Using administrative data to explore potentially aberrant provision of virtual care during COVID-19: a retrospective cohort study of Ontario provincial data

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Abstract

Background: The COVID-19 pandemic has led to a rapid increase in virtual care utilization across the globe. Many healthcare systems have responded, by creating virtual care billing codes that allow physicians to see their patients over telephone or video. This rapid liberalization of billing requirements, both in Canada and other countries, has led to concerns about potential abuse, but empirical data are limited.

Objective: The objectives of this study were to examine whether there were substantial changes in physicians' ambulatory visit volumes coinciding with the liberalization of virtual care billing rules and to describe the characteristics of physicians who significantly increased their ambulatory visit volumes during this period. We also sought to describe the relationship between visit volume changes in 2020 and the volumes of virtual care use in individual physicians and across specialties.

Methods: We conducted a population-based, retrospective cohort study using health administrative data from the Ontario Health Insurance Plan (OHIP), which was linked to the ICES Physician Database (IPDB). We identified a unique cohort of providers based on physicians' billings and calculated the ratio of total ambulatory visits (in-person and virtual) over January-June, 2020 (virtual predominating) relative to that over January-June, 2019 (in-person predominating) for each physician. Based on these ratios, we then stratified physicians into four groups: low, same, high and very high use physicians. We then calculated various demographic and practice characteristics of physicians in each group.

Results: Among 28,383 eligible physicians in 2020, the mean ratio of ambulatory visits in January-June 2020: 2019 was 0.99, SD=2.53 (median 0.81; IQR 0.59-1.0). Only 2,672 physicians (9.4% of all physicians) fell into the high user group and only 291 (1.0% of physicians) fell into the very high users group. High user physicians were younger, more recent graduates, more likely female, and less likely to be international graduates. They also had on average lower volume practices. There was a significant positive correlation between percent virtual care and the 2020:2019 ratio only in the group of physicians who maintained their practice (R=0.35, p<.001). There was also a significant positive correlation between the 2020:2019 ratio and the percent virtual care per specialty (R=0.59, p<.01).

Conclusions: During the early stages of the pandemic, the introduction of virtual care did not lead to significant increases in visit volume. Our results provide reassuring evidence that relaxation of billing requirements early in the COVID-19 pandemic in Ontario were not associated with widespread and aberrant billing behaviors. Furthermore, the strong relationship between the ability to maintain practice volumes and the use of virtual care suggest that the introduction of virtual care allowed continued access to care for patients.

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Abstract

Background:

The COVID-19 pandemic has led to a rapid increase in virtual care utilization across the globe. Many healthcare systems have responded, by creating virtual care billing codes that allow physicians to see their patients over telephone or video. This rapid liberalization of billing requirements, both in Canada and other countries, has led to concerns about potential abuse, but empirical data are limited.

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During the early stages of the pandemic, the introduction of virtual care did not lead to significant increases in visit volume. Our results provide reassuring evidence that relaxation of billing requirements early in the COVID-19 pandemic in Ontario were not associated with widespread and aberrant billing behaviors. Furthermore, the strong relationship between the ability to maintain practice volumes and the use of virtual care suggest that the introduction of virtual care allowed continued access to care for patients.

Introduction

The COVID-19 pandemic has led to a rapid increase in virtual care utilization across the globe[1-5]. In Ontario, Canada's largest province, virtual care increased from 1.6% of all ambulatory visits pre-COVID to 71% during the first wave of the COVID-19 pandemic[3], a much higher rate compared to those reported in other countries such as the US (30%) and Australia (42%)[4,6,7].

While Ontario had pre-existing virtual care billing codes before the onset of the pandemic, these codes were allowable for a single government run online platform and only available to specialists and primary care physicians in rostered patient practices or specialized practices. Primary care physicians outside rostered practices were not included in this model, in order to support continuity of care[8] and respond to growing concerns about fragmentation and poor quality of care received in virtual walk-in clinics, and funding disruptions in Canada[9] and abroad[10].

In Ontario, the pandemic led to the introduction of temporary billing codes in mid-March, 2020 that reimbursed any physician identical amounts for in-person, video, or telephone visits and eliminated prior restrictions on practice type or allowable technology platforms. This rapid liberalization of billing requirements, both in Canada and other countries[4], has led to concerns about potential abuse, but empirical data are limited[11].

The objectives of this study were to examine whether there were substantial changes in physicians' ambulatory visit volumes coinciding with the liberalization of virtual care billing rules and to describe the characteristics of physicians who significantly increased their ambulatory visit volumes during this period. We also sought to describe the relationship between visit volume changes in 2020 and the volumes of virtual care use in individual physicians and across specialties.

