

# Predictors of high-performing family medicine clinics

## Prospective cohort study in Alberta

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### Abstract

**Objective** To identify potential risk and protective factors associated with family medicine (FM) and general practitioner (GP) group performance.

**Design** Prospective cohort study of FM and GP clinics in Alberta, using a Group Practice Review (GPR) framework.

**Setting** FM and GP clinics operating in Alberta between 2017 and 2019.

**Participants** Seventy randomly selected FM and GP clinics.

**Interventions** Clinics were observed and assessed as part of the GPR. Group performance was assessed based on compliance with applicable College of Physicians & Surgeons of Alberta (CPSA) standards of practice (SOPs). Data on physicians' demographic characteristics, practice characteristics, chart scores, and prescribing information were collected from CPSA databases and self-reports.

**Main outcome measures** Predictors of high-performing clinics, defined as meeting 90% or more of applicable SOPs, were identified using logistic regression.

**Results** Four key predictors of group performance (SOP compliance) were identified: prescribing practices, number of workdays per week, number of physicians, and chart scores. Clinics with higher rates of risky prescribing and heavier workloads were less likely to comply with SOPs, while clinics with more physicians and higher chart scores were more likely to be classified as high performing.

**Conclusion** This study is among the first to examine predictors of group performance in FM and GP group practices. Findings highlight the importance of monitoring prescribing behaviour, workload, and chart scores at the clinic level to support physicians and protect patients.

# Facteurs prédictifs d'un rendement élevé dans les cliniques de médecine familiale

## Étude prospective de cohortes en Alberta

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### Résumé

**Objectif** Cerner les facteurs potentiels de risque et de protection associés au rendement des groupes de médecine familiale (MF) et de praticiens généraux (PG).

**Type d'étude** Une étude prospective de cohortes sur les cliniques de MF et de PG en Alberta, au moyen des paramètres d'une revue des pratiques de groupe (RPG).

**Contexte** Des cliniques de MF et de PG actives en Alberta entre 2017 et 2019.

**Participants** Soixante-dix cliniques de MF et de PG choisies de manière aléatoire.

**Interventions** Les cliniques ont été observées et évaluées dans le contexte d'une RPG. Le rendement du groupe était mesuré en fonction de la conformité aux normes de pratique (NDP) applicables du College of Physicians & Surgeons of Alberta (CPSA). Les données sur les caractéristiques démographiques des médecins, les particularités des pratiques, les notes accordées aux dossiers et les renseignements sur les prescriptions ont été recueillies à même les bases de données du CPSA et à partir des auto-évaluations.

**Principaux paramètres à l'étude** Les facteurs prédictifs de cliniques à rendement élevé, définies comme se conformant à 90 % ou plus des NDP applicables, ont été identifiés au moyen d'une régression logistique.

**Résultats** Quatre facteurs prédictifs clés du rendement de groupe (conformité aux NDP) ont été cernés : les pratiques en matière de prescriptions, le nombre de jours de travail par semaine, le nombre de médecins et les scores accordés à l'évaluation. Les cliniques où les taux de prescriptions risquées étaient plus élevés et les charges de travail, plus lourdes, étaient moins susceptibles de se conformer aux NDP, tandis qu'il était plus probable que les cliniques comptant plus de médecins et ayant des scores plus élevés à l'évaluation étaient plus susceptibles d'être classées comme ayant un rendement élevé.

**Conclusion** Cette étude compte parmi les premières à examiner les facteurs prédictifs du rendement de groupe dans les cliniques de MF et de PG. Les constatations révèlent l'importance de surveiller les comportements en matière de prescriptions, la charge de travail et la cote des dossiers à l'échelle de la clinique pour appuyer les médecins et protéger les patients.

