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Changes in primary care visits arising from the COVID-19 pandemic: an international comparative study by the International Consortium of Primary Care Big Data Researchers (INTRePID)

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ABSTRACT

Introduction Through the **INT**ernational Conso**R**tium of **P**rimary Care B**I**g **D**ata Researchers (**INTRePID**), we compared the pandemic impact on the volume of primary care visits and uptake of virtual care in Australia, Canada, China, Norway, Singapore, South Korea, Sweden, the UK and the USA.

Methods Visit definitions were agreed on centrally, implemented locally across the various settings in INTRePID countries, and weekly visit counts were shared centrally for analysis. We evaluated the weekly rate of primary care physician visits during 2019 and 2020. Rate ratios (RRs) of total weekly visit volume and the proportion of weekly visits that were virtual in the pandemic period in 2020 compared with the same prepandemic period in 2019 were calculated.

Results In 2019 and 2020, there were 80 889 386 primary care physician visits across INTRePID. During the pandemic, average weekly visit volume dropped in China, Singapore, South Korea, and the USA but was stable overall in Australia (RR 0.98 (95% CI 0.92 to 1.05, p=0.59)), Canada (RR 0.96 (95% CI 0.89 to 1.03, p=0.24)), Norway (RR 1.01 (95% CI 0.88 to 1.17, p=0.85)), Sweden (RR 0.91 (95% CI 0.79 to 1.06, p=0.22)) and the UK (RR 0.86 (95% CI 0.72 to 1.03, p=0.11)). In countries that had negligible virtual care prepandemic, the proportion of visits that were virtual were highest in Canada (77.0%) and Australia (41.8%). In Norway (RR 8.23 (95% CI 5.30 to 12.78, p<0.001), the UK (RR 2.36 (95% CI 2.24 to 2.50, p<0.001)) and Sweden (RR 1.33 (95% CI 1.17 to 1.50, p<0.001)) where virtual visits existed prepandemic, it increased significantly during the pandemic.

Conclusions The drop in primary care in-person visits during the pandemic was a global phenomenon across INTRePID countries. In several countries, primary care shifted to virtual visits mitigating the drop in in-person visits.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The multiple countries involved to be able to compare experiences in the primary care setting and the large volume of patients visiting primary care around the world is a strength of this study.
⇒ Coming together to form the INTernational ConsoRtium of Primary Care BIg Data Researchers (INTRePID) with local primary care physicians and data experts having the ability to provide local context for the interpretation of findings is a strength of this study.
⇒ The heterogeneity of available data ranging from national level data to only one or a few clinic's data in one country may have limited the representativeness of individual countries data.
⇒ The capture of virtual visits and contacts of primary care physicians and their patients may be more incomplete in settings that did not have remuneration for virtual visits.

INTRODUCTION

On 11 March 2020, the WHO declared the spread of COVID-19 a pandemic.[1] Almost 2 years later, with over 425 million cases and nearly 6 million deaths worldwide as of 24 February 2022,[2] new variants spreading and vaccination issues, the end to the pandemic is uncertain. The COVID-19 pandemic has presented unprecedented challenges in all aspects of daily life around the world, especially in healthcare delivery including primary care.[3 4] Primary care is the foundation on which the highest functioning healthcare systems are built.[5] Primary care practice

and policy has the potential to affect the health impacts of the pandemic, with respect to screening, diagnosis, treatment and prevention of patients with COVID-19[6] and through non-COVID-19 disease management and prevention. Although recent studies have shown less respiratory illnesses as a result of COVID-19 prevention strategies[7 8] and lower overall death rates in Norway,[9] likely due to less spread of other infectious diseases,[10] the unintended consequences of the pandemic are coming more and more to light. Estimates of excess deaths due to the COVID-19 pandemic suggest that the health consequences of the pandemic are not limited to those infected with COVID-19, with more people dying from non-COVID-19 causes[11–13] and many negative indirect effects as well.[14 15]

Although all countries have their own unique primary care healthcare system, changes in healthcare delivery in response to the pandemic, variable degrees of COVID-19 spread[2] and government and public health-imposed containment measures,[16] comparisons between countries may help contextualise local measures. Almost a decade ago, responding to 'emerging infectious diseases with potential widespread health and economic impact' was identified as an international primary care research responsibility.[17]

In response to the need for primary care to prioritise acute care and prevent the spread of disease, healthcare funders in many countries expanded or introduced virtual care (telephone or video) as a mode of delivery for physician visits.[18 19] Yet the design and duration of these virtual care programmes has varied across jurisdictions. There is a lack of evidence comparing the experiences with virtual care in different settings that could be used to support ongoing changes in primary care beyond the pandemic.[20 21] We set out to compare the pandemic impact on volume of primary care visits, as well as uptake of virtual care, in primary care settings in nine different countries around the world.

