

ESTIMATING THE BURDEN OF CARE RELATED TO LONG-COVID IN FAMILY MEDICINE IN SWITZERLAND: A STUDY WITHIN THE SENTINELLA NETWORK

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SUMMARY

In 2020, the COVID-19 pandemic followed by reports of high prevalence of long-lasting symptoms in patients affected by COVID-19 (later named long-COVID) led to much concern about the ability of the Swiss health system to respond to these growing health needs in the population. As a result, our objective was to estimate the burden of care related to long-COVID in family medicine practices in Switzerland.

This study involved 183 family doctors within the Swiss Sentinella surveillance network. It was a study in two parts: the first part was a repeat cross-sectional study between July 2021 and April 2023, in which the incidence of long-COVID-related consultations in family practices was recorded. Patients were considered to have long-COVID if their symptoms lasted more than 4 weeks after the initial infection. Data for the second part were collected between March and October 2023. It consisted of a case series to characterize the population of patients consulting for long-COVID in family practices, in terms of age, gender, comorbidities, changes in the frequency of consultations, reported symptoms and impact on their working ability. It also sought to describe the management of long-COVID patients in family practice. In this second part the WHO definition of long-COVID was used, i.e. patients with symptoms lasting for at least 12 weeks following the initial COVID-19 infection.

We found that overall, the monthly incidence of consultations for long-COVID was low, with a median of 3 per 1000 consultations among internists and 0 among paediatricians. Except for a higher incidence of consultations with general internists compared to paediatricians, we found no significant association between practice characteristics (location, percentage activity, gender of physician, etc.) and the incidence of long-COVID consultations. By the time we collected data for the second part of the study (case series) only a minority of family doctors still had patients with long-COVID coming to their clinic. The burden of consultations and investigations for the 43 patients included in the case series was important in the diagnostic phase but appeared to wane with time. When we started the first part of the study, the available definition for long-COVID were different from the one finally adopted in the international literature. Thus, our estimates must include the changing definition of COVID when compared to the available literature. The small number of reported cases and the high proportion of missing data in the second part of our study no doubt reflect the reduced prevalence of, and interest in long-COVID in 2023, and limit our ability to draw inferences from these data.

In conclusion, our study identified that the burden related to long-COVID consultations in family practice in Switzerland is low, probably no higher than that of similar conditions such as chronic fatigue syndrome. Our data are reassuring in that they confirm that in the current endemic stage of COVID-19, Swiss family practices are not overwhelmed by long-COVID. Although the data from the case series brought little useful insights for current health service planning, the detailed case descriptions could prove useful in the future to anticipate future needs in Switzerland if the prevalence of long-COVID were to rise again in the years to come.

BACKGROUND

By the end of 2020, an increasing number of reports alerted the medical community to the high frequency and potential long-term health and economic consequences related to long-COVID.¹

Long-COVID, a term proposed by patients suffering from this condition, refers to the set of symptoms patients experience after the acute phase of COVID-19.² In October 2021, the World Health Organization (WHO) released a clinical case definition for the post-COVID-19 condition as symptoms that are present 12 weeks after SARS-CoV-2 infection with a minimum duration of 2 months and cannot be explained by an alternative diagnosis.³

Initial prevalence estimates were very heterogeneous, due to the variety of contexts in which the condition was studied, the diversity in sampling for such studies (hospital, non-hospital, community), and, initially, the absence of a clear definition of what long-COVID encompasses.⁴ For adult populations a prevalence range between 7.8 and 27.7% among patients exposed to SARS-CoV2 infection was reported.¹ For children, data remain scarce and the range of estimates varies from 2% at 12 weeks to 58% at 6 months, in part depending on whether only highly symptomatic children are considered, or whether the sample also includes initially asymptomatic children.¹

In Switzerland, initial reports from three cohorts were concerning: 39% of 410 adults recruited through the CoviCare clinic of Geneva University Hospitals reported persistent symptoms 7 to 9 months post initial symptomatic COVID-19.⁵ Two thirds of 430 community participants with previous SARS-CoV2 positive test in Zurich reported persistent symptoms 6 months after the initial infection.⁶ In a similar but larger cohort (n=1106), the same authors later showed that nearly one in five of those who had not been vaccinated before developing the infection had not recovered after two years.⁷ More than half (53%) of 480 patients recruited in outpatient clinics of the CHUV in Lausanne reported ongoing symptoms up to ten months after a mild episode of SARS-CoV2 infection.⁸ Children were also concerned with reports from the SEROCOVID-KIDS study indicating an increased prevalence of persistent symptoms in nearly 10% of adolescents.⁹ These data led to much concern regarding the long-term health, professional, social and family-related burdens of long-COVID and its potential impact on our society in the future. The Swiss prevalence data may, however, have been overestimated due to the sampling strategies used in these three cohort studies. Patients who attend a university hospital outpatient clinic (as was the case for the Lausanne and Geneva cohorts) may not be entirely representative of the general population.^{5,8} As mentioned by the authors of this study themselves, selection bias through identification of more severe cases in the first wave through selective testing, as well as self-selection of more symptomatic patients may also have led to overestimates in the Zurich cohort.⁶ In patients who had been hospitalized, difficulties in distinguishing between post-intensive care syndrome and long-COVID, may have led to overestimations of the latter.⁴ In addition, the presence of symptoms does not necessarily provide information about the burden of these symptoms on patients' health, neither does it inform us on the actual weight of long-COVID on health services in Switzerland.

