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Face-to-face versus telehealth consultations during COVID-19 in Australian general practice: comparison of medication prescribing

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Abstract

Background: There has been a precipitous rise telehealth use in general practice during the COVID-19 pandemic. Understanding differences between face-to-face and telehealth consulting is an important component for planning the future use of telehealth services beyond the pandemic. However, there is limited evidence on whether telehealth consulting impacts medication prescribing under pandemic circumstances.

Aim: To compare medication prescribing in face-to-face *versus* telehealth consultations during the COVID-19 pandemic in Australian general practice.

Design and Setting: This multisite, retrospective observational study used de-identified routinely collected electronic health data extracted from 806 general practices in Victoria and New South Wales (NSW), Australia between April-December 2020.

Method: The primary outcome measure was whether at least one medication was prescribed following a telehealth or face-to-face consultation. Data are reported by medication and for each of the Anatomical Therapeutic Chemical (ATC) Classification System level 1 groups. The secondary outcome measure was first-time prescribing. Telehealth included both telephone and video consultations.

Results: A total of 13,608,216 consultations satisfied the inclusion criteria (61% face-to-face and 39% telehealth). Most telehealth consultations were conducted via telephone (97.8%). Overall, 39.3% of face-to-face and 33.0% of telehealth consultations prescribed at least one medication– a statistically significant difference (adjusted OR 1.38; 95% CI 1.379-1.381). The prescribing rate was greater for face-to-face vs telehealth consultations for all drug groups except ATC level 1N (nervous system).

Conclusion: Under COVID-19 restrictions in the states of Victoria and NSW, Australia, medication prescribing was higher in face-to-face consultations when compared to telehealth consultations in the study population.

Keywords: General Practice, COVID-19, Telemedicine

The COVID-19 pandemic has triggered a dramatic increase in the use of telehealth modalities for consulting in general practice. There is a paucity of quantitative evidence regarding differences between face-to-face and telehealth consultations during the pandemic, particularly for medication prescribing. This large multisite observational study of 806 general practices in two Australian states found a statistically significant difference in medication prescribing between face-to-face and telehealth consultations, with 6.3% more prescriptions issued in face-to-face consultations. Future qualitative research could explore General Practitioner decision-making criteria for prescribing medications during telehealth consultations.

HOW THIS FITS IN

INTRODUCTION:

Since the World Health Organization declared COVID-19 (the disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)) as a pandemic on 11 March 2020, within 15 months, there were 174,532,467 confirmed cases of COVID-19 and the tragic loss of 3,772,340 lives[1] globally. The pandemic has had a devastating impact on healthcare systems around the world with many countries propelled into adopting changes to meet emerging challenges and increasing system demands. One measure widely introduced, or upscaled, during the pandemic was the use of telehealth modalities (including both telephone and video consultations)[2-4] to address the challenges associated with COVID-19 such as infection control, physical distancing, or COVID-Safe restricted activity directives.

Telehealth has been defined by the International Organization for Standardization as "the use of telecommunications techniques for the purpose of providing telemedicine, medical education and health education over distance"[5], and telehealth consultation uptake has rapidly accelerated worldwide[6]. In general practice, primary care and outpatient settings, studies have reported decreases in the overall number of patient consultations[3, 7-9], decreases in face-to-face consultations[3, 7-11], and concomitant increases in telehealth/remote consultations[3, 4, 8-13] with telephone consults more widely used than video consultations[3, 4, 8, 10, 13]. Whilst the expeditious shift towards telehealth consultations has provided accessibility to healthcare practitioners during periods of lockdown and restrictions, differences between the content of US primary care telemedicine and face-to-face consultations (for blood pressure and cholesterol assessments) during the pandemic have been reported[11].

Another aspect of primary care consulting which has the potential to differ between telehealth and face-to-face is medication prescribing. A pre-pandemic systematic review of primary care antibiotic prescribing via remote consultations found mixed evidence of the impact of remote consulting with studies reporting higher, lower and no difference in antibiotic prescribing between face-to-face and remote consultations[14]. During the pandemic, several studies have examined antibiotic prescribing in primary care[9, 15-17], however, fewer studies have examined the relationship between telehealth and prescribing. Researchers from the USA found similar rates of new medication prescribing during the second quarter of 2020 between face-to-face and telemedicine visits[11]; and lower rates of antibiotic prescribing for acute rhinosinusitis for face-to-face (March-May 2019) compared to "virtual visits" (March-May 2020)[18].