New models of primary care delivery and organizational structures for family doctors have been increasingly promoted in recent decades. These models emphasize collaboration among health care professionals and the formation of partnerships between family doctors (also referred to as general practitioners [GPs]).<sup>1</sup> While solo (or independent) practice remains common, group practice is becoming more prevalent.<sup>2-4</sup>

Group practice has been hypothesized to foster a supportive work environment, potentially improving physician well-being and patient care,<sup>3</sup> while solo practice has been associated with greater performance risks.<sup>5,6</sup> Although group practice structures vary, common features include shared equipment and personnel, extended hours of clinic operation, and collaborative decision making.<sup>7,8</sup> Despite these apparent advantages, it remains unclear whether group practices improve patient care. Some evidence suggests that physicians in group settings report higher job satisfaction, which may, in turn, contribute to better performance and outcomes.<sup>1</sup> Recent national data indicate that group- and team-based care models have continued to expand, with workforce pressures and system reforms after 2020 accelerating this trend.<sup>9,10</sup> Multiprofessional group practices in Canada, Europe, and the United States have also been associated with improved care coordination, enhanced quality, and reduced professional isolation.<sup>3,11</sup>

In Alberta, the College of Physicians & Surgeons of Alberta (CPSA), the province's medical regulatory body, oversees physician performance and quality of care. According to CPSA licence renewal data, approximately 56% of family doctors reported working in group practices (internal data from the CPSA, 2019). Recognizing the need to support the quality of care in these settings, CPSA piloted the Group Practice Review (GPR), a cost-effective, evidence-based framework designed to evaluate and improve family medicine (FM) and GPs' clinical practice. The pilot study, conducted with 8 volunteer FM clinics, demonstrated that using the GPR to assess performance at the clinic level was feasible, well-received, and effective at identifying system-level opportunities for improvement.<sup>12</sup> However, the small scope of the pilot study limited its ability to examine predictors of performance across clinics.

The pilot study also underscored the need for further research to assess the applicability of the GPR across a broader range of clinics and to examine the factors that influence performance.<sup>12</sup> This study applied the Cambridge Model, which differentiates between physician competence and performance by recognizing the external influences that shape real-world practice.<sup>13</sup> This perspective helps clarify how group practice structures can affect individual physician and overall clinic performance.

Building on the pilot study, this study applied the GPR framework to a larger, randomly selected sample of clinics in Alberta to examine potential risk and protective

factors associated with FM and GP clinic performance, defined as compliance with CPSA standards of practice (SOPs). These standards reflect both professional and clinical expectations of care, and provide a regulatory measure of group-level quality rather than a direct assessment of clinical competence.

## — Methods —

### Study design

This study employed a prospective cohort design from 2017 to 2019. Ethical approval was obtained from the University of Alberta Health Research Ethics Board (Pro00065137).

### Clinic selection

*Group practice* was defined as 2 or more physicians, working in the same practice, who share responsibility for administrative processes or resources and who can provide cross-coverage for each other's patients.<sup>14</sup> Based on this definition, 70 FM and GP clinics in Alberta were randomly selected according to the operational capacity of the CPSA Continuing Competence department. All participating physicians were registered with CPSA and subject to the *Health Professions Act*, which mandates CPSA to assess physician competence and performance.<sup>15</sup>

Clinics were selected using a simple random sampling method. A list of eligible FM and GP clinics was generated based on the study's inclusion and exclusion criteria, and participating clinics were selected using a random number generator in Microsoft Excel. No stratification by clinic type or other characteristics was used.

All active family medicine clinics in Alberta that met the group practice criteria during the study period were included. Clinics were excluded if they were not community-based; included physicians specializing in other branches of medicine; or included at least 1 physician who had participated in the GPR pilot<sup>12</sup> or was engaged in other CPSA undertakings such as a professional conduct investigation.

### Independent variables

Data collected from CPSA sources included physicians' demographic characteristics and practice and performance metrics.

**Physician and practice characteristics.** Demographic characteristics, certification, years in practice, number of patients, and workdays per week were obtained from self-reported CPSA registration data. Because some GPs practise without Certification in the College of Family Physicians of Canada (CCFP), variation in certification status is reflected in this variable.

