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# Gaining Efficiency.

Increasing the Use of Physician Assistants in Canada



## **Gaining Efficiency: Increasing the Use of Physician Assistants in Canada**

Marc Desormeaux, Matthew Stewart, Kelly Grimes, and Gabriela Prada

### **Preface**

The growing demand for health care in Canada and abroad is a financial concern for governments, business, and all Canadians. With health consuming more than 40 per cent of provincial/territorial budgets in Canada, there is growing concern regarding the sustainability of the health care system and our ability to meet Canadians' health care needs. Delivering high-quality, effective, and sustainable services is both a top priority and one of the most pressing challenges facing governments and businesses as they look to balance health care service demands and costs in the context of an aging population.

The Physician assistant (PA) professional is perceived as a relatively new occupation in Canada despite a 50-year history in the United States and medical clinician analogues found in 48 countries worldwide. One of the current challenges of the profession in Canada is the lack of data on the impact of PAs from a cost-effectiveness/efficiency perspective. This report addresses this by modelling the value of PAs as a function of physician time savings and efficiency gains for three practice areas: primary care, emergency care services, and orthopaedics. These three specialty areas were chosen as a result of a previous literature review and confirmed by an expert panel. Results show that hiring and effectively integrating PAs can result in cost savings when PAs generate productivity enhancements of 30 to 40 per cent, depending on the practice area.

This report is funded by the Canadian Association of Physician Assistants to provide insight into the potential time savings if routine tasks were delegated to PAs to alleviate the pressure that excess demand for care can place on physicians' time. This project leverages The Conference Board of Canada's expertise and existing capacity to estimate the demand for health services and health human resources that is linked to the current and projected burden of illnesses.

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## EXECUTIVE SUMMARY

# Gaining Efficiency: Increasing the Use of Physician Assistants in Canada

### At a Glance

- The first report of the series on the value of physician assistants (PAs) showed that PAs are employed across a wide variety of settings, but predominantly in primary health care and emergency medicine. They act as physician extenders whose scope of practice is highly dependent on the individual PA-to-physician relationship.
- This second report calculates the cost savings that could be generated by hiring more PAs. We focus on three areas of medical practice for economic modelling: primary care, emergency care services, and orthopaedics. We then model the cost savings that could potentially occur as certain tasks are shifted to PAs.
- Demand for health human resources is growing at twice the pace of population growth. We find that integrating more PAs into health care teams can help alleviate the increase in demand, decrease wait times, and alleviate workforce shortages.
- Cost savings occur for primary care when PAs are able to substitute for more than 29 per cent of a physician's time. Similarly, adding PAs to orthopaedic and emergency room care generates savings for the health care system when they are able to substitute for specialists' time.

**This report calculates the cost savings that could be generated for the health system by hiring more physician assistants (PAs). On the advice of an expert panel, three areas of medical practice in Canada were chosen for economic modelling: primary care, emergency care services, and orthopaedics. We model the cost savings that could occur, as physician assistants can be a cost-effective substitute for designated medical tasks. And, by delegating certain tasks to PAs, physicians can focus on more productive tasks.**

Canada's health system consumes a large part of our economic resources: \$219 billion in 2015, or 10.9 per cent of GDP, with hospitals, drugs, and physician services consuming 60 per cent of spending.<sup>1</sup> Governments are looking for new ways to innovate and improve the performance and sustainability of the Canadian health system. One way to meet increased demand is through interprofessional and collaborative care teams. A 2013 Conference Board of Canada report showed that interprofessional health care teams can be more effective than solo providers in the management of various conditions, including diabetes and mental health. In fact, these teams can provide savings to the system and improve economic growth by improving population health outcomes. In turn, these improved outcomes are linked to reduced health care system usage and greater worker productivity.<sup>2</sup>

The objective of this study on the value of PAs is to better understand their role and impact in various health care settings across Canada, as well as to review funding and payment models that have enabled the successful and sustainable integration of PAs into health systems. This report, the second in a series, calculates the cost savings that could be

- 1 Canadian Institute for Health Information, *National Health Expenditure Database*.
- 2 Dinh and Bounajm, *Improving Primary Health Care Through Collaboration: Briefing 3*.

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PAs can provide safe care across a wide range of settings and practice areas.

generated for the health system by hiring more PAs. It incorporates the Conference Board's health economic analysis capacity with the wisdom of an expert panel of physicians and policy-makers that have experience working with physician assistants. The report presents the cost savings that could be achieved in the health care system by increasing the use of PAs to help alleviate some of the rising demand for health human resources. As there is some uncertainty surrounding the amount of time a PA can substitute for a physician, we calculate the potential cost savings under three scenarios.

Although they are relatively new in Canada, PAs can provide safe care across a wide range of settings and practice areas. They act as physician extenders whose scope of practice is highly dependent on the individual PA-to-physician relationship. Most provinces do not regulate PAs (the exceptions being Manitoba and New Brunswick), with the 2015 CanMEDS-PA competency statements acting as a resource in this physician extender role. The supply of PAs in Canada remains low. Currently, four PA education programs—each two years in duration—train students in the medical model and produce approximately 80 graduates per year. Alberta is considering funding a new school in its province.

Manitoba has the longest history integrating PAs, followed by Ontario and then New Brunswick. Alberta has just completed a two-year demonstration project to evaluate PAs as members of teams in various clinical settings, and the project shows PAs to be a valued addition. In fact, five sites provided quantitative impact data on improvements in wait times and clinic capacity. Alberta seems ready to move on PAs being regulated, and its project recommends developing a provincial PA education program to increase supply.

The Conference Board estimated the potential cost savings of increased hiring of PAs. Modelling, using defined assumptions, shows that productivity gains (defined as the output per total cost of labour) would be realized for primary care if a PA can save more than 29 per cent of a physician's time. PAs who assist orthopaedic and emergency room specialists generate productivity gains for the health system when they can be substituted for more than 21 per cent and 25 per cent of these

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Demand for health care services is growing at twice the pace of population growth.

specialists' time, respectively. Evidence from interviews suggests this is achievable when PAs are fully employed. Productivity gains are the result of delegating routine tasks so that physicians can focus their time on tasks more aligned with their specialized skills. The greatest productivity gains are expected to be generated in practice areas where the costs of physicians—including wages and other factors, such as office overhead expenditures—are higher. These results, along with evidence from other countries that PAs can generate greater productivity enhancements for the medical system than those assumed in this report, suggest the cost savings provided by PAs could increase as PAs become more integrated into patient care.

Numerous policy and economic implications arise as a result of this modelling exercise. Aging is a key cost-driver in Canada's health care system; the highest health spending is for seniors. Demand for health care services is growing at twice the pace of population growth, which will put considerable strain on the system. The health workforce implications of this are significant if Canada is to meet the heightened demand for service. Combined with the rise in chronic diseases, more physicians and other types of health providers will be required. But, at the same time, the health workforce is also aging in Canada. PAs can help meet future demand by providing additional hours to physicians for routine tasks. Studies show PAs can deliver similar, or even better, outputs or outcomes for designated competencies.<sup>3</sup> This modelling exercise demonstrates that delegating routine tasks to PAs in various clinical settings leads to cost savings. Workforce planning initiatives should consider PAs to help balance supply and demand. But, they should also monitor, in a more quantitative way, safety and outcomes.

3 Grimes and Prada, *Value of Physician Assistants*.

## CHAPTER 1

# Introduction and Background

### Chapter Summary

- PAs are employed across a wide variety of settings, from primary care to acute care academic centres; but they work predominantly in primary health care and emergency medicine.
- Alberta's recently completed PA demonstration project, as well as evidence from outside of Canada, shows that PAs are a valued addition to care teams.
- PAs can provide safe care across a wide range of settings and practice areas. However, few studies touch demand for physician and physician assistant hours by type of specialty. In fact, impact studies tend to be more around access, waiting times, quality of care, and length of stay.

## Introduction

Through a series of reports, this project aims to better understand the role and impact that physician assistants (PAs) have in various health care settings across Canada. It also reviews funding models that have enabled the successful and sustainable integration of PAs into various health systems. The first report showed the role and impact of PAs in health care and provides context for this report. This second report calculates the economic benefits that could be generated for the health system by hiring more PAs. It comprises expert panel and advisory committee input to the Conference Board's proprietary Canadian Health Care Expenditure Demand Model. The report gives an overview of the physician demand model, assumptions used in the methodology, and the policy implications if the PA supply is expanded.

