Exploring the Impact of Physician Assistants on Orthopedic Surgery Service Efficiency: A Literature Review

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ABSTRACT

Introduction: Orthopedic surgery in Canada faces increasing patient volumes, long wait times, and a shortage of healthcare providers and resources. Physician Assistants (PAs) are increasingly becoming a consideration as a solution to improve healthcare delivery and surgical service efficiency, and continuity of care across the continuum of healthcare.

Objectives: This literature review aims to evaluate the impact of PAs on efficiency metrics within orthopedic surgery services and discover what metrics could be positively affected.

Methods: A comprehensive literature search was conducted using the University of Manitoba libraries, PubMed and MEDLINE Ovid databases. Inclusion criteria included peer-reviewed, published in English, within the past 25 years, and focus on physician assistants in the orthopedic surgery settings. Five studies – three Canadian and two American – met the criteria and were reviewed for common outcome themes.

Results: Across five studies, PAs were found to have a positive impact which could be categorized into five main common themes. Increased surgical throughput and reduced wait times, operating room efficiency and surgeon time optimization, postoperative care and length of stay reduction, cost-effectiveness and resource optimization, and high patient and provider satisfaction.

Conclusion: Physician assistants improve efficiency metrics such as surgical throughput, wait times, operating room efficiency, postoperative care, and provider/patient satisfaction, and provide a cost-effective solution to the challenges faced in orthopedic surgery in Canada. Future research should focus on Canadian multi-centre designs, and standardized outcome measures to further validate their impact.

INTRODUCTION

Orthopedic surgery is a demanding and resource-intensive subspecialty that plays a pivotal role in our healthcare system. Despite advancements in surgical techniques and technology, the field continues to face significant challenges, including increasing patient volumes from an aging population, complex surgical cases, workforce shortages, and prolonged wait times. These pressures strain healthcare systems, resulting in workflow inefficiencies, delayed interventions, and compromised patient outcomes. The growing need for orthopedic surgical care in Canada, coupled with physician shortages and rising operational demands, further highlights the need for innovative solutions to address these challenges.

Orthopedic surgery in Canada is currently facing significant challenges, notably prolonged wait times for procedures such as total hip and knee replacements, and other priority procedures such as elective spine surgery. In 2024 the median wait time between referral from a general practitioner to surgery was 30 weeks for all specialty procedures, a substantial 222% increase from 9.3 weeks in 1993, with a median of 57.7 weeks for orthopedic surgery specifically. (1) The COVID-19 pandemic has further strained the healthcare system, leading to surgical backlogs and extended delays due to the mass cancellation of elective procedures during the pandemic. These prolonged wait times can result in deteriorating patient health, reduced quality of life, and inevitable increased healthcare costs. (2) Addressing these challenges is crucial to improving patient outcomes and the overall efficiency of the healthcare system.

Although there have been multiple attempts in the past to improve access to Orthopedic surgical care for Canadians, such as benchmark wait time initiatives, funding for more surgical equipment, and central intake systems, there is still a significant strain on the healthcare system with the growing demands for orthopedic surgical care in Canada. (3) A promising strategy that

has been slowly making its way to the forefront of healthcare in Canada, is the integration of physician assistants (PAs) into healthcare teams, and in this case, orthopedic surgical teams. PAs are uniquely and highly trained healthcare professionals capable of supporting surgeons across the continuum of care, from preoperative optimization to intraoperative assistance, and postoperative management.

History and Role of Physician Assistants in Canada

The journey toward fully integrating physician assistants into Canada's healthcare system has been long and challenging. The first recorded civilian PAs in Canada were trained at the University of Alberta in 1983. However, these early practitioners resigned due to the lack of professional recognition. (4) In the 1980s, the Canadian Armed Forces established a training program that laid the foundation for the PA profession we recognize today. It was not until 1999 that civilian PAs were officially introduced and regulated within Manitoba's public healthcare system. (5) This marked a significant step toward national integration, with PAs now being recognized and regulated across all 10 provinces in 2024.

