a community-based primary care setting. *Canadian family physician.* 2009;55(12):e76. URL: <http://www.cfp.ca/cgi/reprint/55/12/e76>
16. Sookaneknun P, Richards RM, Sanguansermisri J, Teerasut C. Pharmacist Involvement in Primary Care Improves Hypertensive Patient Clinical Outcomes. *Ann Pharmacother.* December 1, 2004;38(12):2023-8. URL: <http://www.theannals.com/cgi/content/abstract/38/12/2023>
17. Hayward RA. Proactive case management of high-risk patients with type 2 diabetes mellitus by a clinical pharmacist: a randomized controlled trial. *The American journal of*

- managed care. 2005;11:253. URL: <http://drtedwilliams.net/cop/727/diabetes%20disease%20management%203.pdf>
18. Gray D, Armstrong CD, Dahrouge S, Hogg W, Zhang W. Cost-effectiveness of Anticipatory and Preventive multidisciplinary Team Care for complex patients: Evidence from a randomized controlled trial. *Can Fam Physician*. 2010 January 1, 2010;56(1):e20-9. URL: <http://cfp.highwire.org/cgi/content/abstract/56/1/e20>
 19. Stewart A. Can physician assistants be effective in the UK? *Clinical medicine*. 2005;5(4):344. URL: <http://docserver.ingentaconnect.com/deliver/connect/rcop/14702118/v5n4/s13.pdf?expires=1273371010&id=56660713&titleid=5200003&accname=McGill+University+Library+-+Serials+%26+E-Resources+Unit&checksum=609B20671D984826503C02D008ECA15B>
 20. Jones PE. Physician Assistant Education in the United States. *Academic Medicine*. 2007;82(9):882-7. 10.1097/ACM.0b013e31812f7c0c. URL: http://journals.lww.com/academicmedicine/Fulltext/2007/09000/Physician_Assistant_Education_in_the_United_States.14.aspx
 21. Herzlinger RE. Why innovation in healthcare is so hard. *Harvard business review*. 2006;84(5):58. URL: <http://hbr.org/hbr-main/resources/pdfs/comm/philips/innovation-health-care-hard.pdf>
 22. Grumbach K, Bodenheimer T. Can Healthcare Teams Improve Primary Care Practice? *JAMA*. March 10, 2004;291(10):1246-51. URL: <http://jama.ama-assn.org/cgi/content/abstract/291/10/1246>
 23. Care Ontario Ministry of Health. Roadmap to Implementing a Family Health Team, June 23 2009. URL: <http://hdl.handle.net/1873/15110>
 24. Soklaridis S, Oandasan I, Kimpton S. Family health teams: Can health professionals learn to work together? *Can Fam Physician*. 2007 July 1, 2007;53(7):1198-9. URL: <http://www.cfp.ca/cgi/citmgr?gca=cfp;53/7/1198>
 25. Economist T. Controlling Healthcare Costs: Another American Way. *The Economist*. April 29, 2010. URL: http://www.economist.com/business-finance/displaystory.cfm?story_id=16009167&source=hptextfeature

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CROSSROADS

The Canadian Space Agency Space Learning Grants

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The Canadian Space Agency (CSA), via its Space Learning Program offers a bevy of opportunities that Canadian university students may wish to leverage.

Through the Space Learning Grants Program, the CSA provides funding to upwards of 200 students each year – the majority being undergraduate and graduate students – which supports their participation in space-focused learning initiatives. This grant program, designed to assist students with funds to help cover travel, registration and living expenses, is open to students from primary school right up to the doctorate level, so long as the student is either a Canadian citizen or permanent resident of Canada.

Over the past year, funding awarded through this program has allowed students to participate in a wide variety of initiatives covering an array of fascinating disciplines - from an annual Aerospace Medical Association Meeting, and international Lunabotics competitions to Solar-Terrestrial science conferences.

While individual requests for funding can be submitted and considered, budget-permitting, on an ad-hoc basis year-round, there are also two opportunities both earmarked and funded through this program on an annual basis.

The first is the International Astronautical Congress (IAC) – the largest annual international space conference. Each year in February, students are asked to submit abstracts to the CSA on relevant conference topics that will also allow them to highlight their research at the congress. Each abstract undergoes an internal evaluation by CSA scientists, engineers and medical professionals with those achieving the highest rankings

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forwarded to the International Astronautical Federation (IAF) – the organization responsible for the IAC - for final selection. In 2011, close to 60 abstracts were submitted for consideration to be included at the congress in Cape Town, South Africa, with 21 Canadian students ultimately being selected for funding by the Canadian Space Agency to share their work with the conference delegation of international space professionals and other students. For anyone interested in applying to the 2012 edition of IAC, to be held in Naples, Italy, information on the application process will be posted on the student (17+) section of the CSA web site in the late fall.

A second learning opportunity funded by the CSA is the NASA Academy summer program. NASA Academy provides students at the upper undergraduate or early graduate levels with an opportunity to spend 10 weeks paired with a researcher at one of the NASA centres. Students selected to participate are given the extraordinary opportunity to conduct space research with an experienced researcher in addition to developing their own group project with fellow students.

NASA Academy participants are treated to a wonderful introduction to the space field through a series of presentations, meetings and visits at the various NASA centres across the United States. In the past two years, two McGill students have been selected through this competitive process - Medical student Laura Drudi in 2010 and Atmospheric Science student Alexandra Anderson-Frey for the summer of 2011. Information for those interested in applying to the 2012 NASA Academy will also be available via the student section of the CSA web site in the fall.

Finally, the My Research section of the CSA website profiles the next generation of space leaders, providing a showcase for students involved in space-related research. The profiles