METHODS

Triggered by the onset of the COVID-19 pandemic and the understanding of common challenges worldwide, primary care researchers in nine different countries joined together to form the **INT**ernational Conso**R**tium of **P**rimary Care B**I**g **D**ata Researchers (**INTRePID**). INTRePID countries include Australia, Canada, China, Norway, Singapore, South Korea, Sweden, the UK and the USA.

We conducted an international comparative study of changes in primary care visit volumes and the switch to virtual care in INTRePID countries in 2019–2020 to capture the effects of the onset of the global COVID-19 pandemic. Electronic medical record data or physician billing claims data covering the primary care population in a given region, or a sample of the population, were used to estimate weekly visit volume and format of care delivery (see online supplemental material for description of country specific data sources). There were no restrictions based on age or sex in any of the data and all patients presenting to the primary care clinics with a visit to the primary care physician (PCP) in the various settings in INTRePID countries were included. Data were extracted and analysed in each individual country, and aggregated results were shared centrally for comparative analysis. We considered key features of each country's primary care healthcare system, COVID-19 incidence patterns[2] and containment and health indices[16] (a composite measure of 11 policy response indicators such as school and workplace closures, travel bans, testing policy and contact tracing) in the interpretation of our findings.

All INTRePID countries had some level of public funding for primary care delivery and varied based on the extent of funding via private insurance. In all INTRePID countries except for the USA and Singapore, primary care delivery is primarily publicly funded. Apart from Canada, Sweden and the UK, PCPs in INTRePID countries are paid primarily by fee for service. PCPs include family doctors, family physicians, general practitioners or GPs, list patient doctors, polyclinic doctors and in the USA also includes general internists and paediatricians. Healthcare systems varied based on the degree to which patients were expected to cover or have insurance to cover payments and copayments for visits and medications. In all countries except China, South Korea and most situations in the USA, PCPs act as gatekeepers for access to care from secondary care (table 1a). In all INTRePID countries, PCPs provide a broad scope of practice including preventive, acute and chronic disease diagnosis, and management.

Most INTRePID countries responded to the WHO pandemic declaration with corresponding declarations of a 'state of emergency' and implemented healthcare policies and restrictions to prevent the spread of COVID-19 (table 1b). In Australia, Canada, Norway, Sweden and the UK, PCPs were encouraged to limit in-person contacts and use virtual care as much as possible, whereas in China, South Korea and Singapore support for virtual care was more limited, with variation in the extent of remuneration and the duration of time it was available. At the University of Hong Kong-Shenzhen Hospital in China, virtual care in primary care was only available shortly after the pandemic started in China from February 2020 to April 2020. Virtual care became permitted in South Korea from the end of February 2020. In Singapore, telephone and video visits were not offered as services billed by PCPs at any point before or during the pandemic. Administrative and support staff within these clinics were more likely to follow-up with patients by telephone during the pandemic, but these contacts were not captured as part of our estimates of visit volume. In all other countries virtual care was a reimbursable primary care visit delivery mode until the end of 2020 and policies for extensions have occurred such that it is still going on today in many countries (table 1b).

Table 1 (A) Summary of primary care healthcare systems in INTRePID countries. (B) Pandemic timing, virtual care policies and data available for INTRePID countries

Country	Type and level of funding	Payment model for primary care physicians	Cost for patients	Primary care as gatekeeper?
Australia	Both public and private (10%–20%)	Fee for service	Visits: yes, copayments for some visits. Medications: 6.60 AUD/ medicine–41.30 AUD/month.	Yes, for access to specialists
Canada	Public universal access funded at provincial level	Primarily capitation in Ontario	Visits: none. Medications: Ontario provincial formulary only covers residents 65+ years, children without private insurance, those on social assistance and partial coverage for low-income residents.	Yes, for access to specialists
China	Public and private	Fee for service	Visits and medications: social insurance with copayment depending on one's status.	No
Norway	Public funded at a national level	Capitation for 30% of PCPs income, the rest fee for service	Visits: yes, copayments up to an annual upper limit. No patient visit costs for visits related to suspected or confirmed COVID-19, or for children <16 years old. Medications: yes, copayments up to annual upper limit.	Yes, for access to specialists
Singapore	Public and private funded differently	Fee for service	Visits: yes, public polyclinic visits are charged based on residency status and age of patient 14 SGD for adults (citizen) 6.90 SGD for children and elderly (citizen). In private primary care clinics determined by the clinic. However, patients who are citizens can receive subsidies under the Community Health Assist Scheme for visits in private clinics. Medications: yes, amount based on residency status and age in public clinics, in private clinics determined by the clinic.	Yes, for access to specialists in public hospitals. No for access to specialists in private hospitals.
South Korea	Both public and private (proportions vary according to the level and the type of medical care institution)	Fee for service	Visits: yes. Medications: yes.	No
Sweden	Public funded at a national level	Capitation 70% and fee for service 30%.	Visits: yes, patient pays approximately 1/5 of the fee with an annual maximum copayment of 1200 SEK. Medications: yes, copayment with a maximum of 2200 SEK.	Yes
UK	Public national health insurance/taxation	Capitation	Visits: no. Medications: 40% of the population are eligible to pay prescription charges, but children, older people and medications to treat some chronic diseases are exempt from payment.	Yes
USA	Private with public for low income and veterans	Fee for service	Visits: no if covered by insurance. Medications: copayments typically required.	No