PAs in Canada are highly trained and academically qualified healthcare professionals who work under the supervision of physicians to provide a comprehensive range of medical services across various clinical settings. Their roles are designed to complement and extend physician services, thereby enhancing patient access to healthcare. The scope of practice for PAs is determined through a combination of formal education, clinical experience, geographic location and collaborative agreements with supervising physicians. The scope is dynamic and evolves as a PA gains proficiency and demonstrates competence in specific medical specialties. PAs are trained and authorized to conduct patient interviews; obtain health histories; perform

physical examinations and selected diagnostic and therapeutic interventions; order and interpret laboratory and imaging results; and provide consultations on preventative health care. (4)

By optimizing and streamlining the workflow of surgeons, PAs have the potential to reduce wait times, improve surgical throughput, and enhance overall efficiency in care delivery. While the effectiveness of PAs in improving efficiency and patient outcomes has been studied in other healthcare settings, their specific impact on orthopedic surgical workflow remains under-explored. This literature review seeks to highlight this critical gap by evaluating the minimally existing literature on how the integration of PAs into orthopedic surgical teams influence key efficiency metrics.

It is the hope that by synthesizing the current evidence of the existing literature from both Canada and the United States, this review will aid future researchers and provide actionable insight for policymakers, hospital administrators, and members of surgical teams, ultimately guiding workforce planning and resource allocation in this high-demand surgical setting. This study will contribute to the broader conversation about optimizing healthcare delivery, paving the way for a more effective and sustainable approach to orthopedic surgery and utilization of the physician assistant profession in Canada.

METHODS

To understand the impact of PAs on the workflow and efficiency of orthopedic surgery services, a literature review of published research was conducted. The review allowed for a broad search of the literature and identified the key themes that emerged regarding the target population (physician assistants) in a specific practice setting (orthopedic surgery).

Search Strategy

A comprehensive article search was completed using the University of Manitoba's library to find peer-reviewed articles through health databases including PubMed, and MEDLINE Ovid health database. The search included the key terms 'physician assistant,' 'physician associate,' 'physician extender,' 'midlevel practitioner,' 'orthopedics,' 'orthopaedics,' 'arthroplasty,' and 'surgery'. The MEDLINE search revealed 53 results, and the PubMed search revealed 247 results after appropriate filters were applied. One additional study was found using the University of Manitoba libraries College of Medicine collections.

The filters and criteria (Table 1) used to determine the suitability of research for inclusion were as follows: all published study designs in the English language, including orthopedic services, published within the past 25 years, and no location restrictions were used. Literature using "physician assistant" and other variations were used to define the target profession. Literature that encompassed both PAs and nurse practitioners that grouped them in a similar category of "midlevel providers" or "physician extenders" were only included if the provider type was explicitly stated and the PA data could be isolated and extracted. The articles were examined by one reviewer to identify common themes throughout the research by analyzing the data across the various included articles.

Of the 301 articles yielded in the initial search, 5 articles were determined to be suitable for analysis. Articles were excluded from analysis due to exclusion criteria such as profession or setting, not separating practitioner roles clearly, duplications, or inability to access full-text versions of the articles. A breakdown of each study can be found in Table 2.

RESULTS

Increased Surgical Throughput and Reduced Wait Times

A Canadian mixed-method study evaluating the role of a PA in an upper-extremity orthopedic program reported a 113% increase in new patient consultations over 24 months, expediting triage and improving access to care. (6) Similarly, in a retrospective study of a Canadian arthroplasty program, the addition of PAs in a double operating room model led to a 42% increase in hip and knee replacement surgeries, which in turn reduced median wait times from 44 weeks to 30 weeks from one year to the next. (7) Additionally, a retrospective chart review study in an American Level II trauma center further demonstrated that PA presence increased the orthopedic response time by 205 minutes (P=0.0006) and reduced time to surgery by 360 minutes (P=0.03) over one year, emphasizing their role in improving surgical efficiency in emergency settings. (8)

