Computer use in primary care practices in Canada

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Abstract

Objective To examine the use of computers in primary care practices.

Design The international Quality and Cost of Primary Care study was conducted in Canada in 2013 and 2014 using a descriptive cross-sectional survey method to collect data from practices across Canada. Participating practices filled out several surveys, one of them being the Family Physician Survey, from which this study collected its data.

Setting All 10 Canadian provinces.

Participants A total of 788 family physicians.

Main outcome measures A computer use scale measured the extent to which family physicians integrated computers into their practices, with higher scores indicating a greater integration of computer use in practice. Analyses included *t* tests and χ^2 tests comparing new and traditional models of primary care on measures of computer use and electronic health record (EHR) use, as well as descriptive statistics.

Results Nearly all (97.5%) physicians reported using a computer in their practices, with moderately high computer use scale scores (mean [SD] score of 5.97 [2.96] out of 9), and many (65.7%) reported using EHRs. Physicians with practices operating under new models of primary care reported incorporating computers into their practices to a greater extent (mean [SD] score of 6.55 [2.64]) than physicians operating under traditional models did (mean [SD] score of 5.33 [3.15]; $t_{726.60}=5.84$; $P<.001$; Cohen $d=0.42$, 95% CI 0.808 to 1.627) and were more likely to report using EHRs (73.8% vs 56.7%; $\chi^2_1=25.43$; $P<.001$; odds ratio=2.15). Overall, there was a statistically significant variability in computer use across provinces.

Conclusion Most family physicians in Canada have incorporated computers into their practices for administrative and scholarly activities; however, EHRs have not been adopted consistently across the country. Physicians with practices operating under the new, more collaborative models of primary care use computers more comprehensively and are more likely to use EHRs than those in practices operating under traditional models of primary care.

EDITOR'S KEY POINTS

- Using data from the Quality and Cost of Primary Care study, this study examined the use of computers in Canadian primary care practices. Results showed that physicians most often used computers to make appointments, search for medical information on the Internet, and store test results.
- Use of electronic health records is inconsistent across the country. Family physicians who practised within new models of primary care were more likely to report using electronic health records (73.8%) than family physicians who practised within traditional models of care (56.7%).
- Using computers to send prescriptions to pharmacies (ie, electronic prescribing) varies greatly among provinces, but overall the uptake of this practice is low in Canada.

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L'utilisation de l'ordinateur dans les cliniques de soins primaires au Canada

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Résumé

Objectif Vérifier l'utilisation qu'on fait de l'ordinateur dans les cliniques de soins primaires.

Type d'étude L'étude *Quality and Costs of Primary Care* a été effectuée en 2013 et 2014 à l'aide d'enquêtes descriptives transversales dans le but de recueillir des données sur la pratique médicale au Canada. Les cliniques participantes ont répondu à plusieurs de ces enquêtes, notamment au Sondage national des médecins; ce sont les données de cette étude que nous avons utilisées.

Contexte Les 10 provinces du Canada.

Participants Un total de 788 médecins de famille.

Principaux paramètres à l'étude On a utilisé une échelle d'utilisation de l'ordinateur pour déterminer à quel point les médecins de famille utilisaient l'ordinateur dans leur pratique, les scores élevés indiquant une meilleure intégration de cet outil dans leur pratique. Les analyses incluaient des tests de t et de χ^2 pour savoir si l'utilisation de modèles nouveaux ou traditionnels pour les soins primaires avaient une influence sur l'adoption du dossier électronique de santé (DES); des statistiques descriptives ont aussi été utilisées.

