OUTCOME HEALTH

Insights Paper No.4

COVID-19 and Australian General Practice

Medication prescribing changes during the pandemic

21st May, 2020

The fourth in a Series of insight papers prepared by Outcome Health with the support of participating PHNs.

South Eastern Melbourne Primary Health Network
Eastern Melbourne Primary Health Network
Gippsland Primary Health Network
South Western Sydney Primary Health Network
Central and Eastern Sydney Primary Health Network

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Contents

Preamble

This is the fourth in a series of papers which considers the impact of COVID-19 on Australian General Practice and the broader healthcare community:

Paper 1. Report into COVID-19 AND GENERAL PRACTICE, Insights from the first few weeks.
Paper 2. COVID-19 and General Practice, Insights Paper no. 2 – A predictive impact model for the healthcare sector.
Paper 3. COVID-19 and General Practice, insights paper no 3 - A preliminary analysis of changes due to telehealth use

Through the COVID-19 outbreak, Outcome Health has been producing daily reports and dashboards via the POLAR GP tool for Primary Health Networks (PHNs) to allow direct planning and resource allocation through their respective practices. These insight reports are an initiative of the following PHNs – Central and Eastern Sydney, South Western Sydney, Gippsland, Eastern Melbourne and South Eastern Melbourne.

More information about POLAR can be found here polargp.org.au.

Key Learnings

Prescribing habits are extremely sensitive to social changes, with significant spikes (or troughs) being seen on week by week analysis. The changes seen are varied, and some (antimicrobials, for example) seem to be persisting beyond the most acute time of spread. National policies can be informed by real-time monitoring and alert mechanisms, not currently in place. For some changes – even the timelines required to prepare these papers is too slow.

The significance of the impact of patients visiting practice that are not their usual practice provides an interesting twist to the data and is responsible for some of the significant spikes seen. This needs to be explored further.

Recommendations

- Realtime monitoring of prescription data has value and should be established through programs such as POLAR GP – with rapid feedback loops at the general practice, PHN and policy level.
- Mental health has been already identified as a focus in the upcoming months. The increasing use of anxiolytic drugs should be monitored in an ongoing fashion. Mental health will be the focus of our next paper.
- The reductions in Antimicrobial use is currently sustained, and work should be done to ensure more appropriate antimicrobial stewardship can be maintained.
- The activity reported in this paper is prescribing only – linkage to dispensing data would provide invaluable insights.
- As e-prescribing reaches full implementation inclusion of its impact is a consideration for reporting via the POLAR-GP platform

Method

Outcome Health provides Population Level Analysis and Reporting (POLAR) services to Primary Health Networks (PHNs), including for collaborative research in the AURORA Data Space. The current database includes over 10,000 contributing providers including GPs, practice nurses and other general practice staff in 1000 individual practices. The basic programme (called POLAR GP) provides quality assurance and audit/feedback loops to GPs, to enhance care and improve data quality. Two PHNs are in NSW and extend from central Sydney (Central and Eastern Sydney) all the way down to Wingello and Bundanoon in rural NSW (South West Sydney). In Victoria three PHNs include a predominantly rural (Gippsland) and two urban (Eastern Melbourne and South East Melbourne), essentially including the Victorian population east of Craigieburn and Heidelberg in Melbourne, and the great dividing range in rural Victoria. The sample therefore covers about 30% of the Australian populace, with an urban and rural (but not remote) focus.

Ethics approval for the programs data collection has been granted by the RACGP ethics committee, a Privacy Impact Assessment performed by external consultants, as well as regular external security testing. De-identified data is extracted daily and processed into coded schemas: SNOMED for diagnoses, ATC for medications, and other coding schemas for referrals, pathology etc. Further detail about the POLAR program (Including technical, privacy and ethical aspects) has been published and is available at: Pearce C, Mcleod A, Rinehart N, Ferrigi J, Shearer M. What does a comprehensive, integrated data strategy look like: The Population Level Analysis and Reporting (POLAR) program. Stud Health Technol Inform. 2019;264:303-7.

Timing

As these reports gather evidence based on a weekly analysis – interpretation of the figures often requires an understanding of the policy and practical happenings at the relevant time. Below is a representation of the significant events since the beginning of the year, from the first notification of the identification of the virus in China, through to the current staged easing of restrictions. Only significant events for NSW and Victoria are included, as our data comes from only those regions. The timeline highlights the rapidity in which this pandemic formed. The first case was identified in January, when Australia was still grappling with the bushfire crisis. Australia's first death did not occur until March, and social distancing did not start until mid-march

Week	Date	Health	Social Policy
1	1-7 Jan	Virus identified in China	Bushfires
2	8-14 Jan		Bushfire state of emergency declared.
3	15-21 Jan		
4	22-28th Jan	First case confirmed in Australia	
5	29 Jan-4th Feb		WHO declares public health emergency. Travel ban from China
6	5-11th Feb		
7	12-18th Feb		
8	19-25th Feb		
9	26 Feb -3rd March	First Death in Australia	Extended travel ban
10	4-10th March		
11	11-17th March	First Round telehealth items	WHO declares global pandemic NSW social distancing commences. Victoria declares state of emergency
12	18-24th March		Ruby Princess docks. Human biosecurity emergency declared. High level social distancing announced NSW beaches closed
13	25-31st March	Second Round telehealth items	Easter Highest peak of identified cases in both NSW and Victoria
14	1-7th April		Peak of deaths in both states
15	8-14th April		
16	15-21st April		
17	22-28th April	e-prescribing commences – image based prescribing	
18	29 april-5th May		NSW eases restrictions Elective surgery restarts
19	6-12th May		Vic eases restrictions
20	13-19th May		Current week (data may be incomplete)

Medication Overview

POLAR collects high quality prescribing data from general practice clinical systems. The medication prescription workflow requires a prescription to be generated with dose and strength details, meaning the data is structured, coded and therefore relatively easy to interpret. It is, however, limited by the need for it to be a prescribed by the general practitioner (GP). So, medications prescribed only by specialist (Roaccutane for instance, for instance, or specialised cancer medications) will not appear in our data.

In most cases the 'reason for prescription' field is not well recorded, so assumptions about the indication must be taken from either the drug class, or by an association with specific diagnosis in the record. In this analysis we have not attempted the latter. We rely on the large numbers to limit any errors due to 'diagnosis creep'. In other words, whilst antidepressants can be used for other indications such as chronic pain, insomnia, migraine, we believe that the numbers of patients being prescribed the medications for these indications are sufficiently small that the increases we are seeing are due to managing mental health conditions. In other words, even if the use of antidepressants *for migraine* doubled, we would not show any false indications in this data. Any increase is due to the 'most common indication' principle.

POLAR classifies medications according to the ATC classification[1] , a drug and therapeutic classification developed and supported by the World Health Organisation. In the ATC classification system, the active substances are classified in a hierarchy with five different levels. The system has fourteen main anatomical/pharmacological groups or 1st levels.

Each ATC main group is divided into 2nd levels which could be either pharmacological or therapeutic groups. The 3rd and 4th levels are chemical, pharmacological or therapeutic subgroups and the 5th level is the chemical substance. The 2nd, 3rd and 4th levels are often used to identify pharmacological subgroups when that is considered more appropriate than therapeutic or chemical subgroups. The advantage of using a system like ATC is from a population health perspective it gives us the ability to either look at a high level group of medications, eg Cardiac (1st level) Beta Blockers (3rd level) and the individual drug Metoprolol (5th level).

The complete classification of metformin illustrates the structure of the code:

A	Alimentary tract and metabolism (1st level, anatomical main group)
A10	Medications used in diabetes (2nd level, therapeutic subgroup)
A10B	Blood glucose lowering medications, excl. insulins (3rd level, pharmacological subgroup)
A10BA	Biguanides (4th level, chemical subgroup)
A10BA02	metformin (5th level, chemical substance)

Some change on a year by year comparison occurs as part of background changes – if we look at past years, a week by week comparative variation of 10% is not unusual – in other words we are in this report looking for changes that are larger than 10%, and consistent trends (up or down). So for opioids, for instance between 2018 and 2019, there was only one week where the variation exceeded 10%, most being within the range.

To account for variations in numbers, in the tables below there are a minimum of 1000 prescriptions per category (except where noted in the text).

Below is a graph of all medication prescriptions across the first half of the year:

[1] https://www.whocc.no/atc_ddd_index/

- The first COVID-19 case in Australia occurred in week four. Despite the significant bushfire impact, up until that point most prescriptions were following a similar trend to other years (except for medications used in respiratory conditions, discussed later).