## Background

In the mid-1960s, the PA profession began mostly with military medics in their role as medical assistants. Today in Canada, three civilian and one military PA education programs (Ontario and Manitoba) train students in the medical model, typically over two years. As a result, PAs are employed in a wide variety of settings across Canada, from primary care to acute care academic centres. The 2016 Canadian Association of

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Manitoba has the longest history of integrating PAs and funds PAs.

Physician Assistants (CAPA) data show a large drop in those employed in the military (now 19 per cent).<sup>1</sup> The highest numbers of PAs are found in Ontario and Manitoba (where PA university programs are housed).

The first report on the value of physician assistants showed PAs to be unique health providers, as their scope of practice depends directly on the physician–physician assistant relationship. This is achieved either through regulation (Manitoba and New Brunswick) or, as in Ontario, through individual medical directives. The directives' number and content vary widely across settings and practices and reflect a physician assistant's education, experience, and competencies. The 2015 CanMEDS–PA competency statements act as a resource for a PA's role as a physician extender.<sup>2</sup> Activities can include conducting patient interviews, histories, and physical examinations; performing selected diagnostic and therapeutic interventions; providing medical orders and prescriptions; and counselling on preventive health care. The individual relationship between the PA and the supervising physician becomes the essential determinant of each PA's individual clinical role, within the context of the PA's competencies and the PA scope of practice.<sup>3</sup> However, experience, education, clinical setting, and competencies are also important determining factors.<sup>4</sup>

As indicated in the first report, **Manitoba** has the longest history of integrating PAs and funds PAs to work within the regional health authorities for specialty programs or emergency departments. Since 2013, family medicine physicians have piloted PAs in three practice models within Manitoba: community health centres (CHCs), fee-for-service family practice, and a family medicine role within a hospital—later adding three more sites. In 2007, PAs were first introduced in **Ontario** within emergency departments, hospitals, primary care settings,

1 Canadian Association of Physician Assistants, *CAPA Census 2015*.

2 Canadian Association of Physician Assistants, *CanMEDS-PA*.

3 Ibid.

4 Health Professions Regulatory Advisory Council, *Physician Assistants: A Literature Review*.

and in long-term care.<sup>5</sup> These physician assistants were mostly retired Canadian Forces PAs, U.S.-trained PAs, and international medical graduates (IMGs) who qualified to write the national PA certification exam. In 2009, **New Brunswick** undertook a feasibility study on PAs, and the analysis recommended conducting a pilot project in emergency departments.<sup>6</sup>

In 2013, **Alberta** Health Services (AHS) began a two-year demonstration project to evaluate 12 PAs as members of teams in various clinical settings across the province (10 sites). The evaluation of this demonstration project found PAs to be a valued addition to care teams and, as a result, PAs have now been transitioned into the AHS operations. Survey results from Alberta's physicians, patients, residents, and other health care providers, showed high satisfaction with the care provided by PAs.<sup>7</sup> Five sites were able to provide quantitative data on impact and showed various improvements in wait times and clinic capacity (e.g., increases in patient panels, external patient-requested clinic hours, clinical usage, total patients booked, total clinic appointments, and total complete physical examinations). Only the neuroscience and hospitalist programs were unable to link the PA role to measurable system improvements. Following the results of this evaluation, Alberta seems ready to move on PAs being regulated and is now considering a recommendation to develop a provincial PA education program to increase supply.

Outside of Canada, where PAs have a longer history and more data are available, a number of studies have shown that PAs are capable of performing many physician tasks by way of delegation from the supervising physician. In emergency care environments, evidence showed that PAs can manage up to 62 per cent of all patients in

5 HealthForceOntario, *Ontario's Physician Assistant Implementation*.

6 New Brunswick Stakeholder Committee, *Report on the Feasibility of Introducing Physician Assistants to New Brunswick*.

7 Alberta Health Services, *Physician Assistant Demonstration Project*.

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Studies have shown that PAs are capable of performing many physician tasks.

emergency care environments.<sup>8</sup> Meanwhile, in the emergency department setting, PAs appear to be equally capable of performing procedures as a physician if adequately trained and supervised. The quality of care provided by PAs is comparable with that of emergency specialists, (attending) physicians, and senior residents. The study also found that PAs can help to reduce wait times for patients.<sup>9</sup>

8 The Australasian College of Emergency Medicine and Australasian Society for Emergency Medicine, *Roles and Task Assignments*, 9.

9 *Ibid.*, 13.

## CHAPTER 2

# Estimating the Value of Physician Assistants

### Chapter Summary

- This chapter explores potential cost savings that could result through increased hiring of PAs, particularly in three practice areas that were identified as holding the most promise for increased productivity.
- By delegating certain tasks to PAs, physicians can redirect some of their time to more productive tasks.
- Under reasonable assumptions of increased physician productivity, adding physician assistants to the selected specialties of primary care, emergency care services, and orthopaedics can generate cost savings to the health care system.
- Cost savings are largely the result of differences in wages between physicians and physician assistants. Therefore, productivity gains are highest in practice areas where physicians' earnings are higher.

**Despite many studies that have reported positive impacts of increased use of PAs on key issues such as access, wait times, quality of care, and length of stay, integration of PAs as advanced practice clinicians remains low in Canada compared with countries such as the United States, the United Kingdom, and the Netherlands.**

This chapter describes the procedure by which we estimated the cost savings that could be achieved by hiring a greater number of PAs, and it also presents the final results. To estimate the potential cost savings from increased PAs, the Conference Board first projected demand for health care services until 2030 by area of medical practice. The aging of the population and trends in per-physician public health care expenditures and health care services utilization were also factored in. To calculate the savings that could be achieved if more physician assistants were hired, the health care costs in a scenario in which additional demand was met by physicians was compared with the costs in another scenario, where the demand was met by a combination of physicians and PAs.

An expert panel advised the Conference Board economics team on the methodology and assumptions to ensure they reflected various national and provincial contexts appropriately and were sound in approach. The panel consisted of nine specialists from across the country and included health policy experts and physicians spanning the full gamut of medical practice areas. On the advice of the expert panel, we focused our analysis on three areas—primary care, emergency care services, and orthopaedics—that hold the most promise for increased productivity by greater use of PAs. The panel also assisted in assessing the extent to which certain tasks could be delegated to PAs and the increase in the total number of patients a physician could treat with effective delegation to PAs.

The two scenarios that underpinned our calculations were as follows:

**1. Baseline Scenario**

- The number of PAs is held at 500 (i.e., its 2015 level) in every year after 2016, and physicians perform every aspect of the additional medical care required in each year.

**2. Increased PA Scenario**

- Another 400 PAs are added to the current stock over the next five years (i.e., 80 per year, consistent with expected graduation rates). The rate of hiring then grows at an increasing rate, eventually resulting in more than 2,000 new PAs in the system in 2030.<sup>1</sup>
- PAs handle routine patient care tasks—such as charting, information gathering, medical examinations, selected diagnostic and therapeutic interventions, and counselling on preventive care.
- Physicians spend more time on tasks related to their core area of specialization and to treating patients with more complex needs.
- This scenario should not be interpreted as one in which physicians are being “replaced.” Rather, delegation of routine tasks to PAs would be done in accordance with existing regulation or medical directives under the supervision of a physician. As well, the reassignment of tasks would be an effort to alleviate the pressure that excess demand for care in the health system places on physicians’ time.

The results can be interpreted as the total cost savings from increasingly using PAs in place of physician time for a range of medical specialties. Specifically, by employing a PA, a physician would have additional time that could be spent on more productive tasks. It is important to note that this report focuses on the efficiency gains that could be achieved in patient care through increased hiring and effective integration of PAs into the medical system, rather than in terms of the quality of care.<sup>2</sup>

- 1 While there is a significant amount of room to increase the number of PAs working with physicians, the number of PAs hired is one that was deemed feasible by the expert panel.
- 2 Or, alternatively, the amount of additional care that could be provided in a given unit of time.

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Demand for most areas of medical practice will increase at a rate between 1.5 and 1.7 per cent per year over the next 14 years.

As the evidence varies on how much time a current PA is substituting for a physician in certain tasks, we undertook sensitivity analysis around this number to provide a range of potential cost savings.