Continued

Table 1 Continued

Country	Date local pandemic or state of emergency was first declared	Virtual care policy	Data coverage region
Australia	State of emergency in Victoria on 16 March 2020. State of disaster in Victoria on 2 August 2020	Commencing 13 March 2020, and now a permanent feature telephone or telehealth services were made available to physicians and allied health providers. This service is only to be provided where safe and clinically appropriate and limited to patients where there is an established clinical relationship. Bulk billing rates are the same for virtual as they are for in-person visits and the government is encouraging virtual visits.	Select coverage (1256 PCPs in 103 general practices in Victoria).
Canada	State of emergency in Ontario on 17 March 2020. Gradual lifting of restrictions in the summer of 2020. Second wave declared on 28 September 2020, followed by gradual localised restrictions until province wide lockdown on 26 December 2020.	In Ontario, as of March 14, 2020, new billing codes were introduced to cover any physician service provided via telephone or video. Recently extended indefinately. Virtual care was very limited before the pandemic. Payment for virtual visits equal to payment for in-person visits during the pandemic.	Select coverage (392 PCPs in 95 clinics in Ontario).
China	On 23 January 2020, the Guang Dong province government declared a public health state of emergency.	Prior to the pandemic, the hospital did not offer virtual visits. Virtual consultations over a platform called 'wedoctor' for any queries on COVID-19 were offered for free on 1 February–30 April 2020, and the healthcare professionals were not paid additionally for these interactions. These virtual consultations are potentially under-represented here as hospital-based doctors (shown here) have been found to have lower utilisation of internet/telephone-based consultations compared with PCPs in the community.	Select coverage (13 PCPs and 3 psychotherapists in the University of Hong Kong-Shenzhen Hospital family medicine clinic).
Norway	There was an almost complete lockdown from 12 March 2020. The lockdown was gradually lifted from April onwards, but some restrictions were maintained during all of 2020.	Prior to the pandemic, eHealth was already developed and used to a small extent. Patient copayment was the same for virtual and in-person consultations. From 16 March 2020 consultations by phone were reimbursed in the same way. As of 25 March 2020, it was recommended to use telehealth (phone/video) services as much as possible in place of in-person.	Full coverage (national).
Singapore	Singapore implemented a 'circuit breaker' from 7 April 2020 to 1 June 2020, which is a set of safe distancing measures that significantly reduces people's movements and interactions in public and private spaces. People were also encouraged to wear masks when going out.	The public insurance system does not reimburse physicians for virtual care. Had a lot of virtual visits in the hospitals, less so in primary care. Most polyclinic patients had their appointments deferred during COVID-19 and were followed up by phone without cost (hence not captured in the data presented here). PCPs in the public health system were deployed to public health sites. Routine follow-up intervals for chronic disease management were extended.	Select coverage (886 PCPs in six public polyclinics).
South Korea	On 23 February 2020, Infectious Disease Crisis Alert was upgraded to 'Severe'. Social distancing system (level 1, level 1.5, level 2, level 2.5 and level 3) was applied depending on the severity of outbreak.	Prior to the pandemic, virtual visits were not permitted in South Korea. From 24 February 2020, telephone consultation and prescription by fax were temporarily allowed by the Ministry of Health and Welfare. Virtual visits (20 400 KRW) remunerated at slightly lower rates than in-person (20 700 KRW).	Select coverage (5 professors, 3 fellows, and 15 residents in primary care at Asan Medical Centre-Seoul).