- At weeks 6 to eight the number of cases in Australia was starting to rise, leading to a peak in prescriptions in week 9, coinciding with the first death in Australia.

- At week 15 to 19 we now begin to see a slight reduction in prescriptions compared to previous years. Have patients stocked up on scripts earlier in the COVID-period? Is telehealth having an impact? Are patients staying away?

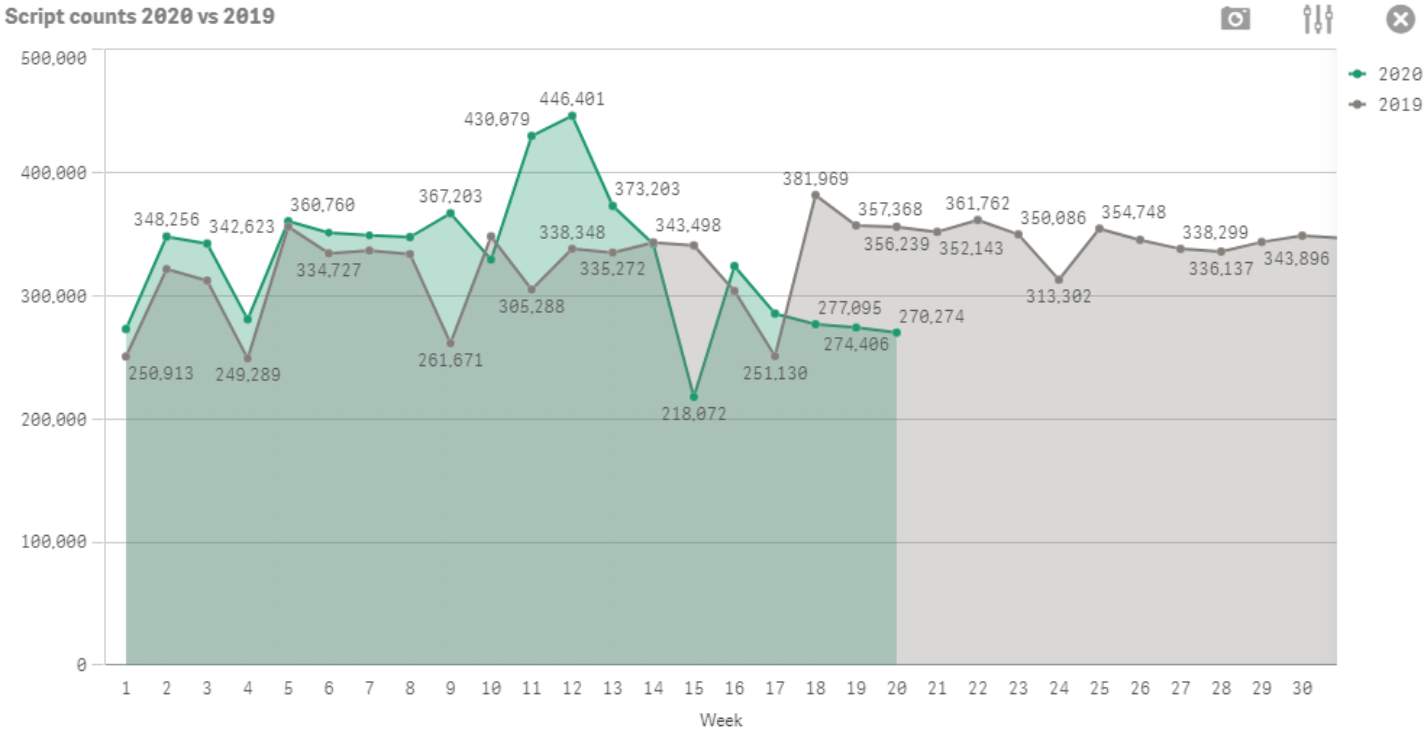

Figure 1, Medication Prescriptions, by week 2020 v 2019.

Figure 1 is the picture for all patients across all practices [2]. However, further explanation can be gained if we look at the types of patients involved. POLAR allows for selection of patients according to the RACGP definition of an active patients, which is three visits across a two-year period. We looked at the figures for active patients in the practice, and inactive (those who have not visited three times over two years).

[2] For a detailed model of the general practice impact – see COVID-19 and General Practice, Insights Paper no. 2 – A predictive impact model for the healthcare sector

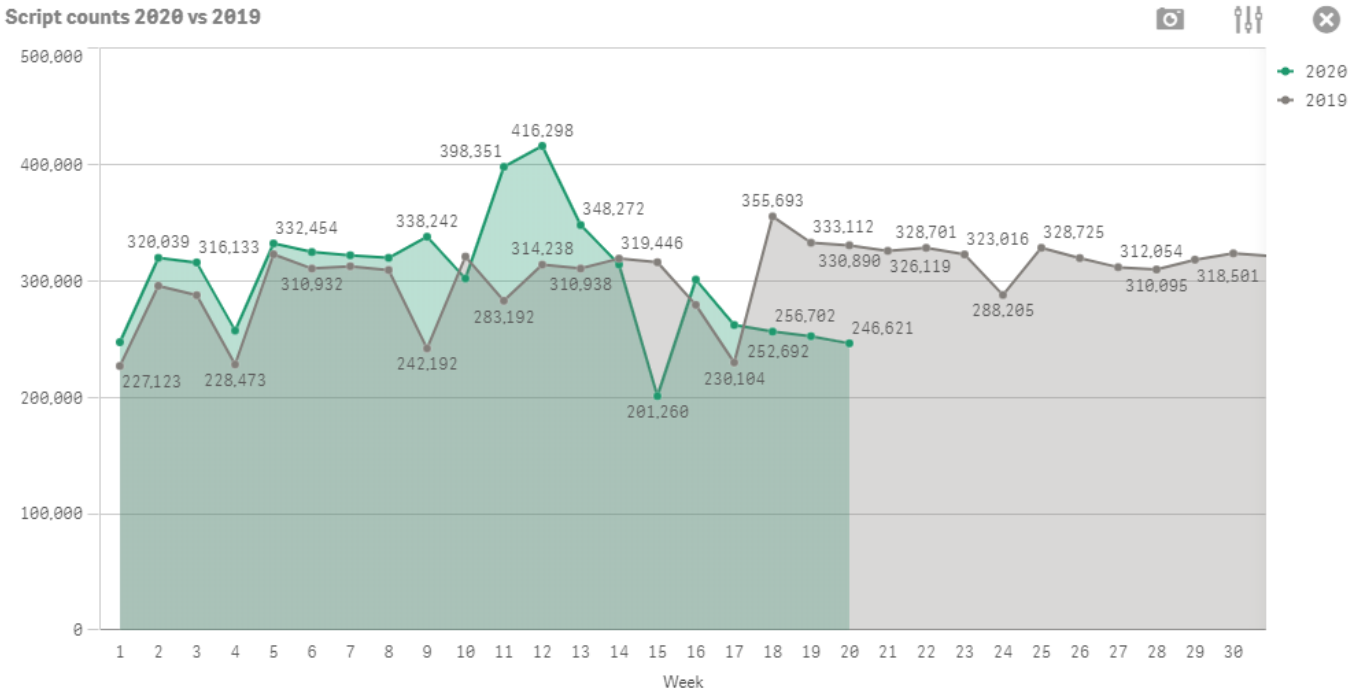

Figure 2 – RACGP Active Patients (More than three visits to the practice across a two-year period)