## Detailed Methodology

To derive the economic benefits of increased hiring of PAs, the following process was employed:

- 1. Forecast of Physician Demand:** The number of hours demanded for the key specialties— primary care, emergency care services, and orthopaedics—were forecast (i.e., the total amount of medical care time that the general population would require) for the years 2017 to 2030, using our health care expenditure demand model. Demand for physicians was based on the current scope of practice and maintained similar productivity levels as today. Increased demand was driven by population growth and the aging of the population, which generated a significant increase in disease prevalence.
- 2. Increased Demand:** Our results projected that demand for most areas of medical practice will increase at a rate between 1.5 and 1.7 per cent per year over the next 14 years (2016 to 2030). Population growth is only expected to grow by 0.9 per cent. Aging of the population is driving the rest of the demand. Overall demand for all physicians is expected to grow by 1.7 per cent per year.
- 3. Total Cost of Medical Care Baseline Scenario:** We projected the number of physicians based on our own projection for demand.
- 4. Physician Billing:** The total cost of medical care under the baseline scenario was determined by applying hourly physician billing rates to the required supply of hours. In addition to salaries, physician billings include a number of items, such as office overhead expenditures, that are covered by the government. As such, billings are the most representative measure of the total costs of physicians to the medical system.

- Average annual fee for service (FFS) billing data per physician (per full-time equivalent (FTE),<sup>3</sup> by area of practice, were obtained from the Canadian Institute for Health Information's (CIHI) National Physician Database for 2013–14.
- CIHI has billing data only up to the year 2013–14. To project annual earnings values to the year 2016 and beyond, the annual salary figures were assumed to grow at the same pace as the average weekly earnings (on an annual basis) for professionals working in the offices of physicians (i.e., NAICS 6211).

5. **Estimating the Total Cost of Medical Care in the Increased PA**

**Scenario:** To estimate the costs of medical care under the increased PA scenario, we estimated the degree to which a PA could substitute for a physician—thus freeing up physicians for more productive tasks. Given the limited evidence available, the testimony of an expert panel was used to assess the increased time that physicians could spend on patient care if certain patient care tasks were delegated to PAs. After assessing the evidence collected in literature reviews, and discussions with the expert panel and the advisory committee, we estimated that current physician assistants increased the time that physicians could spend on direct patient care by as much as 45 per cent. In other words, by assigning certain tasks to PAs, physicians freed about 45 per cent of the time, which can then be redirected to more productive uses. However, to align with the range of responses from our expert panel, and to account for the fact that PAs may not always be used to their full advantage, we used a range of estimates (between 25 and 45 per cent) of how much time a PA could be substituted for a physician.

6. **Specialty Areas:** The panellists believed such an improvement in productivity was possible within most areas of specialization. But, primary care, emergency care services, and orthopaedics were identified as areas for which the increased hiring and effective integration of PAs would be

3 This is one method for calculating the average payment per physician working full-time on average, or providing similar levels of activity as the majority of physicians. For more information, please see Canadian Institute for Health Information, *Approaches for Calculating Average Clinical Payments*.

The number of PAs in Canada is currently estimated to be about 500.

more likely to result in significant productivity enhancements. As such, we first focused our estimates on the cost savings of hiring additional PAs to assist these specialties. However, we also considered scenarios in which PAs were instead allocated across all medical specialties, according to the share of the total hours attributable to each specialty.<sup>4</sup>

7. **Supply of PAs:** The number of PAs in Canada is currently estimated to be about 500. While we believe there is a significant amount of room to increase the number of PAs working with physicians, the number of PAs hired was deemed feasible by the expert panel, based on the current capacity of the various PA schools. In particular, it was assumed 80 graduates would be produced per year, reaching 900 by the year 2021. The PA population was grown exponentially thereafter, reaching 1,800 by 2027 and 2,550 by 2030. This does not include PAs coming from sources such as the Canadian Armed Forces, the U.S., or international medical graduates (IMGs); so, the estimate is believed to be a conservative number.
8. **Substitutable Physician Hours:** The number of hours that a physician is able to redirect to additional patient care is calculated by multiplying the hours supplied by the increased number of PAs by the substitution rate.
9. **PA Earnings:** The annual earnings of the increased number of PAs working in the system were estimated by multiplying the hourly wage for PAs by the number of hours that were being substituted for physicians. It was assumed that PAs earn the annual salary for allied primary health practitioners (NOCS 3124), which includes PAs as outlined in the 2010 data from the 2011 National Household Survey (NHS). This number

4 For instance, if the total number of medical care hours demanded in family medicine accounted for 25 per cent of the total number of medical care hours demanded in a given year, then 25 per cent of new PAs in that year would work in family medicine. Note that throughout this analysis, it was assumed that there would be no PAs working within psychiatry. The practice of psychiatry largely involves psychiatrists working one-on-one with their patients. And, as such, the introduction of a PA could raise confidentiality issues. It was also generally accepted by our panel that PAs would not provide significant time savings within psychiatry.

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Nurse practitioners are another advanced practice provider that can be used as a substitute for certain physician services.

was also in line with salary information received from a recent survey sent to PAs. To project the 2016 value, it was assumed the NHS annual salary grew at the same pace as the average weekly earnings (on an annual basis) for professionals working in the offices of physicians (i.e., NAICS 6211).<sup>5</sup>

10. **Calculate the Cost of Physician Time in the Increased PA Scenario:**  
We calculated the total cost of the required number of physicians by multiplying the hourly physician billings by the demand for physician hours. Demand for physician hours was reduced by the number of hours that were able to be substituted by the supply of PAs. Hourly wages were computed using average annual earnings data for physicians by specialty, which were obtained from CIHI's National Physician Database and grown in the same way as PA wages.
11. **Cost Savings:** Cost savings were calculated as the sum of PA earnings and physician earnings under the increased PA scenario, less the earnings of physicians in the baseline scenario.

### Additional Assumptions

Two additional assumptions were made for the methodology:

12. **Nurse Practitioners:** Nurse practitioners are another advanced practice provider that can be used as a substitute for certain physician services. The model assumed that nurse practitioner hours and productivity levels would be unaffected by the increase in PAs: these variables grew according to projections from a baseline scenario in which no increase in PAs occurred.

5 The value used for all medical professionals (i.e., physicians and PAs) was 2.26 per cent per annum, calculated as the 2010–15 compound average annual growth rate of the average hourly wages of workers in the offices of physicians (NAICS 6211).

13. **Productivity Improvements:** On balance, the productivity improvements described above would likely result in fewer total hours worked by physicians. As a result of these time savings, physicians would be better able to focus on more complex cases as well as see more patients, which could bring down waiting times.

Table 1 shows the final data assumptions used for earnings and hours worked per year used in calculating the cost savings for PAs.

**Table 1**  
**Per Person Cost by Type of Medical Professional**

Area of Medical Practice	2016 Hourly Earnings (\$)	2016 Average Hours Worked	PA Earnings <sup>1</sup> (per cent)	2016 Annual Earnings
Primary care	150.67	1,954	29	294,344
Orthopaedics	202.68	2,226	21	451,116
Emergency	172.83	2,033	25	351,380 <sup>2</sup>
Other specialty	228.13	1,920	19	438,036
PA	43.07	1,925 <sup>3</sup>	100	82,908 <sup>4</sup>

<sup>1</sup> Calculated as hourly PA earnings divided by the hourly earnings of physicians in the particular practice area.

<sup>2</sup> CIHI does not provide annual billings data for emergency medicine. As such, we used the average annual earnings for all physician types.

<sup>3</sup> Equal to the hours worked by physicians, averaged across all areas of practice.

<sup>4</sup> Assumed PA earnings would be equivalent to those of allied primary health practitioners (NOCS 3124).

Source: Conference Board of Canada calculations (based on Statistics Canada's National Household Survey, Canadian Institute for Health Information, and custom survey data).

The aging of the Canadian population will result in increased demand for health care in the coming years. Table 2 summarizes the additional demand for physicians, for the specialties of interest in this report, from 2017 to 2030.<sup>6</sup> From 2017 to 2020, nearly 1,400 additional physicians will be needed each year to meet the increase in demand for medical care caused by the aging population and increased disease prevalence. This number will increase to nearly 1,500 on an average annual basis

- 6 Assumed constant annual hours worked per Step 2 of the calculation procedure—excluding psychiatrists.

between 2021 and 2025, and rise again to about 1,600 for the final five years of the forecast window. Primary care will be the most demanded specialty throughout.