Methods

We conducted a population-based, retrospective cohort study using health administrative data from the Ontario Health Insurance Plan (OHIP), which was linked to the ICES Physician Database (IPDB). Datasets were linked using unique encoded identifiers and analyzed at ICES, an independent, non-profit research institute. Use of these databases for the purposes of this study was authorized under §45 of Ontario's Personal Health Information Protection Act, which does not require review by a research ethics board. A Research Ethics Board (REB) exemption letter was obtained by Woman's College Hospital REB.

We identified a unique cohort of providers based on physicians' billings for ambulatory visits (in-person and virtual). We excluded visits for non-Ontario residents and those with an invalid or missing health card number. We also excluded all physicians with clinical volumes that were inconsistent with an active practice during the pre-COVID period (< 10 ambulatory visits during January-June 2019).

We then calculated the ratio of total ambulatory visits (in-person and virtual) over January-June, 2020 (virtual predominating) relative to that over January-June, 2019 (in-person predominating) for each physician. We included first quarter data in 2020 as it covers the beginning of the pandemic. Data extending past the second quarter of 2020 was unavailable. Based on these ratios, we then stratified physicians into four groups: Low use physicians had ratios from 0.00 to 0.50 (i.e., a 50% or greater reduction in visits in 2020 compared to 2019); Same use physicians were those with ratios over .50, but less than 1.25. High use physicians were those with ratios from 1.25, but less than 6 and very high use physicians were those with ratios equal to or higher than 6 (i.e., an at least 6-fold increase in visits in 2020 compared to 2019). To explore whether the proportions of physicians falling into each category differed much from previous years, we also calculated

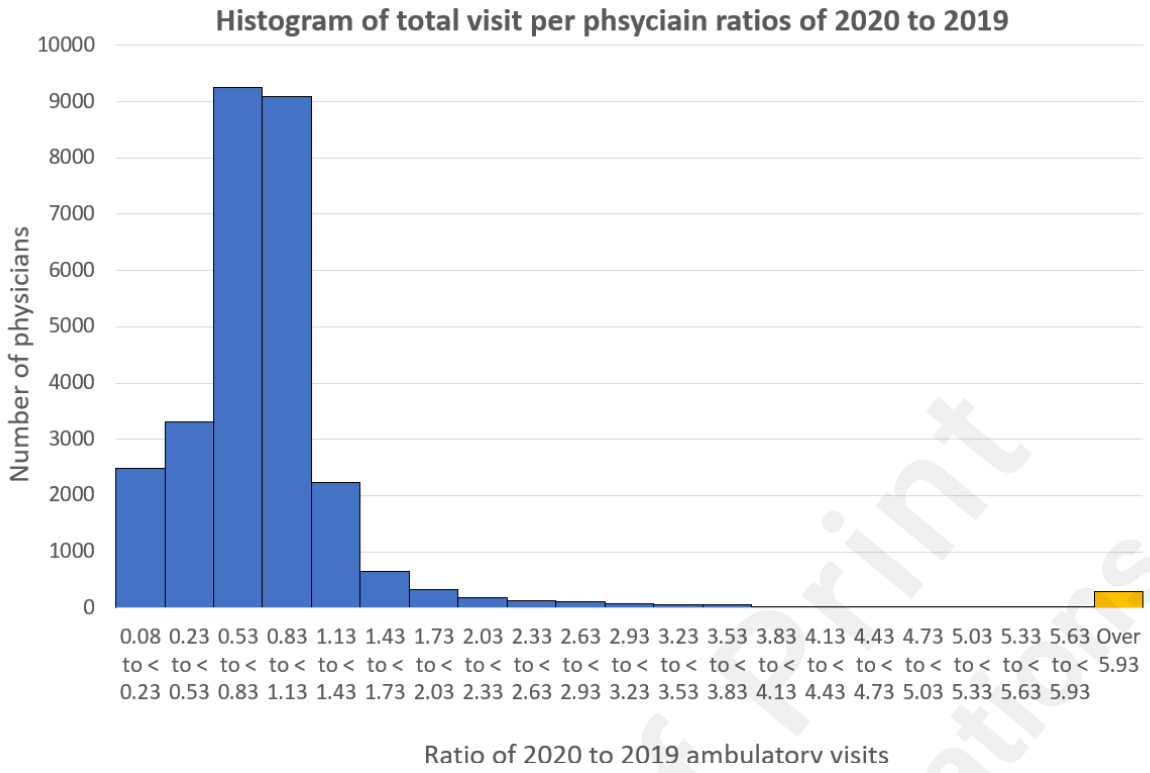
the number of physicians falling into each group (defined as the same ratio ranges) for the periods of January-June, 2019 relative to January-June, 2018.

For all physicians, we also obtained demographic and practice characteristics including, age, sex, years since graduation, training location, practice type (specialist, family practice or focused family practice- physicians focusing 50% or more of their practice in a specific type of care, such as psychotherapy[12]) and specialty. We also calculated the number of unique patients seen, number of total visits and number of virtual visits and number of visits per day (virtual or any).