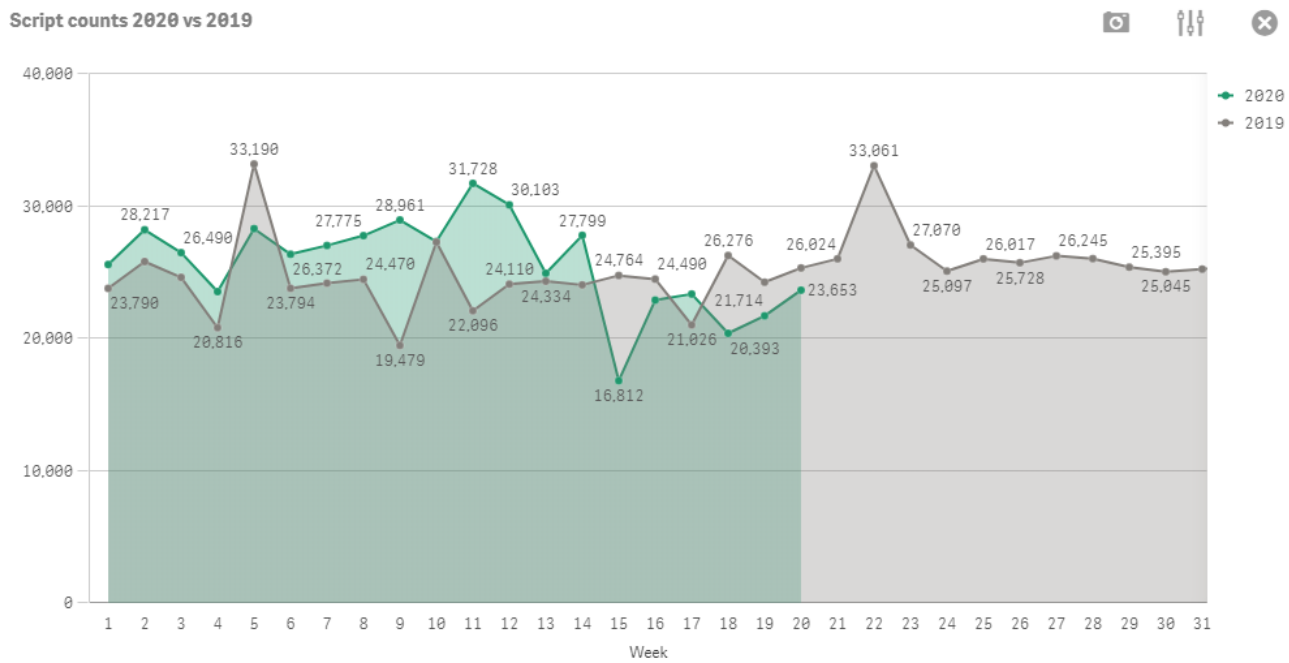

Figure 3 – RACGP Non-active patients (Less than three visits to the practice across a two-year period)

We can see some difference in the pattern that combine to make the overall graph. Active patients have a peak at weeks 10 to 14, inactive patients have a more sustained increase up until about week 12. So during the 'Time of Uncertainty' (see paper 2), many patients who were irregular (or first time) attenders to their GP were being prescribed medications, whereas regular patients obtained prescriptions during the Time of Spread.

Figure 4 shows the changes in the type of prescription between week by ATC Level 1, compared to the same week last year. Red shaded weeks represent a reduced rate, and green shaded cells an increase. Percentages are in the box.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ALIMENTARY TRACT AND METABOLISM	-11%	-13%	-14%	-13%	-14%	-16%	-14%	-15%	-10%	-18%	-19%	-21%	-18%	-17%	-17%	-11%	-9%	-7%	-2%	2%
ANTIINFECTIVES FOR SYSTEMIC USE	-2%	-1%	-2%	5%	5%	13%	-2%	-1%	-12%	8%	-5%	-14%	-17%	-10%	-9%	-19%	-23%	-20%	-21%	-26%
ANTINEOPLASTIC AND IMMUNOMODULATING AGENTS	15%	8%	12%	9%	12%	4%	12%	8%	38%	1%	23%	23%	30%	35%	15%	18%	38%	33%	12%	10%
ANTIPARASITIC PRODUCTS, INSECTICIDES AND REPELLENTS	-2%	0%	-2%	-6%	-3%	-9%	-13%	-7%	-27%	-17%	-27%	-15%	-29%	-20%	-18%	-17%	-16%	-26%	-21%	-17%
BLOOD AND BLOOD FORMING ORGANS	10%	7%	8%	3%	4%	3%	8%	7%	19%	4%	5%	6%	5%	8%	1%	2%	14%	15%	6%	7%
CARDIOVASCULAR SYSTEM	6%	3%	3%	2%	4%	-7%	7%	5%	6%	7%	17%	22%	26%	21%	9%	15%	17%	3%	3%	5%
DERMATOLOGICALS	-5%	-6%	-7%	-3%	-4%	17%	-1%	5%	14%	-12%	-17%	-26%	-28%	-22%	-9%	1%	3%	14%	15%	18%
GENITO URINARY SYSTEM AND SEX HORMONES	-2%	0%	0%	-2%	0%	4%	-1%	1%	1%	-6%	-7%	-9%	-9%	-10%	-9%	-0%	2%	-1%	3%	4%
MUSCULO-SKELETAL SYSTEM	0%	1%	1%	1%	-1%	1%	3%	1%	-1%	-3%	-10%	-16%	-14%	-8%	-6%	1%	3%	1%	3%	9%
NERVOUS SYSTEM	-2%	-0%	0%	-1%	-0%	-8%	1%	1%	-6%	-3%	-5%	-6%	1%	3%	11%	9%	11%	11%	15%	17%
RESPIRATORY SYSTEM	25%	26%	31%	17%	10%	21%	1%	4%	33%	21%	58%	99%	70%	38%	19%	6%	-4%	0%	-14%	-18%
SENSORY ORGANS	-7%	-6%	-9%	-8%	-8%	2%	2%	3%	6%	-5%	-14%	-18%	-18%	-11%	-2%	0%	-1%	6%	1%	3%
SYSTEMIC HORMONAL PREPARATIONS, EXCL. SEX HORMONES AND INSULINS	15%	11%	14%	11%	10%	19%	7%	6%	14%	19%	26%	23%	13%	-4%	-10%	-10%	-9%	-6%	-16%	-24%

Figure 4 – 2019 vs 2020 Prescription changes by class (ATC Level 1)

Clearly there are significant increases and decreases in a range of medications across the period. As would be expected, the largest increase is in 'Respiratory System' prescriptions, although numbers have decreased in the last few weeks. Likely to be a mix of acquiring preventers, stocking up (or potentially hoarding medications), patient hypersensitivity around <u>any</u> respiratory illness and COVID-19 itself. Anti-infectives (the most commonly prescribed medications on the PBS) show a sustained drop. Decreases were seen across 'Alimentary Tract and Metabolism' (peptic ulcer medications, anti-diabetic agents, etc), 'Antiparasitic', 'Dermatologicals.

We also looked at the rural vs urban divide – by comparing Gippsland (a large rural PHN) with Central and Eastern Sydney (a large urban PHN). Figures below show the percent change for antimicrobials (used largely in acute illness) and cardiovascular medications (largely for chronic conditions). Gippsland PHN also had significant impacts early in the year due to the bushfire emergency (see salbutamol impact later in the paper).

