BMJ Open

HOW PRIMARY CARE IN ICELAND SWIFTLY CHANGED ITS STRATEGY DURING THE SARS-COV-2 PANDEMIC

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-043151
Article Type:	Original research
Date Submitted by the Author:	28-Jul-2020
Complete List of Authors:	Sigurdsson, Emil; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Blondal, Anna; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Jonsson, Jon; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Tomasdottir, Margret; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Hrafnkelsson, Hannes; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Linnet, Kristjan; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Sigurdsson, Johann ; Haskoli Islands, Department of Family Medicine; NTNU Det Medisinske Fakultet DMF, Department of Public Health and General Practice
Keywords:	COVID-19, PRIMARY CARE, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

HOW PRIMARY CARE IN ICELAND SWIFTLY CHANGED ITS STRATEGY DURING THE SARS-COV-2 PANDEMIC

Keywords: Covid-19 pandemic, triage, primary healthcare, organisation, teamwork.

Emil Larus Sigurdsson (correspondence author)[1,2]

Anna Bryndis Blondal[1,3]

Jon Steinar Jonsson[1,2]

Margret Olafia Tomasdottir[1,2]

Hannes Hrafnkelsson[1,4]

Kristjan Linnet[2,4]

Johann Agust Sigurdsson[5]

[1]Department of Family medicine, University of Iceland. [2]Development Centre for Primary Health Care in Iceland. [3]Department of Pharmacology, University of Iceland. [4]Primary Health Care of the Capital Area, Reykjavik, Iceland. [5]Faculty of Medicine,

Department of Public Health and General Practice Research Unit, Norwegian University of Science and Technology, Trondheim, Norway.

Corresponding author: Emil L. Sigurdsson, Development Centre for Primary Health Care in Iceland. Alfabakki 16, 109 Reykjavik, Iceland. emilsig@hi.is. +354 8438001.

Word count: 2678

ABSTRACT

OBJECTIVE

To describe how the primary healthcare (PHC) in Iceland changed its tasks to handle the coronavirus pandemic 2019 (covid-19).

DESIGN

Descriptive and an analytical study.

SETTING

Reykjavik, the capital of Iceland.

POPULATION

The Reykjavik area has total of 233 000 inhabitants.

MAIN OUTCOME MEASURES

The number and the mode of consultations carried out. Drug prescriptions and changes in the ten most common diagnoses made in the PHC. Laboratory tests including covid-19 tests. Average numbers in March and April 2020 compared to the same months in 2018 and 2019.

RESULTS

The number of daytime consultations increased by 35% or from 780 to 1 051/1 000 inhabitants during the study period. Telephone and web-based consultations increased by 127%. The same tendency was observed in out-of-hours services. The

number of consultations in maternity and well-child care decreased only by 4%. Changes were seen in the ten most common diagnoses. Most noteworthy, apart from a high number of covid-19 suspected disease, was that immunisation, depression, hypothyroidism and lumbago were not among the top ten diagnoses during the epidemic period. The number of drug prescriptions increased by 10.3% (from 494 to 545 per 1 000 inhabitants). The number of prescriptions from telephone and web-based consultations rose by 55.6%. No changes were observed in antibiotics prescriptions.

CONCLUSIONS

As the first point of contact in the covid-19 pandemic, the PHC in Iceland managed to change its strategy swiftly while preserving traditional maternity and well-child care, indicating a very solid PHC with substantial flexibility in its organisation.

Strengths and limitations

- The strength of the study is that it is based on medical records and registration data from a PHC serving the whole capital area as PHCCs use the same medical record system.
- The information is very reliable and comprehensive.
- The main limitation of this study is that due to the short study period, i.e. two months, we were not able to depict the long-term changes in prescriptions, nor

report on whether any harm came to those patients that had to postpone their regular health care service.

WHAT IS ALREDY KNOWN ON THIS TOPIC
• The covid-19 pandemic has tested the structure and flexibility of healthcare systems globally. • In Iceland, primary healthcare is the first point of contact and primary care professionals serve on the frontlines of healthcare. • The prevalence of covis-19 in Iceland has already been described, but few studies have been published on the response of primary healthcare to the pandemic.
WHAT THIS STUDY ADDS
• By emphasising primary healthcare as frontline practitioners and gatekeepers, tertiary care was protected. • The primary healthcare services remained steady during the epidemic by implementing fundamental care strategies, and at the same time preserving important basic services. • These findings might provide primary healthcare centres worldwide with an example of how to change their strategy during an outbreak.
Box 1 Preparation and implementation of tasks in primary care during covid-19
Preparation (January 2020) • Educating staff about covid-19 disease and the use of personal protective equipment (PPE). • Providing and ordering appropriate materials and supplies. • Educating staff about alternative management plans at work. **Testing and treatment** • Patients with symptoms compatible with those of covid-19 were offered a nasopharyngeal and throat testing with specimens collected by doctors and nurses wearing PPE. • All primary healthcare centres (PHCCs) had daily testing outside their premises, with samples collected while patients were sitting in their cars. At the weekends, the covid-19 sample collections were centralised at a single place.

- A specially equipped car was used for home visits to those who were too ill to get tested at a drive-through centre.
- Covid-19 positive patients received follow-up care by an outpatient clinic staffed by Landspitali – The National University Hospital of Iceland.

The shift in workload management

Patient flow systems

- Patients were advised to call in advance before arriving at the PHCCs.
- Telephone consultations were offered instead of appointments.
- The maternity and well-child care consultations were carried out as scheduled.
- Those with symptoms of respiratory tract infections were given appointments at the healthcare centre, which did not overlap with maternity and well-child care consultations.
- New PHCCs bookings were scheduled through telephone screening by a nurse or a doctor.

PHC preparedness

- The PHC personnel were divided into two groups: those working at the PHCC and the others at home carrying out phone and consultations on the web.
- The PHCCs were separated into two areas, one for patients with respiratory tract infections and the other one for patients without them. Patients with respiratory symptoms were scheduled for the end of the day.
- PHC personnel prioritised work related to covid-19. Non-urgent appointments were rescheduled, and all group activities cancelled.
- The access of patients was increased through telephone consultations and web chat. For example, school nurses were released from their routine duties so they could conduct telephone covid-19 consultations.