**Table 2**

**Demand for Additional Physicians, 2017–30**

(average number of physicians needed, annually)

	All Physicians	Family/ Primary Care	All Specialists	Emergency	Orthopaedics
2017–20	1,365	707	658	14	27
2021–25	1,468	761	708	15	29
2026–30	1,588	823	765	17	32

Sources: Conference Board of Canada calculations based on custom simulations and Canadian Medical Association data.

## Results

The Conference Board model shows that increased hiring and effective integration of PAs are projected to result in cost savings to the health system. (See Table 3). Even if we assume PAs will be able to substitute for only 25 per cent of a physician’s time, there are some overall cost savings. According to average responses from our expert panel on PAs, this should be more than feasible. The fact that all the scenarios are positive suggests that PAs provide a cost-efficient option for the health system, even if their integration and skills are not fully optimized. As the teams mature more and the PAs are able to undertake more tasks, it is expected that their contribution and value-added will increase even more.

The results are largely driven by differences in per-person costs. It was assumed throughout this analysis that the average number of hours worked by medical care professionals on an annual basis would not change. This is not to say that physicians and PAs work the same number of hours each year, but that neither group will see growth in the amount of time they spend working over the forecast period. PAs earned more than the threshold productivity value only when working with primary care physicians, and only under the 25 per cent scenario.

(See Table 1.) Given that the costs of increased hiring so rarely exceeded the productivity gains of hiring additional workers, it is understandable that, on an aggregate basis, cost savings are realized in every scenario.

If PAs are shared across all specialties—instead of being directed to primary care, emergency care services, and orthopaedics—there would still be likely cost savings. In fact, with a similar substitution assumption, there are more potential efficiency gains in total when PAs generate productivity enhancements in all medical practice areas than when the improvement only occurs in primary care, emergency care services, and orthopaedics. (See Table 3.) This is because, in the former situation, more PAs are assisting specialist physicians in areas other than orthopaedic and emergency room care. Specialists have a significantly higher hourly wage and consequently have the greatest potential cost savings.

**Table 3**

**Total Efficiency Gains and Time Savings of PAs, 2017–30**

<b>PA Productivity</b> (per cent)	<b>Practice Area for Productivity Gain</b>	<b>Additional Hours Available to Physicians</b> (millions)	<b>Efficiency Gains</b> (\$ millions)
25	Primary care, orthopaedics, and emergency room	5.7	22.4
35	Primary care, orthopaedics, and emergency room	7.9	525.1
45	Primary care, orthopaedics, and emergency room	10.2	1,027.8
25	All practice areas	5.7	89.2
35	All practice areas	7.9	618.6
45	All practice areas	10.2	1,148.1

Source: The Conference Board of Canada.

Table 4 provides a breakdown of the division of the total costs of PAs across medical specialties. It demonstrates how the distribution of efficiency gains changes across areas of medical practice with PA productivity levels. Again, the PA earnings percentage figures provided in Table 1 explain the results; only when the productivity gains within a specialty exceed the associated PA earnings percentage are savings generated.

**Table 4**  
**Total Efficiency Gains of PAs by Medical Practice Area, 2017–30**

(\$ millions)

PA Productivity (per cent)	Practice Area for Productivity Gain	Total Efficiency Gains	Primary Care	Emergency	Orthopaedics	Other Specialists
25	Primary care, orthopaedics, and emergency room	22.4	-51.6	1.3	72.6	0
35	Primary care, orthopaedics, and emergency room	525.1	92.4	166.5	266.3	0
45	Primary care, orthopaedics, and emergency room	1,027.80	236.3	331.6	459.9	0
25	All practice areas	89.2	-84.5	0	4.6	169
35	All practice areas	618.6	151.2	5.5	16.8	445.1
45	All practice areas	1,148.10	386.8	11	29	721.3

Source: The Conference Board of Canada.

Modelling using the assumptions outlined in the methodology shows efficiency gains are realized for primary care once a PA improves productivity by more than 29 per cent. (See Table 1.) PAs who assist orthopaedic and emergency room specialists generate efficiency gains for the health system when they improve productivity by more than 21 and 25 per cent, respectively.

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As PAs become more integrated into the system, the productivity gains may be even greater.

It appears that PAs provide a cost-efficient option for the health system, even at the productivity levels expected to be generated by PAs at the start, when their integration and skills are not optimized. And the data from other countries suggests that as PAs become more integrated into the system, the productivity gains may be even greater than those reported by our expert panel. This could generate more efficiencies as time progresses.

## CHAPTER 3

# Policy Implications and Conclusion

### Chapter Summary

- An aging population and the associated rise in chronic disease will increase demand for health services, requiring more physicians and other types of health providers. The physician forecasting model shows demand for health care services growing at twice the pace of population growth, thus straining the system.
- Physician assistants can be an efficient substitute for designated medical tasks. And forecasts of the cost of delivering health care under different assumptions, regarding the use of physician assistants, begin the discussion on the efficiency gains that can be found, alleviating the demand on physicians' time.
- Recent studies at the provincial level are providing stronger evidence of the value PAs add to health care systems.

**This chapter provides a more detailed discussion of the results. It also provides insight into the policy and economic implications of modelling the value of physician assistants.**

## Policy Implications

The policy and economic implications of this modelling exercise are multifold. However, seven main themes arise:

1. **Consequences of Aging:** Conference Board research has made it evident that the aging of Canada's population will have a significant negative impact on the country's fiscal position in the coming years. Every province is expected to incur higher aging-induced costs in each of the next five years. Ontario, Quebec, and British Columbia will be responsible for the majority of Canada's additional aging-related health care costs over the next five years—not surprising given their large populations. Also, for most provinces, the magnitude of the cost growth appears to be increasing over time. According to these projections, the rise in health care costs due to population aging is not only growing each year, it is growing at an increasing rate (up to 1.9 per cent per year by 2020).<sup>1</sup> The annual per capita cost of providing health care to Canadians over the age of 65 is five times that for those under 65. For those over 80 years, the difference is ten-fold.<sup>2</sup> By 2046, spending on continuing care for seniors will increase from \$29.3 billion in 2011 to \$184.2 billion.<sup>3</sup> The health workforce implications of this are significant to meet this heightened demand for service.
2. **Physician Supply:** The increased demand of an aging population, combined with the rise in chronic diseases, means that more physicians and other types of health providers will be required. In fact, a 2016 study

1 The Conference Board of Canada, *Federal Policy Action*.

2 Canadian Institute for Health Information, *National Health Expenditure Database*.

3 The Conference Board of Canada, *Federal Policy Action*.

of high-cost users showed that fracture of the femur was one of the top contributors. This is common in an aging population that has a higher risk for falls.<sup>4</sup> The number of physicians in Canada has increased over the last years; it is now at 224 per 100,000 population in 2014.<sup>5</sup> Physician assistants can help meet future demand by providing additional hours to physicians for other, less-routine tasks.

3. **Substitution and Delegation:** This modelling exercise delegates routine tasks to PAs that could be done in an effort to alleviate the pressure that rapidly growing demand for health care services places on physicians' time. Substitution occurs when one member of the health workforce team assumes part of the tasks of another. Studies are beginning to show that PAs can be an effective substitute providing high-quality care. One U.S. study looked at delegation and comparative productivity and showed that PAs can substitute for physicians in about 85 per cent of primary care tasks.<sup>6</sup> Another Australian study found that PAs can manage up to 62 per cent of all patients in emergency care environments.<sup>7</sup> Within this context, the scenarios provided in this report, are very conservative and should be easily attained.
  
4. **Supply of PAs:** The supply of PAs in Canada remains low. Four PA education programs train students in the medical model (Canadian Forces Medical Services School, University of Manitoba, McMaster University, and the Consortium of PA Education of the University of Toronto, Northern Ontario School of Medicine, and The Michener Institute of Education at University Health Network). These programs are two years in length and produce approximately 80 graduates per year. Manitoba's program does confer a master's degree, so it requires a four-year bachelor's degree as a prerequisite. Alberta is considering funding a new school in its province. Given the shorter length of PA programs,

4 Guilcher, Bronskill, Guan, and Wodchis, *Who Are the High-Cost Users?*

5 Canadian Institute for Health Information. *Physicians in Canada*.

6 Hooker, Cawley, and Asprey, "Economic Assessment of Physician Assistants."

7 The Australasian College of Emergency Medicine and Australasian Society for Emergency Medicine, *Roles and Task Assignments*.

there is an opportunity cost that could be capitalized on. For example, U.S. data show the opportunity cost of producing a PA is about 20 per cent of that of a physician.<sup>8</sup>

5. **Infrastructure Costs:** The modelling exercise purports orthopaedics to have the most promise to improve productivity, given the higher difference between physicians' and PAs' wages.
  