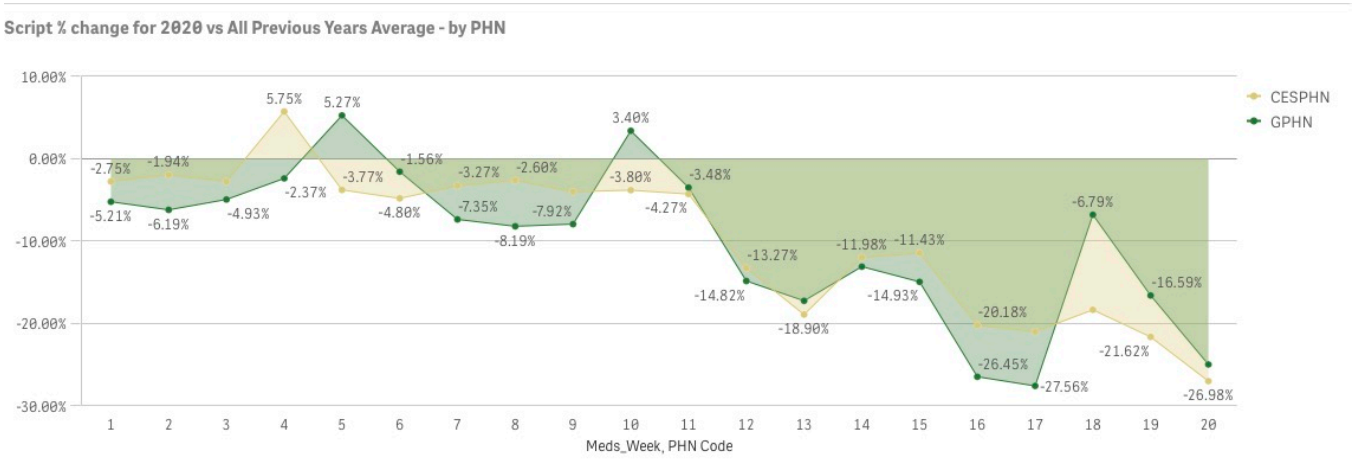

Figure 5 – rural versus urban anti-infectives level 1

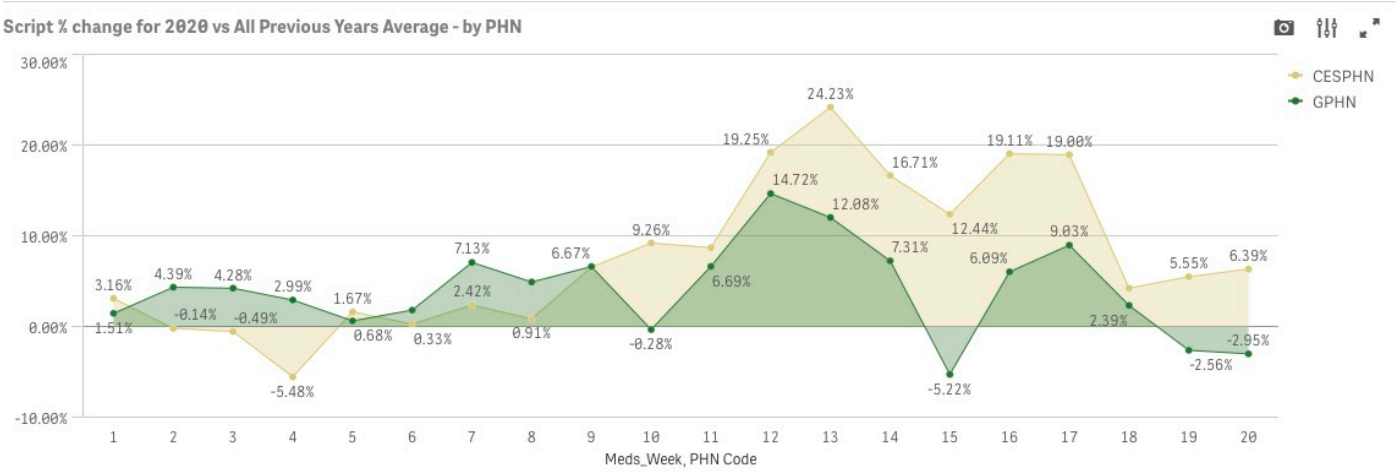

Figure 6 – rural versus urban – cardiovascular Level 1

We can see little difference in the use of antimicrobials, but a relative increase in the chronic disease cardiovascular drugs – which may reflect that rural patients felt relatively unaffected by the COVID crisis unfolding in urban areas and had more confidence in supply issues. Gippsland also had a rise during the early part of the year during the bushfire crisis, when people were being displaced.

There are a lot of questions raised by this high level overview, some of which we will cover in more detail in the next sections, when we look at specific drug classes.

Antimicrobials

Previous work by researchers on POLAR data has already shown a decrease in antibiotic use according to guidelines [3], but the drop we see here is quite marked across the majority of antibiotic L3 classes and is consistent. Figure 7 shows a further breakdown of anti-infectives at Level 3.

Medication Level 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ANTIINFECTIVES FOR SYSTEMIC USE	-1%	-0%	-1%	5%	4%	2%	-1%	-1%	-2%	8%	-6%	-14%	-17%	-7%	-6%	-17%	-21%	-13%	-18%	-25%
BETA-LACTAM ANTIBACTERIALS, PENICILLINS	2%	-1%	-0%	9%	10%	4%	-5%	-2%	3%	15%	6%	-6%	-20%	-33%	-27%	-42%	-45%	-34%	-39%	-47%
OTHER BETA-LACTAM ANTIBACTERIALS	-4%	-3%	-7%	-4%	-2%	-1%	3%	4%	-5%	2%	-14%	-22%	-20%	-14%	3%	-11%	-9%	4%	6%	0%
TETRACYCLINES	4%	6%	11%	13%	10%	14%	7%	3%	6%	4%	-7%	-11%	-16%	-20%	-23%	-28%	-30%	-21%	-20%	-22%
VIRAL VACCINES	-4%	11%	3%	-3%	1%	-9%	-3%	-12%	-15%	0%	-18%	5%	54%	229%	116%	115%	72%	43%	12%	-3%
DIRECT ACTING ANTIVIRALS	12%	22%	8%	18%	29%	22%	11%	13%	12%	41%	13%	2%	-8%	-21%	-20%	-21%	-20%	-13%	-13%	-17%
BACTERIAL VACCINES	-13%	-10%	-15%	-5%	-17%	-21%	-16%	-23%	-28%	-18%	-38%	-45%	-48%	-36%	-40%	-33%	-30%	-37%	-40%	-39%
SULFONAMIDES AND TRIMETHOPRIM	-8%	-0%	3%	6%	-0%	-4%	6%	6%	1%	6%	-14%	-21%	-12%	-1%	14%	8%	9%	20%	17%	12%
OTHER ANTIBACTERIALS	8%	-6%	1%	8%	4%	9%	3%	-7%	-1%	-1%	-17%	-23%	-13%	-8%	-1%	6%	1%	7%	2%	-2%
BACTERIAL AND VIRAL VACCINES, COMBINED	-19%	-7%	8%	36%	11%	-6%	4%	-21%	-34%	-23%	-73%	-93%	-94%	-92%	-97%	-93%	-93%	-93%	-91%	-93%

[3] Yan J, Hawes L, Turner L, Mazza D, Pearce C, Buttery J. Antimicrobial prescribing for children in primary care. J Paediatr Child Health. 2018.

Figure 7 – Level 3 anti-infectives

You can see that the actual reductions are uneven, with trimethoprim and other beta-lactam antimicrobials (cephalexin and first generation cephalosporins) showing an increase in the past few weeks. Whilst the beta lactam antimicrobials are reduced around 30%, amoxycillin (which is the most commonly prescribed drug) represents the largest cut, with levels at 50% of last year. For Figure 8 we have selected a few specific antimicrobials for closer analysis.

Amoxycillin and Roxithromycin show a steady decline to 50% levels compared to last year, which seems to be maintained. Cephalexin remains consistent across a range of -20 to +9%, and Flucloxacillin and Trimethoprim show a bi-phasic change, with an initial decrease followed by a consistent increase.

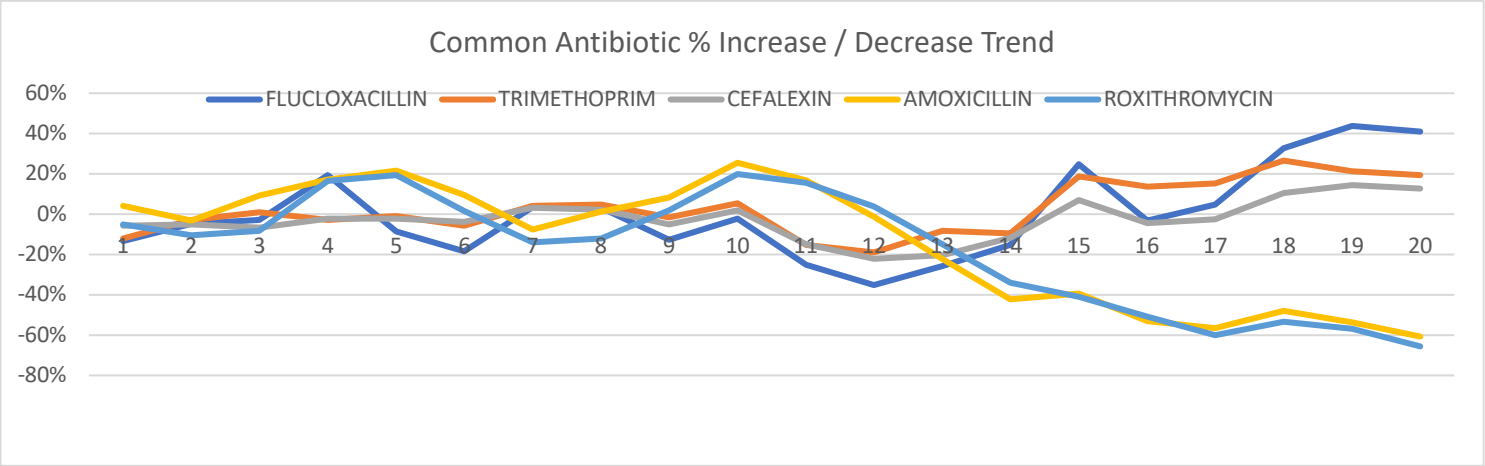

Figure 8 – specific antimicrobials

So the changes to antimicrobial prescribing are not uniform. The likely explanations will be related to the indications for these antimicrobials. Amoxicillin and Roxithromycin are primarily used in respiratory diseases, as part of the management of exacerbations of COPD. They are also still widely used for Viral Upper Respiratory Tract Infections, ear infections and bronchitis, despite most guidelines suggesting antimicrobials are only indicated for these conditions in limited circumstances. These are all reduced in the environment of physical distancing and in some cases (Otitis Media) need a face to face examination, at a time when parents are reluctant to bring children to the doctor. One hypothesis is that in a telehealth environment, and with the current publicity around viral illness, it is easier to persuade parents that antimicrobials are not required for upper respiratory tract infection.