Operating Room Efficiency and Surgeon Time Optimization

In addition to enhancing surgical throughput via patient flow preoperatively, PAs contribute to greater operating room (OR) efficiency and surgeon time optimization. In the upper-extremity orthopedic surgical program, PA involvement in a double OR model saved two hours per surgical day and reduced the total time surgeons were in the OR by 20.6%, streamlining workflow, maximizing OR utilization and optimizing surgeon time. Although the overall time saved was net positive, it was found that preoperative setup time increased by 38.6% with the integration of the PA. (6) Similarly, in the Canadian arthroplasty program, the four surgeons saved an estimated 50 minutes per arthroplasty patient equating to 204 hours saved per surgeon annually due to PA involvement, enabling them to dedicate more time to clinical responsibilities, research, and administrative duties. (7) There were minimal improvements in

OR setup time of 0.43 minutes (P=0.03) but ultimately found no significant impact on OR efficiencies in the Level II trauma centre study. (8)

Postoperative Care and Length of Stay Reduction

Beyond the operating room, PAs significantly enhance postoperative care and reduce hospital length of stay (LOS). In a community orthopedic surgery service, a retrospective analysis revealed that integrating a PA resulted in a significant three-day reduction in LOS for total hip and knee arthroplasty patients from 8.2 to 5.2 days. (9) Similarly, a PA-led preoperative optimization program for total knee arthroplasty (TKA) demonstrated that the LOS of the non-optimized group (no PA involvement preoperatively) was 2.97 (± 2.04) days and the optimized group led by PA was only 1.27 (±1.10) days (P<0.001). Patients in the optimized group had zero readmissions or reoperations within 90 days, and only 1 emergency room (ER) visit in that time, compared to 2 readmissions and 2 ER visits within the first 30 days in the non-optimized cohort, followed by 3 additional readmissions, 5 more ED visits, and 5 reoperations in the 30-90 days after surgery. Complication rates were also significantly less for the optimized group at 6.7% when compared to the non-optimized group at 23.3% (P=0.004). (10) The 2016 study by Althausen et al. (8), further demonstrated that PA involvement led to a decrease in post-operative complication rates by 4.67% (P=0.0034), likely resulting from a significant increase in deep vein thrombosis (DVT) prophylaxis use by 6.73% (P=0.0084), and post-operative antibiotic administration by 2.88% (P=0.032). This study also demonstrated a decreased LOS by 0.61 days which was not statistically significant. Lastly, Hepp et al. (6) noted that PAs saw approximately 60%-70% of patients post-operatively and attended twice daily rounds for 5 different surgeons, and attended clinic once a week, where they could see patients for follow-up appointments post-operatively.

Cost Effectiveness and Resource Optimization

From a cost-effectiveness perspective, the inclusion of PAs in orthopedic surgery teams has been found to be cost-neutral or cost-saving. In the Canadian arthroplasty program, PA salaries were offset by their ability to replace general practitioners as surgical assistants, without increasing overall program expenses. (7) In a trauma center setting, indirect cost savings were substantial, from the 310 patients that PAs were involved with in the ER in 2007 and the resulting 175.7 minutes saved in ER time, PAs demonstrated cost savings of $41,394, along with increasing patient flow. It was also estimated that a possible total of $147,417 could have been saved if PAs were involved in the management of all 1104 patients in the study. (8) Additionally, the TKA preoperative optimization program demonstrated significant financial benefits, with primary hospital admission costs reduced by $4,086 per patient, and readmission-adjusted savings reaching $5,340 per patient (P=0.018), both being statistically significant. (10) Lastly, in the community orthopedic retrospective analysis, Smook (9) revealed that integrating a PA resulted in a three-day reduction in LOS for total hip and knee arthroplasty patients, leading to an estimated $1 million in annual hospital bed cost savings alone.