6. **Utilization and Spending:** Concerns have been raised that advanced practice clinicians, such as PAs, can increase utilization and spending. A 2016 study within Kaiser Permanente found no evidence of this when nurse practitioners (NPs) and PAs are under a physician's supervision.<sup>9</sup> Everett, Morgan, and Jackson recently reported similar outcomes with a physician assistant or advanced practice nurse (APN) as a usual provider of care, compared with physician-only care. The exception is greater use of primary care.<sup>10</sup> Alberta's demonstration project did gather data showing that, in primary care, PAs can increase outputs/throughputs in certain areas. These areas include patient panels; clinical usage; total clinic appointments, total walk-ins; total patients seen; total PA clinic appointments; total, complete physical examinations; and total follow-up appointments.<sup>11</sup>
  
7. **Funding Models:** Despite the many benefits associated with the use of PAs, there is still a lack of a stable, sustainable model for funding and remuneration of these professionals in Canada. Funding for PAs is derived from a number of sources that include provincial governments, often through pilot or demonstration projects; block funding, such as academic specialty groups; and direct funding from physicians. As a result, in Canada, PAs are employed in a wide variety of settings. Funding models are the subject of an upcoming report, so are only touched on here. However, a U.S. Veterans Health Administration study found PA

8 Hooker, Cawley, and Asprey, "Economic Assessment of Physician Assistants."

9 Liu and others, "The Impact of Using Mid-Level Providers."

10 Everett, Morgan, and Jackson, "Primary Care Physician Assistant."

11 Alberta Health Services, *Physician Assistant Demonstration Project*.

productivity higher in primary care roles than in other specialties. But productivity was also higher in rural or non-teaching settings, and where the PA's scope of practice allowed significant autonomy.<sup>12</sup>

## Conclusion

The sustainability of Canada's health system is always in question. Our health system still consumes a large part of Canadian economic resources—\$219 billion in 2015, or 10.9 per cent of GDP. Hospitals, drugs, and physician services consume 60 per cent of this spending. Demand will only increase with the aging of the Canadian population and the resulting rise in chronic diseases. Governments are looking for new ways to innovate and improve performance. One way to meet heightened demand is through interprofessional and collaborative care teams. The Conference Board of Canada through its unique modelling exercise shows that physician assistants can be an efficient substitute for designated medical tasks. PAs can help meet future demand by providing additional hours to physicians for other, less-routine tasks. Studies show that PAs can deliver similar, or even better, outputs or outcomes for designated competencies.<sup>13</sup> While more prospective (or even retrospective) case-control research studies to measure the quantitative impact of PAs on the Canadian health system are needed, economic models like these begin the discussion on the potential efficiency gains that can be attained by integrating PAs to interprofessional teams, alleviating the demand on physicians' time.

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[www.conferenceboard.ca/e-Library/abstract.aspx?did=8347](http://www.conferenceboard.ca/e-Library/abstract.aspx?did=8347)

- 12 Moran and others, "Factors Associated With Physician Assistant and Nurse Practitioner Productivity."
- 13 Grimes and Prada, *Value of Physician Assistants: Understanding the Role*.

## APPENDIX A

# Bibliography

Alberta Health Services. *Proposed Initiative Physician Assistant Demonstration Project*. Edmonton: AHS, 2013.

—. *Physician Assistant Demonstration Project: Final Evaluation Report*. Edmonton: AHS, 2015.

Ashton, C. W., A. Aiken, and D. Duffie. "Physician Assistants: A Solution to Wait Times in Canada?" *Healthcare Management Forum* 20, no. 2 (2007): 38–42.

Ballwag, R., and R. Cohn. "Shaping Great Physician-PA Teams: An Analysis of Key Factors Contributing to the Success of the Physician-Physician Assistant Partnership." *International Medical Workforce Collaborative Conference*. 2010.

Bohm, E. R., M. Dunbar, D. Pitman, C. Rhule, and J. Araneta. "Experience With Physician Assistants in a Canadian Arthroplasty Program." *Canadian Journal of Surgery* 53, no. 2 (2010): 103–8.

Born, K., C. Doig, and S. Pendharkar. "Integrating Physician Assistants in Canada." *HealthyDebate*, December 5, 2013. <http://healthydebate.ca/2013/12/topic/politics-of-health-care/integrating-physician-assistants-in-canada> (accessed February 8, 2016).

Bourgeault, I., and G. Mulvale. "Collaborative Health Care Teams in Canada and the USA: Confronting the Structural Embeddedness of Medical Dominance." *Health Sociology Review* 15, no. 5 (2006): 481–95.

Bowen, S. *Introduction of Physician Assistants Into Primary Care—Baseline Assessment and Evaluation Recommendations: Baseline Report Prepared for the Introducing Physician Assistants Into Primary Care Steering Committee*. Prepared for the Manitoba government, 2014.

Bowen, S., I. Botting, L. Huebner, and others. "Potential of Physician Assistants to Support Primary Care: Evaluating Their Introduction at 6 Primary Care and Family Medicine Sites." *Canadian Family Physician* 62, no. 5 (2016): e268–e27.

Burrows, K., M. Vanstone, and I. Jones. *Physician Assistants in Canada*. Ottawa: CAPA, 2015.

Buske, L. *2010 National Physician Survey*. Canadian Medical Association, College of Family Physicians of Canada, and Royal College of Physicians and Surgeons of Canada, 2010. <http://nationalphysiciansurvey.ca/surveys/2010-survey/2010-results/>.

Canadian Association of Physician Assistants. *Scope of Practice and National Competency Profile*. 2009. <https://capa-acam.ca/> (accessed February 8, 2016).

—. *CAPA Census 2015*. <https://capa-acam.ca/wp-content/uploads/2015/11/2015-Census-Survey-Summary.pdf>

—. *Canadian Physician Assistant Profession: The Potential Impact on the Ontario Health Care System*. 2012. <https://capa-acam.ca/> (accessed February 8, 2016).

—. *CanMEDS-PA, 2015*. <https://capa-acam.ca/wp-content/uploads/2015/11/CanMEDS-PA.pdf> (accessed February 8, 2016).

Canadian Institute for Health Information (CIHI). *Canada's Health Care Providers: Provincial Profiles, 2013*. Ottawa: CIHI, 2014.

—. *Physicians in Canada*. Ottawa: CIHI, 2015.

—. *Approaches for Calculating Average Clinical Payments per Physician Using Detailed Alternative Payment Data*. Ottawa, CIHI, 2015.

—. *National Health Expenditure Database, 2015*. [www.cihi.ca/en/spending-and-health-workforce/spending/health-spending-data/national-health-expenditure-database](http://www.cihi.ca/en/spending-and-health-workforce/spending/health-spending-data/national-health-expenditure-database).

Cawley, J. F., and R. S. Hooker. "Physician Assistants in American Medicine: The Half-Century Mark." *The American Journal of Managed Care* 19, no. 10 (2013): e333–41.

—. "The Effects of Resident Work Hour Restrictions on Physician Assistant Hospital Utilization." *Journal of Physician Assistant Education* 17, no. 3 (2006): 41–43.

Coplan, B., J. Cawley, and J. Stoehr. "Physician Assistants in Primary Care: Trends and Characteristics." *Annals of Family Medicine* 11, no. 1 (2013): 75–79.

Coplan, B., and J. E. Meyer. "Physician Assistants—One Less Doctor(ate) in the House." *The Journal of the American Medical Association* 305, no. 24 (2011): 2571–72.

Costa, D. K., D. J. Wallace, A. E. Barnato, and J. M. Kahn. "Nurse Practitioner/Physician Assistant Staffing and Critical Care Mortality." *CHEST* 146, no. 6 (2014): 1566–73.

Cunningham, R. *Tapping the Potential of the Health Care Workforce: Scope-of-Practice and Payment Policies for Advanced Practice Nurses and Physician Assistants*. Background Paper No. 76. National Health Policy Forum, 2010.

Curren, J. "Nurse Practitioners and Physician Assistants: Do You Know the Difference?" *MEDSURG Nursing* 16, no. 6 (2007): 404–07.

Decloe, M., J. McCready, J. Downey, and J. Powis. "Improving Health Care Efficiency Through the Integration of a Physician Assistant Into an Infectious Diseases Consult Service at a Large Urban Community Hospital." *Canadian Journal of Infectious Diseases and Medical Microbiology* 26, no. 3 (2015): 130–32.