Continued

Table 1 Continued

Country	Date local pandemic or state of emergency was first declared	Virtual care policy	Data coverage region
Sweden	1 February 2020: COVID-19 classified as a disease dangerous to the public and society. 26 February 2020: high alert at the National Board of Health and Welfare. 16 March 2020: people over age 70 years were urged to avoid all contact with others. Gradual limitations of public gatherings. In general, Sweden was a relatively open society with no general lockdown, or mandatory mask wearing.	Payments for virtual visits are half of the amount for in-person visits. The virtual (telehealth) services have been open to everyone, and in April 2020, the population was encouraged to use a telehealth solution if suitable for their visits. In Sweden, the 21 regions provide care for their own patients, but there are also a few national providers of telehealth that charge fee-for-service.	Full coverage of Uppsala region, 150 PCPs.
UK	Enacted the Coronavirus Act 2020 on 25 March 2020 that provided government with emergency powers.	Virtual care is being used to reduce risk of infection for staff and patients. It is encouraged to promote virtual consultations and introduce it where it does not exist yet. Using video consultation is recommended in addition to telephone. Videoconferencing is encouraged as well as commercial apps such as Skype and Facetime for urgent use. However, physical visits were allowed only if benefits outweighed risks.	Select coverage (there are 1800 practices in the network and 15 million patients across England (26% of the population)). This study was done on a subset of 5.6 million patients (~10% of the population), recruited to be evenly geographically spread across England.
USA	National emergency declared on 13 March 2020.	Very few US healthcare systems had used virtual care prior to the pandemic but by March 2020 most systems provided virtual care.	Select coverage (236 PCPs in one health organisation in each of California, Texas and Colorado).

Select coverage: convenience sample within a region.
Full coverage: all clinics/practices within a region.
INTRePID, INTernational ConsoRtium of Primary Care BIg Data Researchers; PCP, primary care physician.

Measurements

Primary outcome measures were the total number of primary care visits per week in each country and the total visits per week that were virtual. Visits refer to a patient and PCP interaction that is remunerated by local publicly or privately funded health insurance plans. The term visit can be referred to as an attendance, encounter, consultation, contact or event in various INTRePID countries. We considered the format of care delivery. Using methods appropriate to data sources in each country, primary care visits were classified as in-person or virtual. Virtual visits included both telephone and video consultations between patients and GPs as it was not possible to distinguish between these types of visits in all countries. As email correspondence between patients and PCPs were unable to be identified in all INTRePID countries, we elected to only include telephone and video visits except in Norway where e-consultation (secure e-mail correspondence) was the main form of virtual care both prepandemic and in the pandemic period. Separate counts for each week in 2019 and 2020 were created for in-person visits and for virtual visits, which added together created the total visit volume for each week. To facilitate comparison between countries, weekly visit volume was calculated by the International Organization for Standardization (ISO) (https://www.iso.org/home.html) week.

Data analysis

We summarised weekly in-person, virtual and total visit volume across all weeks in 2019 and 2020 in the INTRePID countries. The total visit volume and proportion of virtual visits were obtained during the pandemic period in 2020 as well as the corresponding period in 2019 (the prepandemic period). The start of the pandemic period coincided with the global pandemic declaration by the WHO on 11 March 2020 until the end of 2020 (pandemic period: ISO weeks 12–52) for all countries except China where the local pandemic was declared on 23 January 2020 (pandemic period: ISO weeks 5–52).

To examine the impact of the pandemic on total visit volume in each country, we estimated rate ratios (RRs) comparing the mean weekly visit volume in the pandemic period and prepandemic periods. In countries where virtual care was offered before and after the pandemic (Norway, Sweden and the UK), we repeated the same analysis for weekly virtual visit volume to evaluate the relative change in mean weekly virtual visit rate in the pandemic period compared with the prepandemic period. For both

Table 2 Total number of visits (in-person and virtual) in 2019–2020 and the total visit volume and proportion of virtual visits in the prepandemic and pandemic periods for the INTRePID countries

Country	Total visit volume in 2019–2020	Total visit volume		Proportion of virtual visits (%)	
		Prepandemic period	Pandemic period	Prepandemic period	Pandemic period
Australia	3 295 140	1 330 608	1 306 095	–	41.8
Canada	1 775 258	714 509	682 448	0.0	77.0
China	131 326	69 495	49 823	–	0.0
Norway	29 272 958	11 343 591	11 499 561	3.3	27.0
Singapore	2 371 659	1 053 615	773 418	–	–
South Korea	117 395	48 495	41 614	–	2.5
Sweden	3 185 700	1 278 258	1 166 475	29.0	42.2
UK*	40 343 066	917*	793*	20.7	56.6
USA	396 884	160 683	142 625	–	27.5