**Compliance with standards of practice.** SOPs represent the minimum requirements physicians must meet to be considered competent.<sup>16</sup> The SOP implementation

review assessed compliance with multiple CPSA standards during a structured on-site evaluation that included observation of the clinic environment and reviews of clinic policies and legislated privacy documents. The assessed domains were documentation and record management, prescribing, infection prevention and control, patient access and continuity of care, and professional responsibilities. While these criteria reflect regulatory standards encompassing required professional and ethical practices, several also assessed clinical and operational dimensions of care. Therefore, SOP compliance was used as a proxy for overall group performance, reflecting both clinical and professional quality rather than direct clinical competence. Details of the CPSA SOP domains and representative criteria are shown in Supplemental Table 1, available from **CFPlus\***. Compliance was quantified using the SOP implementation tool, which calculated the percentage of applicable SOPs met by each clinic.

**Chart scores.** Chart reviews were conducted by CPSA nurses who were independent of the participating clinics and trained in the GPR protocol. Each reviewer completed standardized training and used a predefined checklist to ensure consistency across all clinics. Using predefined criteria, and without evaluating clinical reasoning, the reviewers evaluated the quality of the documentation in 10 patient charts in each clinic. The

reviews assessed patient identification, emergency contacts, medications, allergies, medical and social history, health maintenance plans, and the dates of the most recent updates. Each element was rated as *met*, *partially met*, or *not met*, and the final chart score was calculated as the percentage of applicable criteria met.

**Complaint data.** Complaint data were sourced from the CPSA complaints database, and the average number of complaints per registration year was calculated for each group practice.

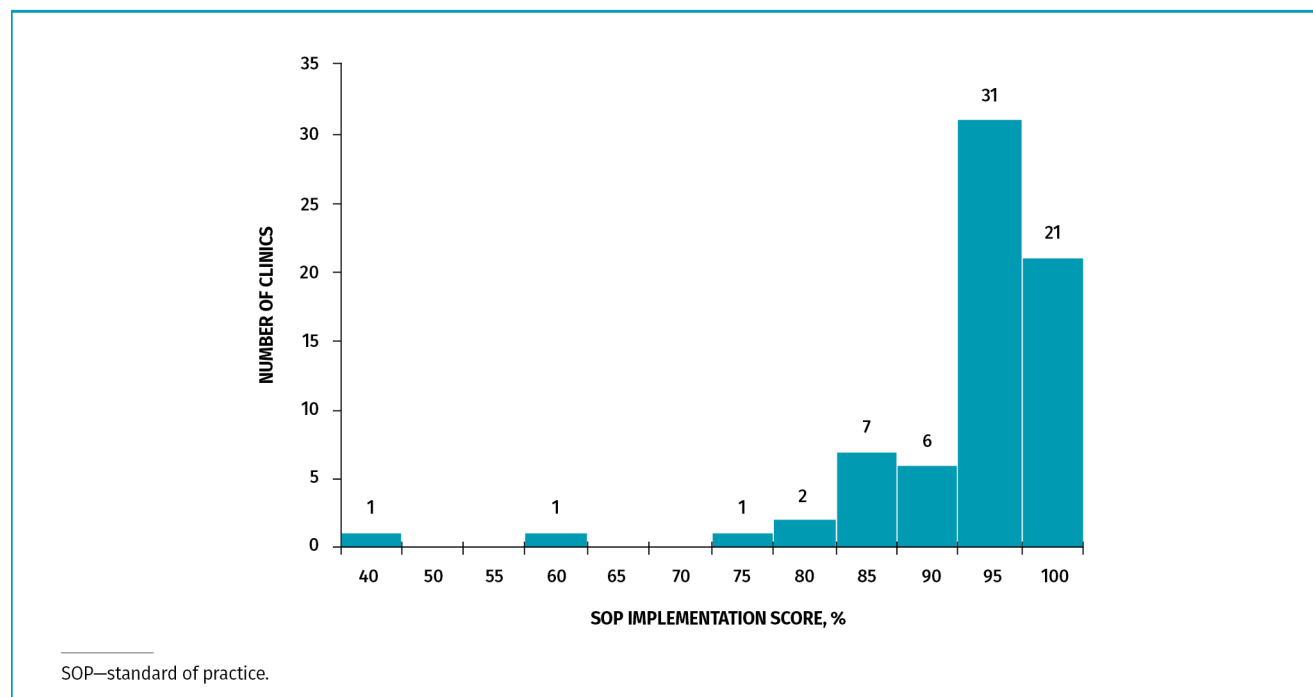
**Prescribing data.** Prescribing data were obtained from Alberta's Pharmaceutical Information Network, which tracks all the filled prescriptions issued by physicians and records medication details and dosages. CPSA has real-time access to these data in order to monitor prescribing practices. Prescribing flags included the number of patients prescribed potentially harmful doses of opioids ( $\geq 90$  mg oral morphine equivalents per day<sup>17</sup>) and of benzodiazepines ( $\geq 3$  times the defined daily dose of benzodiazepines<sup>18,19</sup>).