Introduction

The SARS-CoV-2 (covid-19) pandemic has challenged the structure, organisation and flexibility of healthcare systems worldwide and has in a certain way led to rebooting of the general practice.[1-3] In the global health policy, primary healthcare (PHC) is the cornerstone of healthcare and the first point of contact.[4] In epidemics and a pandemic, as the first line of defence, the role of PHC in the healthcare system is more important than ever. Whereas the hospitals have to concentrate on the disease, people-centred PHC has to focus on the patients as well as the health of the whole community at a population health level. In such situations, triage and gatekeeping play a central role. Firstly, the task is to protect the healthcare professionals in the first line of defence from becoming infected. Other important responsibilities include informing the population, identifying and protecting individuals and groups of vulnerable people from getting infected, and last but not least, protecting the tertiary care level, the hospitals so they would not become overwhelmed or out of function because of infected staff and too many covid-19 cases. Some guidelines have been published to assist general practitioners (GPs) how to act on covid-19.[5 6]

Soon after the information about the spreading of the Coronavirus from Wuhan in China in late 2019, Iceland like other countries started to prepare for an epidemic (Box 1). Before covid-19 was diagnosed in Iceland the Directorate of Health had published a Pandemic National Response Plan.[7] The plan was updated during the

pandemic and adapted to these special circumstances.[8] After the first case was diagnosed, Iceland´s Director of Health, Iceland´s Chief Epidemiologist and the National Commissioner of the Icelandic Police´s Department of Civil Protection and Emergency Management held daily public meetings with updates on the state of the pandemic and government reactions. Already on 6 March, the team declared the highest alert level, an emergency phase, as a result of the outbreak.

During this pandemic, the PHC in Iceland has had the role as the first point of contact for people with symptoms of the respiratory tract including covid-19 -like symptoms. Directions or indications for tests were published and promoted by the Directorate of Health. Most of the tests for covid-19 in clinical situations were taken in primary healthcare centres (PHCCs). Patient with confirmed covid-19 infection were taken care of by a special unit at Landspitali- The National University Hospital of Iceland. People in quarantine were cared for by the PHC. The organisation of PHC in Iceland was rapidly and substantively changed in order to meet the demands posed by the pandemic.

Thus, when the first case of covid-19 was diagnosed in Iceland on the 28th February 2020, the PHC sector was confronted with an entirely new and unprecedented disease. To face those challenges, our PHCCs had to adapt swiftly on a much larger scale than ever before, and completely alter their tasks to defeat the enormous and acute encounter ahead. The spread of covid-19 in Iceland has already been described.[9] To date, information on the role of PHC in the covid-19 pandemic is lacking and only a few reports have been published on that matter.[10]

The aim of this paper is to describe the changes in PHC in Iceland during the covid-19 pandemic, especially in the mode of service and in certain measures of outcomes.

Setting, data sources and methods

Setting

The Icelandic healthcare system, like other Nordic welfare systems, is based on solidarity and equitable distribution of services. It is mainly financed through public funds, even though the patient pays some minor fees at the time of service.[11]

The Capital Region of Iceland had approximately 233 000 inhabitants at the beginning of 2020, or almost 2/3 of the total 364 000 inhabitants.[12] The PHC in Reykjavik, the capital area, has 19 PHCCs. The PHCCs are staffed by GPs, midwives, nurses, psychologists and other personnel. The Capital Region has PHC out-of-hours service, and a walk-in clinic which also provides home visits for those too sick to attend the clinic. Additionally, PHC operates a web chat for all residents.

The access to PHCCs is through pre-booked face-to-face consultations, phone consultations, web-based consultations and home visits. Furthermore, a walk-in service at the PHCCs is available during daytime for more acute needs.

Thus, when the first case of covid-19 was diagnosed Friday the 28th February, the PHC preparations and actions taken were accelerated (Box 1). It was clear from that point, through advertisements in the media and on site posters in PHCCs, that triage was needed, filtering out patients with symptoms that could be related to covid-19 should call the clinic rather than arrive unannounced at the PHCC. A week later, all

patients with a pre-booked appointment were offered a phone consultation instead of an in-person visit.

At the beginning of March, patients with symptoms compatible with those of covid-19 were offered a test. All PHCCs had daily testing outside their healthcare premises, with samples collected through the windows of the patients' cars. Doctors and nurses wearing all the necessary personal protective equipment, collected nasopharyngeal and throat samples from patients. During the weekends, covid-19 virus testing was centralised in one place. Moreover, during the day and out-of-hours, a specially equipped car was used for home visits to those too sick to get tested at a drive-through centre. In these visits, samples were collected and people were assessed for the need of hospital admission. Covid-19 positive patients received follow-up care by an outpatient clinic operated by Landspitali- The National University Hospital of Iceland.

Data sources and methods

Data were extracted from the medical records database of the PHC in Iceland. The PHC has a common medical records database that is accessible by the PHCCs. The number of contacts to PHC, types of contact, most common diagnoses, and medical prescriptions were observed for March and April in the years 2018, 2019 and 2020. The number of blood and urine tests was gathered from the laboratory at Landspitali-The National University Hospital of Iceland. Furthermore, the number of covid-19 tests performed in March and April 2020 was obtained from the Directorate of Health.

The data analyses are descriptive and analytical, centring on changes in the services provided during these periods. Statistical analyses were performed using SPSS version 26. All P-values are two-sided and the statistical significance was considered at P-values less than 0.05.

The study was approved by The National Bioethics Committee and the Data Protection Authority in Iceland (VSN-20-095).

Results

From the beginning, the PHC prioritised work related to covid-19, and matters that could wait were set aside. School nurses were called in to do phone consultations related to covid-19. New PHC appointments were booked through telephone screening by a nurse or a doctor and great emphasis was put on providing maternity and well-child care.

The healthcare centres were also divided into two areas, either for patients with or without symptoms of respiratory tract infection (RTI).

As of the middle of March, the PHCCs and the after-hours service designated special rooms in their premises for patients with possible infections and all staff wore masks and gloves for general consultations. From the very beginning it was emphasised that people should call ahead to the PHCC in order to get permission to present there. This message was driven home with increased intensity as the pandemic approached its culmination. Furthermore, when receptionists at the PHCC contacted

clients who had appointments in order to offer a telephone consultation, they were asked either to call in advance or refrain from turning up if any common cold symptoms should arise in the meantime.

From the 3 March 2020, samples were taken for testing covid-19 with clients sitting in their cars outside the health care centre. Very soon, organised afternoon appointments were brought about at all the healthcare centres where such services were not already in place.

Those who had RTI symptoms were given appointments at PHCC that did not overlap with times for maternity and well-child care.