Prepandemic period=weeks 12–52 in 2019, except in China where it was weeks 5–52 in 2019.
Pandemic period=weeks 12–52 in 2020, except in China where it was weeks 5–52 in 2020.
*Unlike the other INTRePID countries, the number of clinics that contributed data for UK varied over time. To account for this, the visit volume is reported as total visits per 10 000 patients covered in each period. For all other countries, the population is assumed to be fixed over the duration of this study.
INTRePID, INTernational ConsoRtium of Primary Care BIg Data Researchers.

analyses, RRs were obtained from a Poisson generalised linear model with an indicator of the pandemic period included as a covariate. We obtained robust SEs, two-sided p values and 95% confidence intervals (CIs) using the Newey-West method to account for autocorrelation. Bandwidth selection was performed using the procedure of Newey and West 1994 with prewhitening. All analyses were conducted with R V.4.0.3.

Role of the funding source

None of the study funding sources played a role in the study design, collection, analysis, interpretation of the data, writing of the report or in the decision to submit the paper for publication.

Patient and public involvement

Neither patients nor the public were directly involved in the conduct of the study.

RESULTS

Overall, we captured 80 889 386 primary care visits in INTRePID countries in 2019 and 2020 (table 2). At the onset of the pandemic, visit volume decreased in all INTRePID settings, with variation across countries in the timing and duration of this change and the degree to which virtual visits increased to fill the gap in in-person visit volume (figure 1). Comparing the average weekly visit volume in the pandemic period to the prepandemic period, we observed significant decreases in China, Singapore, South Korea, the USA, but not in Australia, Canada, Norway, Sweden or the UK (table 3).

All INTRePID countries experienced a drop in in-person visits to PCPs immediately following the pandemic onset and showed various degrees of recovery either through a rebounding of in-person visits or a switch to virtual visits (figure 2). The countries with the largest decreases in visit volume during the pandemic (China (RR 0.72 (95% CI 0.58 to 0.88)), Singapore (RR 0.73 (95% CI 0.65 to 0.83)), South Korea (RR 0.86 (95% CI 0.79 to 0.94)) were those who did not shift to virtual care (table 2, figure 2). In countries that supported virtual care during the pandemic period, the decline in in-person visits appeared to be partially or completely mitigated by an increase in virtual visit rate. In Canada, Australia and the USA, virtual visits were not offered before the pandemic due to the regulatory environment or accounted for <1% of prepandemic visit volume. However, the overall visit volume in Canada was relatively stable across the pandemic and control periods, with a large increase in virtual care (77.0% of the weekly visit rate in the pandemic period). A similar pattern was observed for the uptake of virtual care in Australia (41.8%) and the USA (27.5%) (table 2, figure 2). Sweden and the UK were the only countries in which telephone or video visits were widely used prepandemic, while a small proportion of visits occurred virtually in the prepandemic period in Norway. During the pandemic, virtual visits increased substantially in all three of these countries (table 3).

DISCUSSION

Principal findings

The drop in in-person visits in primary care with the onset of the pandemic was a global phenomenon across INTRePID countries. Countries that embraced virtual care were able to mitigate the drop in in-person visits such that overall visit volume to primary care was largely maintained. The countries that had the lowest uptake of virtual