It was striking, back in 2021, that despite these high prevalence estimates, informal data suggested family medicine and paediatric services in Switzerland were not overwhelmed by patients presenting with long-COVID. Initial data from the canton of Vaud suggested that long-COVID represented less than 1% of family medicine consultations in this canton since April 2021.¹⁰ Similarly, data from England, analysing electronic medical records of 96% of the entire English population (58 million patient records) between February 2020 and May 2021, showed that long-COVID was coded for only 20.3 to 55.6 per 100 000 patients, suggesting this condition was rarely recognized in primary care.¹¹ Although, in the absence of appropriate coding, a much higher prevalence could not be excluded, it is reasonable to think that if GP practices in England were overwhelmed by long-COVID cases this would have led to a significant increase in coding this condition in 2021. The unclear / varying definition of long-COVID until the end of 2021 may, however, have led to misreporting of this condition in family practice. In a retrospective study including >1000 patients with a diagnosis of SARS-CoV2 pneumonia attending a primary healthcare center in Spain in 2020, the prevalence of patients reporting persisting symptoms was 28.3% at 4 weeks, and 8.3% at 12 weeks.¹²

In reaction to media reports of high prevalence of long-COVID, Swiss political leaders expressed concerns about the country's ability to cope with such a high disease burden. To guide health service planning it appeared essential to gather more precise data from the primary care context. The pre-existing Swiss Sentinella surveillance system offered the opportunity to contribute to defining a clearer picture of the situation.

We thus designed a study, which took place in two parts. The primary objective of part A was initially to estimate the prevalence of long-COVID in patients attending family medicine (general internal medicine and paediatric) practices in Switzerland. Due to the methodological constraints related to data collection within the Sentinella network, this objective was later adapted to the measure of the incidence of long-COVID-related consultations in family medicine practice. The main objectives of part B were to characterize the population of patients consulting for long-COVID conditions in family practice, in terms of age, gender, comorbidities, changes in the frequency of consultations, reported symptoms and impact on their working ability. It was also seeking to describe the management of long-COVID patients by family doctors (needs for investigations, referrals, inpatient vs institutional or home care).

METHODS

STUDY POPULATION AND DATA COLLECTION

We used the data collected by family doctors (general internists and paediatricians) within the Swiss Sentinella network. Each week, family doctors within the network provide entirely anonymous data about patients seen in their consultation as part of the epidemiological surveillance managed by the Federal Office of Public Health (FOPH), in collaboration with the Sentinella program commission composed of representatives of reporting doctors and of the Swiss family Medicine Institutes.¹³

The Sentinella physicians transmit anonymous data to the FOPH. The physicians' identity is coded, and the key to this code is kept safely at the FOPH. Most of the time the code corresponds to only one reporting doctor. In some cases, several doctors in one practice report under the same code. The anonymous dataset is then transferred to the research team for statistical analyses. Personal identifiable health-related information was not made available to the research team.

Part A

This was a repeat cross-sectional study in which we initially aimed to estimate the prevalence of long-COVID in family medicine. When setting up the study, we soon realized that the data available through Sentinella would not allow us to estimate a patient-related prevalence, as Sentinella members collect anonymous data about recorded consultations, not about individual patients. The objective was thus adjusted to measure the monthly incidence of long-COVID-related consultations in the participating practices.

The anonymous data were collected in a proforma questionnaire and transmitted monthly by Sentinella doctors to the FOPH via an electronic portal. The data collection form for this part of the study was based on the NICE definitions of long-COVID, i.e. with long-COVID defined either as (1) ongoing symptomatic COVID-19 if symptoms were present between 4 & 12 weeks after the initial infection, or (2) post-COVID syndrome if symptoms were present for >12 weeks after the initial infection. When this part of the study was designed, the NICE definitions were the most used in the literature.¹

The data for part A were collected between July 2021 and April 2023. In July 2021, the doctors were asked to provide summary data about the first 6 months of the year. As from August 2021, doctors provided monthly reports in relation to the past 4 weeks.

Part B

This was a case-series that sought to estimate the burden of care for long-COVID patients. For this part, Sentinella doctors were first asked to describe the management of maximum three long-COVID patients, on a paper form. Based on results of part A, we estimated that most doctors would not be following more than three patients with long-COVID at a time. The few Sentinella doctors (n<5) who were following more long-COVID patients were asked to provide information about the first three patients seen at the time of data collection. The definition of long-COVID for this part of the study was based on the WHO consensus definition.¹ Paper surveys were then manually recorded to create a dataset for the analysis. Then, on a weekly basis, they reported about any new event in the follow-up of the patient described in the case report.

The data collection period for part B was from March to October 2023.

STATISTICAL ANALYSIS

The analysis for part A was descriptive. Categorical variables were summarized using proportions, and 95% confidence intervals (95% CI); continuous variables were summarized using means (SD) if normally distributed or alternatively, medians (IQR). As

mentioned above, data collection for part A was carried out in two stages. Initially, data were reported over six months (January to July 2021), then from August 2021 to April 2023, data were collected monthly. Thus, incidence rates of long-COVID consultations per 1000 doctor-patient contacts were first calculated over six months (for the period from January to July 2021). Followed by incidence rates calculated by month for the second part of data collection (August 2021-April 2023).

Monthly incidence of long-COVID consultations was calculated using the number of long-COVID related consultations within a month divided by the number of doctor-patient contacts within the same month, as available in the Sentinella reporting system. This outcome was summarized as the number of long-COVID consultations for 1000 doctor-patient contacts. Ordinal multinomial logistic regression was used to explore the association between certain doctor characteristics (see below) and monthly long-COVID-related consultation incidence (using data collected between August 2021-April 2023). For logistic regression calculations, incidence rates were regrouped into four categories, based on median incidence rates for each doctor:

- Monthly incidence of 0 long-COVID consultations per 1000 patient-doctor contacts reported throughout the study period.
- Median monthly incidence between 0.1 and 5 long-COVID consultations per 1000 consultations
- Median monthly incidence between 5.1 and 10 long-COVID consultations per 1000 consultations
- Median monthly incidence >10 long-COVID consultations per 1000 consultations

The alpha significance level was fixed at 0.05. Univariate ordinal logistic regressions were first conducted for each physician characteristics: Sentinella region, zone of practice, specialization (internal medicine or paediatrics), physician activity rate, gender, and number of contributions (i.e. number of months in which the physician contributed data during the study period). Subsequently, we built a multivariable ordinal logistic regression including all variables, the results of which were expressed as an odd ratio.