With the precipitous rise in telehealth consultations during the pandemic, gaining an understanding of its impact on prescribing in primary care is an important component for planning the future use of telehealth beyond the current COVID-19 pandemic. Building on our previous research, which compared socioeconomic and demographic factors in the uptake of telehealth[19] and changes in medication prescribing during the pandemic in Australian general practice[20], the purpose of the current study was to compare medication

prescribing in face-to-face *versus* telehealth consultations during the COVID-19 pandemic in Australian general practice.

METHODS

Study design and setting

We conducted a multisite, retrospective observational study utilising routinely collected electronic health data extracted from 806 general practices across five Primary Health Networks (PHNs) in the states of Victoria and New South Wales (NSW), Australia. Three of the PHNs were from Victoria including two in metropolitan Melbourne and one in a mainly rural area. The two other PHNs were from NSW including one in metropolitan Sydney and one incorporating both metropolitan and rural areas of NSW. The study period was from April 1, 2020 to December 31, 2020.

Study context

As part of the Australian Government's response to the pandemic, a Primary Care Package was introduced which included temporary Medicare Benefits Schedule (MBS) items for telehealth from 13 March 2020[21]. Temporary telehealth service items could be billed by General Practitioner (GP) and other medical practitioners for non-hospital patients with whom they had an "established clinical relationship" and included separate item numbers for telehealth via videoconference and telephone consultation[22]. In addition, the COVID-19 National Health Plan announced that electronic prescribing (e-Prescribing) and dispensing would be fast tracked over a period of 8 weeks[23, 24]. The e-Prescribing provisions included options for prescriptions to be faxed or emailed to a patient's preferred pharmacy or sent directly to the patient via short message service (SMS) or email[24]. Further contextual information is presented in Supplementary Figure S1.

Participants

The study participants included patients who received professional GP consultations for standard attendance, chronic disease management and/or mental health services during the study period (Figure 1). The MBS items used to identify these services are presented in Supplementary Table S1. Patients seeking other services (e.g. diagnostic testing) and non-GP consultations (e.g. other medical practitioners, specialists, consultant physicians, psychiatrists, nurse practitioners and other allied health practitioners attendances) were excluded. Patients who received both face-to-face and telehealth consultations in one day were also excluded as the aim of the study was to compare the two consultation types in terms of medication prescribing.

Data source

We utilised de-identified general practice data sourced from the Population Level Analysis and Reporting (POLAR) platform. The platform covers nearly 30% of the Australian population from over 800 general practices across the two states[17]. The details about POLAR platform have been published elsewhere[25, 26]. In brief, some of the key data collected include *patient demographics* (age, gender, patient postcode, patient status), *service provided* (MBS items, service group (e.g. standard attendance, chronic disease management), service date) and *medication prescribed* (name, dose, quantity, strength, frequency, repeats, prescribing date, and the anatomical therapeutic chemical classification (ATC) codes of the medication).

The patient status (active or non-active) was determined using the Royal Australian College of General Practitioners (RACGP) criteria whereby, a patient is considered 'active' if they have attended the practice/service ≥3 times in the last two years[27]. We utilised the patient's postcode to determine remoteness of residential location and socioeconomic status of the patients based on the Australian Accessibility/Remoteness Index and the Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD)[28]. The ATC system is developed by the World Health Organization (WHO) to classify active ingredients of medications based on their site of action (organ or system) and therapeutic, pharmacological and chemical properties[29]. According to the system, medications are classified in a hierarchy with five different levels with each level having a certain number of groups or subgroups. For instance, ATC level 1 has fourteen main anatomical/pharmacological groups and level 3 has over 260 chemical, pharmacological or therapeutic subgroups[29].

Variables

The primary outcome measure was whether at least one medication was prescribed following the consultation. We presented results for any medication prescribing; and separately for each of the ATC level 1 groups. The secondary outcome measure was first-time prescribing. We reviewed the patient's medication prescribing history over the last four years (since January 2017) to determine whether a given medication was prescribed for the first time or not. The primary independent variable was the consultation type (face-to-face *vs* telehealth).Telehealth included both telephone and video consultations. The co-variates considered in the model included gender, age (grouped as <40, 40-59, 60-74 and ≥75), socioeconomic status, patient status, remoteness index, PHN, the state of the practice.