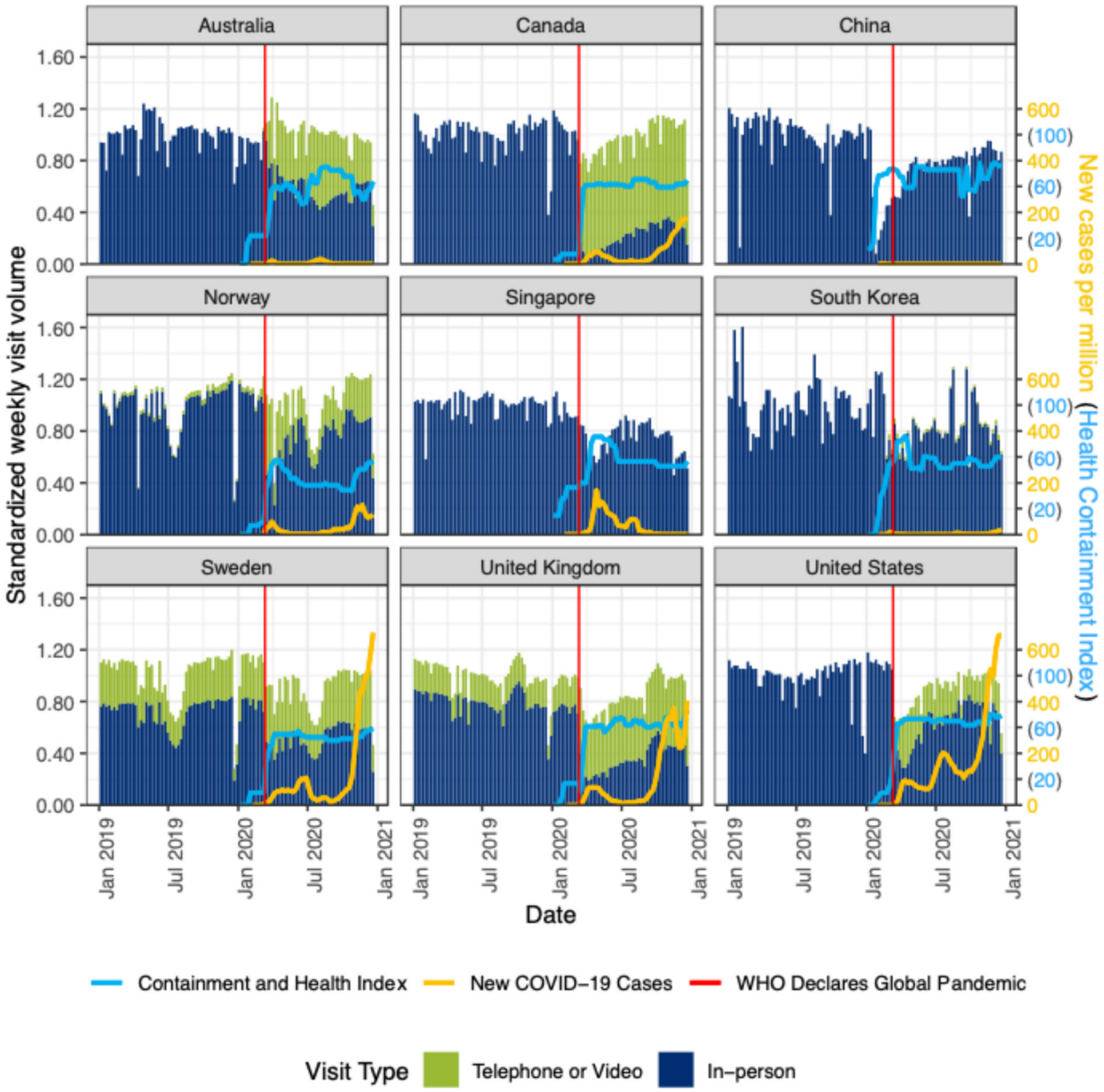

Figure 1 Changes in primary care visits, COVID-19 spread and health containment indices in INTRePID countries in 2019–2020. INTRePID, INTernational ConsoRtium of Primary Care BIg Data Researchers.

care had the lowest rates of total visit volume during the pandemic compared with the prepandemic period. The impacts of replacing in-person visits with virtual ones to maintain stable primary care service levels remains to be seen and is an area for future research. The experiences across INTRePID countries illustrate that there is considerable variability in how much virtual care was used during the pandemic and to what degree prepandemic service patterns have returned.

The uptake of virtual care did not appear to be related to the degree of COVID-19 spread (figure 1) as the countries with the greatest COVID-19 incidence (Sweden, USA and UK) were similar in proportion of visits that were virtual during the pandemic as countries that had moderate or relatively lower COVID-19 incidence. Given that the health containment indices (figure 1) were similar among most INTRePID countries, it is difficult to correlate health containment indices with visit patterns. However, Norway did have slightly lower health containment index scores than other INTRePID countries and was the country that best maintained prepandemic visit volume in the pandemic period. It is interesting to note that the three countries that were the highest in rates of virtual care in the pandemic period (Canada, UK and Sweden) were the three countries among INTRePID that had primarily capitation payment model primary care systems. It is possible that a capitation payment model system whereby a physician has a set group of patients that they are remunerated to care for, regardless of the number of times a patient is seen, may be more amenable to virtual PCP visits.

Table 3 Relative change in the average weekly visit volume comparing the pandemic period to the prepandemic period

Country	Total visit volume		Virtual visit volume	
	RR of total volume in the pandemic versus prepandemic period (95% CI)	P value	RR of virtual volume in the pandemic versus prepandemic period (95% CI)	P value
Australia	0.98 (0.92 to 1.05)	0.591	–	–
Canada	0.96 (0.89 to 1.03)	0.237	–	–
China	0.72 (0.58 to 0.88)	0.002	–	–
Norway	1.01 (0.88 to 1.17)	0.852	8.23 (5.30 to 12.78)	<0.001
Singapore	0.73 (0.65 to 0.83)	<0.001	–	–
South Korea	0.86 (0.79 to 0.94)	<0.001	–	–
Sweden	0.91 (0.79 to 1.06)	0.221	1.33 (1.17 to 1.50)	<0.001
UK	0.86 (0.72 to 1.03)	0.107	2.36 (2.24 to 2.50)	<0.001
USA	0.89 (0.82 to 0.96)	0.005	–	–