Dehn, R. W., D. M. Brock, A. O. Keller, R. S. Hooker, and D. Mittman. "Commentaries on Health Services Research." *Journal of the American Academy of Physician Assistants* 28, no. 6 (2015): 1–3.

Dies, N., S. Rashid, M. Shandling, C. Swallow, A. M. Easson, and E. Kennedy. "Physician Assistants Reduce Resident Workload and Improve Care in an Academic Surgical Setting." *Journal of the American Academy of Physician Assistants* 29, no. 2 (2016): 41–6.

Dinh, Thy, and Fares Bounajm. *Improving Primary Health Care Through Collaboration: Briefing 3—Measuring the Missed Opportunity*. Ottawa: The Conference Board of Canada, 2013.

Doan, Q., R. S. Hooker, H. Wong, J. Singer, S. Sheps, N. Kisson, and D. Johnson. "Canadians' Willingness to Receive Care From Physician Assistants." *Canadian Family Physician* 58, no. 8 (2012): e459–64.

Doan, Q., V. Sabhaney, N. Kisson, S. Sheps, and J. Singe. "A Systematic Review: The Role and Impact of the Physician Assistant in the Emergency Department." *Emergency Medicine Australasia* 23, no. 1 (2011): 7–15.

Drennan, V., R. Levenson, M. Halter, and C. Tye. "Physician Assistants in English General Practice: A Qualitative Study of Employers' Viewpoints." *Journal of Health Services Research & Policy* 16, no. 2 (2011): 1–6.

Drennan, V. M., K. Chattopadhyay, M. Halter, S. Brearley, S. de Lusignan, J. Gabe, and H. Gage. "Physician Assistants in English Primary Care Teams: A Survey." *Journal of Interprofessional Care* 26, no. 5 (2012): 416–18.

Drennan, V. M., M. Halter, L. Joly, H. Gage, R. L. Grant, J. Gabe, S. Brearley, W. Carneiro, and S. de Lusignan. "Physician Associates and GPs in Primary Care: A Comparison." *British Journal of General Practice* 65, no. 634 (2015): e344–50.

Ducharme, J., R. J. Alder, C. Pelletier, D. Murray, and J. Tepper. "The Impact on Patient Flow After the Integration of Nurse Practitioners and Physician Assistants in 6 Ontario Emergency Departments." *Canadian Journal of Emergency Medicine* 11, no. 5 (2009): 455–61.

Ducharme, J., J. Buckley, R. Alder, and C. Pelletier. "The Application of Change Management Principles to Facilitate the Introduction of Nurse Practitioners and Physician Assistants Into Six Ontario Emergency Departments." *Healthcare Quarterly* 12, no. 2 (2009): 70–77.

Everett, C. M., C. T. Thorpe, M. Palta, P. Carayon, C. Bartels, and M. A. Smith. "Physician Assistants and Nurse Practitioners Perform Effective Roles on Teams Caring for Medicare Patients With Diabetes." *Health Affairs (Project Hope)* 32, no. 11 (2013): 1942–48.

Everett, C. M., P. Morgan, and G.L. Jackson. "Primary Care Physician Assistant and Advance Practice Nurses Roles: Patient Healthcare Utilization, Unmet Need, and Satisfaction." *Healthcare*. Elsevier, 2016. pii: S2213-0764(15)30038-5. doi: 10.1016/j.hjdsi.2016.03.005.

Farmer, J., M. Currie, J. Hyman, C. West, and N. Arnott. "Evaluation of Physician Assistants in National Health Service Scotland." *Scottish Medical Journal* 56, no. 3 (2011): 130–34.

Forte, G., K. Graham, and B. K. Frogner. "Commentaries on Health Services Research." *Journal of the American Academy of Physician Assistants* 29, no. 1 (2016): 1–2.

Fréchette, D., D. Hollenberg, A. Shrichand, C. Jacob, and I. Datta. *What's Really Behind Canada's Unemployed Specialists? Too Many, Too Few Doctors?* Findings from the Royal College's employment study. Ottawa: The Royal College of Physicians and Surgeons of Canada, 2013.

Fréchette, D., and A. Shrichand. "Insights Into the Physician Assistant Profession in Canada." *Journal of the American Academy of Physician Assistants* 29, no. 7 (2016): 35–39.

Gadbois, E., E. Miller, D. Tyler, and O. Intrator. "Trends in State Regulation of Nurse Practitioners and Physician Assistants, 2001 to 2010." *Medical Care Research and Review* 72, no. 2 (2015): 200–19.

- Gafni, A., S. Birch, and G. Buckley. *Economic Analysis of Physician Assistants in Ontario: Literature Review and Feasibility Study*. Working paper. Hamilton: Centre for Health Economics and Policy Analysis, McMaster University, 2011.
- Garland, A., and H. B. Gershengorn. "Staffing in ICUs: Physicians and Alternative Staffing Models." *CHEST* 143, no. 1 (2013): 214–21.
- Gerrie, B., and E. A. Holbrook. "The Evolutionary Role of Physician Assistants Across the United States, Canada, and the United Kingdom." *International Journal of Exercise Science* 6, no. 1 (2013): 1–8.
- Gershengorn, H. B., H. Wunsch, R. Wahab, D. E. Leaf, D. Brodie, G. Li, and P. Factor. "Impact of Non-Physician Staffing on Outcomes in a Medical ICU." *CHEST* 139, no. 6 (2011):1347–53.
- Grimes, Kelly, and Gabriela Prada. *Value of Physician Assistants: Understanding the Role of Physician Assistants Within Health Systems*. Ottawa: The Conference Board of Canada, 2016.
- Grover, A., J. M. Orlowski, and C.E. Erikson. "The Nation's Physician Workforce and Future Challenges." *The American Journal of the Medical Sciences* 351, no. 1 (2016): 11–19.
- Guilcher, S., S. Bronskill, J. Guan, and W. Wodchis. "Who Are the High-Cost Users? A Method for Person-Centred Attribution of Health Care Spending." *PLOS One* 11, no. 3 (2016).
- Halter, M., V. Drennan, K. Chattopadhyay, W. Carneiro, J. Yiallourous, S.de Lusignan, H. Gage, J. Gabe, and R. Grant. "The Contribution of Physician Assistants in Primary Care: A Systematic Review." *BMC Health Services Research* 13 (2013): 223.
- Hamilton, G. M., and M. D. Decloe. "Reviewing the Evidence for Canada's Physician Assistant Initiative." *University of Toronto Medical Journal* 88, no. 2 (2011): 88–90.
- Hariharan, S. "Using Advance Practice Registered Nurses and Physician Assistants to Ease Physician Shortage." *Physician Leadership Journal* 2, no. 3 (2015): 46–51.

Hawkins, C. M., M. A. Bowen, C. A. Gilliland, D. G. Walls, and R. Duszak Jr. "The Impact of Nonphysician Providers on Diagnostic and Interventional Radiology Practices: Operational and Educational Implications." *Journal of the American College of Radiology* 12, no. 9 (2015): 898–904.

Health Council of Canada. *Health Care Renewal in Canada: Measuring Up?* Toronto: Health Council of Canada, 2007.

HealthForceOntario. *Ontario' Physician Assistant Implementation: Report of the Evaluation Subcommittee.* Toronto: HealthForceOntario, 2011.

—. *PA Project Update.* Fall 2008.

—. *PA Project Update.* Issue #2, Winter 2009.

—. *PA Project Update.* Issue #3, Fall 2009.

—. *PA Project Update.* Issue #5, Spring 2011.

Health Professions Regulatory Advisory Council. *Physician Assistants: A Jurisdictional Review.* Toronto: Health Professions Regulatory Advisory Council, 2011.

—. *Physician Assistants: A Literature Review.* Toronto: Health Professions Regulatory Advisory Council, 2011.

Health Workforce Australia. *The Potential Role of Physician Assistants in the Australian Context. Volume 2: Literature Review.* Adelaide: Health Workforce Australia, 2011.

Health Workforce New Zealand. *Evaluation of the Physician Assistant Trial.* Final Report. 2012.

Henry, L. "Physician Assistants, Nurse Practitioners, and Community Health Centers Under the Affordable Care Act." *Human Organization* 74, no. 1 (2015): 42–51.