High Patient and Provider Satisfaction

Lastly, both patient and provider satisfaction with PA involvement was consistently high within the relevant studies. Patients surveyed from the upper-extremity program reported an average satisfaction score from 47 patients of 9.65/10, while provider surveys indicated improved team efficiency and reduced workload for surgeons with most item means being 4.0+ on a 5.0-point scale. (6) In keeping with the positive response to PA integration from patients and providers, 91.3% of hip replacement patients, and 87.7% of knee replacement patients reported positive experiences. Surgeons unanimously agreed (100%) that PAs improved their job

satisfaction and allowed them to safely increase their surgical volume, and one surgeon even commented that "the capabilities of PAs exceed that of a R5 resident." Healthcare staff, including 10 OR nurses and 22 ward nurses strongly supported the continued use of PAs in surgical teams, stating that they were necessary to run 2 ORs at once, and that they created a sense of 'team' on the ward. Although the consensus was mostly positive from staff, 40% of OR nurses and 32% of ward nurses agree that some tasks performed by PAs really should have fallen within the nursing scope. Additionally, the 6 surgical residents agreed that PAs reduced their workload, but only 50% agreed that PAs facilitated their learning and 30% felt they improved their OR experience. (7)

DISCUSSION

The physician assistant profession is relatively new, leaving a large landscape to expand and improve the profession to aid in the never-ending search for innovative ways to improve the medical field. This also means that historically there has been a lack of understanding or inquisition on the impact of the profession, and therefore, a lack of research. Due to its lack of familiarity and utilization, particularly in Canada, there is a large gap in the research done on the PA profession, and even more so in subspecialties such as orthopedic surgery. From the plethora of medical research done in the setting of orthopedic surgery, there were minimal studies that could be utilized in this literature review that were relevant to the research question: how the integration of PAs effects the efficiency of orthopedic surgical teams. This further highlights the need for more focused studies in this under-investigated setting.

Although the five studies that were examined in this review all used different methodologies, they all demonstrated that implementing PAs into an orthopedic surgical setting

led to some degree of positive impact. This literature review served to highlight the positive effects and demonstrate to healthcare providers and policy makers, the many benefits of having a PA as part of an orthopedic surgical team, including decreased wait times, increased surgical throughput, positive economic effects, and improved patient and provider satisfaction.

Increased Surgical Throughput and Reduced Wait Times

Prolonged wait times have been an ongoing challenge in the orthopedic surgical specialty. In 2018 and 2019 only 72% of patients received hip and knee replacements within the 26-week benchmark time, with some patients waiting over a year for surgery. (11) This is not including orthopedic procedures such as elective spinal procedures or shoulder arthroplasty, which do not currently have benchmark times, suggesting that there is little accountability or incentive to decrease wait times to surgery. As of 2010, low back pain was the leading cause of disability (12), and hip and knee osteoarthritis were the 11th highest contributor to disability worldwide (13). The high incidence of these conditions highlights that prolonged wait times do have detrimental effects on patients' quality of life and could lead to long-term sequelae of their condition, and suboptimal post-operative outcomes.

The integration of PAs into orthopedic surgical teams has been shown to significantly improve surgical throughput and therefore reduce wait times. The studies in this review demonstrated, with the integration of PAs, an impressive increase of patient consultations (6), an almost doubling in the amount of hip and knee surgeries performed during the study period and dramatically decreased median wait times by ~14 weeks (7). During clinic consultation days, PAs were able to see as many patients as the surgeons did, allowing surgeons to focus on more complex cases. PAs managed routine follow-ups and triaged patients effectively, further optimizing surgeon availability, and allowing patients with urgent conditions to receive

expedited care. This could be useful to potentially double the number of patients seen in a week or allow for fewer clinic days, increasing time spent in the operating room for surgeons, and ultimately lessening the burden of disease and suffering of patients.

Operating Room Efficiency and Surgeon Time Optimization

Another area in which PAs were shown to be of positive impact was in the operating room, demonstrating significant benefits of optimizing surgeon efficiency and OR resource utilization. In both the upper extremity program study (6) and the Canadian arthroplasty study (7), the double OR model with PA involvement resulted in a net gain of two hours per surgical day and an annual savings of 204 hours per surgeon, respectively. By assisting with surgical preparation, positioning, intraoperative assistance, such as closing the surgical site while the surgeon is in the other OR, along with postoperative management, PAs allow surgeons to focus on complex surgical tasks, while maintaining a high surgical output and ultimately allowed more time for other tasks such as clinical responsibilities, research, and administrative duties. Although there were discrepancies found in the OR setup times, the overall efficiency gains outweighed these differences and may be explained by the skill level and number of years of practice, particularly in a surgical specialty of the PAs in the study. Even with the small direct improvements in OR setup time, the ability of a PA to offload tasks from surgeons remains an asset and these positive findings reinforce the importance of integrating PAs into orthopedic surgical teams to improve productivity, reduce surgeon burnout, and enhance overall healthcare efficiency.