Statistical methods

Descriptive statistics including medians (IQR) and frequency (%) were reported. Multilevel mixed-effects logistic models with practice-specific random intercepts were used to evaluate the association between the consultation type (face-to-face vs telehealth) and outcome measures (medication prescribing). This approach adjusts for the clustering effect while also controlling for known confounders. The analyses were adjusted for both patient case-mix (gender, age, socioeconomic status, patient status, and the remoteness

index) and practice characteristics (PHN and the state of the practice). The strength of association was estimated using the odds ratio (OR) with 95% confidence intervals (CI).

The risk-adjusted medication prescribing rate (Figure 2) was determined using logistic regression with a robust variance estimation using a similar method as described previously by Lenzi et al[30]. Patient baseline characteristics including age, gender, socioeconomic status, patient status and the remoteness index were used to generate the risk-adjusted rate. All p-values were 2-tailed and $P<0.05$ was considered statistically significant. Analyses were conducted using Stata version 16 (StataCorp LP, College Station, TX).

Ethical Considerations

This study has received ethical approval from Macquarie University Human Research Ethics Committee (52020675617176). Outcome Health[31] has been granted ethical approval to collect and use general practice data by the RACGP National Research and Evaluation Ethics Committee (NREEC 17–008).

RESULTS

Participants

A total of 13,608,216 patient consultations (8,235,130 from Victoria and 5,373,086 from NSW) for either standard, chronic disease management or mental health from 806 practices satisfied the inclusion criteria. Of these, 61% (n=8,303,233) were face-to-face and 39% (n=5,304,983) were telehealth consultations (Figure 1). The majority of the telehealth consultations involved telephone (97.8%, n=5,188,643). Table 1 presents the demographic characteristics of consultations.

Medication prescribing patterns

The proportion of consultations with at least one medication prescribed was 36.9% (n=5,016,626), regardless of the consultation type. There were a total of 8,616,463 prescriptions. Medication prescribing patterns according to the ATC levels 1 and 3 are shown in *Supplementary* Table S2. Medications for the *nervous system* followed by the *cardiovascular system* were the leading ATC level 1 drug classes accounting for 24.9% and 18.2% of all prescriptions respectively. The top fifteen ATC level 3 drug classes accounted for 53.7% of the total prescriptions. '*Opioids'*, '*antidepressants'* and '*lipid-modifying agents, plain'* were the top three ATC level 3 drug classes accounting for 6.5%, 5.3% and 5.2% of all prescriptions, respectively (Table S2).

Primary outcome – differences in medication prescribing

Overall, 39.3% (n=3,264,748) of face-to-face and 33.0% (n=1,751,878) of telehealth consultations prescribed at least one medication – a statistically significant difference of 6.3% (adjusted OR 1.38; 95% CI 1.379-1.381).

The difference in prescribing rate between face-to-face and telehealth consultations was greater in NSW compared to Victoria (9.9% *vs* 5.4%) (Table 2).

The difference in prescribing between face-to-face vs telehealth consultations for each of the ATC level 1 drug groups is shown in Supplementary Figures S2-S3. The prescribing rate was greater for face-to-face vs telehealth consultations for all drug groups except for ATC level 1 N (nervous system). The highest difference in prescribing rate between face-to-face and telehealth consultations was observed for ATC level J (anti-infective for systemic use) prescribing (8.2% vs 5.5% - a difference of 2.7%). However, ATC code D (Dermatologicals) had the highest adjusted OR of 2.67 (95% CI 2.64-2.69).

Figure 2 presents the adjusted medication prescribing rate for face-to-face vs telehealth consultations over time. The prescribing rate was greater for telehealth consultations in April (34.8% *vs* 31.1%), but from May onwards, the rate was consistently greater for face-to-face consultations. The peak difference in the prescribing rate between the two consultation types was reached in June with a difference of 10.2% (9.9% in Victoria and 12.5% in NSW).

Secondary outcome – differences in first-time prescribing

Of the total 5,016,626 consultations with prescriptions, 41.0% (n=2,057,545) were prescribed a medication for the first time. Overall, the proportion of consultations with first-time prescription was 18.3% (n=1,520,401) for face-to-face and 10.1% (n=537,144) for telehealth consultations – a difference of 8.2% (adjusted OR 2.03; 95% CI 2.020-2.031). The difference was slightly higher for NSW compared to Victoria (Table 3).