MANAGING MISSING DATA AND OUTLIERS IN PART A

In the data cleaning phase, we identified outliers or illogical incidence values in the monthly incidence rates. To differentiate true outliers from data entry errors, we examined the data for long-COVID consultations and doctor-patient contacts for each entry leading to an incidence rate above the ninety fifth percentile. We documented each decision of inclusion or exclusion of the monthly data in relation to these values. The summary of this process is available in Appendix 1.

The analysis for part B was descriptive. Since the number of cases was relatively small, we present mainly frequency data for most variables except age and number of consultations, which were summarized using means (SD). We created categories to summarize lab tests and further investigation options.

RESULTS

RESULTS OF PART A

183 family doctors (156 general internists and 27 paediatricians) completed at least one monthly questionnaire in relation to COVID-19 during the period of the study. 116 (63%) doctors in the network (92 internists and 17 paediatricians) provided data in the first report covering consultations between January and July 2021. Only 35 doctors (31 internists and 4 paediatricians) provided monthly data for the entire duration of the study. If we consider near complete reporting (data available for at least 12 of the reporting months), this was available for 112 (63%) of the family doctors (94 (62%) internists & 18 (69%) paediatricians). Considering only the doctors who *could* contribute 12 months or more of data (i.e. excluding doctors who left or joined the Sentinella network during the study period), the proportion of doctors providing data for at least 12 of the reporting months was 70%.

Physician characteristics (see Table 2)

Eighteen of the 183 reporting doctors in the study were “group-reporting doctors”, i.e. several doctors reporting under the same code. One third were women (n=59; 32%). Most (n=156; 85%) were general internists and most (74%) worked in an urban area. The wide majority worked at an EFT higher than 0.8.

The median number of monthly patient-doctor contacts for the entire sample was 256 (IQR: 179-334). The median number of monthly patient-doctor contacts was 410 (IQR: 375-765), for “group-reporting doctors” and 244 (IQR: 179-334) for the others.

Number of patients with long-COVID and incidence of long-COVID-related consultations

Table 1 shows the summary of the data collected in part A of the study. In the first semester of 2021 GPs followed a median of 3 patients with symptoms lasting between 4 and 12 weeks, and a median of 2 patients with symptoms lasting more than 12 weeks after the COVID-19 infection. Most paediatricians saw none such patients in their consultations. In the period between August 2021 and April 2023, the median incidence of monthly consultations for long-COVID was 3 per 1000 consultations for general internists and 0 per 1000 consultations for paediatricians. The multivariable ordinal multinomial logistic regression confirmed that this difference in incidence between general internists and paediatricians was statistically significant. It also showed that physicians from central Switzerland had a higher odd of having a higher median incidence of long-COVID-related consultations compared to their peers from other regions. (Table 2).

Table 1 summarizing the main results from part A, with data collected between July 2021 and April 2023

Outcome	Question / variable	Summary measure: median (IQR) n is number of reporting doctors	Range across reporting Sentinella doctors
First semester of 2021			
Patients with ongoing symptomatic COVID-19 (4-12 weeks) in the first semester of 2021	Approximately how many COVID-19 patients with symptoms for more than 4 weeks up to 12 weeks (ongoing symptomatic COVID) have you treated since the beginning of 2021? (Number counted or estimated)	Total (n=111): 2 (0-5) GPs (n=93): 3 (1-5) Ped (n=18): 0 (0-0)	Total (n=111): 0-50 GPs (n=93): 0-50 Ped (n=18): 0-2
Median number of consultations per patient with ongoing symptomatic COVID-19 in the first semester of 2021	What is the average number of visits such a COVID patient makes for persistent symptoms until recovery? (Number counted or estimated)	Total (n=77): 3 (2-4)	Total (n=77): 0-35
Patients with post-COVID syndrome in the first semester of 2021	Approximately how many COVID-19 patients with symptoms for more than 12 weeks (=post-COVID syndrome) have you treated since the beginning of 2021? (Number counted or estimated)	Total (n=110): 1 (0-2) GPs (n= 92): 2 (0-3) Ped (n=15): 0 (0-0)	Total (n=110): 0-175 GPs (n= 92): 0-175 Ped (n=18): 0-4
Median number of consultations per patient with post-COVID syndrome in the first semester of 2021	How many consultations did such a COVID patient have on average for their post- COVID syndrome? (Number counted or estimated)	Total (n=70): 4 (3-6)	Total (n=70):0-12
August 2021 to April 2023			
Median monthly incidence of consultations for ongoing symptomatic COVID-19 (>4 weeks) between August 2021 and April 2023	Number of consultations for patients with symptoms for more than 4 weeks, per 1000 doctor-patient contacts in the past month	Total (n=183): 0/1000 (0-8.9/1000) GPs (n=156): 3.0/1000 (0-10.5/1000) Ped: 0/1000 (0-0/1000)	Total: 0-130.1/1000 GPs: 0-130.1/1000 Ped: 0-51.3/1000

Table 2: Physician characteristics and results of the ordinal multinomial logistic regression exploring the association between these characteristics and median monthly incidences of long-COVID-related consultations during the study period.