It is important to note that the double operating room model used in 2 of these studies is not standard practice nationally across Canada, as many facilities do not have the resources to support this system, making these findings difficult to apply to other institutions at face value.

Despite this, these findings may still be applied to a single OR model, but on a lesser scale. For example, freeing up time between cases for surgeons to review the next case, or to do administrative work. It is also important to note that the minimal efficiency changes in the trauma centre study (8) may not be as directly comparable, as the nature of emergency surgery varies greatly from that of elective procedures, and this was an American-based study, which may differ in the PA role and the way the OR functions. This further highlights the need for more recent Canadian-based research on PAs in orthopedic surgery.

Postoperative Care and Length of Stay Reduction

PAs and their role in postoperative care presents both significant benefits and potential challenges. Studies consistently demonstrate that PA involvement leads to reduce length of stay, fewer complications, and therefore improved patient outcomes. By optimizing postoperative management, PAs contribute to better adherence to protocols, such as DVT prophylaxis and antibiotic administration (8), directly impacting patient safety. Additionally, their ability to conduct rounds, sometimes multiple times a day, manage follow-ups, and provide continuity of care reduces readmissions and emergency department visits. (6,10) PAs play a significant role on the surgical ward, without them, surgeons or residents would be required to take additional time away from clinic and the OR to round on patients, ultimately having a downstream effect on surgical volumes and wait times.

Although the positive impacts of PAs on postoperative care are evident, there may be some drawbacks and other factors to consider. While PAs improve efficiency, their integration requires appropriate training, supervision, and support which may not always be feasible in a resource limited setting. Additionally, once comfortable, increased responsibilities may be shifted onto the PA, away from surgeons and residents, potentially leading to concerns in

complex patient cases, and may be out of the scope of practice of PAs, depending on their individual experience and which province they are practicing in. The scope of practice of PAs in Canada changes drastically from hospital to hospital, clinical settings, and even under different physician supervision. This leaves large variation in the abilities and responsibilities of PAs, which could limit their impact in certain environments, making it difficult to apply the findings of these studies generally. Despite this, the PA in Hepp et al. study (6) was unable to give verbal or written orders without the co-signature of a supervising physician and still was able to make a significant impact on postoperative care, demonstrating that as the physician assistant profession grows so will the role and impact of the PAs. Although there are challenges, like in any profession, the evidence overwhelmingly supports that PAs can play a crucial role in enhancing surgical care.

Cost Effectiveness and Resource Optimization

The initial financial impact of adding PAs into orthopedic surgery teams seems to boast positive net financial gains, but before we can draw any conclusions on the matter, there are multiple factors that must be accounted for. In this exploration of the literature, PAs were shown to contribute to cost savings by reducing hospital length of stay, improving efficiency in emergency and perioperative care, and decreasing readmission rates. Additionally, their ability to replace general practitioners (GPs) as surgical assistants ensures that their salaries are offset without adding overall healthcare expenditures. This role substitution not only frees GPs from operating room duties but also enables them to continue with their clinical responsibilities in the community, an especially valuable benefit given the widespread shortage of family physicians across Canada. (14) As a result, the integration of PAs may indirectly support improved access and continuity of care in primary care settings.

However, there are important variables to consider, while PA integration may have demonstrated cost neutrality and savings, this did not account for the initial training and supervision that is required when onboarding a new PA, which can be substantially costly. Two of the five studies in this review were based in the United States in which they have a multi-payer system, whereas the other three were based in Canada which operates under a single-payer system, where the government funds essential healthcare services. These two systems differ dramatically, so it is important to factor in hospital and physician funding models and regulatory limitations when analyzing the potential benefits of having PAs in orthopedic surgery, as this could affect PA utilization, billing, salaries, etc. It is also important to note that the estimated $1 million cost savings were just that - an estimate - and there was no comprehensive financial analysis performed. Despite these considerations, the overall evidence suggests that when implemented effectively, PAs provide both financial and clinical benefits that could justify their position in orthopedic surgery.