Henry, L. R., R. S. Hooker, and K. L. Yates. "The Role of Physician Assistants in Rural Health Care: A Systematic Review of the Literature." *The Journal of Rural Health* 27, no. 2 (2011): 220–29.

Hooker, R. S. "Physician Assistants and Nurse Practitioners: The United States Experience." *Medical Journal of Australia* 185, no. 1 (2006): 4–7.

Hooker, R. S., and L. Kuilman. "Physician Assistant Education: Five Countries." *Journal of Physician Assistant Education* 22, no. 1 (2011): 53–58.

Hooker, R. S., J. A. Benitez, B.H. Coplan, and R. W. Dehn. "Ambulatory and Chronic Disease Care by Physician Assistants and Nurse Practitioners." *Journal of Ambulatory Care Management* 36, no. 4 (2013): 293–301.

Hooker, R. S., and A. N. Muchow. "Modifying State Laws for Nurse Practitioners and Physician Assistants Can Reduce Cost of Medical Services." *Nursing Economic\$* 33, no. 2 (2015): 88–94.

Hooker, R. S., S. P. Robie, J. M. Coombs, and J. F. Cawley. "The Changing Physician Assistant Profession: A Gender Shift." *Journal of the American Academy of Physician Assistants* 26, no. 9 (2013): 36–44.

Hooker, R. S., J. F. Cawley, and C. M. Everett. "Predictive Modeling the Physician Assistant Supply: 2010–2025." *Public Health Reports* 126, no. 5 (2011): 708–16.

Hooker, R. S., J. F. Cawley, and D. P. Asprey. "Economic Assessment of Physician Assistants: Chapter 11." *Physician Assistants: Policy and Practice*: (2009): 341–72.

Hussey, P. S., C. Eibner, M. S. Ridgely, and E. A. McGlynn. "Controlling U.S. Health Care Spending: Separating Promising From Unpromising Approaches." *The New England Journal of Medicine* 361, no. 22 (2009): 2109–11.

Jones, I., and N. St-Pierre. "Physician Assistants in Canada." *Journal of the American Academy of Physician Assistants* 27, no. 3 (2014): 11–13.

Jones, I. W. "Should International Medical Graduates Work as Physician Assistants?" *Journal of the American Academy of Physician Assistants* 28, no. 7 (2015): 8–10.

—. “Where the Canadian Physician Assistants Are in 2012.” *Journal of the American Academy of Physician Assistants* 25, no. 10 (2012): E54–57.

Jones, I. W., and R. S. Hooker. “Physician Assistants in Canada. Update on Health Policy Initiatives.” *Canadian Family Physician* 57, no. 3 (2011): e83–8.

Jung, H. W. “The Birth of Physician Assistants in Canada.” *Canadian Family Physician* 57, no. 3 (2011): 275–76.

Kahn, S. A., S. A. Davis, C. T. Banes, B. M. Dennis, A. K. May, and O. D. Gunter. “Impact of Advanced Practice Providers (Nurse Practitioners and Physician Assistants) on Surgical Residents’ Critical Care Experience.” *The Journal of Surgical Research* 199, no. 1 (2015): 7–12.

Kartha, A., J. D. Restuccia, J. F. Burgess Jr., J. Benzer, J. Glasgow, J. Hockenberry, D. C. Mohr, and P. J. Kaboli. “Nurse Practitioner and Physician Assistant Scope of Practice in 118 Acute Care Hospitals.” *Journal of Hospital Medicine* 9, no. 10 (2014): 615–20.

Kirch, D. “Physician Workforce Shortages: What Do the Data Really Say?” *Academic Medicine* 90, no. 12 (2015): 1581–82.

Kleinpell, R., N. Ward, L. Kelso, F. Mollenkopf Jr., and D. Houghton. “Provider to Patient Ratios for Nurse Practitioners and Physician Assistants in Critical Care Units.” *American Journal of Critical Care* 24, no. 3 (2015): e16–21.

Kreder, H., and T. Rumble. “Physician Assistants in Orthopaedic Practice in Canada: COA Discussion Paper.” National Standards Committee, Canadian Orthopaedic Association, 2006.

Kulatunga-Moruzi, C. *The Integration of the Inaugural Graduates of the McMaster University Physician Assistant Education Program Into Ontario’s Health Care System: A Survey of Employer Perceptions and Reflections*. Ontario Health Human Resources Research Network, 2011.

Lewis, S., A. Nicholson, A. F. Smith, and P. Alderson. “Physician Anaesthetists Versus Non-Physician Providers of Anaesthesia for Surgical Patients.” *Cochrane Database of Systematic Reviews* 11, no. 7 (2014).

Liaw, W. R., A. Jetty, S. M Petterson, L. E Peterson, and A. W. Bazemore. "Solo and Small Practices: A Vital, Diverse Part of Primary Care." *Annals of Family Medicine* 14, no. 1 (2016): 8–15.

Lichtenstein, B., D. Reuben, and A. Karlamangla. "Effect of Physician Delegation to Other Healthcare Providers on the Quality of Care for Geriatric Conditions." *Journal of the American Geriatrics Society* 63, no. 10 (2015): 2164–70.

Liebich, G. *Physician Assistants: Utilisation in the United States and Internationally—An Update*. Herston, AU: Centre for Military and Veterans Health, 2007.

Liu, H., M. Robbins, A. Mehrotra, D. Auerbach, B. E. Robinson, L. F Cromwell, and D. W. Roblin. "The Impact of Using Mid-Level Providers in Face-to-Face Primary Care on Health Care Utilization." *Medical Care*, July 2016. [Epub ahead of print.]

Macdonald, W. A. *Report on the Feasibility of Introducing Physician Assistants in New Brunswick*. Fredericton: Government of New Brunswick, 2009.

Magnus, B. "Foreign-Trained Doctors Dominate Pilot Project." *CMAJ* 178, no. 11 (2008): 1411.

Malish, R. G., G. L. Maxwell, R. Witters, L. Z. Macias-Moriarity, and R. L. Gelperin. "Perceptions of Frontline Providers on the Appropriate Qualifications for Battalion Level Care in United States Army Ground Maneuver Forces." *Military Medicine* 176, no. 12 (2011):1369–75.

Martin-Misener, R., and others. "Cost-Effectiveness of Nurse Practitioners in Primary and Specialised Ambulatory Care: Systematic Review." *BMJ Open* 5, no. 6 (2015): e007167.

Menchine, M. D., W. Wiechmann, and S. Rudkin. "Trends in Midlevel Provider Utilization in Emergency Departments From 1997 to 2006." *Academic Emergency Medicine* 16, no. 10 (2009): 963–69.

Mikhael, N., O. Ozon, and C. Rhule. *Defining the Physician Assistant Role in Ontario: Ontario Physician Assistant Scope of Practice Statement and Ontario Physician Assistant Competency Profile*. Toronto: HealthForceOntario, 2007.

Ministry of Health and Long-Term Care. "Funding Alternatives for Family Physicians." *2011 Annual Report of the Office of the Auditor General of Ontario*, Chapter 3, Section 3.06, 150–70.

Moote, M., C. Krsek, R. Kleinpell, and B. Todd. "Physician Assistant and Nurse Practitioner Utilization in Academic Medical Centers." *American Journal of Medical Quality* 26, no. 6 (2011): 452–60.

Moote, M., R. Nelson, R. Veltkamp, and D. Campbell. "Productivity Assessment of Physician Assistants and Nurse Practitioners in Oncology in an Academic Medical Center." *Journal of Oncology Practice* 8, no. 3 (2012): 167–72.

Moran, E. A., E. Basa, J. Gao, D. Woodmansee, P. L. Almanoff, and R. S. Hooker. "Factors Associated With Physician Assistant and Nurse Practitioner Productivity in the Veterans Health Administration." *Journal of the American Academy of Physician Assistants* 29, no. 7 (2016).

Morgan, P. A., N. D. Shah, J. S. Kaufman, and M. A. Albanese. "Impact of Physician Assistant Care on Office Visit Resource Use in the United States." *Health Services Research Journal* 43, no. 5, Part 2 (2008): 1906–22.

Nabagiez, J. P., M. A. Shariff, M. A. Khan, W. J. Molloy, and J. T. McGinn. "Physician Assistant Home Visit Program to Reduce Hospital Readmissions." *The Journal of Thoracic and Cardiovascular Surgery* 145, no. 1 (2013): 225–33.