Trimethoprim is primarily used for urinary tract infections, and also occasionally for skin infections. Flucloxacillin for skin infections. Both are more easily managed by telehealth (see paper 3) especially if video consultations are available. The initial drop covers weeks 12 to 15, covering the onset of telehealth and physical distancing and rising again one patients and GPs accommodate new ways of working. Cephalexin is used for respiratory, skin and urinary tract infections, and is the common drug where allergy to penicillin is present. Its use in a wide variety of indications has supported its continuing use.

Also of note in this Level 1 grouping is the vaccines. Viral vaccines show a large increase – which is almost exclusively influenza vaccines. Influenza vaccination has been encouraged much earlier this year than in previous years – and practices are performing intense mass vaccination campaigns. At the same time there are significant reductions in bacterial vaccines. Closer examination of that group shows that pneumococcus vaccinations are markedly up, but that tetanus and its variations are reduced, likely due to a drop in injuries. Not surprisingly, travel vaccinations are also markedly reduced.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
BACTERIAL VACCINES	-2%	-5%	-12%	1%	-18%	-22%	-20%	-22%	-25%	-19%	-31%	-33%	-39%	-21%	-22%	-20%	-11%	-28%	-34%	-32%	-36%
⊖ ANTIINFECTIVES FOR SYSTEMIC USE	-2%	-5%	-12%	1%	-18%	-22%	-20%	-22%	-25%	-19%	-31%	-33%	-39%	-21%	-22%	-20%	-11%	-28%	-34%	-32%	-36%
PNEUMOCOCCUS, PURIFIED POLYSACCHARIDES ANTIGEN	16%	41%	-48%	140%	37%	26%	27%	14%	786%	612%	1883%	1716%	1211%	1565%	1196%	523%	522%	431%	161%	318%	257%
PNEUMOCOCCAL VACCINES	86%	64%	13%	95%	88%	512%	243%	6%	128%	519%	883%	1292%	1214%	1579%	786%	569%	647%	199%	284%	262%	39%
TETANUS VACCINES	-16%	5%	3%	-0%	-7%	-11%	8%	0%	-28%	-6%	-19%	-29%	-41%	-38%	-41%	-21%	-20%	-29%	-29%	-26%	-5%
MENINGOCOCCAL VACCINES	12%	-17%	-10%	-10%	-32%	-30%	-36%	-28%	-24%	-30%	-43%	-50%	-62%	-56%	-35%	-39%	-14%	-31%	-27%	-23%	-34%
MENINGOCOCCUS B, MULTICOMPONENT VACCINE	4%	-21%	-29%	-5%	-38%	-43%	-39%	-46%	-30%	-33%	-55%	-55%	-64%	-47%	-41%	-24%	-15%	-8%	-23%	-21%	-36%
TYPHOID VACCINES	8%	23%	-3%	17%	15%	13%	-11%	-13%	-35%	-39%	-77%	-99%	-99%	-95%	-95%	-97%	-98%	-97%	-99%	-99%	-100%
CHOLERA VACCINES	-29%	1%	-24%	6%	7%	-24%	-14%	-2%	-27%	-53%	-75%	-98%	-100%	-99%	-100%	-99%	-100%	-100%	-100%	-97%	-96%

Figure 9 – bacterial vaccines

Mental health medications

Analysis of the data has revealed impacts in GP recording of mental health diagnoses, with an initial increase during the time of uncertainty [4], and a steady increase currently as we endure the constraints of lockdown. Figure 10 shows the overall increase in mental health prescriptions ATC level 3 in all categories, as predicted by our impact model presented in paper 3.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NERVOUS SYSTEM	1%	3%	3%	0%	1%	-1%	5%	4%	-1%	-0%	-4%	-4%	4%	5%	10%	11%	13%	13%	16%	20%
⊕ ANTIDEPRESSANTS	5%	5%	5%	6%	8%	4%	9%	9%	5%	4%	5%	5%	9%	6%	8%	14%	17%	14%	14%	18%
⊕ ANXIOLYTICS	-3%	-3%	-4%	-6%	-5%	-10%	-1%	-4%	-8%	-5%	-11%	-8%	5%	3%	17%	7%	9%	15%	20%	21%
⊕ HYPNOTICS AND SEDATIVES	-4%	-0%	2%	-1%	-2%	-5%	-1%	1%	-4%	-3%	-13%	-14%	-5%	0%	6%	9%	10%	8%	12%	19%
⊕ ANTIPSYCHOTICS	-3%	5%	1%	-2%	-1%	3%	4%	-0%	-5%	1%	-6%	-7%	2%	9%	14%	12%	14%	16%	23%	30%
⊕ DRUGS USED IN ADDICTIVE DISORDERS	1%	11%	5%	-7%	-2%	2%	10%	7%	-10%	-5%	-17%	-16%	1%	2%	8%	5%	10%	15%	10%	14%
⊕ DOPAMINERGIC AGENTS	3%	1%	21%	5%	-5%	8%	37%	12%	4%	4%	6%	17%	22%	20%	8%	16%	20%	8%	20%	15%

Figure 10 – ATC level 3 medications used in mental health.

Figure 11 is a further breakdown for medications used in mental health conditions (using a threshold of 400 prescriptions per month to include some of the less prescribed medications). Included in the figure are medications used for addictive disorders. We can see that whilst there is a steady increase in the use of antidepressants, there has been a marked recent increase in anxiolytic prescribing, most notably for diazepam.

[4] See GP Insights paper 2: An impact model on the healthcare system.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ANTIDEPRESSANTS	**5%**	**5%**	**5%**	**6%**	**8%**	**4%**	**9%**	**9%**	**5%**	**4%**	**5%**	**5%**	**9%**	**6%**	**8%**	**14%**	**17%**	**14%**	**14%**	**18%**
ESCITALOPRAM	15%	17%	10%	19%	14%	2%	18%	21%	10%	8%	15%	19%	22%	17%	18%	22%	33%	26%	38%	33%
SERTRALINE	5%	5%	10%	13%	11%	3%	8%	17%	5%	14%	13%	9%	5%	8%	20%	29%	29%	19%	13%	36%
FLUOXETINE	-	12%	16%	-	21%	-9%	18%	12%	6%	18%	15%	2%	8%	9%	-	-	-	38%	26%	-
AMITRIPTYLINE	-3%	8%	8%	1%	-1%	-7%	8%	9%	-0%	16%	7%	9%	18%	15%	8%	29%	31%	25%	26%	32%
MIRTAZAPINE	-4%	-0%	2%	14%	16%	-1%	7%	12%	12%	8%	-2%	1%	8%	18%	17%	21%	37%	29%	26%	-
VENLAFAXINE	-3%	-1%	8%	5%	-1%	7%	10%	2%	-3%	5%	14%	10%	11%	6%	13%	23%	25%	16%	32%	21%
DESVENLAFAXINE	-	9%	11%	-	8%	-2%	5%	2%	5%	-	4%	10%	23%	9%	-	-	-	9%	24%	-
DULOXETINE	-	10%	2%	-	6%	-3%	-1%	2%	0%	8%	8%	-1%	1%	1%	-	-	16%	27%	25%	-
NON-SELECTIVE MONOAMINE REUPTAKE INHIBITORS	7%	10%	8%	-2%	5%	19%	10%	8%	12%	10%	1%	13%	15%	3%	3%	-7%	11%	5%	9%	20%
SELECTIVE SEROTONIN REUPTAKE INHIBITORS	11%	4%	4%	5%	9%	9%	9%	8%	6%	-0%	1%	4%	5%	1%	0%	9%	7%	5%	5%	4%
OTHER ANTIDEPRESSANTS	7%	-0%	0%	2%	4%	5%	6%	7%	4%	-5%	2%	-4%	3%	4%	3%	7%	11%	8%	3%	5%

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ANXIOLYTICS	**-3%**	**-3%**	**-4%**	**-6%**	**-5%**	**-10%**	**-1%**	**-4%**	**-8%**	**-5%**	**-11%**	**-8%**	**5%**	**3%**	**17%**	**7%**	**9%**	**15%**	**20%**
DIAZEPAM	-3%	-5%	-4%	-4%	-7%	-13%	0%	-3%	-8%	-3%	-13%	-4%	5%	5%	24%	15%	17%	29%	37%
BENZODIAZEPINE DERIVATIVES	-1%	0%	-2%	-2%	-2%	-5%	2%	-2%	-5%	-7%	-10%	-9%	4%	0%	11%	1%	1%	4%	9%
OXAZEPAM	-10%	-11%	-9%	-15%	-11%	-16%	-10%	-12%	-19%	-3%	-9%	-15%	6%	12%	18%	5%	12%	17%	17%

Figure 11 – individual mental health medications

It would seem therefore that the rigours of lockdown have increased the anxiety levels in the community, certainly in this acute phase, without a similar level of increase in anti. We will explore this aspect more in our next paper.