### Dependent variables

The primary outcome was the SOP implementation score, which represents the percentage of applicable SOPs a clinic had met. Clinics with scores of 90% or higher were classified as higher performing, while those with scores less than this threshold of 90% were lower performing. **Figure 1**, which depicts the distribution of SOP implementation scores across the participating

\*Supplementary Table 1 is available from <https://www.cfp.ca>. Go to the full text of the article online and click on the **CFPlus** tab.

**Figure 1.** Distribution of standard of practice implementation scores among family medicine and general practitioner clinics participating in the Group Practice Review:  $N=70$ .



## — Results —

clinics, shows a visible cutoff around 90% that serves as the natural breakpoint in the data distribution. A sensitivity analysis was conducted to assess the stability of this threshold, examining whether findings remained consistent with cutoffs between 80% and 100%.

**Statistical analysis.** Analyses were conducted using R version 3.6.1. Descriptive statistics were used to summarize demographic characteristics, SOP implementation scores, and performance measures. Logistic regression was used to assess the associations between SOP implementation score categories (acceptable versus unacceptable) and predictors of group performance. The model was refined using forward and backward selection techniques. Model assumptions were tested, and model selection was based on the Akaike information criterion to ensure optimal fit and parsimony. A beta regression model was used to confirm the robustness of the findings, with continuous SOP implementation score as the outcome.

Overall, 70 clinics, comprising 594 physicians, participated in the GPR from 2017 to 2019. On average, 57% of physicians held a CCFP designation, and approximately 2% worked exclusively as locums. Demographic and practice characteristics are presented in **Table 1**.

Data collected from the participating clinics revealed factors influencing group performance. Given the small sample size (n=70), 3-factor models were the most parsimonious. The 2 best group performance models are shown in **Table 2**. The factors these 2 models have in common are potentially risky prescribing of benzodiazepines (a risk factor) and larger clinic size (a protective factor). A third factor, either better chart scores (a protective factor) or the increasing number of workdays per week (a risk factor), differed between the models.

Sensitivity analysis confirmed that SOP implementation scores (ie, sign and effect of correlation as well as the risk or protective direction of the covariates)

**Table 1. Physician demographic and practice characteristics of family medicine and general practitioner clinics participating in the Group Practice Review: N=70.**

VARIABLE	MEAN (SD)	RANGE
Time in operation, y	23.9 (16.9)	0-66
Total number of physicians in clinic (all)	8.5 (4.4)	3-24
Number of full-time physicians in clinic	5.1 (3.4)	0-19
Average age of physicians in clinic, y	48.4 (5.6)	38.2-69.5
Proportion of male physicians in clinic, %	57.0 (24.4)	0-100
Average number of workdays per week	4.8 (0.5)	3.7-6.0
Average number of complaints per physician per registration year	0.075 (0.061)	0-0.255
Average number of patients prescribed ≥3 DDD* per year	2.07 (1.68)	0-6.75
Average number of patients prescribed ≥90 mg OME per day per year	0.94 (1.11)	0-6.20
SOP implementation scores, %	91.18 (9.32)	42.86-100
Chart scores, %	73.36 (18.59)	19.12-100

DDD—defined daily dose, OME—oral morphine equivalent, SOP—standard of practice.  
\*The average number of patients prescribed ≥3 times the DDD of a benzodiazepine drug per year.