Results

Among 28,383 eligible physicians in 2020, the mean ratio of ambulatory visits in January-June 2020: 2019 was 0.99, SD=2.53 (median 0.81; IQR 0.59-1.0). Only 291 (1.0%) were very high users, 2,672 physicians (9.4%) were high users, and 5422 (19.1%) were low users (Figure 1). In comparison, the previous year (2019:2018 visit ratio), among 27,709 eligible physicians, 289 (1.0%) were very high users, 3395 (12.3%) were high users, and 2937 (10.6%) were low users.

Figure 1: Histogram showing the total number of physicians by ambulatory visit volume ratio (2020:2019). Proportions of <1 indicate fewer visits in January-June 2020 when compared to January-June 2019, while a proportion >1 suggested increased visits in January-June 2020. Note the last bin in orange represents anybody over a ratio of 5.93, representing the top 1%.



High user physicians were younger, more recent graduates, more likely female, and less likely to be international graduates than those who maintained their volumes (same use group) (*P<.001*) (Table 1). These effects were even more pronounced in the very high user group. They were also more likely to be specialists than primary care providers (*P<.001*), and physicians in focused primary care practices were more likely to be high or very high users relative to specialists (*P<.001*).

Physicians in the two high use groups had on average lower volume practices in both 2020 and 2019 (*P<.001*), and volumes were especially smaller in 2019 with fewer patients seen (*P<.001*). The effect was larger for the very high users (*P<.001*). Providers in the two higher user groups had fewer visits per billing day and fewer total patients seen in 2020 (*P<.001*), but higher percentage of virtual care visits (*P<.001*) and similar number of virtual care visits per day to the same user group (Table 1).

Table 1: Physician characteristics, stratified by ratio of ambulatory visits in January-June 2020:2019. Visits of 0.00-0.50 correspond to physicians who had a 50%-or-greater reduction in ambulatory visits between 2019-2020. Visits of ≥ 1.25 <6 correspond to physicians who had a 25%-6 fold increase in visits between 2019-2020.

		All	Low 0-0.5	Same >0.5-<1.25	High >=1.25-<6.0	Very High >=6.0	p-value
Total Sample		N=28,383	N=5,422	N=19,998	N=2,672	N=291	
Age	Mean ± SD	53.9 ± 11.2	56.1 ± 12.6	53.7 ± 10.8	51.9 ± 11.24	49.2 ± 11.5	<.001
Years since graduation	Mean ± SD	25.1 ± 13.3	26.7 ± 15.5	25.4 ± 12.5	20.5 ± 12.60	15.8 ± 11.7	<.001
Sex	(% Female)	41.8%	42.5%	40.6%	48.4%	55.4%	<.001
Canadian/International trained	(% Canadian trained)	76.4%	77.2%	75.7%	81.6%	83.5%	<.001
Number of unique patients seen in 2019 (Jan-Jun)	Mean ± SD	729.2 ± 795.0	496.53 ± 675.0	858.28 ± 828.8	308.81 ± 433.4	55.46 ± 60.5	<.001
	Median (IQR)	539 (163-999)	257 (75-689)	691 (295-1,129)	153 (50-402)	35 (17-72)	<.001
Number of unique patients seen in 2020 (Jan-Jun)	Mean ± SD	556.7 ± 618.1	155.2 ± 297.0	684.5 ± 639.5	428.0 ± 577.4	439.3 ± 408.9	<.001
	Median (IQR)	408 (100-789)	35 (0-183)	559 (241-910)	236 (81-567)	347 (133-590)	<.001
Percent virtual care visits in 2020 (Jan-Jun)	Mean ± SD	31.9 ± 22.7	14.95 ± 24.3	34.03 ± 20.0	40.3 ± 26.2	42.3 ± 28.6	<.001
	Median (IQR)	34 (11-49)	0 (0-22)	37 (19-49)	44 (18-60)	42 (21-61)	<.001
Number of virtual care visits in 2020 (Jan-Jun)	Mean ± SD	400.7 ± 571.0	52.1 ± 139.5	471.3 ± 570.6	411.9 ± 771.3	294.8 ± 315.1	<.001
	Median (IQR)	231 (30-551)	1 (0-37)	324 (98-639)	199 (32-494)	205 (70-432)	<.001
Number of total visits in 2020 (Jan-Jun)	Mean ± SD	1,101.2 ± 1,228.9	292.2 ± 484.9	1,300.0 ± 1,257.7	877.9 ± 1,293.1	738.0 ± 655.7	<.001
	Median (IQR)	780 (240-1,503)	108 (23-370)	1,004 (454-1,715)	495 (151-1,105)	538 (274-976)	<.001
Number of total visits in 2019 (Jan-Jun)	Mean ± SD	1,304.8 ± 1,420.4	800.5 ± 1,103.6	1,561.5 ± 1,483.3	541.4 ± 855.9	66.1 ± 73.7	<.001
	Median (IQR)	934 (286-1,799)	392 (101-1,128)	1,212 (539-2,078)	267 (74-658)	43 (20-84)	<.001
Number of visits per billing day in 2020 (Jan-Jun)	Mean ± SD	12.1 ± 9.5	8.1 ± 8.3	13.2 ± 9.5	9.7 ± 9.8	10.2 ± 7.3	<.001
	Median (IQR)	9 (5-15)	5 (2-10)	11 (6-16)	7 (3-12)	7 (4-12)	<.001
Number of virtual visits per billing day in 2020 (Jan-Jun)	Mean ± SD	8.6 ± 6.7	5.0 ± 5.2	9.1 ± 6.5	8.1 ± 7.6	7.4 ± 5.4	<.001
	Median (IQR)	7 (4-11)	3 (2-6)	7 (4-11)	6 (3-10)	6 (3-9)	<.001
Practice Type	Specialist	15,201 (53.6%)	3,058 (56.4%)	10,419 (52.1%)	1,590 (59.5%)	134 (46.0%)	<.001
	Primary Care Provider	9,393 (33.1%)	1,366 (25.2%)	7,560 (37.8%)	436 (16.3%)	31 (10.7%)	
	Focused Primary Care Provider[a]	426 (1.5%)	120 (2.2%)	190 (1.0%)	97 (3.6%)	19 (6.5%)	
	Misc.	3363	878	1829	549	107	