Cardiac Medications

Anti-infectives medications are used in acute situations, mental health is a category with specific indications, conversely the cardiac medications ATC level 1 category represents a group of drugs that by and large are used in the settings of chronic disease; heart failure, hypertension, ischaemic heart disease. The next figure looks at the cardiac medications. By and large we see a sustained rise from week 11 to 17, as patients become adjusted to the changing environment.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
CARDIOVASCULAR SYSTEM	6%	2%	3%	2%	4%	-7%	7%	6%	6%	7%	18%	23%	27%	21%	9%	16%	18%	2%	2%	5%
LIPID MODIFYING AGENTS, PLAIN	3%	1%	3%	1%	4%	-10%	4%	5%	4%	8%	16%	23%	29%	23%	9%	16%	17%	0%	1%	6%
ANGIOTENSIN II ANTAGONISTS, PLAIN	7%	1%	2%	-0%	7%	-6%	7%	7%	6%	10%	20%	24%	21%	18%	3%	14%	12%	1%	-3%	-3%
ANGIOTENSIN II ANTAGONISTS, COMBINATIONS	1%	1%	2%	1%	3%	-10%	7%	4%	2%	5%	18%	25%	26%	17%	6%	13%	16%	0%	-0%	1%
BETA BLOCKING AGENTS	14%	8%	6%	1%	7%	-0%	13%	8%	15%	10%	24%	24%	29%	23%	16%	21%	19%	6%	8%	8%
ACE INHIBITORS, PLAIN	6%	7%	4%	9%	4%	-7%	5%	5%	4%	2%	17%	21%	21%	16%	5%	8%	16%	-1%	1%	6%
SELECTIVE CALCIUM CHANNEL BLOCKERS WITH MAINLY VASCULAR EFFECTS	3%	-2%	-3%	-4%	-1%	-13%	7%	8%	6%	10%	20%	27%	37%	27%	16%	20%	22%	3%	9%	14%
HIGH-CEILING DIURETICS	6%	10%	-0%	4%	8%	0%	20%	6%	2%	-3%	3%	6%	24%	23%	22%	21%	37%	21%	20%	21%
ACE INHIBITORS, COMBINATIONS	7%	-2%	4%	6%	3%	-10%	2%	1%	4%	7%	16%	25%	28%	20%	11%	18%	14%	0%	1%	4%
LIPID MODIFYING AGENTS, COMBINATIONS	13%	-3%	5%	-4%	-0%	-6%	4%	3%	6%	7%	12%	21%	29%	26%	15%	15%	22%	-1%	4%	-3%
ANTIADRENERGIC AGENTS, CENTRALLY ACTING	3%	-1%	3%	11%	12%	-10%	8%	3%	12%	6%	24%	18%	32%	27%	1%	42%	9%	17%	6%	16%
VASODILATORS USED IN CARDIAC DISEASES	14%	10%	10%	-3%	0%	7%	5%	-2%	33%	-1%	2%	17%	18%	14%	9%	3%	23%	26%	13%	4%
SELECTIVE CALCIUM CHANNEL BLOCKERS WITH DIRECT CARDIAC EFFECTS	-0%	1%	10%	-9%	8%	-6%	-6%	0%	8%	9%	19%	30%	27%	12%	11%	14%	25%	-9%	-11%	5%
POTASSIUM-SPARING AGENTS	19%	13%	20%	19%	20%	12%	21%	8%	43%	0%	39%	28%	39%	37%	26%	14%	40%	8%	11%	22%
ANTIARRHYTHMICS, CLASS I AND III	16%	1%	5%	10%	10%	7%	14%	8%	11%	18%	21%	15%	16%	36%	9%	8%	23%	6%	5%	6%

Figure 12 – Cardiac medications

Anti-inflammatory Medications

Figure 13 shows more detail of the changes in anti-inflammatory medications (included within ATC 1 Musculoskeletal conditions in Figure 4). There is a decrease in all of these medications, although Diclofenac (Voltaren and other brand names) showed a larger drop (41% vs an all other drug average of 26%) at week 14/15. This mirrors a trend common across many drug groups – a drop at some stage during the time of spread (weeks 11-16) when hospital cases are rising and there was maximal media coverage encouraging people to stay at home. The drop appears to have been maintained, which may be due to the impacts of reduced activity. Whilst exercise has been encouraged by policy makers, this is difficult in a lockdown situation for those with musculo-skeletal impairment.

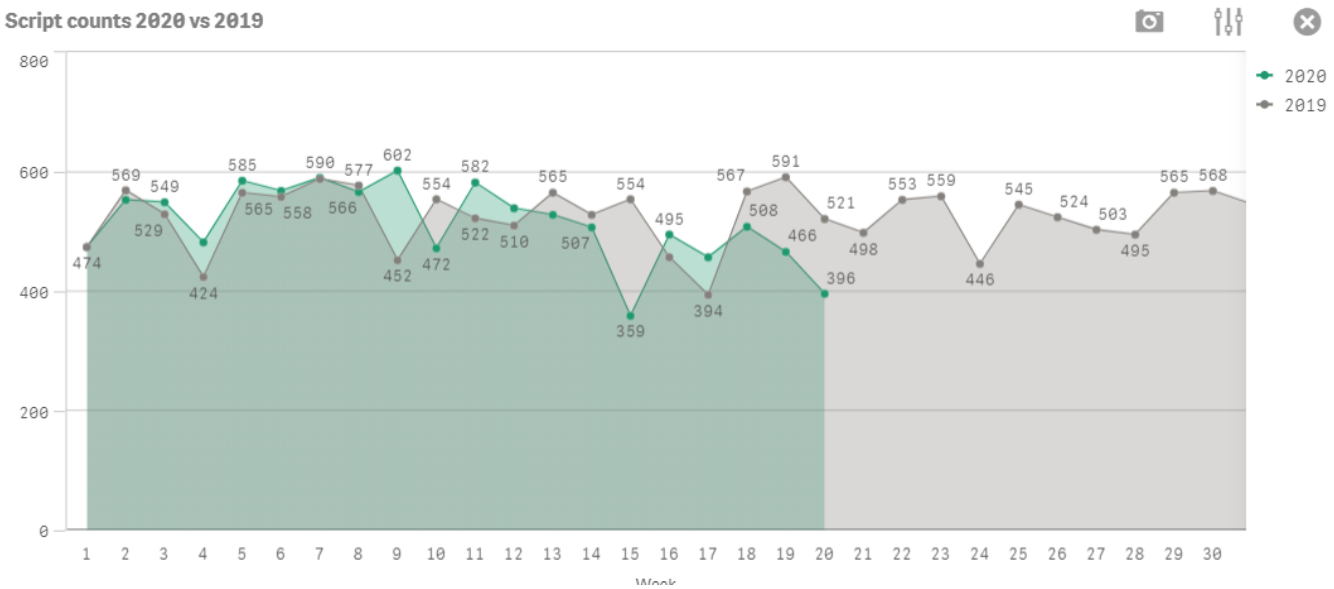

Figure 13 – anti-inflammatory medications, all patients

This is an example where the RACGP non-active patients had a significant impact on prescribing, with an early rise in non-active patients receiving prescriptions, although these numbers are relatively low.