Consultation rates and modalities

On average during the two periods, March/April 2018 and 2019, the number of daytime consultations were 780/1 000 inhabitants. In the same period in 2020 the consultations were 1 051/1 000 inhabitants which is a 35% increase from the average number per 2018 and 2019 (table 1). Telephone consultations increased by 69%, web-based consultations by 213% and office visits decreased by 41% (table 1). Total number of consultations in maternity and well-child care (telephone, office and home visits) decreased only by 4% between 2018 and 2019 vs 2020.

Out-of-hours consultations

Telephone consultations increased from 125/1 000 inhabitants in 2018/2019 to 320/1 000 inhabitants in 2020, an increase by 156%. Home visits increased also from 4/1 000 inhabitants to 7/1 000 inhabitants a 75% increase. However, the number of office

visits decreased from 69/1 000 inhabitants to 37/1 000 inhabitants a 46% decrease (table 1).

Table 1 **Number and mode of consultation in primary healthcare centres and out-of-hours service during March and April 2018/19 vs 2020**

	PHC				OHS				Total			
	2018/19	2020			2018/19	2020			2018/19	2020		
	N	N	%	p	N	N	%	p	N	N	%	p
Telephone consultations	335	567	+69	*	125	320	+156	*	460	887	+93	*
Office visits	357	209	-41	*	69	37	-46	*	426	246	-42	*
Web based consultation	88	275	+213	*					88	275	+213	*
Home visits					4	7	+75	*	4	7	+75	*

N Number per 1 000 inhabitants
* All changes are statistically significant p<0.001

Through March and April 2020 there was a rise in telephone and web-based consultations, while office visits decreased. School healthcare service was stopped but maternity and well-child care services remained stable (fig 1).

Fig 1 here:

Web chat

In 2018 a web-chat room was established in PHC where people could seek advice and guidance. In March/April 2018 and 2019 there were 2 contacts/1 000 inhabitants but in the same period 2020 they were 93/1 000 inhabitants (p<0.0001).

Tests for covid-19

During the two-month period, a total of 10 162 samples were collected at the PHCCs and examined in the Department of Clinical Microbiology, Landspitali - The National

University Hospital of Iceland. That is 43 samples per 1 000 inhabitants. Of those tests 1 089 (11%) turned out positive.

Laboratory tests

The number of laboratory tests in prenatal care increased by 10% between the years 2018/2019 and 2020. The number of laboratory tests in general was 335/1 000 inhabitants in the years 2018/2019 but in 2020 it was 244/1 000 inhabitants, a 27% decrease ($p<0.0001$). The most common blood tests in both periods were blood count, thyroid stimulating hormone, vitamin B12. The most common test in 2020 was test for covid-19 from throat and nasopharynx swabs.

Most common diagnoses

During the pandemic, the 10 most common diagnoses were substantially different from the most common diagnoses in the same months the two years before. Common diagnoses like immunisation, depression, hypothyroidism and lumbago are not among the most common diagnoses in the pandemic period (fig 2).

Fig 2 here:

Changes in the mode of patient contact leading to prescriptions and their number

All prescriptions

In March/April 2018-2019, there was an average of 494 prescriptions issued by GPs per 1 000 inhabitants and a total of 545 prescriptions per 1 000 inhabitants in

March/April 2020 (p=0.022), an increase of 10.3%. The number of prescriptions from telephone and web-based consultations rose by 55.6% from 293 per 1 000 inhabitants in 2018/2019 to 456 in 2020 (p<0.0001). At the same time, prescriptions issued by GPs during office visits, plummeted as the standard care during covid-19 by 56.2% from 201/1 000 to 88/1 000 inhabitants in 2020 (p<0.0001) (fig 3).

Fig 3 here:

Antibiotic prescriptions

The average number of antibiotic prescriptions was 45 per 1 000 inhabitants in March/April 2018-2019, and a total of 44 per 1 000 inhabitants in March/April 2020 (p=0.91). However, results also display an increase in telephone and web-based consultation prescriptions in 2020 (136.4%) compared to more traditional direct office visits contacts, from 11/1 000 inhabitants to 26/1000 inhabitants in 2020 (p=0.013). Meanwhile, prescriptions issued after office visits were reduced from the average in 2018 and 2019 to 2020 by almost half (47.1%) from 34/1 000 inhabitants to 18/1 000 inhabitants (p=0.024) (fig 4).

Fig 4 here:

Discussion

One of the main concerns of the health authorities in Iceland as well as elsewhere, was whether the hospitals, especially the intensive care units, would be overwhelmed. The number of respirators was the critical obstacle. Therefore the plan was, among other things, to delay the spread of the virus, thereby sharpening the gatekeeping role of the primary healthcare and spreading the workload.

Our study clearly reveals the importance of well-established PHC as the place of first contact during the covid-19 pandemic 2020. By prompt detection and effective triage of potentially infected patients the PHC managed to establish levels of care.

Furthermore, our study shows the capacity and flexibility of the comprehensive service of primary care in the capital area of Reykjavík, Iceland. The size of the PHCCs, the number of professionals as well as teamwork allowed dividing up areas and services according to risk estimates, keeping the maternity care and well-child care almost at the same level as before. However, the increase in the frequency of feared health complaints (ICD-10 Z71.1) and lack of face-to-face contacts during this period, indicates a longer lasting follow-up as a consequence of this pandemic.

Our data show a substantial increase in number of contacts with our patients during this pandemic, and an abrupt change in mode of appointments compared to same period 2018 and 2019. Those changes were in harmony with recommendations from health authorities.

The role of out-of-hours consultations in PHC is always of immense importance and in this pandemic it played even a more significant role as a part of the frontline health care responses.

Interestingly, there was an enormous rise in web-based consultations during the epidemic indicating that our traditional ways of assisting our patient, by either a face-to-face or a telephone conversation, have to be revised.[13-15]

Of special interest is the fact that in spite of the increase in web-based and telephone consultations instead of face-to face contacts, the number of antibiotic prescriptions remained constant compared to the years before. This indicates that covid-19-like symptoms and fear of superinfections had little impact on antibiotic prescriptions.[16]

Regarding the changes in the ten most common diagnoses it is of particular interest to observe the high number of individuals diagnosed with feared health complications in 2020. This undoubtedly indicated an area of worries in the community.