[a]Focused Primary Care providers are primary care providers who specialize in a specific care (e.g. palliative care)

Specialties with a large percentage of their total physician population being in the high users group included emergency medicine (41 of 230, 17.8%), psychiatry (378 of 2061, 18.3%), and internal medicine (147 of 999, 14.7%). The same specialties were common

among the very high users (Table 2).

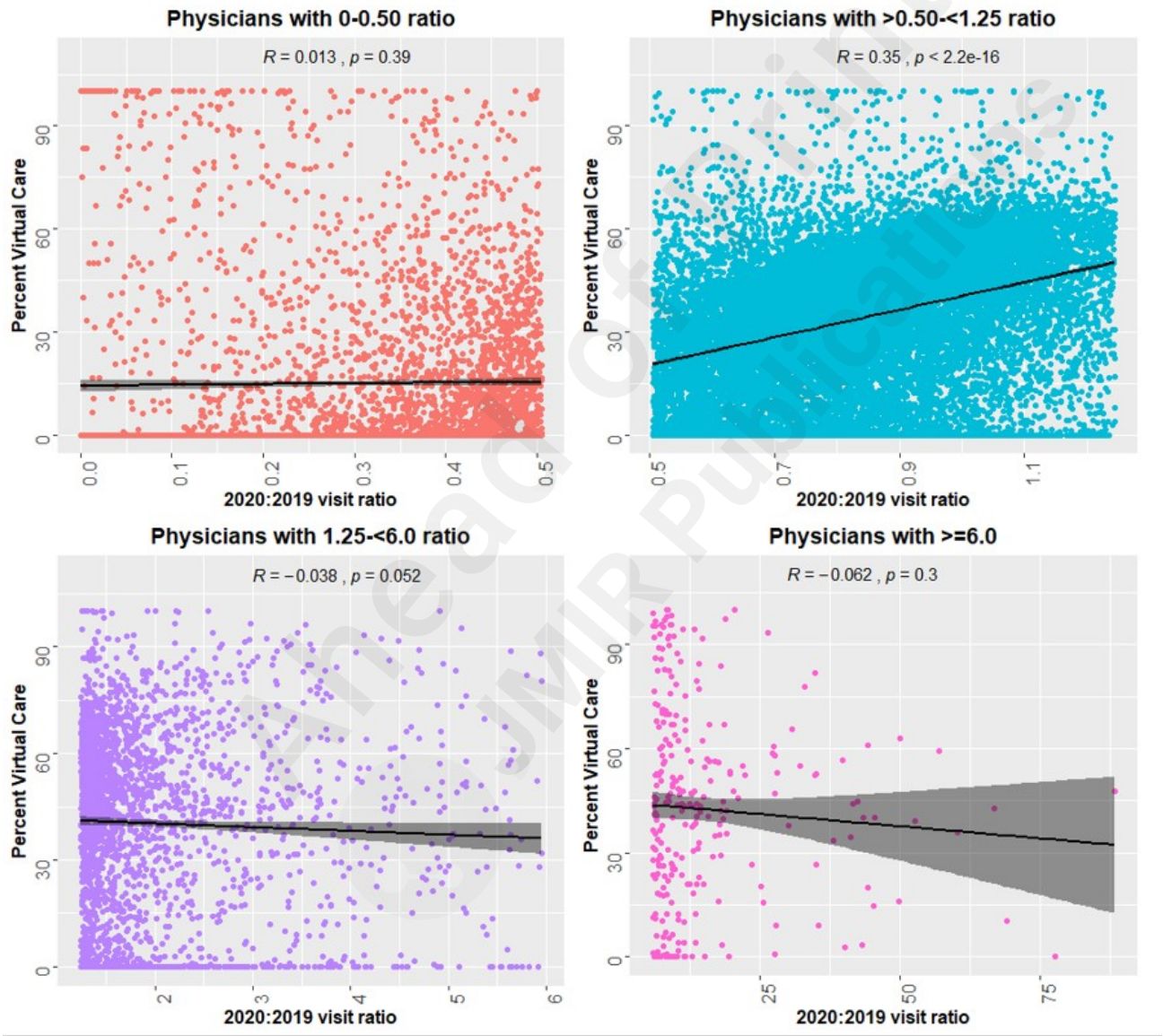
Table 2: Total number of physicians per specialty across each group and percentage physicians per specialty falling in each category.