Résultats Presque tous les médecins (97,5 %) ont déclaré se servir de l'ordinateur dans leur pratique, avec des scores modérément élevés (score moyen [DS] de 5,97 [2,96] sur 9) tandis que plusieurs (65,7 %) mentionnaient l'utiliser pour le DES. D'après leurs déclarations, les médecins exerçant dans des cliniques utilisant les nouveaux modèles de soins primaires étaient de plus grands utilisateurs de l'ordinateur que ceux qui travaillaient selon le modèle traditionnel (score moyen [DS] de 6,55 [2,64] contre 5,33 [3,15]; $t_{726,60}$=5.,84; P<,001; d de Cohen =0,42, IC à 95% 0,808 à 1,627); ils étaient aussi plus susceptibles de dire qu'ils utilisaient le DES (73,8% contre 56,7%; χ^2_1=25,43; P<,001; rapport de cotes=2,15). On notait aussi que l'utilisation de l'ordinateur varie de façon significative entre les provinces.

Conclusion Au Canada, la plupart des médecins de famille ont intégré l'ordinateur à leur pratique pour des activités d'ordre administratif ou pour de la formation; toutefois, cet outil n'a pas été adopté de manière égale partout dans le pays. Les médecins qui exercent selon de nouveaux modèles de soins primaires, davantage axés sur la collaboration, utilisent l'ordinateur de façon plus globale et sont plus susceptibles d'utiliser les DES que ceux qui fonctionnent selon des modèles traditionnels de soins primaires.

POINTS DE REPÈRE DU RÉDACTEUR

- À l'aide des données de l'étude *Quality and Costs of Primary Care*, nous avons examiné l'utilisation qu'on fait de l'ordinateur dans les cliniques de soins primaires au Canada. Les résultats indiquent que la plupart des médecins se servent souvent de l'ordinateur pour fixer des rendez-vous, pour obtenir des renseignements d'ordre médical dans Internet et pour conserver les résultats d'examens.
- L'utilisation du dossier électronique de santé est toutefois variable au pays. Les médecins de famille qui utilisent les nouveaux modèles de soins primaires étaient plus susceptibles de s'en servir (73,8 %) par rapport à ceux qui utilisent les modèles traditionnels (56,7 %).
- L'utilisation de l'ordinateur pour faire parvenir les ordonnances aux pharmacies (autrement dit les ordonnances par voie électronique) varie beaucoup selon les provinces, mais cette pratique est plutôt rare au Canada.

Cet article a fait l'objet d'une révision par des pairs.
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Computers are used in primary care offices for a variety of reasons, including writing prescriptions, referrals, billing, scheduling tests and appointments, and electronic record keeping.[1,2] The use of computers can help organize medical information and facilitate communication between providers.[3] Integrating computers into primary care practice also has clinical implications, as it influences the patient-physician relationship and can have a positive effect on clinical outcomes.[1,4]

One important way that computers are being used in primary care is to keep electronic health records (EHRs) or electronic medical records. Although the terms *electronic health records* and *electronic medical records* are not the same by definition,* in practice they are conflated and used interchangeably throughout the literature.[2,5] Electronic health records have been shown to have a positive effect on structural practice issues and health care processes such as coordination of care, communication, and care for patients with complex needs; however, the effect of EHR use on clinical outcomes is less clear and the debate is ongoing.[1,3,4,6-10]

Recent research suggests that the model of care also affects patients and physicians, including patient access to care, physician satisfaction, and the patient-physician relationship.[4,11-13] Primary care is the most important entry point into the health care system in Canada, and is the first step for many when obtaining clinical services.[14] To ensure that primary care is functioning well and providing necessary care, substantial revisions have been made to primary care delivery models in Canada in recent years.[15,16] Some provinces have supported new primary care practice models that are based on integrating physicians and other health care providers to work collaboratively to provide more comprehensive care.[16,17] Traditional models of care, on the other hand, tend to be less team-oriented and more solo practices, and often use a fee-for-service payment model.[18] Although research reveals that new models of primary care have some advantages, such as greater patient involvement and physician job satisfaction, these new models of care have not been adopted evenly across provinces. (Detailed descriptions of new and traditional models of care by province have been published previously.[11,19,20]) Health care delivery models differ considerably between the provinces because health care in Canada falls under provincial jurisdiction, not federal, and some provinces support new primary care practice models more vigorously than others do.[17,21]

As there is a lack of research on how differing models of primary care practice incorporate computer use, the relationship between computer use and models of care is investigated in this study. Given the focus on collaboration and integration in new models of care, it was expected that physicians in new-model practices would be more likely to integrate computers in order to facilitate communication with other providers.