Our results show that, as was expected that the list of the 10 most common diagnoses in the pandemic included diagnoses related to covid-19, but still common diagnoses as hypertension, anxiety, insomnia and pain are among the 10 most common diagnoses. However, diagnoses as depression, hypothyroidism and lumbago were not among 10 most common diagnoses during the epidemic. The decrease in the use of laboratory tests might indicate a change in ordinary patient care. Nevertheless, the number of drug prescriptions did not decrease and in fact increased slightly, suggesting that the prescription of continuous medication was not disrupted. Studies or reports on how general practice faced the covid-19 are scarce so comparison of our study with others is very limited.[10]

Our study supports the experience from the coronavirus outbreak in China regarding the importance of PHC, especially that we will be 'first in and last out'.[17]

After the first wave of the covid-19 epidemic in Iceland, national data on 8 June show that 1 807 persons became infected with the SARS-CoV-2 virus (4.9/1 000) of whom 118 patients were hospitalised (or 6.5% of those infected) and of whom 30 needed intensive care. Ten people died (0.5% of those infected).[18] These figures are the lowest in the Nordic countries and also in comparison to others with similar age distribution and standard of living.[19]

History has told us that epidemics ultimately resolve and they usually follow a certain pattern and the first wave of covid-19 epidemic in Iceland appeared to do just that.[20] [21]

If the covid-19 pandemic continues for the next years the PHC has gained an important knowledge and experience on how to manage and optimise the care of their patients during such a serious outbreak.[22]

Conclusions and implications

We conclude that PHC in Iceland managed to accomplish its role as a first line gatekeeper and was able to change its task swiftly in an effort to deal with covid-19. At the same time the traditional maternity and well-child care was preserved, indicating a substantial flexibility in the organisation. Whether and how new technology, such as web-based and video consultations will be taken into consideration as future option for PHC is a topic for further research and quality development.

Author affiliations

[1]Department of Family Medicine, University of Iceland. [2]Development Centre for Primary Healthcare in Iceland. [3]Faculty of Pharmaceutical Science, University of Iceland. [4]Primary Health Care of the Capital Area, Reykjavik, Iceland. [5]Faculty of Medicine, Department of Public Health and General Practice Research Unit, Norwegian University of Science and Technology, Trondheim, Norway.

We thank the chief medical doctor at the Primary Health Care of the Capital Area, Reykjavik, the Primary Health Care of Hofdi, Reykjavik, the Primary Health Care of Lagmuli, Reykjavik, the Primary Health Care of Urdarhvarf, Reykjavik, the Primary Health Care of Salastodin, Reykjavik, and The Out-of-Hours Clinic in Reykjavik, Iceland.

Contributors: All authors contributed to the design and gathering of information for the study. All authors contributed to the writing of the article and revised and approved the final version.

Funding: This research was supported by the Research Fund of the Icelandic College of Family Physicians.

Competing interests: All authors declare no conflict of interests.

Ethical approval: The study was approved by The National Bioethics Committee and the Data Protection Authority in Iceland (VSN-20-095).

1. Rasanathan JJK, Nolan T. A "Deep Breath In" for GPs. BMJ 2020;369:m1437. doi: 10.1136/bmj.m1437.

2. Kamerow D. Covid-19: Don't forget the impact on US family physicians. BMJ 2020;368:m1260. doi: 10.1136/bmj.m1260.

3. Fraher EP, Pittman P, Frogner BK, et al. Ensuring and Sustaining a Pandemic Workforce. New Engl J Med 2020;382(23):2181-83. doi: 10.1056/NEJMp2006376.

4. The Astana Declaration: the future of primary health care? Lancet 2018;392(10156):1369. doi: 10.1016/S0140-6736(18)32478-4.

5. Razai MS, Doerholt K, Ladhani S, et al. Coronavirus disease 2019 (covid-19): a guide for UK GPs. BMJ 2020;368:m800. doi: 10.1136/bmj.m800.

6. Greenhalgh T, Koh GCH, Car J. Covid-19: a remote assessment in primary care. BMJ 2 020;368:m1182. doi: 10.1136/bmj.m1182.

7. Landsáætlun CBRNE. Published by Iceland´s Chief Epidemiologist and the Icelandic Police´s Department of Civil Protection and Emergency Management, January 2020.

8. Heimsfaraldur – Landsáætlun edition 3.1. Published by Iceland´s Chief Epidemiologist and the Icelandic Police´s Department of Civil Protection and Emergency Management, May 25th 2020. (available at: https://www.landlaeknir.is/utgefid-efni/skjal/item29596/).

9. Gudbjartsson DF, Helgason A, Jonsson H, et al. Spread of SARS-CoV-2 in the Icelandic Population. N Engl J Med 2020 doi: 10.1056/NEJMoa2006100.

10. Mash B. Primary care management of the coronavirus (COVID-19). S Afr Fam Pract (2004) 2020;62(1):e1-e4. doi: 10.4102/safp.v62i1.5115.

11. Sigurgeirsdottir S, Waagfjoreth J, Maresso A. Iceland: health system review. Health Syst Transit 2014;16(6):1-182, xv.

12. Statistics Iceland. https://px.hagstofa.is/pxis/pxweb/is/?rxid=633839273-14c5-42ba-9a72-1d87b83270c4.

13. Keesara S, Jonas A, Schulman K. Covid-19 and Health Care's Digital Revolution. New Engl J Med 2020;382(23):e82. doi: 10.1056/NEJMp2005835.

14. Duffy S, Lee TH. In-Person Health Care as Option B. New Engl J Med 2018;378(2):104-06. doi: 10.1056/NEJMp1710735.

15. Ackerman SL, Dowdell K, Clebak KT, et al. Patients Assess an eConsult Model's Acceptability at 5 US Academic Medical Centers. Ann Fam Med 2020;18(1):35-41. doi: 10.1370/afm.2487.

16. Hsu J. How covid-19 is accelerating the threat of antimicrobial resistance. BMJ 2020;369:m1983. doi: 10.1136/bmj.m1983.

17. Li DKT. Challenges and responsibilities of family doctors in the new global coronavirus outbreak. Fam Med Community He 2020;8(1) doi: UNSP e000333 10.1136/fmch-2020-000333.

18. The Directorate of Health and The Department of Civil Protection and Emergency Management. (Available from: https://www.covid.is/english).

19. Johns Hopkins University. COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE). 2020. https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6.

20. Rosenberg CE. What is an epidemic? AIDS in historical perspective. Daedalus 1989:1-17.

21. Jones DS. History in a Crisis - Lessons for Covid-19. N Engl J Med 2020;382(18):1681-83. doi: 10.1056/NEJMp2004361.

22. Rauh AL, Linder JA. Covid-19 care before, during, and beyond the hospital. BMJ 2020;369:m2035. doi: 10.1136/bmj.m2035.