Variables	Categories	Number of doctors in this category	Median monthly incidence of long-COVID-related consultations per 1000 consultations, number (%) of doctors in this category				OR	P value	Adjusted OR	P value
			0	0.1 to 5	5.1 to 10	>10				
			88 (49.2)	27 (15.1%)	30 (16.8%)	34 (19.0%)				
Sentinella region	GE/NE/VD/VS	43 (23%)	25 (59.5)	2 (4.8)	8 (19.1)	7 (16.7)	1.0	NA	1.0	NA
	BE/FR/JU	39 (21%)	20 (52.4)	9 (23.7)	5 (13.2)	4 (10.5)	0.98 (0.42-2.28)	0.967	0.67 (0.26-1.70)	0.401
	AG/BL/BS/SO	28 (15%)	13 (48.2)	4 (14.8)	4 (14.8)	6 (22.2)	1.44 (0.56-3.65)	0.439	1.83 (0.65-5.18)	0.255
	LU/NW/OW/SZ/UR/ZG	14 (8%)	4 (30.8)	1 (7.7)	0 (0)	8 (61.5)	6.32 (1.70-23.49)	0.006	6.11 (1.47-25.33)	0.013
	AI/AR/GL/SG/SH/TG/ZH	39 (21%)	14 (35.9)	9 (25.1)	10 (25.6)	6 (15.4)	1.75 (0.77-3.95)	0.175	1.36 (0.54-3.47)	0.508
	GR/TI	20 (11%)	12 (60)	2 (10)	3 (15)	3 (15)	0.91 (0.31-2.61)	0.856	0.81 (0.25-2.63)	0.733
Physicians rate of professional activity	<50%	7 (4%)	3 (42.9)	0 (0)	1 (14.3)	3 (42.9)	1.0	NA	1.0	NA
	50%-80%	66 (37%)	34 (51.5)	4 (6.1)	14 (21.2)	14 (21.2)	0.47 (0.01-2.22)	0.344	0.14 (0.02-0.80)	0.027
	81%-100%	89 (50%)	47 (52.8)	18 (20.2)	9 (10.1)	15 (16.9)	0.36 (0.79-1.68)	0.197	0.10 (0.01-0.57)	0.010
	>100% (*)	17 (9%)	4 (23.5)	5 (29.4)	6 (35.3)	2 (11.8)	0.72 (0.14-3.83)	0.706	0.47 (0.04-5.67)	0.551
Gender	Female	59 (32%)	33 (55.9)	2 (3.4)	12 (20.3)	12 (20.3)	1.0	NA	1.0	NA
	Male	105 (60%)	52 (49.5)	21 (20.0)	13 (12.4)	19 (18.1)	1.01 (0.55-1.87)	0.973	1.20 (0.55-2.61)	0.37
	Mixed (*)	15 (8%)	3 (20)	4 (26.7)	5 (33.3)	3 (20)	2.18 (0.82-5.80)	0.116	1.24 (0.16-9.48)	0.835
Zone	Urban	132 (74%)	63 (47.8)	22 (16.7)	20 (15.2)	27 (20.4)	1.0	NA	1.0	NA
	Intermediate	30 (16%)	16 (53.3)	4 (13.3)	7 (23.3)	3 (10.0)	0.76 (0.36-1.59)	0.467	0.54 (0.23-1.25)	0.150
	Rural	17 (10%)	9 (52.9)	1 (5.9)	3 (17.6)	4 (23.5)	0.99 (0.37-2.61)	0.978	0.91 (0.87-0.96)	0.522
General internist or paediatrician	Internist	152 (85%)	63 (41.4)	25 (16.4)	30 (19.8)	34 (22.4)	18.69 (4.28-81.5)	<0.001	46.7 (8.6-254.1)	<0.001
	Paediatrician	27 (15%)	25 (92.6)	2 (7.4)	0 (0)	0 (0)	1.0	NA	1.0	NA
Completeness of data reporting	Number of monthly data contributions, median (IQR)	18 (9-21)	19 (10-21)	21 (16-22)	17 (8-20)	11 (6-18)	0.94 (0.91-0.98)	0.007	0.91 (0.87-0.96)	<0.001

(*) in group-reporting practices

DESCRIPTION OF THE LONG-COVID CASES REPORTED IN PART B

Between March and June 2023, 27 Sentinella practices provided data about 43 patients with long-COVID (symptoms >12 weeks after the initial infection).

Figure 1 presents the main data about the 43 patients included in the case-series. The mean age of patients was 52 years (SD 16.4). 62% were female. About half of the patients were multimorbid (they had two or more chronic conditions). The distribution of all chronic conditions is presented in Table 3. One in five patients were unvaccinated against COVID-19 and about 2 thirds were fully vaccinated. Not all patients underwent blood tests or other tests such as imaging. The most common blood tests were related to the assessment of fatigue. Lung function testing was the most proposed additional test. Further testing was infrequent during follow-up (Table 4).

Figure 2 shows healthcare-related variables in relation to the 43 cases. In the 12 months prior to COVID diagnosis, the mean number of consultations per year was 4.9 (SD 3.5), whereas following COVID the mean number (adjusted to a full year if the duration between COVID-19 diagnosis and data reporting was shorter than a year) was 7.5 (SD 4.6). There were large variations in management between patients with a minority of patients followed-up by the family doctor without any further specific management, and others referred to specialists and/or other health professionals. A little more than half the patients in the case series received physiotherapy. About half were proposed psychotherapy. A high number of patients (32/43) were referred to a specialist, with one in four referred to a long-COVID consultation. Similarly, a high number of patients from the case series were hospitalised.