Nabagiez, J. P., M. A. Shariff, W. J. Molloy, and others. "Cost Analysis of Physician Assistant Home Visit Program to Reduce Readmissions After Cardiac Surgery." *The Annals of Thoracic Surgery* (2016).

National Commission on Certification of Physician Assistants. 2014 *Statistical Report of Certified Physician Assistants: An Annual Report of the National Commission on the Certification of Physician Assistants*. Johns Creek, Georgia: NCCPA, 2015.

National Standards Committee of the Canadian Orthopaedic Association. *Report on Orthopaedic Clinical Assistants in Manitoba*. Winnipeg: COA, 2007.

New Brunswick Stakeholder Committee. *Report on the Feasibility of Introducing Physician Assistants to New Brunswick*. Fredericton: New Brunswick Department of Health, 2009.

O'Connor, T. M., and R. S. Hooker. "Extending Rural and Remote Medicine With a New Type of Health Worker: Physician Assistants." *Australian Journal of Rural Health* 15, no. 6 (2007): 346–51.

Ontario Health Human Resources Research Network. "Physician Assistants." *HFO Radius*, 9 (2012). [http://rorrhs-ohhrrm.ca/index.php?option=com\\_content&view=article&id=319%3A-issue-9-august-2012-physician-assistants-&catid=16%3Ahfo-radius&Itemid=30&lang=en](http://rorrhs-ohhrrm.ca/index.php?option=com_content&view=article&id=319%3A-issue-9-august-2012-physician-assistants-&catid=16%3Ahfo-radius&Itemid=30&lang=en) (accessed February 8, 2016).

Park, J. "Nurse Practitioner and Physician Assistant Staffing in the Patient-Centered Medical Homes in New York State." *Nursing Outlook* 63, no. 5 (2015): 593–600.

Park, M., D. Cherry, and S. L. Decker. *Nurse Practitioners, Certified Nurse Midwives, and Physician Assistants in Physician Offices*. NCHS Data Brief, no. 69. Atlanta: Centers for Disease Control and Prevention. 2011.

Parle, J., and J. Ennis. "Physician Associates: The Challenge Facing General Practice." *British Journal of General Practice* 65, no. 634 (2015): 224–25.

Peterson, L., B. Blackburn, S. Petterson, J. C. Puffer, A. Bazemore, and R. L. Phillips. "Which Family Physicians Work Routinely With Nurse Practitioners, Physician Assistants or Certified Nurse Midwives." *The Journal of Rural Health* 30, no. 3 (2014): 227–34.

Quella, A., D. M. Brock, and R. Hooker. "Physician Assistant Wages and Employment, 2000–2025." *American Academy of Physician Assistants* 28, no. 6 (2015): 56–58.

Ranzenbach, E. A., L. Poa, M. Puig-Palomar, M. Holtzman, S. Miller, and M. Mohr. "The Safety and Efficacy of Physician Assistants as First Assistant Surgeons in Cardiac Surgery." *Journal of the American Academy of Physician Assistants* 25, no. 8 (2012): 52.

Rayburn, W. F., and E. E. Tracy. "Changes in the Practice of Obstetrics and Gynecology." *Obstetrical and Gynecological Survey* 71, no. 1 (2016): 43–50.

Reddy, A., C. E. Pollack, D. A. Asch, A. Canamucio, and R. M. Werner. "The Effect of Primary Care Provider Turnover on Patient Experience of Care and Ambulatory Quality of Care." *JAMA Internal Medicine* 175, no. 7 (2015): 1157–62.

Riley, L., T. Litsch, and M. Cook. "Preparing the Next Generation of Health Care Providers: A Description and Comparison of Nurse Practitioner and Medical Student Tuition in 2015." *Journal of the American Association of Nurse Practitioners* 28, no. 1 (2016): 6–10.

Ross, N., J. Parle, P. Begg, and D. Kuhns. "The Case for the Physician Assistant." *Clinical Medicine* 12, no. 3 (2012): 200.

Salsberg, E. S. "Is the Physician Shortage Real? Implications for the Recommendations of the Institute of Medicine Committee on the Governance and Financing of Graduate Medical Education." *Academic Medicine* 90, no. 9 (2015): 1210–14.

Schäfer, W., M. Kroneman, W. Boerma, M. van den Berg, G. Westert, W. Devillé, and E. van Ginneken. "The Netherlands: Health System Review." *Health Systems in Transition* 12, no.1 (2010): 1–229.

Seo, B., T. S. Chauhan, and L. Buske. "The Results of the First Canadian National Physician Assistant Survey." *Journal of the American Academy of Physician Assistants* 24, no. 10 (2011): 63.

Sigurdson, L. *Meeting Challenges in the Delivery of Surgical Care: A Financial Analysis of the Role of Physician Assistants*. Halifax: Saint Mary's University, 2006.

Stonebridge, Carole. *Impact of Other Health Professionals: Discussion Paper*. Ottawa: The Conference Board of Canada, 2008.

Stonebridge, Carole, Greg Hermus, and Klaus Edenhoffer. *Future Care for Canadian Seniors: A Status Quo Forecast*. Ottawa: The Conference Board of Canada, 2015.

Taylor, M., W. Taylor, K. Burrows, J. Cunnington, A. Lombardi, and M. Liou. "Qualitative Study of Employment of Physician Assistants by Physicians: Benefits and Barriers in the Ontario Health Care System." *Canadian Family Physician* 59, no. 11 (2013): e507–13.

The Australasian College of Emergency Medicine and Australasian Society for Emergency Medicine. *Roles and Task Assignments*. Melbourne, AU: ACEM, 2011.

The Conference Board of Canada. *Federal Policy Action to Support the Health Care Needs of Canada's Aging Population*. Ottawa: CBoC, 2015.

Theunissen, B., S. Lardenoye, P. Hannemann, K. Gerritsen, P. Brink, and M. Poeze. "Fast Track by Physician Assistants Shortens Waiting and Turnaround Times of Trauma Patients in an Emergency Department." *European Journal of Trauma and Emergency Surgery* 40, no. 1 (2014): 87–91.

Tholl, B., and K. Grimes. *Strengthening Primary Health Care in Alberta Through Family Care Clinics: From Concept to Reality*. Edmonton: Alberta Health, 2012.

Timmermans, M. J. C., A. J. A. H. van Vught, M. Van den Berg, E. D. Ponfoort, F. Riemens, J. van Unen, T. Wobbes, M. Wensing, and M. G. H. Laurant. "Physician Assistants in Medical Ward Care: A Descriptive Study of the Situation in the Netherlands." *Journal of Evaluation in Clinical Practice* (2015).

van den Driesschen, Q., and F. de Roo. "Physician Assistants in the Netherlands: Commentary." *Journal of the American Academy of Physician Assistants* 27, no. 9 (2014).

van Vught, A. J., A. M. Hettinga, E. J. Denessen, M. J. Gerhardus, G. A. Bouwmans, G. T. van den Brink, and C. T. Postma. "Analysis of the Level of General Clinical Skills of Physician Assistant Students Using an Objective Structured Clinical Examination." *Journal of Evaluation in Clinical Practice* 21, no. 5 (2015): 971–75.

Vanstone, M., S. Boesveld, and K. Burrows. "Introducing Physician Assistants to Ontario." *Health Reform Observer—Observatoire des Réformes de Santé* 2, no. 1 (2014): Article 4.

Virani, S., T. Maddox, and P. Chan. "Provider Type and Quality of Outpatient Cardiovascular Disease Care: Insights From the NCDR PINNACLE Registry." *Journal of the American College of Cardiology* 66, no. 16 (2015): 1803–181.

Wai, E., D. Roffey, and S. Kingwell. *A Report Outlining the Value of a Physician Assistant in the Spine Program at TOH*. Ottawa: The Ottawa Hospital, 2013.

Wodchis, W., P. Austin, and D. Henry. "A 3-Year Study of High-Cost Users of Health Care." *Canadian Medical Association Journal* (January 2016), DOI: 10.1503.

Wong, S., and V. Farrally. *The Utilization of Nurse Practitioners and Physician Assistants: A Research Synthesis*. Prepared for the Michael Smith Foundation for Health Research. Vancouver: Centre for Health Services and Policy Research, University of British Columbia, 2013.

Young, A., H. Chaudhry, X. Pei, K. Halbesleben, D. H. Polk, and M. Dugan. "A Census of Actively Licensed Physicians in the United States, 2014." *Journal of Medical Regulation* 101, no. 2 (2015): 8.

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