**Table 2. Odds ratios and 95% confidence intervals for group performance factors of clinics participating in the Group Practice Review**

MODEL	FACTOR	ODDS RATIO (95% CI)	RISK (-) OR PROTECTIVE (+)	P VALUE
Model 1	DDD*	0.517 (0.324-0.825)	-	.0056
	Number of full-time physicians in clinic	1.679 (1.178-2.393)	+	.0042
	Number of workdays per week	0.135 (0.028-0.643)	-	.0121
Model 2	DDD*	0.600 (0.404-0.890)	-	.0110
	Total number of physicians in clinic	1.368 (1.031-1.817)	+	.0300
	Chart score	1.032 (0.996-1.069)	+	.0850

CI—confidence interval, DDD—defined daily dose.  
\*The number of patients receiving ≥3 times the DDD of a benzodiazepine drug.

remained stable if the cutoff point was between 80% and 95%. Beta regression analysis further confirmed the importance of chart scores, clearly demonstrating improved prediction by the models that included this factor versus those that did not.

## — Discussion —

The GPR identified 4 potential predictors of FM and GP clinic performance, defined as compliance with the CPSA's SOPs. These standards apply to both professional and clinical domains, and offer a regulatory perspective of group performance that complements traditional measures of clinical competence. The risk and protective factors associated with clinic performance were prescribing practices, the number of workdays per week, the number of practising physicians, and chart scores. The colinear variables highlight the importance of the underlying concepts or themes being measured. Given the small sample size, comparability across the top models makes selecting a single best model arbitrary. These findings align with evidence after 2020 showing system-level factors such as workload, coordination, and team composition to be key determinants of clinic performance and physician well-being.<sup>9,10</sup>

### Prescribing practices

Many patients on high doses of benzodiazepines was identified as a risk factor. Studies have shown that physicians often maintain consistent prescribing patterns across different drug categories.<sup>20,21</sup> However, most of these studies examined overall prescribing volume rather than dose intensity. In addition, there is limited direct evidence linking prescribing of high doses of benzodiazepines to prescribing patterns at the broader clinic level. This paucity of dose-specific research highlights a gap in the literature and the need for research exploring how high-risk prescribing behaviour develops in group practices where physicians share patient care responsibilities and prescribing norms. Qualitative evidence indicates that local norms and peer behaviour can shape prescribing decisions in clinical teams and reinforce group-level patterns that either support or undermine safe practices.<sup>6,22,23</sup> Emerging regulatory and safety literature emphasizes the importance of monitoring prescribing culture within clinical teams, rather than focusing solely on individual prescribers.<sup>22,24</sup>

While previous studies have compared group and solo practices,<sup>20,21</sup> this study examined variations within group practices. That some clinics consistently engage in risky prescribing indicates being in a group practice does not automatically safeguard against potentially harmful behaviour. Although group settings generally foster better adherence to guidelines, some still develop permissive prescribing norms. This underscores the importance of monitoring multiple prescribing metrics.

If a clinic is flagged for risky prescribing (eg, over-prescribing benzodiazepines), a closer look at other prescribing behaviour may be warranted. The risky prescribing patterns of 1 physician may be perpetuated across the group when physicians cover care of each other's patients and share care responsibilities.<sup>6</sup> Alternatively, within-group comparisons may obscure broader benchmarks, resulting in clinics with high prescribing patterns underestimating their risk levels.