Figure 1: Part B – Long COVID cases – assessment data

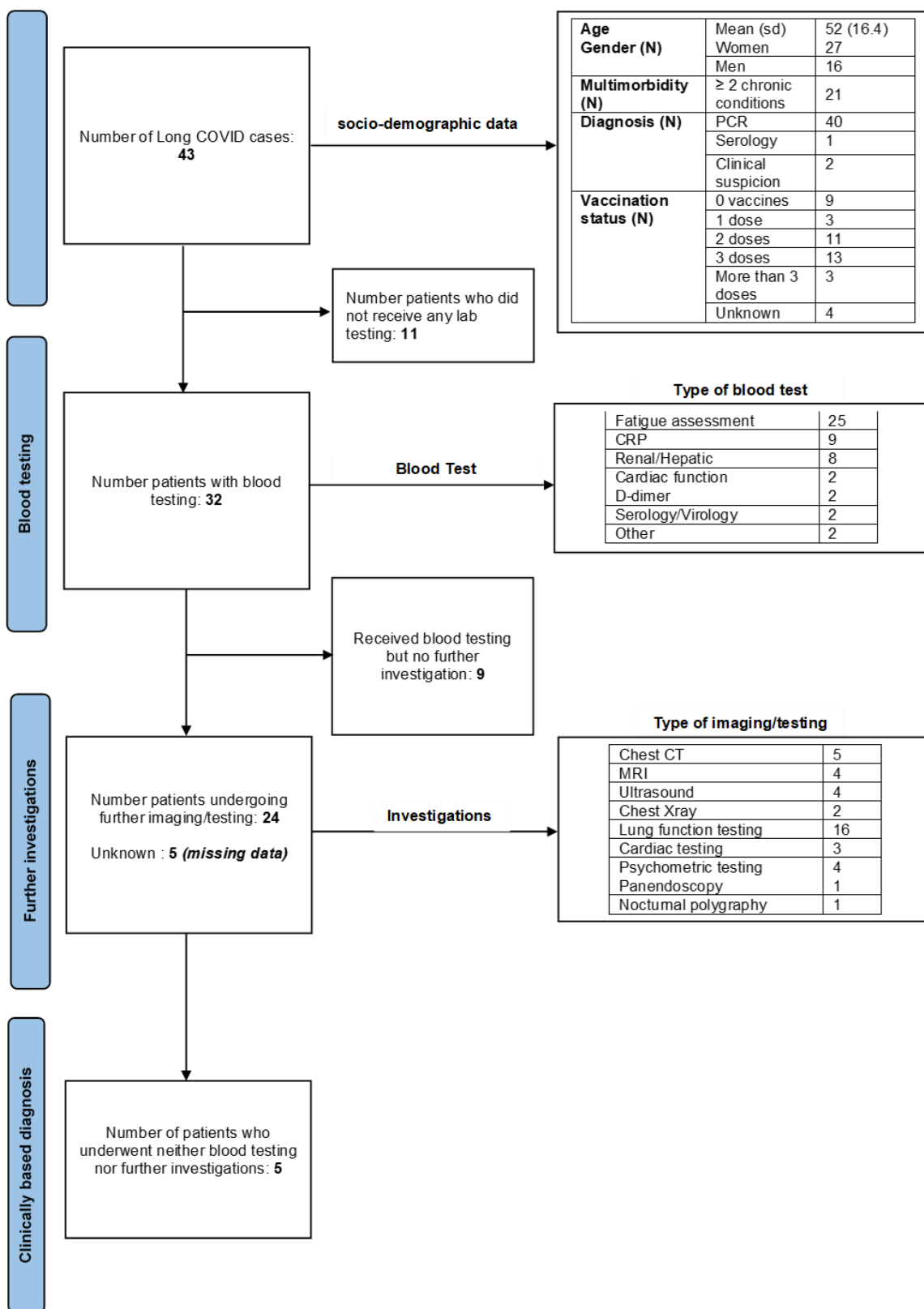


Table 3: Frequency of chronic conditions among the 43 patients of the case series

Chronics conditions	N patients
General and unspecified	
General pain	8
Digestive system	
Irritable bowel syndrome	2
Metabolic, nutritional, endocrine	
Obesity	5
Respiratory	
Chronic bronchitis	1
Chronic obstructive pulmonary disease	3
Asthma	6
Eye	
Macular degeneration	1
Cardiovascular	
Risk factor for cardiovascular disease	2
Ischaemic heart disease without angina	2
Atrial fibrillation/flutter	2
Pulmonary heart	2
High blood pressure	4
Uncomplicated hypertension	4
Neurological	
Epilepsy	1
Migraine	5
Neuritis/peripheral neuropathy	5
Skin	
Chronic skin ulcer	1
Osteoarticular	
HIV-positive rheumatoid arthritis	2
Coxarthrosis	1
Osteoporosis	2
Male genital system	
Prostate cancer	1
Psychology	
Tobacco abuse	1
Somatoform disorder	2
Depression	9
Phobia, obsessive-compulsive disorder	1
Personality disorder	3
Post-traumatic stress disorder	3
Medication abuse	1
Memory impairment	1