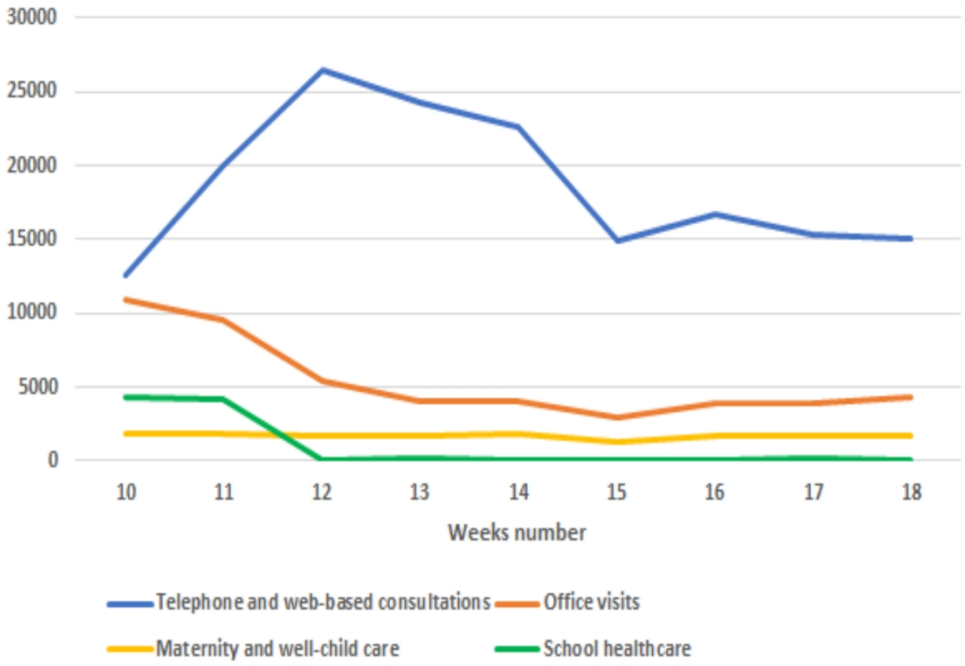
FIGURE LEGENDS

Fig 1 The number of different daytime consultation modes for each week in March and April 2020.

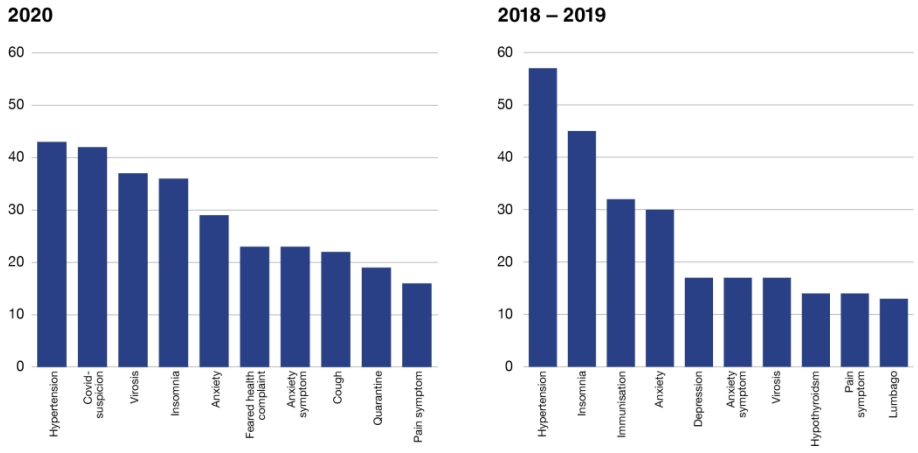
Fig 2 The ten most common diagnoses (ICD10) made in 2020 (left) and 2018/19 (right). Numbers are per 1 000 inhabitants.

Fig 3 The number of prescriptions/1 000 inhabitants in primary healthcare. Changes in the mode of patient contact during covid-19.

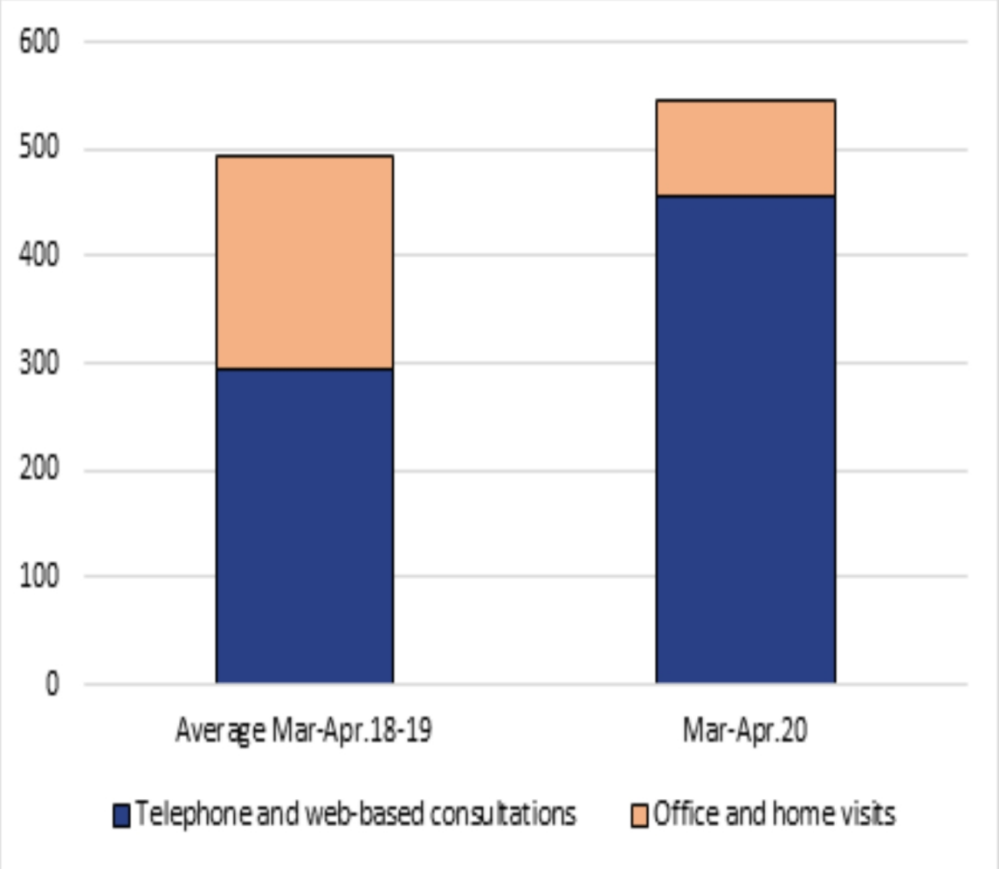
Fig 4 The number of antibiotic prescriptions/1 000 inhabitants in primary healthcare. Changes in the mode of patient contact during covid-19.