For countries with virtual care before and after the pandemic onset (Norway, Sweden and the UK), relative change in the weekly virtual visit volume is presented.
Prepandemic period=weeks 12–52 in 2019, except in China where it was weeks 5–52 in 2019.
Pandemic period=weeks 12–52 in 2020, except in China where it was weeks 5–52 in 2020.
*Unlike the other INTRePID countries, the number of clinics that contributed data for UK varied over time. An offset for the total number of patients covered for each week was added to the Poisson regression to account for this. For this reason, the RR is not directly comparable with the other countries.
INTRePID, INTernational ConsoRtium of Primary Care BIg Data Researchers; RR, rate ratio.

Funding policies may explain some of the differences in virtual care uptake during the pandemic. The low number of virtual visits observed in China, South Korea and Singapore reflect policy decisions on how PCPs were or were not renumerated for virtual care. However, there was also variation among the other INTRePID countries where policies supported renumeration for virtual visits such that funding policies alone may not fully explain the differences in primary care visits we observed. Other factors such as the perceived effectiveness of virtual visits, perceived barriers in patient access and satisfaction with virtual care may have influenced both the availability and uptake of virtual visits in primary care across INTRePID countries.

The large immediate drop in in-person visits seen in Canada and China at the onset of the pandemic may reflect previous experience with severe acute respiratory syndrome (SARS-CoV-1),[22] whereas other countries did not have as large a change in in-person visits. However, our results illustrate that China and Canada adopted different responses to adapt to this sudden change in in-person primary care services. In Canada, in-person visits were replaced with virtual visits such that total visit volume was largely maintained, and virtual visits continued to be the dominant format of care delivery throughout 2020. In China, the shift to replace missing in-person visits with virtual ones was minimal. As a result, total visit volume was lower during the pandemic than in the prepandemic period, but the number of in-person visits returned to prepandemic levels by the end of 2020. Although the health impacts of these differences remain to be seen, this example illustrates the value of comparing pandemic responses across jurisdictions. Studies done in a single country or health system might not recognise how the response taken locally during the pandemic compares with others internationally. The ability to compare experiences through INTRePID can provide further insight into the advantages and disadvantages of adopting virtual care models during the pandemic and beyond.

Comparison with other studies

Previous studies have looked at the switch to virtual care in one or a few jurisdictions.[23–25] Reduced access to in-person health services at the start of the pandemic is a common finding and consistent with our results across INTRePID. Researchers have also observed that the content of primary care visits changed during the pandemic.[26–28] This could be the result of changing population health needs or priorities during the pandemic or related to the increased use of virtual care. The current study illustrates that the increased use of virtual care was not universal and provides a foundation for future studies into the consequences of ongoing changes in primary care across INTRePID. This study allows for the individual countries to understand how they compare with other countries in the uptake of virtual visits in primary care. Experts in some jurisdictions predict that primary care may be changed forever or at least for the foreseeable future.[29 30] This study is an illustration of the adaptability of primary care in the face of a pandemic around the world. There is a need for continued research to support ongoing changes in primary care beyond the pandemic and INTRePID is well positioned to meet this challenge.