		Low 0-0.5	Same >0.5-<1.25	High >=1.25-<6.0	Very High >=6.0	Low 0-0.5	Same >0.5-<1.25	High >=1.25-<6.0	Very High >=6.0
	Total	n	n	n	n	%	%	%	%
Psychiatry	2061	328	1326	378	29	15.9%	64.3%	18.3%	1.4%
Emergency Medicine	230	57	126	41	6	24.8%	54.8%	17.8%	2.6%
Family Medicine	13,244	2,366	9,715	1,042	121	17.9%	73.4%	7.9%	0.9%
Medicine									
Internal Medicine	999	233	604	147	15	23.3%	60.5%	14.7%	≤1.5%
Infectious Diseases	148	27	101	20	0	18.2%	68.2%	13.5%	0.0%
Critical Care	99	29	53	13	<=5	29.3%	53.5%	13.1%	≤5.1%
Endocrinology	269	18	215	34	<=5	6.7%	79.9%	12.6%	≤1.9%
Nuclear Medicine	48	15	24	6	<=5	31.3%	50.0%	12.5%	≤10.4%
Hematology	217	23	164	27	<=5	10.6%	75.6%	12.4%	≤2.3%
Cardiology	684	77	527	78	<=5	11.3%	77.0%	11.4%	≤0.7%
Respirology	308	32	237	35	<=5	10.4%	76.9%	11.4%	≤1.6%
Geriatric Medicine	152	29	105	16	<=5	19.1%	69.1%	10.5%	≤3.3%
Rheumatology	213	19	172	22	0	8.9%	80.8%	10.3%	0.0%
Anesthesiology	1,179	480	597	101	<=5	40.7%	50.6%	8.6%	≤0.4%
Nephrology	242	23	198	20	<=5	9.5%	81.8%	8.3%	≤2.1%
Clinical Immunology	84	22	56	6	0	26.2%	66.7%	7.1%	0.0%
Gastroenterology	345	39	281	24	<=5	11.3%	81.4%	7.0%	≤1.4%
Obstetrics And Gynecology	808	98	659	45	6	12.1%	81.6%	5.6%	0.7%
Other Specialties									
Diagnostic Radiology	624	179	355	84	6	28.7%	56.9%	13.5%	1.0%
Medical Oncology	269	34	200	35	0	12.6%	74.3%	13.0%	0.0%
Pediatrics	1487	395	938	146	8	26.6%	63.1%	9.8%	0.5%
Radiation Oncology	211	14	178	19	0	6.6%	84.4%	9.0%	0.0%

Neurology	410	53	321	33	<=5	12.9 %	78.3 %	8.0%	≤1.2 %
Physical Medicine And Rehab	211	48	146	16	<=5	22.7 %	69.2 %	7.6%	≤2.4 %
Dermatology	236	52	173	11	0	22.0 %	73.3 %	4.7%	0.0%
Surgery	2868	536	2212	104	16	18.7 %	77.1 %	3.6%	0.6%
Other Specialties	384	91	246	43	4	23.7 %	64.1 %	11.2%	1.0%
Misc	353	105	69	126	53	29.7 %	19.5 %	35.7%	15.0 %

Pearson correlations between 2020:2019 visit ratio and percent of visits completed virtually showed a significant positive correlation only among physicians from the same users group (R=0.35, *P<.001*) (Figure 2).