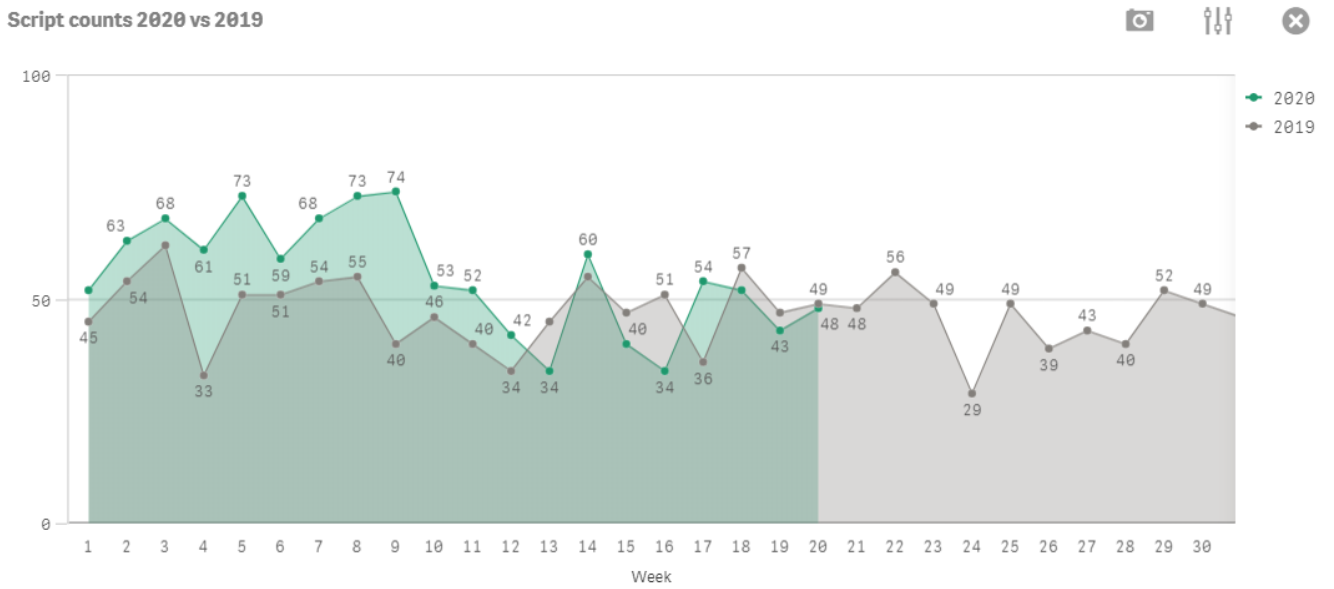

Figure 13 – anti-inflammatory medications, RACGP non-active patients.

Alimentary Tract and Metabolism

Eaxamining the reduction in alimentary medications shows that the overall reduction is in fact due to the largest group – Omeprazole and the other 'prazoles – which have had restrictions changed in the past year. Also, a reduction in the antiemetics and antinauseants possibly due to lack of reduction in cases of gastroenteritis. This category also includes blood glucose lowering agents and insulins which stayed stable but had an with an increase in the middle zone.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DRUGS FOR PEPTIC ULCER AND GASTRO-OESOPHAGEAL REFLUX DISEASE (GORD)	-30%	-31%	-31%	-33%	-34%	-40%	-33%	-34%	-31%	-37%	-35%	-36%	-32%	-32%	-32%	-27%	-27%	-27%	-9%	-4%
BLOOD GLUCOSE LOWERING DRUGS, EXCL. INSULINS	4%	2%	-0%	4%	7%	-4%	9%	2%	6%	10%	13%	23%	25%	24%	12%	23%	21%	7%	8%	17%
ANTIEMETICS AND ANTINAUSEANTS	19%	10%	9%	18%	10%	8%	0%	5%	-7%	-16%	-27%	-44%	-46%	-39%	-30%	-27%	-25%	-19%	-21%	-24%
PROPULSIVES	-5%	-4%	0%	-3%	-3%	8%	-3%	-10%	-17%	-15%	-29%	-38%	-31%	-24%	-13%	-10%	-8%	1%	-2%	-4%
INSULINS AND ANALOGUES	4%	-9%	-6%	-8%	-12%	-2%	-8%	-2%	18%	8%	40%	57%	40%	26%	12%	-1%	-1%	-8%	-11%	1%

Figure 14 – alimentary tract and metabolism related medications

Contraceptives

In line with the concerns about patients not attending for routine chronic disease and preventive care, we examined the use of contraceptives. Oral contraceptives are generally in line, with a slight decrease in the time of spread, but there was a significant drop in the topical contraceptives (IUCDs) – many of which are inserted either by specialists as an elective procedure, or by GPs in their surgery, at a time when procedures were being curtailed due to distancing.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HORMONAL CONTRACEPTIVES FOR SYSTEMIC USE	-4%	-4%	-1%	-7%	-6%	14%	-8%	-0%	-0%	-11%	-10%	-14%	-16%	-19%	-14%	-3%	-9%	3%	4%	-1%
CONTRACEPTIVES FOR TOPICAL USE	7%	11%	7%	8%	7%	18%	0%	21%	74%	-4%	-16%	-48%	-49%	-47%	-37%	-21%	-11%	-32%	19%	-5%

Figure 15 - contraceptives

Other Individual Medications

In paper 1 we covered some initial insights in prescribing patterns of individual medications [5] that we will revisit with new data. Outcome Health had already been tracking Salbutamol (used in asthma) as there had been a spike in prescribing during the bushfire crisis, with poor air quality across the country. We had seen a second spike during the time of spread of SARS-COV-2, as people stocked up on their inhalers (and leading to a restriction on the numbers pharmacies could dispense). We had noticed a spike in prescribing Hydroxychloroquine as social media (including the US president) advocated its efficacy in treating Covid-19 in advance of any scientific studies. At the same time, a theory (since refuted by studies) was proposed that as the virus used the ACE receptors to enter the lung tissue, use of ACE inhibitors might therefore predispose to contracting COVID -19 or worsen the disease once contracted.

[5] GP insights paper 1 – Report into COVID-19 AND GENERAL PRACTICE, Insights from the first few weeks.