The objective of this study was to examine the use of computers in Canadian primary care practices using the data set from the Quality and Cost of Primary Care (QUALICOPC) study. Three research questions were posed: How do Canadian family physicians use computers in their practices? To what extent do Canadian family physicians in different provinces use EHRs in their practices? and Does computer use differ between physicians who operate their practices under new models of primary care and those who operate under traditional models of primary care?

METHODS

The QUALICOPC study is a cross-sectional international study conducted in 34 countries, including Canada.[22-24] For this study, only Canadian data were used, and because health care in Canada is under provincial jurisdiction, data analysis focused on comparisons between provinces. This project was approved by the research ethics boards at each provincial lead's institution.[24] Detailed information on how this study was conducted across Canada can be found elsewhere.[24] In brief, the QUALICOPC study used 4 surveys to assess quality, cost, and equity in primary health care systems: the Patient Value Survey, the Patient Experience Survey, the Practice Survey, and the Family Physician Survey (FPS). This study was conducted using data from the FPS, which consisted of 69 items investigating physicians' professional activities, patient populations, and practice issues.

Participants

Invitations to participate in this project were sent to physicians in 10 Canadian provinces.[24] Participants were physicians working in family or general practice, with participation limited to 1 physician per practice (for detailed recruitment information, see Wong et al).[24] Participating physicians filled out the FPS and received $200 in compensation. Although 792 physicians completed the survey, some were dropped owing to the amount of missing data, and 1 physician did not report his or her computer use and was excluded from these analyses. The final sample comprised 788 physicians (391 female, 397 male), ranging in age from 21 to 85 years (mean [SD] age of 49.04 [11.03]). Owing to its small population, Prince Edward Island's data were combined with New Brunswick's data.

Measures

Computer use. The FPS included 1 question asking physicians how they used computers in their practices

*In this article, it is referred to as an *electronic health record* to remain consistent with the survey terminology.

(FPS Q47); the question presented 9 purposes for computer use: make appointments, issue invoices, issue drug prescriptions, send prescriptions to the pharmacy, send referral letters to medical specialists, keep consultation records, store diagnostic test results, search medical information on the Internet, and maintain and use EHRs. There was also a 10th option available for physicians to indicate that they did not use a computer. We created a computer use scale (CUS) to measure the extent of physicians' integration of computers.† To calculate computer use scores, we assigned a value of 1 for each computer use purpose selected (excluding the item indicating no computer use) and a value of 0 for each item not selected, and then summed the values to produce the final computer use score. Scores on this aggregated scale ranged from 0 (not using a computer in the practice at all) to 9 (using a computer in the practice for all the purposes listed). The CUS demonstrated excellent internal consistency (Cronbach $\alpha = .89$). Finally, 1 of the FPS Q47 items identified whether EHRs were used in the physician's practice; therefore, this item was used to specifically examine EHR use.

Model of care. A single dichotomous (yes or no) question was used to assess the model of care in which the practice operated (FPS Q5): "Is your clinic part of a new model of primary health care benefiting from special funding or part of a governmental led reform?" Previous research using the QUALICOPC data set defined *new* and *traditional* models of primary care in Canada. Although there are variations in how new and traditional models are implemented, new models tend to be collaborative and use capitation payment, whereas traditional models are more likely to be solo, fee-for-service practices.[11]

RESULTS

Sample characteristics

The provincial response rates for completion of the surveys ranged between 57% and 84% (for detailed methodology and recruitment, see Wong et al).[24] Participating physicians were distributed among 5 types of population centres (eg, urban, small town), and approximately half of them reported that their practices operated under a new model of primary care. Practice characteristics are summarized in **Table 1**.