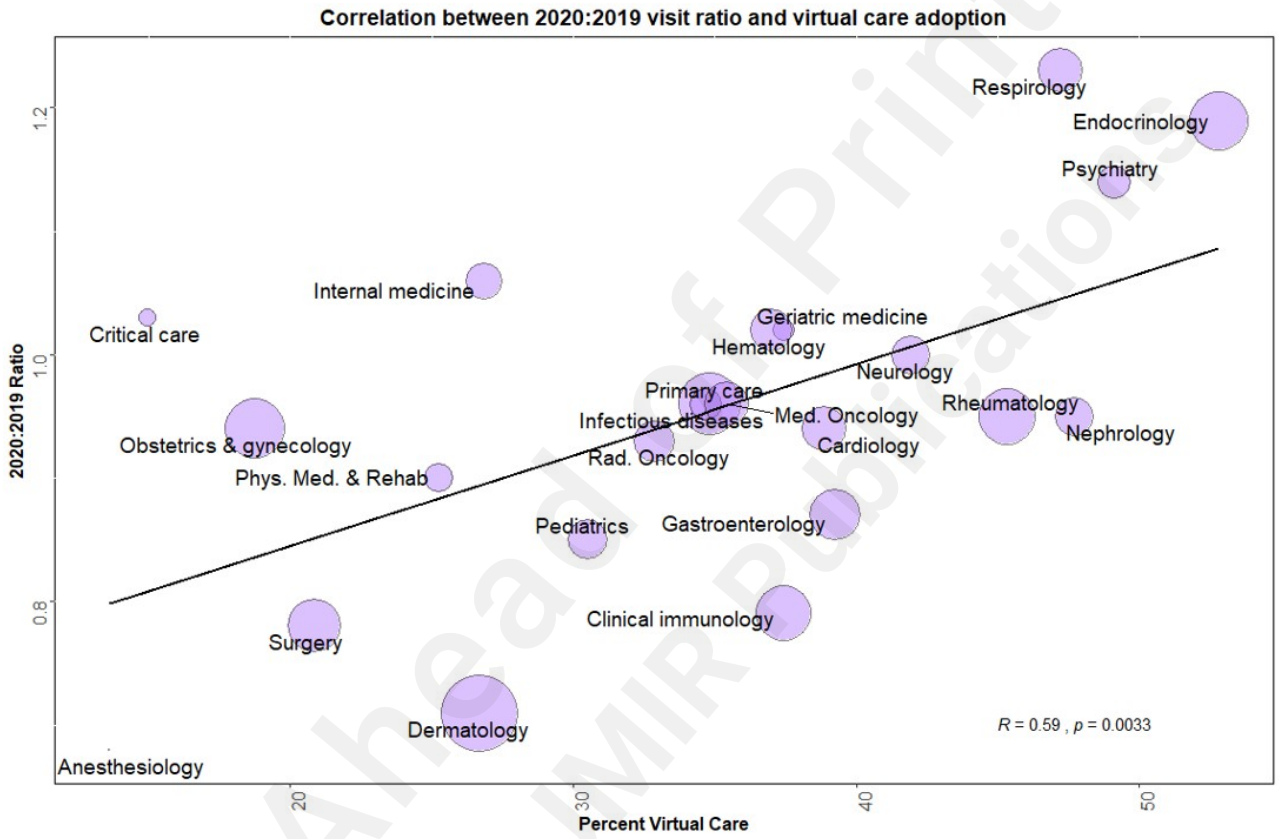
Figure 2: Correlation between 2020:2019 visit ratio and percent virtual care in the four groups of providers: those who reduced (0-.50), maintained (>0.5-<1.25), increased (1.25-< 6) and those that significantly increased (≥6) their practice in 2020 relative to 2019.



Finally, we also calculated the Pearson correlation coefficient between the average 2020:2019 ratio per specialty and the percent virtual care used per specialty. We excluded emergency medicine, diagnostic radiology and nuclear medicine as they were outliers and

had both the highest 2020:2019 visit ratios (1.6, 1.3 and 2.9 respectively) and lowest percentages of virtual care (12.4%, 1.5% and 8.2% respectively). There was a significant positive correlation between the 2020:2019 ratio and the percent virtual care across specialties (R=0.59, *P<.01*) (Figure 3).

Figure 3: Correlation between 2020:2019 visit ratio and virtual care adoption across specialties. The size of each sphere indicates the number of visits completed.



Discussion

During the early stages of the pandemic, the introduction of virtual care did not lead to significant increases in visit volume. Only about 10% of physicians increased their visit volumes by 25%-or-more in 2020 relative to 2019. In total, our results provide reassuring evidence that relaxation of billing requirements early in the COVID-19 pandemic in Ontario were not associated with widespread and aberrant billing behaviors.

Providers who increased their visit volumes tended to be specialists, younger, more recent graduates, and more likely female. Among providers who increased their practice volumes,

there was no relationship between the magnitude of increase and virtual care adoption. A significant relationship was observed, however, among providers who maintained their practice. This relationship was also maintained at the specialty level. Endocrinology, respirology and psychiatry maintained best their practices and had higher rates of virtual care adoption.