Figure 2 – Long COVID management in 43 patients from the case series

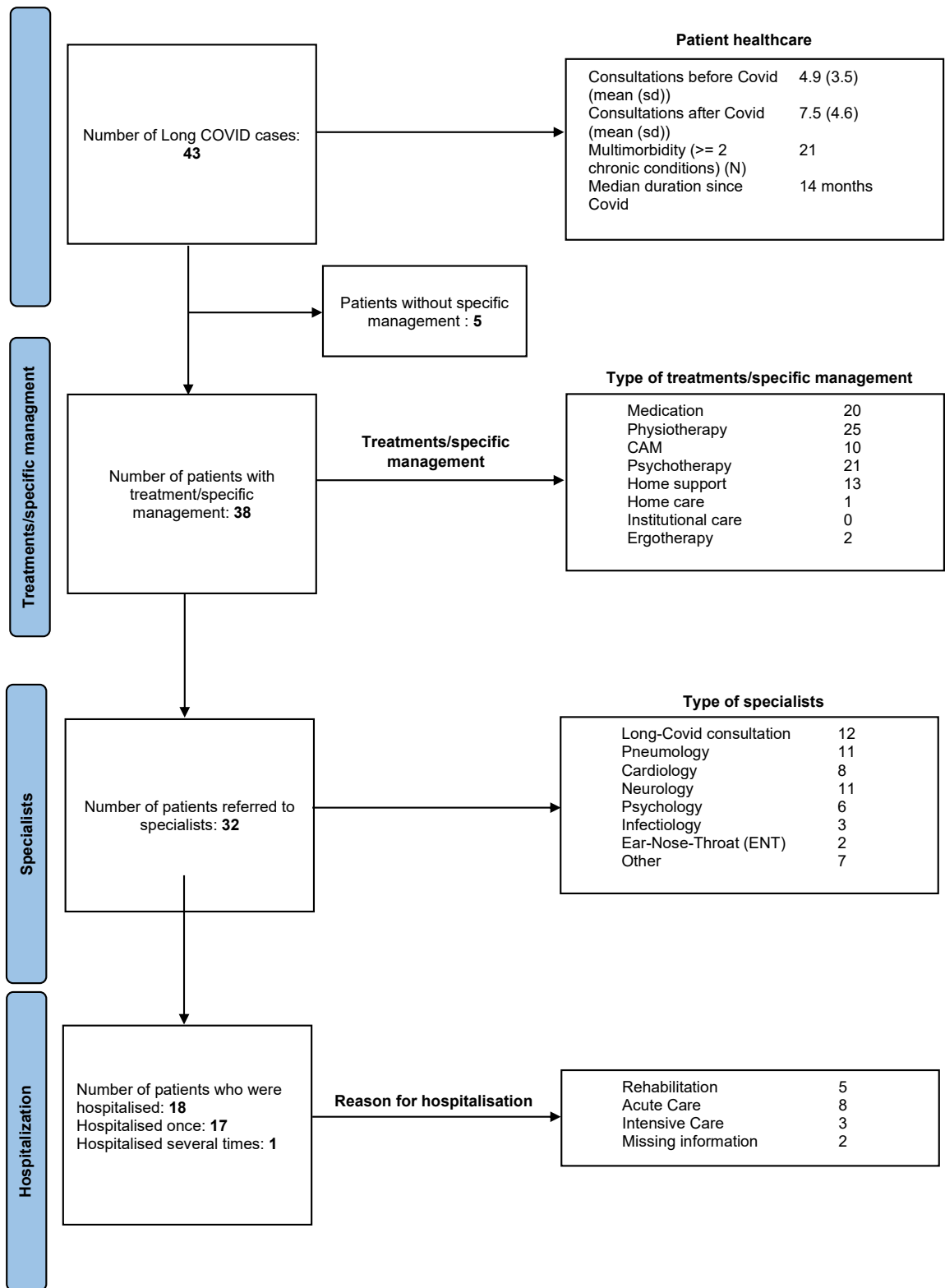


Table 4: Blood testing and imaging/test among long-COVID patients reported in the case series

	T0	M1	M2	M3	M4	M5	M6	M7	M8
N patient with available data	43	30	36	35	30	25	27	26	14
N Patient seen by family doctor at follow up	NA	11/30	15/36	13/35	9/30	10/25	12/27	8/26	2/14
Total patients with blood testing	32/43	1/11	2/15	2/13	2/9	0/10	0/12	1/8	0/2
- Fatigue	25	0	0	0	0	0	0	0	0
- CRP	9	0	0	0	0	0	0	0	0
- Renal/Hepatic	8	0	0	0	0	0	0	0	0
- Cardiac function	2	0	1	0	0	0	0	0	0
- D-dimer	2	0	0	0	0	0	0	0	0
- Serology/Virology	2	0	0	0	0	0	0	0	0
- Other	1	1	0	1	0	0	0	0	0
- Unspecified or missing	0	1	1	1	2	1	1	1	0
Total patients undergoing imaging or other tests	24/43	1/11	1/15	0/13	0/9	2/10	2/12	1/8	0/2
- Chest CT	5	0	1	0	0	0	0	0	0
- MRI	4	0	0	0	0	0	0	0	0
- Ultrasound	4	0	0	0	0	0	0	0	0
- Chest Xray	2	0	0	0	0	0	0	0	0
- Lung function testing	16	1	0	0	0	1	0	1	0
- Cardiac testing	3	0	0	0	0	1	1	0	0
- Psychometric testing	4	0	0	0	0	0	0	0	0
- Panendoscopy	1	0	0	0	0	0	0	0	0
- Nocturnal polygraphy	1	0	0	0	0	0	1	0	0
- Unspecified or missing	5	1	3	0	0	2	2	0	2

T0= baseline

M1-M8= 1st to 8th month of follow-up

Working capacity

Table 5 presents the evolving working capacity of the 43 patients included in the case series.

In the 12 months prior to COVID diagnosis five patients had received a full-time sick leave, and one patient had a part time sick leave. After COVID this number was much higher.

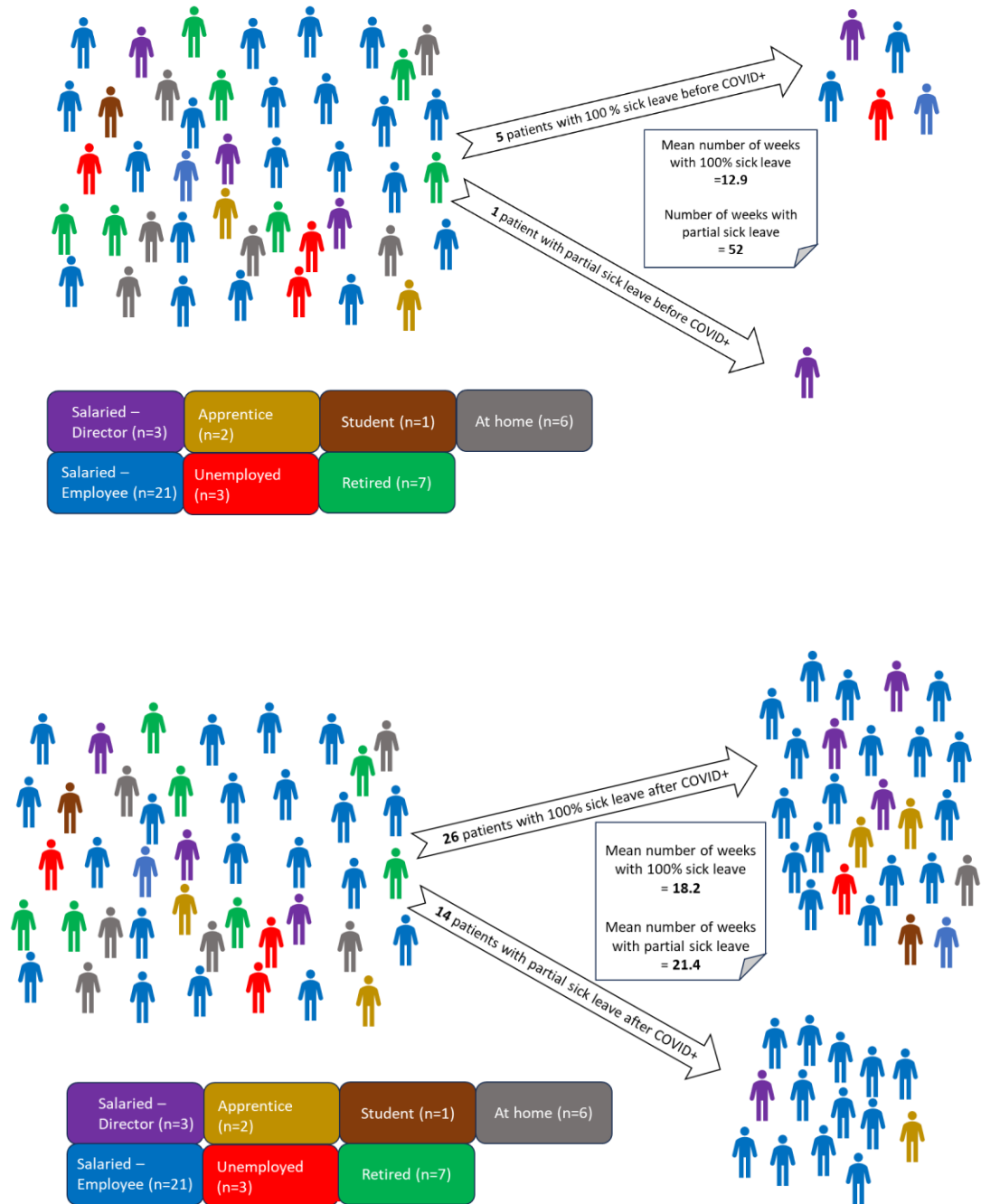
The same data are presented in a more graphical way in Figure 3. Figure 4 presents the evolution of the patients' working capacity during the 8 months following the inclusion of patients as cases in the series. Many professionally active patients benefited from sick leave throughout the study period, yet the large amount of missing data precludes clear interpretation of these data.