These findings reveal the complex dynamics of prescribing behaviour in group practices. Future research could examine how prescribing patterns relate to group size.

### Number of workdays per week

Another risk factor was the number of days per week physicians worked. Studies have consistently shown that higher patient volumes and heavier workloads increase the risk of poor performance at an individual level.<sup>5,25,26</sup> Our findings suggest that this workload-related risk may also affect performance at the group level. When most of the physicians in a clinic have heavy workloads, the group's overall capacity for peer collaboration, review, and quality improvement may be reduced, increasing the likelihood of systemic lapses. This aligns with the Cambridge Model, which emphasizes that contextual or system-level factors influence performance by affecting individual competence and the quality of care.<sup>13</sup>

### Chart scores

A novel and important predictor of performance was chart scores, which reflect the quality of medical record keeping. Good record keeping may also indicate stronger internal processes or healthier within-group culture. While the literature on individual physicians' chart reviews has been mixed, experiential evidence from Canadian physician-assessors supports the value of chart reviews in assessing individual physician performance.<sup>6</sup> The predictive strength of chart scores in this study suggests that the quality of documentation may be a meaningful indicator of overall group performance.

### Number of physicians in the clinic

Both the number of full-time physicians (model 1, **Table 2**) and the total number of physicians (model 2, **Table 2**) were associated with higher SOP implementation scores, which may reflect the distribution of responsibilities in larger teams. These findings suggest that team-based environments can help buffer performance concerns. The Commonwealth Fund's 2022 International Health Policy Survey of Primary Care Physicians identified several key challenges physicians face, including heavy workloads, fragmented care, and limited health information systems.<sup>27</sup> These issues are particularly pressing in primary care, where effective coordination among professionals is essential. The survey also found that group practices are more likely than solo practices

to employ additional staff (52% versus 34%), thus potentially improving the coordination of care and reducing physician workload.<sup>27</sup>

These results underscore the potential benefits of group-based models for supporting physician well-being and enhancing the quality of care. Previous studies have shown that multiprofessional group practices can improve physician income and the quality of care.<sup>3,11</sup> Together, these findings emphasize the importance of evaluating and improving group-level performance as part of comprehensive system and workforce planning in primary care.


## Limitations

As group-based models become increasingly prevalent in health care delivery, evaluating performance at the group level is essential. This study enhances our understanding of how group dynamics can influence physician performance. However, this study also has limitations. While SOP compliance indicates broad regulatory and operational quality, all the aspects of clinical competence may not be captured. Factors such as patient population characteristics, socioeconomic status, and clinic location can also influence prescribing patterns and overall performance. Such contextual data were not available for this study.

Another limitation is the use of self-reported data, which are inherently biased.<sup>28</sup> In addition, the study was limited to 70 FM and GP clinics in Alberta, so the findings may not be generalizable to other regions or jurisdictions.

Further examination of group practices, through chart reviews or site visits, could help identify actionable initiatives. These may include financial or nonfinancial incentives, resource allocation, and quality improvement initiatives. Examining high-performing groups could also help identify best practices, enabling a reduction in data collection requirements and greater efficiency in allocation of resources.<sup>24</sup>

## Conclusion

This study is one of the first to identify predictors of group performance in primary care clinics. As group practices become more common, it is important that medical regulators understand the implications. Clinics with potentially harmful prescribing practices or that operated on more workdays per week were less likely to comply with the CPSA SOPs. In contrast, practice groups with more physicians and higher chart scores were more likely to comply with the SOPs. These results highlight the importance of assessing performance beyond the individual level and suggest that targeted group-level interventions may help improve the quality of care. Future research could focus on replicating these findings in larger, more diverse samples; exploring causal relationships; and developing practical tools for the early identification and support of at-risk clinics. 

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### Contributors

All authors contributed to conceptualizing and designing the study; to collecting, analyzing, and interpreting the data; and to preparing the manuscript for submission.

### Competing interests

All authors report employment with the College of Physicians & Surgeons of Alberta.

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