Our results are consistent with data from the US that showed that despite the introduction of virtual care, overall visit volumes decreased in the early periods of COVID-19[6]. In fact, the introduction of virtual care during the pandemic allowed physicians to maintain their practices. Higher rates of virtual care use among providers who maintained their practice volumes were associated with better maintenance of visit volumes during the pandemic. This trend was also observed in the US[6] and here we confirm these findings with an analysis of the entire physician and patient population in a healthcare system with a single insurance plan where the introduction of virtual care payment policies occurred at the same time for the entire population.

At least two specialties that show high virtual care adoption rates and good maintenance of visit volumes during the pandemic were consistent in both Ontario and the US[6]: psychiatry and endocrinology. Mental health care has the potential to be better suited for virtual care as it often does not require a physical exam and it has been successful in adopting virtual care services both before[14] and after the pandemic[15]. Successful adoption in endocrinology during the pandemic has also been reported[16].

Limitations to our study include a relatively brief time window for evaluating the impact of billing code liberalization which makes it unclear whether the trends will be maintained in the long-term. Our reliance on administrative data also precludes us from robustly evaluating appropriateness of individual visits.

In total, our study suggests that liberalization of virtual care billing requirements coinciding

with the COVID-19 pandemic was not associated with an alarming increase in individual physician visit volumes and should serve to assuage concerns over widespread fraud. Furthermore, the strong relationship between the ability to maintain practice volumes and the use of virtual care suggest that the introduction of virtual care allowed continued access to care for patients.