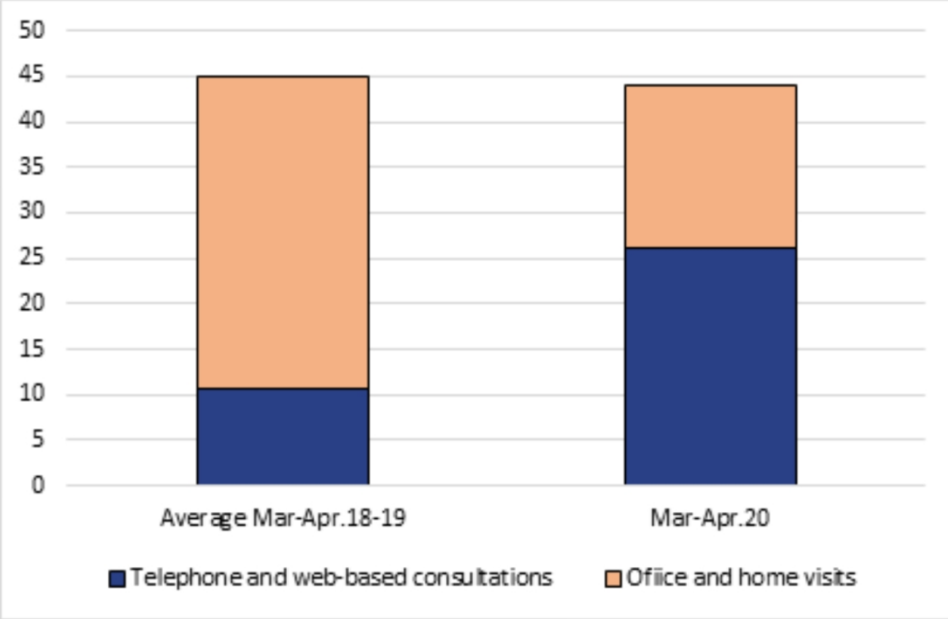
439x381mm (96 x 96 DPI)



656x312mm (96 x 96 DPI)



439x381mm (96 x 96 DPI)



439x381mm (96 x 96 DPI)

BMJ Open

HOW PRIMARY HEALTHCARE IN ICELAND SWIFTLY CHANGED ITS STRATEGY IN RESPONSE TO THE COVID-19 PANDEMIC

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-043151.R1
Article Type:	Original research
Date Submitted by the Author:	15-Oct-2020
Complete List of Authors:	Sigurdsson, Emil; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Blondal, Anna; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Jonsson, Jon; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Tomasdottir, Margret; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Hrafnkelsson, Hannes; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Linnet, Kristjan; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Sigurdsson, Johann ; Haskoli Islands, Department of Family Medicine; NTNU Det Medisinske Fakultet DMF, Department of Public Health and General Practice
Primary Subject Heading:	General practice / Family practice
Secondary Subject Heading:	Epidemiology, Infectious diseases
Keywords:	PRIMARY CARE, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, COVID-19, INFECTIOUS DISEASES, Epidemiology < INFECTIOUS DISEASES

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

HOW PRIMARY HEALTHCARE IN ICELAND SWIFTLY CHANGED ITS STRATEGY IN RESPONSE TO THE COVID-19 PANDEMIC

Keywords: Covid-19 pandemic, triage, primary healthcare, organisation, teamwork.

Emil L. Sigurdsson (correspondence author)[1,2] emilsig@hi.is

Anna B. Blondal[2,3,4]

Jon S. Jonsson[1,2]

Margret O. Tomasdottir[1,2]

Hannes Hrafnkelsson[1,4]

Kristjan Linnet[2,4]

Johann A. Sigurdsson[4,5]

Author affiliations

[1]Department of Family Medicine, University of Iceland. [2]Development Centre for Primary Healthcare in Iceland. [3]Faculty of Pharmaceutical Science, University of Iceland. [4]Primary Health Care of the Capital Area, Reykjavik, Iceland. [5]Faculty of Medicine, Department of Public Health and General Practice Research Unit, Norwegian University of Science and Technology, Trondheim, Norway.

ABSTRACT

OBJECTIVE

To describe how the primary healthcare (PHC) in Iceland changed its strategy to handle the coronavirus pandemic 2019 (covid-19).

DESIGN

Descriptive observational study.

SETTING

Reykjavik, the capital of Iceland.

POPULATION

The Reykjavik area has a total of 233 000 inhabitants.

MAIN OUTCOME MEASURES

The number and the mode of consultations carried out. Drug prescriptions and changes in the ten most common diagnoses made in the PHC. Laboratory tests including covid-19 tests. Average numbers in March and April 2020 compared to the same months in 2018 and 2019.

RESULTS

Pragmatic strategies and new tasks were rapidly applied to the clinical work to meet the foreseen health care needs caused by the pandemic. The number of daytime consultations increased by 35% or from 780 to 1 051/1 000 inhabitants ($p<0.001$)

during the study period. Telephone and web-based consultations increased by 127% (p<0.001). The same tendency was observed in out-of-hours services. The number of consultations in maternity and well-child care decreased only by 4% (p=0.003). Changes were seen in the ten most common diagnoses. Most noteworthy, apart from a high number of covid-19 suspected disease, was that immunisation, depression, hypothyroidism and lumbago were not among the top ten diagnoses during the epidemic period. The number of drug prescriptions increased by 10.3% (from 494 to 545 per 1 000 inhabitants, p<0.001). The number of prescriptions from telephone and web-based consultations rose by 55.6%. No changes were observed in antibiotics prescriptions.

CONCLUSIONS

As the first point of contact in the covid-19 pandemic, the PHC in Iceland managed to change its strategy swiftly while preserving traditional maternity and well-child care, indicating a very solid PHC with substantial flexibility in its organisation.

Strengths and limitations of this study

- The data is based on medical records of all contacts to the primary health-care centres.
- The PHC in the research area serve the whole capital area which counts two thirds of the population of Iceland.
- The contact register information is very reliable and comprehensive.

- Due to the short study period, i.e. two months, we were not able to depict the long-term changes in health care services.
- The consequences of postponing regular health-care service are not presented.

Box 1 Preparation and implementation of tasks in primary care during covid-19

Preparation (January 2020)

- Educating staff about covid-19 disease and the use of personal protective equipment (PPE).
- Providing and ordering appropriate materials and supplies.
- Educating staff about alternative management plans at work.