High Patient and Provider Satisfaction

The high level of patient and provider satisfaction with PA integration shown in this review highlight the positive impact these midlevel providers have on surgical efficiency, team dynamics, and patient-centered care. With both patient and provider satisfaction from the survey performed by Hepp et al. (6) and Bohm et al. (7), it is evident that PAs can reduce surgeon and resident workload, improve job satisfaction, and enable increased surgical volumes. Nurses recognized the value of PAs maintaining workflow efficiency and fostering a sense of teamwork. Although the overall response was positive there were some role conflicts with the nurses, which could be easily mitigated with clear scope delineations to ensure optimal role utilization. Additionally, many of the surgical residents did not particularly feel that physician assistants

facilitated their learning, which could have been due to the lack of physical presence of PAs in the OR during their training period.

It is important to note, the studies used subjective survey data for practitioner and patient opinions, which could be subject to bias and limits objective outcome measures. Despite these limitations, the integration of PAs in orthopedic surgical settings demonstrated overwhelmingly positive feedback from the healthcare teams and patients, underscoring the valuable role PAs play in orthopedic surgical teams on efficiency, team dynamics, and patient-centered care.

There were multiple common limitations of note among the five studies. A key limitation in this review were the single-centre designs, which restricts the generalizability of the study's findings. By focusing on individual institutions and single practitioners, these studies fail to capture the variability in healthcare infrastructure, PA role utilization, and resource allocation across different hospitals, provinces, and healthcare systems. The impact of PAs on surgical efficiency and patient outcomes may differ significantly. For example, in rural versus urban settings or teaching versus non-teaching hospitals, as there are stark differences in resources and staffing such as presence of residents, learners, and nurses in these settings. In that regard, it is important to consider that not all institutions have the capacity to implement a double operating room model as resources such as staffing and OR availability may be limited. The study designs also did not allow for large sample sizes and only implemented 1-2 PAs in the study period, even further limiting applicability and generalizability.

Another common limitation is the reliance on retrospective data collection and self-reporting survey-based methodologies, which may introduce selection bias and limit accuracy of results, as they are inherently subjective and may over or underestimate the true impact of the

PA. Similarly, the lack of long-term follow-up data in most studies limits the ability to assess sustained benefits or drawbacks of PAs over time.

The studies also failed to consider the PAs experience, training, and scope of practice, with some studies noting discrepancies in efficiency metrics based on PA experience levels, which suggest that the findings may not be directly and widely applicable to all PA roles in orthopedic surgery and make direct comparisons difficult.

CONCLUSION

This literature review used five studies to highlight the significant benefit of integrating PAs into orthopedic surgical teams. The evidence demonstrates that PAs enhance surgical throughput, reduce wait times, optimize surgeon time, and improve operating room efficiency. Additionally, their involvement in postoperative care reduces hospital length of stay and lowers complication rates. Financially, PAs contribute to cost savings by decreasing readmissions and improving resource utilization. High levels of patient and provider satisfaction reinforce the value of PAs in surgical teams. However, challenges including role confusion among nurses, and lack of educational benefits to surgical residents did arise. The studies also have limitations, including single-centre designs, small sample sizes, retrospective methodologies, and lack of long-term follow-up.

Despite some challenges and limitations, the findings in this review strongly support the integration of PAs in the preoperative, intra-operative, and post-operative settings as a valuable, economically favourable solution to improving efficiency, access, and quality of care in orthopedic surgery. Future research should be based in Canadian healthcare facilities and should focus on multi-centre investigations with standardized methodologies, realistic and obtainable

implementation variables, and formal economic analysis to further support the positive impact that physician assistants have on orthopedic surgery teams.