Use of computers and EHRs

Computer use. Most physicians reported using computers in their practices (97.5%). Among physicians who reported using computers in their practices, scores on the CUS were moderately high (mean [SD] score of 5.97 [2.96] out of 9), indicating the extent of the integration of computers into the primary care practice. Physicians in New Brunswick and Prince Edward Island, Newfoundland, and Quebec reported the least comprehensive computer use in their practices as compared with family physicians in the rest of Canada. Mean computer use scores for each province are presented in **Table 2**. For some activities, such as making appointments, use was similar among most of the provinces. However, for some other activities, such as issuing drug prescriptions, use ranged from as low as 29.3% to as high as 90.2% (**Table 3**).[25]

Table 1. Sample characteristics: *N = 788.*

DESCRIPTIVE VARIABLES	N (%)*
Practice location	
• Large city centre	235 (30.1)
• Small town	153 (19.6)
• Rural area	152 (19.5)
• Suburbs	133 (17.1)
• Urban-rural mix	107 (13.7)
Primary care model	
• New	416 (52.8)
• Traditional	372 (47.2)
Survey language	
• English	577 (73.2)
• French	211 (26.8)
Canadian-born physician	559 (71.5)

*Denominators vary owing to missing data.

Table 2. Mean (SD) computer use scale scores, by province and all of Canada

PRACTICE LOCATION*	MEAN (SD) SCORE†	NO. OF FAMILY PHYSICIANS
British Columbia	7.20 (2.41)	59
Alberta	7.23 (2.45)	115
Saskatchewan	6.50 (3.15)	20
Manitoba	7.51 (2.22)	41
Ontario	7.63 (2.02)	184
Quebec	3.95 (2.53)	215
New Brunswick and Prince Edward Island	3.91 (2.74)	54
Nova Scotia	6.36 (3.20)	59
Newfoundland and Labrador	4.20 (2.44)	41
Canada	5.97 (2.96)	788

*Data collected from the Family Physician Survey (Q47) from the Quality and Cost of Primary Care study.
†Computer use was scored on a scale from 0 to 9, with 9 indicating complete integration of computer use.

†This was a scale constructed from available survey items and as such it has not been validated.

Table 3. Proportion of physicians in primary care practices who use computers for various actions

	PHYSICIANS, %									
COMPUTER USE*	BC	AB	SK	MB	ON	QC	NB AND PE	NS	NL	CANADA
Making appointments	93.2	90.4	85.0	90.2	95.7	72.6	64.8	83.1	51.2	82.5
Issuing invoices	81.4	83.5	85.0	68.3	78.3	20.0	40.7	67.8	46.3	58.0
Issuing drug prescriptions	84.7	83.5	65.0	90.2	87.5	50.7	29.6	69.5	29.3	67.9
Sending prescriptions to the pharmacy†	39.0	38.3	60.0	58.5	57.6	13.5	13.0	45.8	4.9	34.8
Sending referral letters to medical specialists	81.4	78.3	60.0	85.4	83.7	27.4	44.4	72.9	48.8	61.5
Keeping records of consultations	84.7	84.3	65.0	85.4	90.2	40.0	31.5	71.2	46.3	66.6
Storing diagnostic test results	83.1	86.1	65.0	90.2	89.1	48.8	40.7	74.6	46.3	70.1
Searching medical information on the Internet	94.9	93.9	95.0	95.1	92.9	83.3	92.6	83.1	92.7	90.0
Maintaining and using electronic health records	78.0	84.3	70.0	87.8	87.5	39.1	33.3	67.8	53.7	65.7
I do not use a computer	0.0	1.7	0.0	2.4	0.5	5.1	1.9	6.8	0.0	2.5

AB—Alberta, BC—British Columbia, MB—Manitoba, NB—New Brunswick, NL—Newfoundland and Labrador, NS—Nova Scotia, ON—Ontario, PE—Prince Edward Island, QC—Quebec, SK—Saskatchewan.

*Data collected from the Family Physician Survey (Q47) from the Quality and Cost of Primary Care study.

†This is considered to be electronic prescribing, as discussed by Clark.[25]

Use of EHRs. More than half (65.7%) of physicians reported using EHRs in their practices, ranging from 87.8% in Manitoba to 33.3% in New Brunswick and Prince Edward Island.