Testing and treatment

- Patients with symptoms compatible with those of covid-19 were offered a nasopharyngeal and throat testing with specimens collected by doctors and nurses wearing PPE.
- All primary healthcare centres (PHCCs) had daily testing outside their premises, with samples collected while patients were sitting in their cars. At the weekends, the covid-19 sample collections were centralised at a single place.
- A specially equipped car was used for home visits to those who were too ill to get tested at a drive-through centre.
- Covid-19 positive patients received follow-up care by an outpatient clinic staffed by Landspitali – The National University Hospital of Iceland.

The shift in workload management

Patient flow systems

- Patients were advised to call in advance before arriving at the PHCCs.
- Telephone consultations were offered instead of appointments.
- The maternity and well-child care consultations were carried out as scheduled.
- Those with symptoms of respiratory tract infections were given appointments at the healthcare centre, which did not overlap with maternity and well-child care consultations.
- New PHCCs bookings were scheduled through telephone screening by a nurse or a doctor.

PHC preparedness

- The PHC personnel were divided into two groups: those working at the PHCC and the others at home carrying out phone and consultations on the web.
- The PHCCs were separated into two areas, one for patients with respiratory tract infections and the other one for patients without them. Patients with respiratory symptoms were scheduled for the end of the day.
- PHC personnel prioritised work related to covid-19. Non-urgent appointments were rescheduled, and all group activities cancelled.
- The access of patients was increased through telephone consultations and web chat. For example, school nurses were released from their routine duties so they could conduct telephone covid-19 consultations.

Introduction

The COVID-19 pandemic caused by SARS-COV-2 has challenged the structure, organisation and flexibility of healthcare systems worldwide and has in a certain way led to rebooting of the general practice.[1-3] In the global health policy, primary healthcare (PHC) is the cornerstone of healthcare and the first point of contact.[4] In epidemics and a pandemic, as the first line of defence, the role of PHC in the healthcare system is more important than ever. Whereas the hospitals have to concentrate on the disease, people-centred PHC has to focus on the patients as well as the health of the whole community at a population health level. In such situations, triage and gatekeeping play a central role. Firstly, the task is to protect the healthcare professionals in the first line of defence from becoming infected. Other important

responsibilities include informing the population, identifying and protecting individuals and groups of vulnerable people from getting infected, and last but not least, protecting the tertiary care level, the hospitals so they would not become overwhelmed or out of function because of infected staff and too many covid-19 cases. Some guidelines have been published to assist general practitioners (GPs) how to act on covid-19.[5 6]

Soon after the information about the spreading of the Coronavirus from Wuhan in China in late 2019, Iceland like other countries started to prepare for an epidemic (Box 1). Before covid-19 was diagnosed in Iceland the Directorate of Health had published a Pandemic National Response Plan.[7] The plan was updated during the pandemic and adapted to these special circumstances.[8] After the first case was diagnosed, Iceland´s Director of Health, Iceland´s Chief Epidemiologist and the National Commissioner of the Icelandic Police´s Department of Civil Protection and Emergency Management held daily public meetings with updates on the state of the pandemic and government reactions. Already on 6 March, the team declared the highest alert level, an emergency phase, as a result of the outbreak.

During this pandemic, the PHC in Iceland has had the role as the first point of contact for people with symptoms of the respiratory tract including covid-19 -like symptoms. Directions or indications for tests were published and promoted by the Directorate of Health. Most of the tests for covid-19 in clinical situations were taken in primary healthcare centres (PHCCs). Patient with confirmed covid-19 infection were taken care of by a special unit at Landspitali- The National University Hospital of Iceland.

People in quarantine were cared for by the PHC. The organisation of PHC in Iceland was rapidly and substantively changed in order to meet the demands posed by the pandemic.

Thus, when the first case of covid-19 was diagnosed in Iceland on the 28 February 2020, the PHC sector was confronted with an entirely new and unprecedented disease and the PHC preparations and actions taken were accelerated (Box1). To face those challenges, our PHCCs had to adapt swiftly on a much larger scale than ever before, and completely alter their tasks to defeat the enormous and acute encounter ahead. The spread of covid-19 in Iceland has already been described.[9] To date, information on the role of PHC in the covid-19 pandemic is lacking and only a few reports have been published on that matter.[10]

The aim of this paper is to describe the changes in PHC in Iceland during the covid-19 pandemic, especially in the mode of service and in certain measures of outcomes.

Methods

Setting

The Icelandic healthcare system, like other Nordic welfare systems, is based on solidarity and equitable distribution of services. It is mainly financed through public funds, even though the patient pays some minor fees at the time of service.[11] The general tasks of the PHCCs are defined by laws and regulations, and their administration is under the auspices of the health authorities. Thus, the management decisions are made locally in accordance with government policy. The health care

offered by the PHCCs is based on holistic approach thereby including general practice, maternity care, well-child care, school health care, minor surgery and emergency care.

The Capital Region of Iceland had approximately 233 000 inhabitants at the beginning of 2020, or almost 2/3 of the total 364 000 inhabitants.[12] The PHC in Reykjavik, the capital area, has 19 PHCCs. The PHCCs are staffed by GPs, midwives, nurses, psychologists and other personnel. The Capital Region has PHC out-of-hours service, and a walk-in clinic which also provides home visits for those too sick to attend the clinic. Additionally, PHC operates a web chat for all residents. The access to PHCCs is through pre-booked face-to-face consultations, phone consultations, web-based consultations and home visits. Furthermore, a walk-in service at the PHCCs is available during daytime for more acute needs.

It was clear from the beginning of the pandemic that through advertisements in the media and on-site posters in PHCCs, that triage was needed. A week later, all patients with a pre-booked appointment were offered a phone consultation instead of an in-person visit.

At the beginning of March, patients with symptoms compatible with those of covid-19 were offered a test. All PHCCs had daily testing outside their healthcare premises, with samples collected through the windows of the patients' cars. Doctors and nurses wearing all the necessary personal protective equipment, collected nasopharyngeal and throat samples from patients. During the weekends, covid-19 virus testing was centralised in one place. Moreover, during the day and out-of-hours, a specially

equipped car was used for home visits to those too sick to get tested at a drive-through centre. In these visits, samples were collected and people were assessed for the need of hospital admission. Covid-19 positive patients received follow-up care by an outpatient clinic operated by Landspitali- The National University Hospital of Iceland.