DISSCUSSION

Summary

In this multisite, retrospective observational study of general practices using routinely collected health data from over 13.6 million patient consultations, face-to-face consultations were more prevalent than those conducted via telehealth (61% versus 39%). Telehealth consultations were predominantly telephone (97.8%). Overall, there was a statistically significant higher (+6.3%) prescribing rate for face-to-face consultations. During the study period April-December 2020, the prescribing rate was only greater for telehealth consultations in April (towards the end of the first wave of the pandemic in Australia[32]), but from May onwards, the rate was consistently greater for face-to-face consultations, despite a second wave in Victoria between late-June and early-September[32]. Prescribing rate was greater for face-to-face vs telehealth consultations for all ATC groups, except for medications for nervous system. The proportion of consultations with a first-time prescription was 8.2% higher in face-to-face consultations.

Strengths and limitations

A major strength of the current study is the population sample size of over 13.6 million patient consultations. The large sample size also permitted direct comparison of face-to-face and telehealth consultations during the same time period. In addition, the study period extends beyond the early phase of the pandemic and captures two distinct waves encompassing the middle of the first wave in both NSW and Victoria and the second wave in Victoria alone (late-June to early-September in 2020), however, it did not capture the beginning of the first wave of the pandemic when there may have been increases in medication prescribing[33] due to consumer stockpiling. The study is limited to the context of general practice in two Australian states within a national COVID-19 policy environment and may not be generalisable to other settings or beyond pandemic circumstances. Our analysis did not determine whether a telehealth consultation resulted in a follow-up face-to-face consultation for the purpose of medication prescribing. Our analyses were performed using routinely-collected data and may therefore be subject to unmeasured confounding factors.

Comparison with existing literature

During our study period, telehealth represented 39% of general practice consultations. In contrast, a study by Murphy et al in UK primary care found 90% of GP consultations during April 2020 were conducted via remote consultation[3], however, this may reflect contextual differences in case numbers, local restrictions and a shorter study timeframe compared to the current study. Murphy et al[3] also reported greater use of telephone compared to video consultations which is consistent with our study findings and pandemic-period reports of Veteran Affairs outpatients in the US[8] and general practice in Australia[13].

The need to acknowledge context (COVID-19 restrictions/policies) and timeframe (waves of pandemic) in comparing literature during the pandemic is highlighted in our study findings where prescribing rate was greater for telehealth consultations in April (towards the end of the initial wave of the pandemic in Australia) but from May onwards, the rate was consistently higher for face-to-face consultations (despite a second wave in Victoria). Our April prescribing data resembles data from a study of primary healthcare in Iceland between March-April 2020, which showed an increase in the number of prescriptions issued from web and telephone-based consultations, with overall numbers for web and telephone issued prescriptions being higher when compared to office and home visits[34] (although relatively higher numbers were also apparent pre-pandemic)[34].

Overall, the risk adjusted prescribing rate in our study was higher for face-to-face consultations post April 2020, with prescribing rate greater for all drug groups except for medications for nervous system. Our study fills the knowledge gap for medication prescribing between telehealth and face-to-face consultations across all medication categories as there is currently little comparable evidence examining the relationship between general practice consultation modality and medication prescribing during the pandemic, with

prescribing studies focussing on antibiotics[18] and/or pre-pandemic periods[14, 35]. In a study of antibiotic prescribing for acute rhinosinusitis, Miller et al. reported a significantly lower rate of antibiotic prescribing in virtual patient visits during March-May 2020 when compared to in-person visits during the same months of the previous year[18]. New medication prescribing in US primary care was studied by Alexander et al who found similar proportions between telemedicine (39.3%) and office-based consultations (44.9%) during quarter two 2020[11] which is slightly less than the results from our study period which found the proportion of consultations with a first-time prescription was 8.2% higher in face-to-face when compared to telehealth consultations.

Implications for research and/or practice

Understanding differences between face-to-face and telehealth consulting is important for planning the future use of telehealth modalities beyond the pandemic. Our study findings for medication prescribing add valuable evidence to the limited literature currently available for general practice prescribing by mode of consultation during pandemic circumstances. The significantly higher prescribing rate for face-to-face consultations found in the current study suggests that prescribing may be an important factor in choice of consultation modality, particularly for new medication prescribing. As detailed by Greenhalgh and Rosen[36], choice of consultation modality is impacted by a complex interaction of many contributing factors. Future qualitative research could explore GP decision-making criteria for determining whether medications are prescribed during telehealth consultations.

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Ethical approval: Ethics approval for the project was provided by Macquarie University Human Research Ethics Committee (52020675617176). Ethics to collect and use general practice data has been obtained by Outcome Health, the data custodians[37] granted by the Royal Australian College of General Practitioners (RACGP) ethics committee (17-008).