Table 5: Sick leave before and after COVID diagnosis in the 43 patients from the case series, stratified by employment status.

Status	Before COVID+				After COVID+			
	100% sick leave		Partial sick leave		100 % sick leave		Partial sick leave	
	N of patient	Mean (SD) number of weeks*	N of patient	Mean (SD) number of weeks*	N of patient	Mean (SD) number of weeks*	N of patient	Mean (SD) number of weeks*
Salaried - Director	1	4 (0)	1	52 (0)	3	19.3 (23.4)	1	50 (0)
Salaried - Employee	3	2.8 (1.8)	0	0 (0)	18	14.8 (11.9)	12	19.6 (17.4)
Apprenticeship	0	0 (0)	0	0 (0)	2	28 (33.9)	1	14 (0)
Unemployed	1	52 (0)	0	0 (0)	1	52 (0)	0	0 (0)
Student	0	0 (0)	0	0 (0)	1	24 (0)	0	0 (0)
Retired	0	0 (0)	0	0 (0)	0	0 (0)	0	0 (0)
At home	0	0 (0)	0	0 (0)	1	15 (0)	0	0 (0)
Total	5	12.9 (21.9)	1	52 (0)	26	18.2 (15.8)	14	21.4 (18.0)

*Annualized mean number of weeks of leave (extrapolated for patients with duration since COVID diagnosis that were longer, or shorter than 12 months)

Figure 3: Sick leave before and after COVID+ stratified by professional status



DISCUSSION

MAIN FINDINGS

Our study within the Sentinella surveillance network shows that overall family doctors in Switzerland are not confronted with a high number of patients with long COVID in their usual practice. The median monthly incidence of long-COVID related consultations was 3 per 1000 consultations for general internists and most paediatricians had no COVID-related consultations during the study period.

Only a minority of family doctors provided data for the case series part of the study. The extent of assessment and management for these 43 patients varied, but overall, most patients in the case series appeared to be offered extensive workup as well as referral to other healthcare professionals and other specialists. Patients in the case series had nearly twice as many consultations with the family doctor after COVID compared to before the infection. Full or partial sick leave was very frequent among patients in the series.

A LOW INCIDENCE OF LONG-COVID-RELATED CONSULTATIONS

Initial reports from Switzerland provided alarming figures in relation to the prevalence of long-COVID in our population.^{5,6,8} Given that these data were based on cohorts recruited in in- and outpatient hospital settings, they may have included patients who were more severely affected by COVID-19 and thus had a higher probability of developing a post COVID condition. In addition, the inclusion of patients who had been hospitalised for COVID-19 may have led to overdiagnosis of long-COVID through an overlap with post-intensive care syndrome.⁴ Since we initiated our study, other publications from Switzerland and elsewhere have also suggested a lower burden of long-COVID on primary care than initially described.^{10,11,14-17} Studies have also shown that post-COVID condition resolves in less than a year in the majority of patients, particularly if the initial COVID-19 was mild.^{17,18} In addition, the risk of developing long-COVID varies according to the SARS-CoV2 strain causing the initial infection, with the current Omicron strain being associated with a much lower risk than previous strains.¹⁹ Finally, widespread immunisation against COVID-19 may also have contributed to the reduction in the overall incidence of post-COVID condition in our population.²⁰

The lower incidence of post-COVID condition following COVID-19 with the Omicron strains and/or immunisation probably also explains why the number of cases reported by physicians of the Sentinella network for part B of this study was low. Only 27 physicians provided detailed reports about 43 patients with long-COVID followed in their practice between March and October 2023. We surveyed the physicians in the network to identify reasons for not reporting any cases. Among 163 physicians active in the network in March 2023, 32 reported they had no patients with long-COVID in their consultations, two answered they had no time to report cases and 103 did not provide a reason for not reporting any cases. The median incidence of long-COVID-related consultations in March 2023 was 0. Informal discussions with family doctors within the Sentinella Program Commission and in the family medicine institutes confirmed that most colleagues no longer see patients with post-COVID conditions in their consultation in 2023. Thus, it is likely that the low number of cases in the case series reflects a low burden of care in Swiss family practices in 2023.