Computer use by model of care. Independent sample *t* tests revealed a statistically significant difference between physicians who operated under new models of primary care and those who operated under traditional models of care, with physicians working in new models (mean [SD] score of 6.55 [2.64]) scoring higher on the CUS than physicians working in a traditional model (mean [SD] score of 5.33 [3.15]); $t_{726.60}$=5.84; P<.001; Cohen d=0.42, 95% CI 0.808 to 1.627).

Use of EHRs by model of care. A χ^2 test of independence revealed a statistically significant difference between the new and the traditional models of primary care regarding EHR use, with physicians working in a new model being more likely to report using EHRs than physicians working in a traditional model (73.8% vs 56.7%; χ^2_1=25.43; P<.001; odds ratio=2.15).

DISCUSSION

Computer use in physicians' offices has increased over the past decade.[26] Although there are variations in the purposes for which computers are used, this study shows that almost all primary care practices use computers. Results show that Canadian physicians most often use computers to make appointments, search for medical information on the Internet, and store test results. The use of electronic prescribing is low in Canada, with roughly 1 in every 3 practices engaging in this form of prescribing. Rates of electronic prescribing vary in countries that have similar health care systems to Canada, such as Australia.[27] Electronic prescribing in Australia is around the same level as in Canada, whereas it is common practice in the Netherlands, with 94% of family physician practices participating.[25]

The literature suggests EHRs are generally seen as positive additions to a physician's office; however, only about 65% of our sample reported using computers to maintain EHRs. This is less than in Australia and much less than in the Netherlands where almost all practices use EHRs.[25] Physicians in New Zealand and the United Kingdom have also adopted computer use to a greater extent than those in Canada.[28] Findings regarding EHR use are consistent with previous research indicating that some provinces have implemented EHRs in family medicine practices to a greater extent than others.[29] Provinces in eastern Canada, with the exception of Nova Scotia, lag behind the rest of the country in EHR use. In New Brunswick and Prince Edward Island, less than one-third of the participating family physicians reported using EHRs. One important barrier to EHR adoption is the cost of purchasing the system and entering existing patient charts, which might obstruct EHR use in economically disadvantaged regions of Canada.[29,30] In this study, practices in New Brunswick had the least comprehensive use of computers and the lowest uptake

of EHRs in Canada. Previous research indicates that New Brunswick also lags behind the rest of the country in terms of coordination of care.[31] Given the link between computer use and communication, using computers more comprehensively and adopting EHRs might help facilitate coordination of care by improving communication and information sharing between providers.[3] Therefore, it is no surprise that physicians practising under new models of care use computers to a greater extent and have a higher uptake of EHRs than those operating under old models. New models of care are more focused on collaboration among physicians and other allied health professionals, and as a result might include specific funding for tools such as EHRs that facilitate information sharing.[16,17] Some provinces are working to increase EHR use. For example, the New Brunswick Medical Society is now actively trying to introduce EHRs in practices.[32]

Limitations

The QUALICOPC survey is a cross-sectional survey with voluntary participation, which might create bias in the sample. The response rate was better in some provinces than in others, but even so was low in all provinces, limiting the generalizability of the results. In addition, the CUS was created from the available survey items and was therefore not validated.

Conclusion

Computer use in primary care practices is almost universal, but there is some variability across Canada in terms of how extensively computers are used. In addition, the use of EHRs is inconsistent across the country. Physicians operating their practices under a new, more collaborative model of primary care use computers more comprehensively than physicians whose practices operate under traditional models of primary care, which tend to be solo, fee-for-services practices. New-model practices are also more likely to have adopted EHRs than traditional practices are. As Canada's approach to primary care continues to move toward integrating care providers to provide more collaborative care, it is likely that physicians will continue to enjoy the advantages computer technology provides. Future research should continue to explore the benefits of increased computer integration, especially EHRs, in primary care practices.

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Contributors

All authors contributed to the concept and design of the study; data analysis and interpretation; and preparing the manuscript for submission.

Competing interests

None declared

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