Competing interests: The authors have no competing interests to declare.

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Table 1: Baseline characteristics of consultations, April-December 2020.

Variables, n (%)	Face-to-face (n=8,303,233)	Telehealth (n=5,304,983)	Overall (n=13,608,216)
Female	4,684,918 (56.4)	3,324,348 (62.6)	8,009,266 (58.8)
Age group			
<40	3,342,444 (40.3)	2,086,727 (39.3)	5,429,171 (39.9)
40-59	2,063,824 (24.9)	1,420,669 (26.8)	3,484,493 (25.6)
60-74	1,714,115 (20.6)	1,030,080 (19.4)	2,744,195 (20.2)
≥75	1,182,850 (14.2)	767,507 (14.5)	1,950,357 (14.3)
Socioeconomic status/ IRSAD*			
1 (most disadvantaged)	932,407 (11.3)	429,285 (8.1)	1,361,692 (10.0)
2	1,089,856 (13.2)	559,819 (10.6)	1,649,675 (12.2)
3	1,101,025 (13.3)	795,165 (15.0)	1,896,190 (14.0)
4	1,933,384 (23.3)	1,292,530 (24.4)	3,225,914 (23.8)
5 (most advantaged)	3,227,349 (39.0)	2,216,393 (41.9)	5,443,742 (40.1)
Remoteness*			
Major cities	7,417,738 (89.5)	4,695,032 (88.7)	12,112,770 (89.2)
Inner regional	793,798 (9.6)	560,362 (10.6)	1,354,160 (10.0)
Outer regional/remote/ very remote	73,194 (0.9)	38,290 (0.7)	111,484 (0.8)
Patient status			
Active	7,646,925 (92.1)	5,116,207 (96.4)	12,763,132 (93.8)
Non-active	656,308 (7.9)	188,776 (3.6)	845,084 (6.2)
State			
Victoria	4,470,203 (53.8)	3,764,927 (71.0)	8,235,130 (60.5)
NSW	3,833,030 (46.2)	1,540,056 (29.0)	5,373,086 (39.5)

*≈0.2% missing data.

Table 2: Difference in medication prescribing between face-to-face *vs* telehealth consultations, April-December 2020.

Consultation type		Number of consultations with at least one medication prescribed, n (%)	Total consultations	Face-to-face *vs* Telehealth	
				Difference	OR (95% CI)*
Victoria	Face-to-face	1,807,097 (40.4)	4,470,203	5.4%	1.28 (1.270-1.281)
	Telehealth	1,319,473 (35.0)	3,764,927		
NSW	Face-to-face	1,457,651 (38.0)	3,833,030	9.9%	1.62 (1.619-1.630)
	Telehealth	432,405 (28.1)	1,540,056		
Overall	Face-to-face	3,264,748 (39.3)	8,303,233	6.3%	1.38 (1.379-1.381)
	Telehealth	1,751,878 (33.0)	5,304,983		

***Adjusted for age, gender, socioeconomic status, patient status, remoteness, PHN, and the state of the practice.**

Table 3: Difference in first-time medication prescribing between face-to-face *vs* telehealth consultations, April-December 2020.

Consultation type		Number of consultations with a first-time prescription, n (%)	Total consultation	Face-to-face *vs* Telehealth	
				Difference	OR (95% CI)*
Victoria	Face-to-face	830,677 (18.6)	4,470,203	7.9%	1.93 (1.929-1.940)
	Telehealth	401,378 (10.7)	3,764,927		
NSW	Face-to-face	689,724 (18.0)	3,833,030	9.2%	2.33 (2.32-2.35)
	Telehealth	135,766 (8.8)	1,540,056		
Overall	Face-to-face	1,520,401 (18.3)	8,303,233	8.2%	2.03 (2.020-2.031)
	Telehealth	537,144 (10.1)	5,304,983		

***Adjusted for age, gender, socioeconomic status, patient status, remoteness, PHN, and the state (NSW or Victoria) of the practice.**

Figure 1: Participant selection flow chart, April-December 2020. *Indicates prescriptions not associated (linked) with the selected Medicare Benefit Scheme (*MBS) items* for standard, chronic disease management and mental health-related consultations. General practitioner (GP); MH (Mental Health).

Figure 2: Risk-adjusted rate of prescribing at least one medication by month of GP consultation, April-December 2020. Risk-adjustment included patient level variables (age, gender, socioeconomic status, patient status and the remoteness index).