VARIATIONS IN THE INCIDENCE OF LONG-COVID-RELATED CONSULTATIONS

Unsurprisingly, long-COVID-related consultations were significantly more common among internists compared to paediatricians. Indeed, most paediatricians reported no long-COVID-related consultations during the entire duration of the study. This is in line with the prevalence of post-COVID condition in children, which is clearly lower than that in adults.¹⁸ This differential prevalence likely reflects a tropism of SARS-CoV2 towards older more co-morbid adults, as well as differential immune responses between children and adults.

Whereas most family doctors from the Sentinella network reported only very few long-COVID-related consultations during the study period, a minority had much higher incidence rates for such consultations. This was for example the case for physicians from the Central part of Switzerland (LU/NW/OW/SZ/UR/ZG cantons). This was not a region with a higher incidence of COVID-19 infections compared to other Swiss regions during the pandemic.²¹ Given that the number of Sentinella doctors in this region is relatively small, this higher incidence may have therefore been driven by a group of physicians attracting such patients in particular in their consultation (due to a specific expertise). Another hypothesis could be that some doctors in this region may also have been applying less stringent criteria for the diagnosis of post-COVID condition, thus leading to a certain level of overdiagnosis in their practice.¹¹

ASSESSMENT AND MANAGEMENT OF LONG-COVID IN THE CASE SERIES

The case series revealed a large heterogeneity in the assessment and management of patients with long-COVID in Swiss family practices. This can be understood in view of the varied presentations of long-COVID patients and the importance of adapting management to individual patient needs. Overall, the burden on services appeared to be high with patients consulting their physician twice as frequently after COVID. There was also a high need for further testing and referral to specialists. The rate of referrals was very much higher than the usual rate of referral from primary care.²² This no doubt illustrates the lack of ease and need for guidance in the follow-up of patients with this new condition. The recent publication of guidelines for primary care physicians in Switzerland can assist family doctors in the diagnosis and management of this condition in the future.²³

The case series also showed the high burden of long-COVID on patients' working capacity. Indeed, most professionally active patients appeared to have benefitted from partial or total sick leave during their long-COVID condition, a clear increase compared to the situation before their SARS-CoV2 infection. Caution is needed however in interpreting these data: in the absence of clear diagnostic tests for long-COVID, the physicians may have identified patients to include in the study more easily if they consulted regularly for the renewal of a sick leave certificate.

LIMITATIONS

At the time the protocol for this study was established, the most widely available definition of long-lasting COVID was that proposed by the UK National Institute for Clinical Excellence (NICE). This definition distinguished between 1) persistent symptomatic COVID-19 if symptoms were present

between 4 and 12 weeks after initial infection, or 2) post-COVID syndrome if symptoms were present for >12 weeks after initial infection. For part A of the study, the research group decided to focus on ongoing symptomatic COVID-19, i.e. patients with symptoms from 4 weeks after the initial infection. By the time we set up part B, the most commonly used definition was the consensus definition proposed by the WHO, which defined post-COVID disorder as the presence of relevant symptoms 12 weeks after initial SARS-CoV2 infection. If this more restrictive definition had already been used in Part A, our incidence figures would undoubtedly have been even lower than those we report.

One of our initial objectives was to measure the prevalence of long-COVID among patients consulting in family medicine in Switzerland. This proved impossible within the Sentinella network. Sentinella reporting doctors report data about the number of consultations they provide, not about the number of patients they see. Since all data are collected anonymously, there is no possibility to identify whether a patient has one or several consultations during a reporting period.

Using the number of weekly doctor-patient contacts, we were, however, able to calculate the incidence of long-COVID-related consultations per 1000 doctor-patient contacts, thus providing information on the burden of long-COVID related care on Swiss family practices.

Only 35 doctors provided data for the entire study period. However, a larger number of doctors contributed data for at least 12 months of the study period, so the participation rate using this criterion is 70%. As doctors who did not contribute data likely refrained due to a lack of cases to report, the incidence rates presented here are likely conservative estimates.

Low reporting rates affect the validity of part B of our study. Indeed, we do not know to what extent the cases described are truly representative of most cases seen in Swiss family practices. However, current epidemiological data suggest a reduction in the prevalence of long-COVID due to the limited duration of illness in most patients, the preventive role of immunisation and the reduced likelihood of developing long-COVID following infection with the currently circulating SARS-CoV2 strains.¹⁹

IMPLICATIONS FOR THE FUTURE

Our results suggest that the current burden of care related to long-COVID in Swiss primary care practices is relatively low, with a low incidence of consultations related to long-COVID.

However, the case series documented a high need for assessment and management of individual patients affected by the disorder, as well as a significant impact on the ability of these patients to work. Given the high burden of long-COVID on affected individuals, identifying treatments to support recovery remains important.

Due to the current low prevalence of the disease, family physicians will not have the opportunity to develop their expertise through exposure to affected patients in the near future. They will need to rely on the expertise in interprofessional and multidisciplinary care that was developed at the height of the pandemic, and have easy access to the recommendations that were recently published as a result of this expertise.²³ This same expertise, combined with the knowledge acquired in this case series, will

be useful in scaling up appropriate care should the prevalence of long-COVID increase again in the future.

CONCLUSIONS

Our repeat cross-sectional study identified that the burden related to long-COVID consultations in family practice in Switzerland is low. Our data are reassuring in that they confirm that in the current endemic stage of COVID-19, Swiss family practices are not overwhelmed by long-COVID.

On the other hand, the case series documented that at the individual patient level, the burden of care for each patient is high, as are the repercussions on patients' ability to work.

While the case series data may offer only limited immediate insights for current health service planning, the detailed descriptions of individual cases may prove useful in the future. These detailed accounts have the potential to be instrumental in anticipating and addressing future healthcare needs in Switzerland, particularly if the prevalence of long-COVID or other post-infectious disorders were to rise again in the future.

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