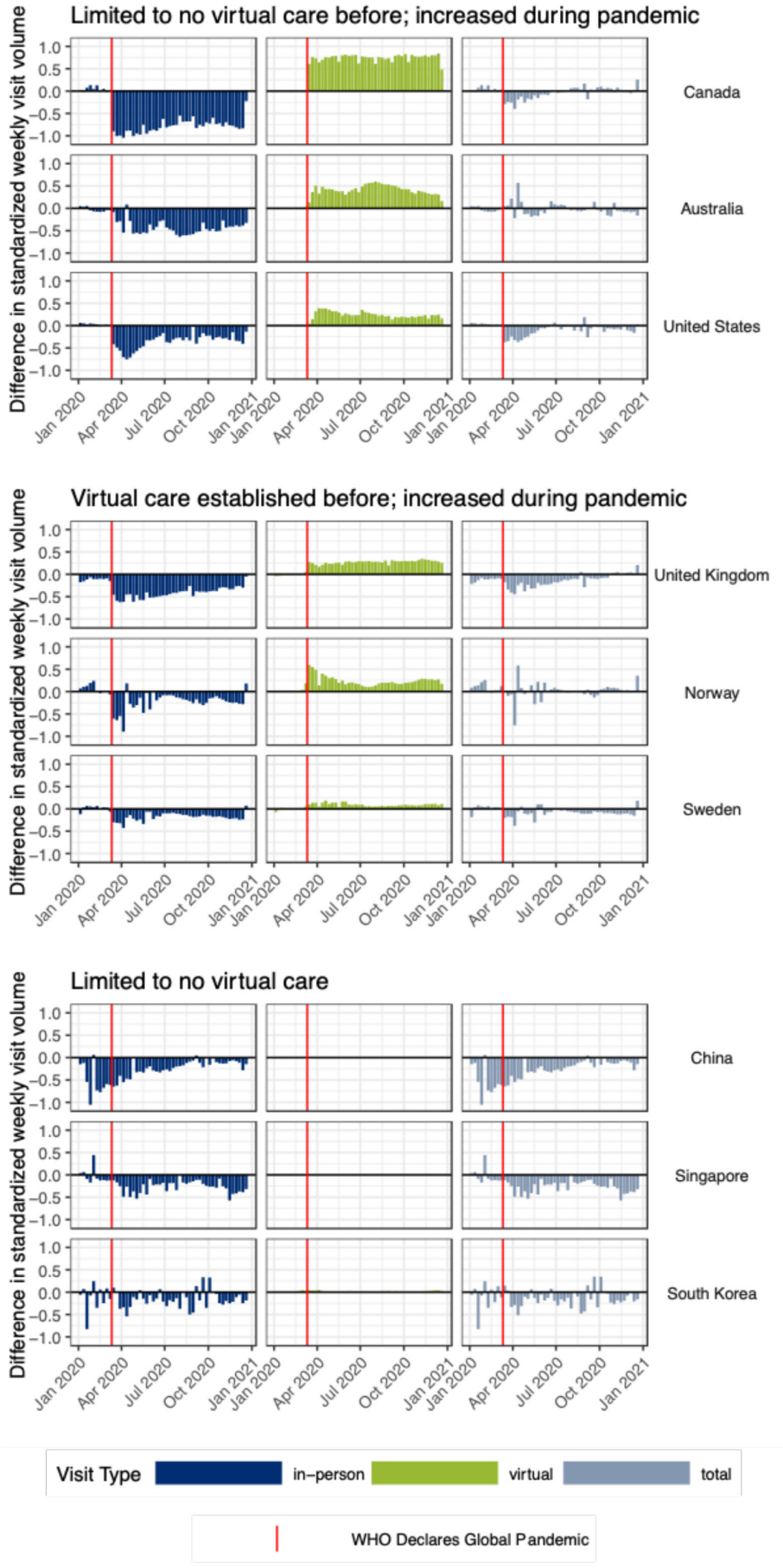

Figure 2 Year-over-year change in weekly visit volume, by country and visit type.

Strengths and limitations

Over the course of the past 2 years, COVID-19 and the effects of the pandemic have dominated the medical literature. While international comparative studies on COVID-19 impact or response are not new in primary care, previous studies have been largely descriptive[3 31] or based on survey responses.[32] The formation of INTRePID, using local experts to discuss and agree on comparable measures, perform local analysis, provide local context for interpretation of findings, the large volume of patients visiting primary care around the world and the focus on primary care are strengths of this endeavour.

There are nevertheless several limitations we must acknowledge with this study. First, there was a large variation of data availability in INTRePID countries. The availability of data ranged from national level data to only one or a few clinic's data in one country. In countries where there were fewer physicians contributing, the data may be less representative of the whole country and the national COVID-19 spread, and health containment indices may not accurately reflect the situation in settings that were locally sampled. Second, while we defined visits as those that we could reasonably measure through billing data sources in each country, we acknowledge that this approach does not capture all the activities of PCPs and in countries that did not allow for remuneration of virtual care, the activity of PCPs may be differentially under captured here. Third, it is possible that other care providers increased delivery of primary care services in some jurisdictions, and we were not able to measure this in this study. Last, we were limited to only having weekly visit data in 2019 and 2020 and focused our analyses on the average change in weekly visit volume comparing the pre and post pandemic periods rather than analysing trends in visit volume or format of care. We also only present unadjusted analyses as demographics and other environmental factors were not available for analysis.

CONCLUSIONS

The aftermath of the pandemic will only be known in the time to come. How the switch to virtual care may have impacted the quality of care provided is not yet known, will be subject for future study and will be of interest to both patients, providers and policy makers as the pandemic resolves.[21 31]

We have established the foundation for future international comparative studies on the impact of the pandemic on primary care in multiple countries.[33] Primary care around the world has proven to be flexible and adaptable to provide patient care throughout the pandemic.

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