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FIGURES & TABLES

Table 1. Inclusion & Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Articles published in the last 25 years	Articles outside of the 25-year publication window
English language only	Articles published in other languages that were inaccessible in English language
Studies focused on Physician Assistants (PAs) in orthopedic surgery settings	Studies not involving PAs or where PA-specific data could not be isolated
All study designs accepted – preferred were all forms of primary research (randomized controlled trials, prospective/retrospective studies, cohort studies)	Studies grouping PAs and NPs without distinguishing between them
No restrictions on study location	Duplicate studies or studies where full text was inaccessible

Table 2. Study Breakdowns

Study	Country/Setting	Study Design	Independent Variable	Dependent Variables / Outcomes	Study Population
Hepp et al. (2017)	Canada – Upper-extremity orthopedic program	Mixed-methods, retrospective	Integration of PA in surgical workflow	Surgical throughput, OR efficiency, surgeon time, patient & provider satisfaction	5 surgeons, 1 PA, 28 healthcare providers and 47 patients surveyed
Bohm et al. (2010)	Canada – Arthroplasty program	Retrospective cohort study	PA participation in double OR model	Volume of surgeries, surgeon time saved, wait time, staff feedback, resident learning	4 surgeons, PAs (unknown quantity), 34 nurses, 6 orthopedic residents, 25 patients
Althausen et al. (2013)	USA – Level II trauma center	Retrospective cohort study	Employment of PAs in trauma orthopedic care	Surgical response time, time to surgery, LOS, DVT prophylaxis, complications, cost savings	2 PAs, 1104 orthopedic trauma patients – PA present in care of 310 patients
Smook, T. (2015)	Canada – Community Orthopedics	Retrospective chart review	PA integration in inpatient care	Length of stay, hospital cost savings	120 Hip/knee arthroplasty patients – 45 in the 6 moths pre- PA, 75 in the 12 months post-PA hiring
Olsen et al. (2023)	USA – Total Knee Arthroplasty pre-op optimization program	Retrospective cohort study	PA-led preoperative optimization	Length of stay, complications, readmissions (30 & 90 days), ED visits, hospital costs	45 TKA patients – optimized (PA, n=15) vs non-optimized (no PA= 30)

Table 3. Results Summary

Themes	**Study 1: Upper-Extremity Program (6)**	**Study 2: Canadian Arthroplasty Program (7)**	**Study 3: Level II Trauma System (8)**	**Study 4: Community Orthopedics (9)**	**Study 5: TKA Preoperative Optimization (10)**
Increased Surgical Throughput and Reduced Wait Times	113% increase in new patient consultations over two years, improving triage and access to care.	42% increase in hip and knee replacements, reducing median wait times from 44 weeks to 30 weeks.	205-minute faster orthopedic response time (P = 0.0006) and 360-minute improvement in time to surgery (P = 0.03).	Not directly measured.	Not directly measured.
Operating Room Efficiency and Surgeon Time Optimization	Saved two hours per day of surgeon time in OR (20.6%) in a double OR model, allowing more procedures per day.	204 hours of surgeon time saved annually, allowing for more research and clinical duties.	Minimal improvement in OR setup time (0.43-minute reduction, P = 0.03), but no significant impact on total OR efficiency.	Not directly measured.	Not directly measured.
Postoperative Care and Length of Stay Reduction	PAs attended rounds on 5 surgeons' patients, improving follow-up care and relieving workload for surgeons.	Not directly measured.	LOS decreased by 0.61 days (not statistically significant). DVT prophylaxis rates increased by 6.73% (P=0.0084), postoperative antibiotic administration improved by 2.88% (P=0.0302) Post-op complications decreased by 4.67% (P=0.0034)	Reduced LOS by 3 days per patient (from 8.2 to 5.2 days)	Reduced LOS from 2.97 days to 1.27 days (P < 0.001), and zero readmissions in optimized patients compared to 5 in non-optimized group.
Cost Effectiveness and Resource Optimization	Not directly measured.	Cost-neutral impact—PA salaries replaced GP assistants without increasing costs.	Indirect savings in ER time ($41,394) and OR setup costs ($3,207) led to significant financial benefits.	Estimated that one PA had the potential to save the hospital ~$1,000,000 in bed costs alone.	Hospital costs reduced from $19,814 to $15,728 per patient (P = 0.049), with additional readmission-adjusted savings of $5,340 per patient (P = 0.018).