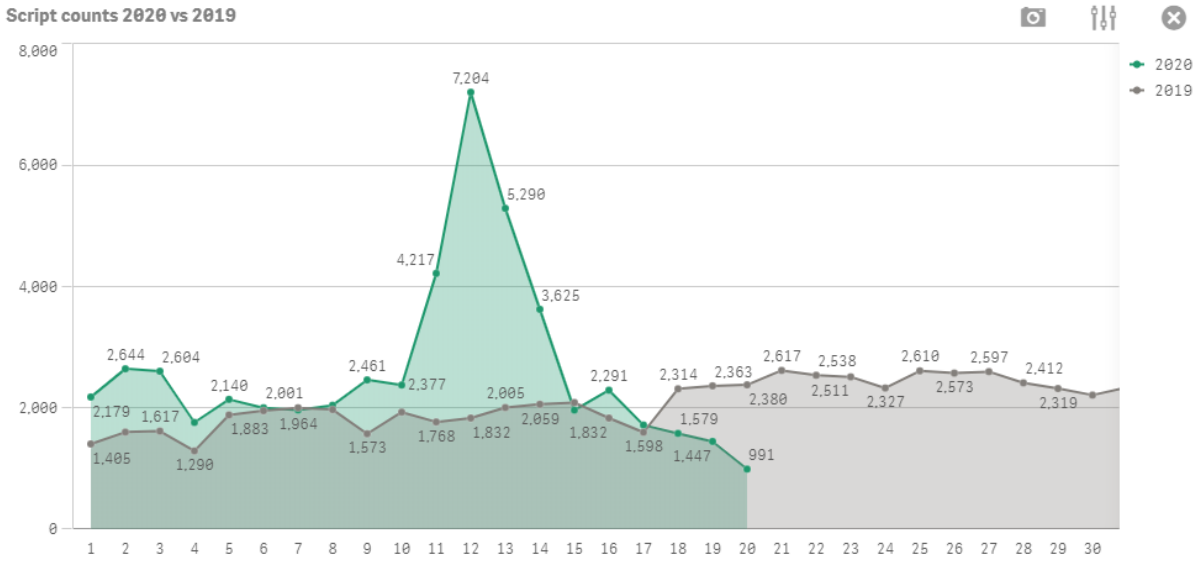

Figure 16 – Salbutamol / Ventolin prescribing

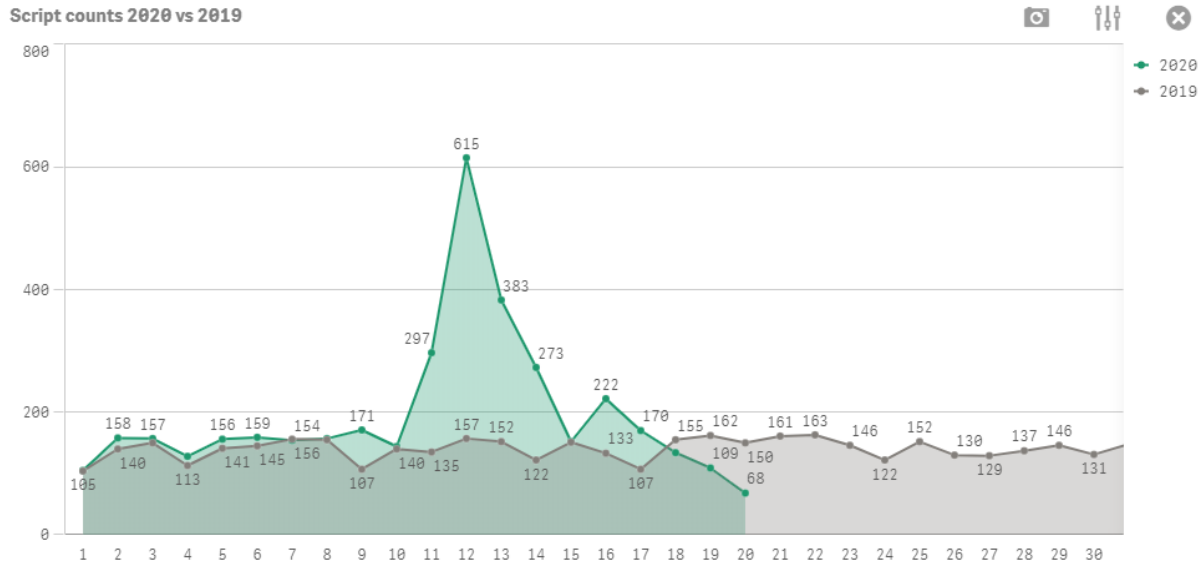

Figure 17 - Hydroxychloroquine prescribing

Figures 16 and 17 show that the spike in prescribing for salbutamol and hydroxychloroquine have passed, with levels now approaching the normal, background level of prescribing. The Hydroxychloroquine rise was particularly rapid – we noted a rise two weeks before it became apparent though other sources. Figure 18 (below) shows a spike in ACE inhibitor prescribing but little change otherwise. The spike follows similar rises in other drugs used in chronic disease (see figure 12)

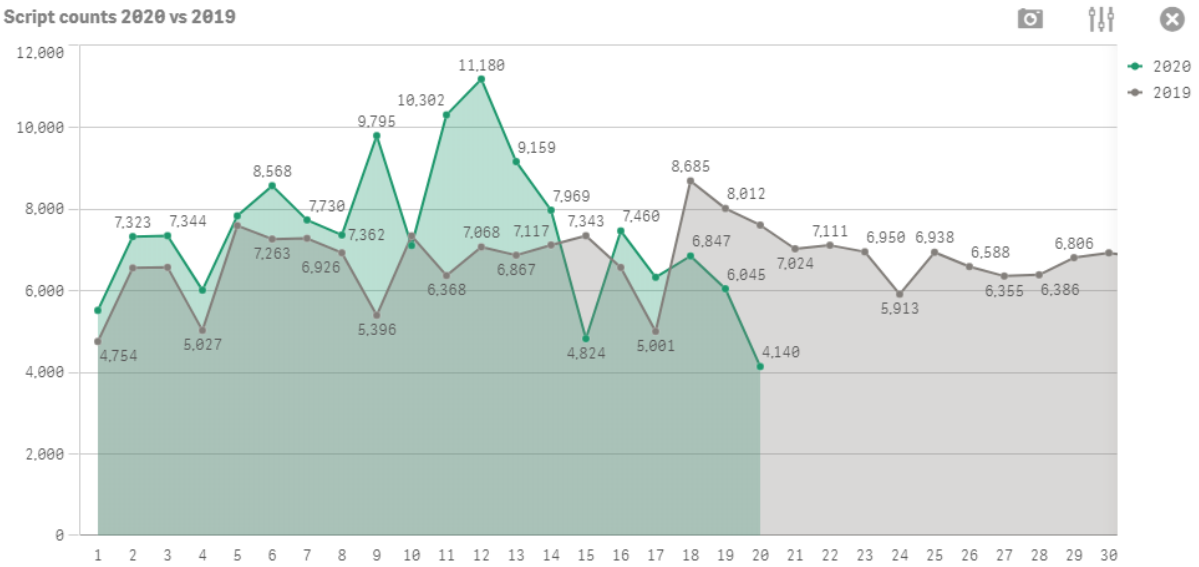

Figure 18 – ACE inhibitors, plain & combination.

Conclusion

In an ideal world, there would be little change in prescribing levels year on year, and for drugs taken regularly (such as for chronic disease), the rate should not vary much during the year. In our data, we see a reduction in the peptic ulcer drugs that predates the current pandemic, and due to policy change (a scheduling restriction). We see a bifold increase in respiratory medication, coming from the bushfire emergency and the COVID-19 pandemic emergency. The changes that we see are often related to social issues – so reductions (or increases) during the time of spread, or when social distancing was being introduced.

Medications for chronic disease, particularly respiratory – rose for the time of COVID-19 spread, representing both a reasonable approach of patients wishing to ensure a supply of regular medications and a degree of hoarding (stockpiling medications beyond a reasonable amount) Marked were two spikes of prescribing to patients who were not active patients of the prescribing practice – with implications for continuity of care. Antimicrobial prescribing remains low as we enter week 20, however.

Prescribing habits have always been subject to social issues – the persistent use of antimicrobials for viral illnesses of the respiratory tract has demonstrated that. Our data shows again that social issues can have profound effects, and that the changes can be rapid, with surges or drops across periods of weeks. Spikes occur around the announcement of travel bans, Hydroxychloroquine rises despite any evidence, or even in the Australian context any significant media around its use (although its use had been discussed on social media), whereas we find little influence by health impacts, in part because the health impact of COVID-19 itself was low overall.

Limitations to our data:

This series of papers is being produced quickly to help guide early thinking about the impact of COVID19 on Australian General Practice. Given the speed of development, the limited resources

available for analysis and other factors they should be understood as early thinking and appropriate caveats applied. In particular it should be noted that:

1. There are thousands of drugs available both on the PBS and off it. They are too numerous to present individual variations for every drug, hence our use of the ATC classification.
2. Not all general practices opt in to each PHN's QI program. Accredited and general practitioner owned practices are over-represented in the data. Data from some corporate general practice, non-accredited general practices and 'paper only' general practice are not included, (the 'paper only' group now represents approximately 5% of general practice). Use trends from these groups may well be markedly different from this data set. Nevertheless, the sample represents the vast majority of practices.
3. Change is occurring rapidly: daily and weekly reports show snapshots of weekly activity that may not represent longer term trends. Peaks can come and go in weeks.
4. The data we have is of prescribing events, and not of dispensing. Although it is a useful proxy for what patients actually consume.
5. This is data, and we have made assumptions about the social context – all such assumptions should be explored by further research

   We encourage all health system decision-makers to consider these predicted impacts and early insights and to plan ahead, in particular working with their PHNs to facilitate the changes needed to further enhance the overall system response to the current pandemic situation.

   Acknowledgments and thanks to the practices that contribute data and for their commitment to quality improvement.

Next steps

We believe that the information contained here, and the ongoing monitoring we can do, will be of interest to policy makers and other PHNs. We encourage groups to engage with us on ongoing issues, and we look forward to being involved in policy discussions in the future. We intend to continue these papers ongoing, if we can attract funding support.

The next topic we will be focussing on is a detailed study of the mental health impacts. Paper 2 predicted a rise in mental health issues during the Time of Consequences, which our data is revealing. This is also being noted by other sources, with the government announcing significant funding to improve mental health care. Tying together themes from the previous four papers, we will undertake a detailed analysis using mental health diagnoses and medications to hopefully form a comprehensive picture of the mental health impacts.

In addition to the contacts below, if you have feedback and/or questions of the data – contact kgardner@outcomehealth.org.au. This activity remains a service provided by Outcome Health on behalf of the PHNs, as we feel it important to inform policy and planning. It is not funded in any other way.

OUTCOME HEALTH

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The POLAR Program

Outcome Health is a Not-For-Profit providing innovative services to the Healthcare sector and Primary Health Networks in particular. The POLAR suite provides advanced data analytics and population health to GPs and PHNs, with an emphasis on delivering outcomes. Data is used to support patient care, population health and research. More information at www.outcomehealth.org.au.

Across six PHNs – Outcome Health extracts data from over 1000 practices for the purposes of informing practice and policy at the GP, PHN and national level. Data is extracted using a purpose built tool, data is stripped of identifying information and further coded and classified to create a useful data set. At the practice level all data can be re-identified, creating useful tools for practices to identify at risk patients, At the PHN level, information is collated and made available for population health and practice support initiatives. Finally, the pooled data is made available for collaborative research via the Aurora research platform.