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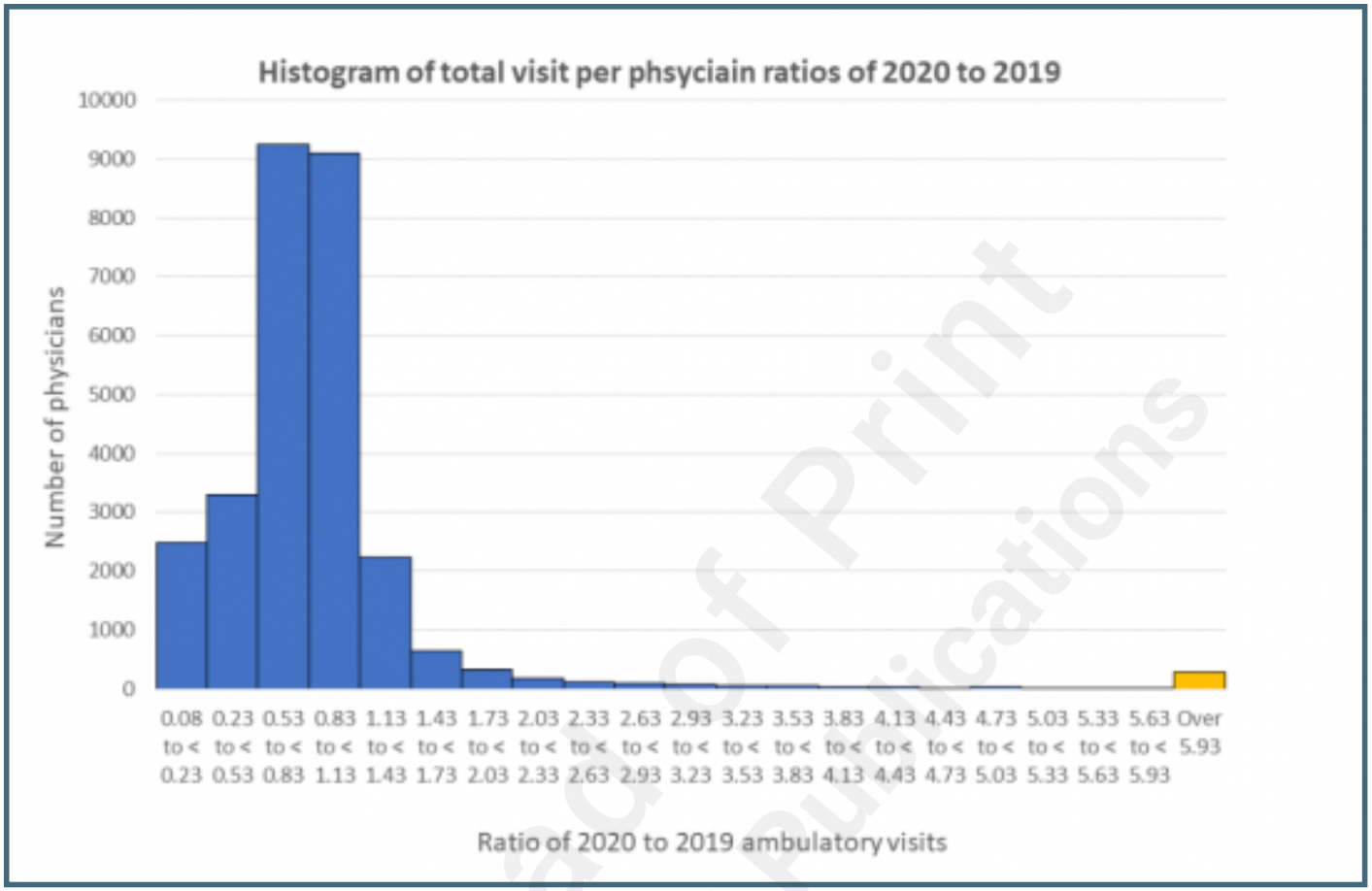
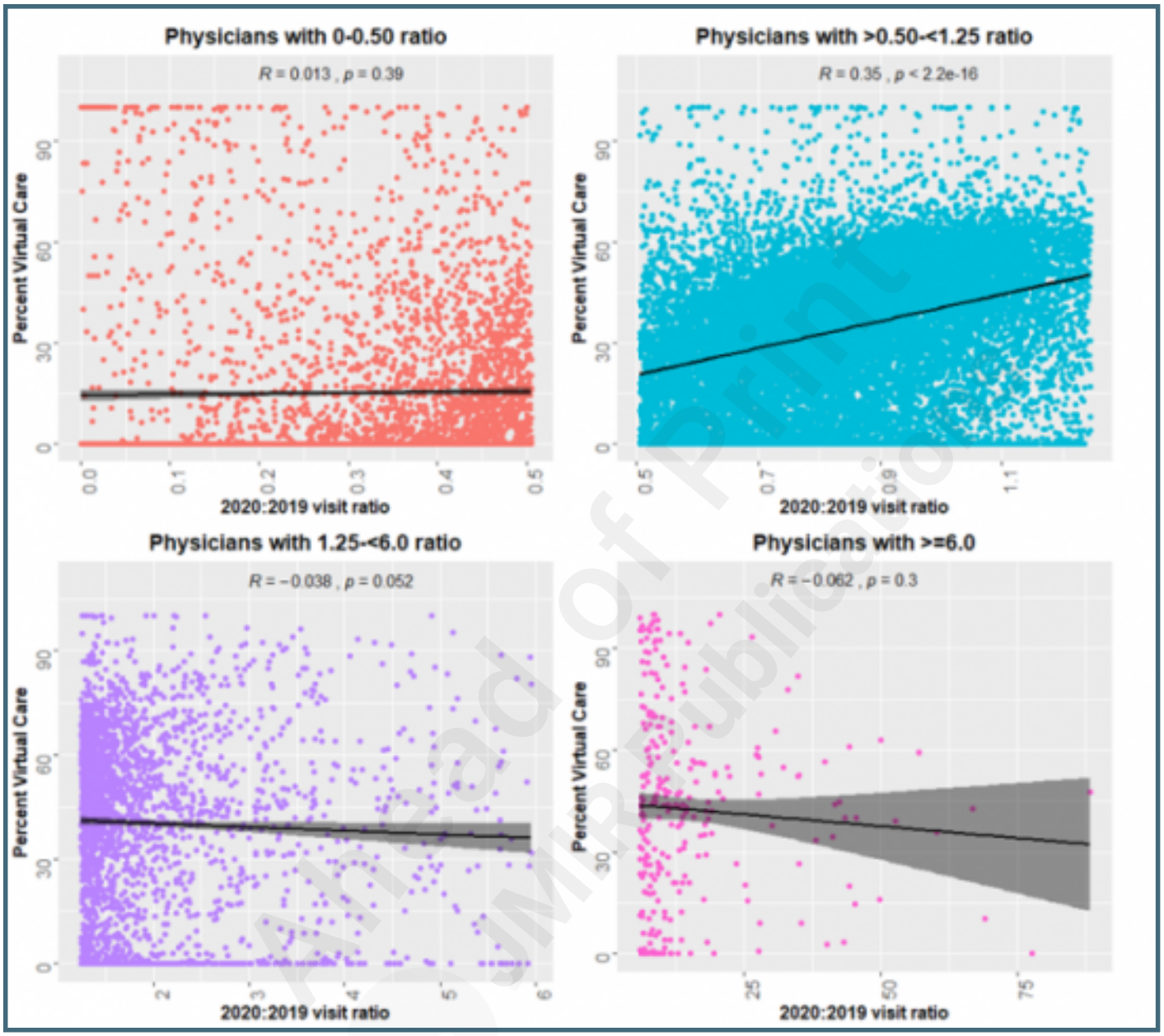
Supplementary Files

Figures

Histogram showing the total number of physicians by ambulatory visit volume ratio (2020:2019). Proportions of 1 suggested increased visits in January-June 2020. Note the last bin in orange represents anybody over a ratio of 5.93, representing the top 1%.



Correlation between 2020:2019 visit ratio and percent virtual care in the four groups of providers: those who reduced (0-.50), maintained (>0.5-6) their practice in 2020 relative to 2019.



Correlation between 2020:2019 visit ratio and virtual care adoption across specialties. The size of each sphere indicates the number of visits completed.