High Patient and Provider Satisfaction	Patients rated PA care highly (9.65/10), and providers reported improved workflow and efficiency.	91.3% of hip replacement and 87.7% of knee replacement patients had positive experiences with PA. All healthcare workers surveyed agreed that PAs had a positive impact on orthopedic team efficiency.	Not Measured	Not Measured	Not measured

REFERENCES

1. Fraser Institute. *Waiting your turn: wait times for health care in Canada, 2024 report* [Internet]. Vancouver, BC: Fraser Institute; 2024 [cited 2025 Mar 4]. Available from: https://www.fraserinstitute.org/studies/waiting-your-turn-wait-times-for-health-care-in-canada-2024
2. Canadian Institute for Health Information. *More surgeries being done, but wait times are still long* [Internet]. Ottawa, ON: CIHI; 2024 [cited 2025 Mar 4]. Available from: https://www.cihi.ca/en/taking-the-pulse-measuring-shared-priorities-for-canadian-health-care-2024/health-workforce-and-surgeries/more-surgeries-being-done-but-wait-times-are-still
3. Amar C, Pomey MP, SanMartin C, De Coster C, Noseworthy T. Sustainability: orthopedic surgery wait time management strategies. *Int J Health Care Qual Assur*. 2015;28(4):320–331. doi:10.1108/IJHCQA-11-2013-0131
4. Jones IW. Where are Canada's PAs in 2023? *JAAPA*. 2023;36(6):1–6. doi:10.1097/01.JAA.0000923588.97421.cf
5. Canadian Association of Physician Assistants. *History* [Internet]. Ottawa, ON: CAPA; [cited 2025 Mar 1]. Available from: https://capa-acam.ca/pa-profession/history
6. Hepp SL, Suter E, Nagy D, Knorren T, Bergman JW. Utilizing the physician assistant role: case study in an upper-extremity orthopedic surgical program. *Can J Surg*. 2017;60(2):115–121. doi:10.1503/cjs.002716
7. Bohm ER, Dunbar M, Pitman D, Rhule C. Experience with physician assistants in a Canadian arthroplasty program. *Can J Surg*. 2010;53(2):103–108.
8. Althausen PL, Shannon S, Owens B, et al. Impact of hospital-employed physician assistants on a level II community-based orthopaedic trauma system. *J Orthop Trauma*. 2013;27(4):e87-e91. doi:10.1097/BOT.0b013e3182647f29
9. Smook T. *Physician assistants making a difference: a retrospective study on discharge times in community orthopedics* [Internet]. Winnipeg, MB: University of Manitoba; 2015 [cited 2025 Apr 1]. Available from: https://mspace.lib.umanitoba.ca/server/api/core/bitstreams/97847d46-b976-4fb9-8e1d-b66886ec242b/content
10. Olsen AS, Giunta NM, Jamison MP, Chen AF, Fitz W, Iorio R. A total knee arthroplasty preoperative optimization program managed by an advanced practice provider (Physician Assistant) decreases complications and cost: A pilot study. *J Arthroplasty*. 2023;38(6S):S77-S80. doi:10.1016/j.arth.2023.03.064
11. Canadian Institute for Health Information. *Joint replacement wait times* [Internet]. Ottawa, ON: CIHI; 2020 [cited 2025 Mar 25]. Available from: https://yourhealthsystem.cihi.ca/hsp/inbrief?lang=en#!/indicators/004/joint-replacement-wait-times/;mapC1;mapLevel2;/
12. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, et al. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis*. 2014;73(6):968–74. doi:10.1136/annrheumdis-2013-204428
13. Cross M, Smith E, Hoy D, Nolte S, Ackerman I, Fransen M, et al. The global burden of hip and knee osteoarthritis: estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis*. 2014;73(7):1323–30. doi:10.1136/annrheumdis-2013-204763

14. Li K, Frumkin A, Bi WG, Magrill J, Newton C. Biopsy of Canada's family physician shortage. *Fam Med Community Health*. 2023;11(2):e002236. doi:10.1136/fmch-2023-002236