Data source

Data were extracted from the medical records database of the PHC in Iceland. The PHC has a common medical records database that is accessible by the PHCCs. The number of contacts to PHC, types of contact, most common diagnoses according to ICD-10 version of the classification system for diagnoses and medical prescriptions were observed for March and April in the years 2018, 2019 and 2020. The number of blood and urine tests was gathered from the laboratory at Landspitali- The National University Hospital of Iceland. Furthermore, the number of covid-19 tests performed in March and April 2020 was obtained from the Directorate of Health.

Data analyses

The data analyses are descriptive and analytical, centring on changes in the services provided during these periods. All P-values are two-sided and the statistical significance was considered at p-values less than 0.05, using a chi-square test

Patient and public involvement:

No patient involved.

Results

Implementation of tasks and shift in workload management are shown in Box 1. From the beginning, the PHC prioritised work related to covid-19, and matters that could wait were set aside. School nurses were called in to do phone consultations related to covid-19. New PHC appointments were booked through telephone screening by a nurse or a doctor and great emphasis was put on providing maternity and well-child care.

The healthcare centres were also divided into two areas, either for patients with or without symptoms of respiratory tract infection (RTI).

As of the middle of March, the PHCCs and the after-hours service designated special rooms in their premises for patients with possible infections and all staff wore masks and gloves for general consultations. From the very beginning it was emphasised that people should call ahead to the PHCC in order to get permission to present there. This message was driven home with increased intensity as the pandemic approached its culmination. Furthermore, when receptionists at the PHCC contacted clients who had appointments in order to offer a telephone consultation, they were asked either to call in advance or refrain from turning up if any common cold symptoms should arise in the meantime.

Consultation rates and modalities

On average during the two periods, March/April 2018 and 2019, the number of daytime consultations were 780/1 000 inhabitants. In the same period in 2020 the consultations were 1 051/1 000 inhabitants which is a 35% (p<0.001) increase from the average number per 2018 and 2019 (table 1). Telephone consultations increased by 69% (p<0.001), web-based consultations by 213% (p<0.001) and office visits decreased by 41% (p<0.001) (table 1). Total number of consultations in maternity and well-child care (telephone, office and home visits) decreased from 67.5/1 000 inhabitants 2018/2019 to 65/1 000 inhabitants 2020 or only by 4% (p=0.001).

Out-of-hours consultations

Telephone consultations increased from 125/1 000 inhabitants in 2018/2019 to 320/1 000 inhabitants in 2020, an increase by 156% (p< 0.001). Home visits increased also from 4/1 000 inhabitants to 7/1 000 inhabitants a 75% increase. However, the number of office visits decreased from 69/1 000 inhabitants to 37/1 000 inhabitants a 46% decrease (p< 0.001) (table 1).

Table 1 here:

Through March and April 2020 there was a rise in telephone and web-based consultations, while office visits decreased. School healthcare service was stopped but maternity and well-child care services remained stable (fig 1).

Fig 1 here:

Fig 1 The number of different daytime consultation modes for each week in March and April 2020.

Web chat

In 2018 a web-chat room was established in PHC where people could seek advice and guidance. In March/April 2018 and 2019 there were 2 contacts/1 000 inhabitants but in the same period 2020 they were 93/1 000 inhabitants ($p<0.0001$).

Tests for covid-19

During the two-month period, a total of 10 162 samples were collected at the PHCCs and examined in the Department of Clinical Microbiology, Landspitali - The National University Hospital of Iceland. That is 43 samples per 1 000 inhabitants. Of those tests 1 089 (11%) turned out positive.

Laboratory tests

The number of laboratory tests in prenatal care increased by 10% ($p< 0.001$) between the years 2018/2019 and 2020. The number of laboratory tests in general was 335/1 000 inhabitants in the years 2018/2019 but in 2020 it was 244/1 000 inhabitants, a 27% decrease ($p< 0.001$). The most common blood tests in both periods were blood count, thyroid stimulating hormone, vitamin B12. The most common test in 2020 was test for covid-19 from throat and nasopharynx swabs.

Most common diagnoses

During the pandemic, the 10 most common diagnoses were substantially different from the most common diagnoses in the same months the two years before. Common diagnoses like immunisation, depression, hypothyroidism and lumbago are not among the most common diagnoses in the pandemic period (fig 2).

Fig 2 here:

Fig 2 The ten most common diagnoses (ICD10) made in 2020 (left) and 2018/19 (right). Numbers are per 1 000 inhabitants.

Changes in the mode of patient contact leading to prescriptions and their number

All prescriptions

In March/April 2018-2019, there was an average of 494 prescriptions issued by GPs per 1 000 inhabitants and a total of 545 prescriptions per 1 000 inhabitants in March/April 2020 ($p< 0.001$), an increase of 10.3%. The number of prescriptions from telephone and web-based consultations rose by 55.6% from 293 per 1 000 inhabitants in 2018/2019 to 456 in 2020 ($p<0.001$). At the same time, prescriptions issued by GPs during office visits, plummeted as the standard care during covid-19 by 56.2% from 201/1 000 to 88/1 000 inhabitants in 2020 ($p< 0.001$) (fig 3).

Fig 3 here:

Fig 3 The number of prescriptions/1 000 inhabitants in primary healthcare.

Changes in the mode of patient contact during covid-19.

Antibiotic prescriptions

The average number of antibiotic prescriptions was 45 per 1 000 inhabitants in March/April 2018-2019, and a total of 44 per 1 000 inhabitants in March/April 2020 (p=0.1). However, results also display an increase in telephone and web-based consultation prescriptions in 2020 (136.4%) compared to more traditional direct office visits contacts, from 11/1 000 inhabitants to 26/1000 inhabitants in 2020 (p< 0.001). Meanwhile, prescriptions issued after office visits were reduced from the average in 2018 and 2019 to 2020 by almost half (47.1%) from 34/1 000 inhabitants to 18/1 000 inhabitants (p< 0.001) (fig 4).

Fig 4 here:

Fig 4 The number of antibiotic prescriptions/1 000 inhabitants in primary healthcare.

Changes in the mode of patient contact during covid-19.

Discussion

Our study illustrates the importance of well-established PHC as the place of first contact during the covid-19 pandemic 2020. By prompt detection and effective triage of potentially infected patients the PHC managed to establish levels of care. Furthermore, our study shows the capacity and flexibility of the comprehensive

service of primary care in the capital area of Reykjavík, Iceland. The size of the PHCCs, the number of professionals as well as teamwork allowed dividing up areas and services according to risk estimates, keeping the maternity care and well-child care almost at the same level as before. However, the increase in the frequency of feared health complaints (ICD-10 Z71.1) and lack of face-to-face contacts during this period, indicates a longer lasting follow-up as a consequence of this pandemic.

Our data show a substantial increase in number of contacts with our patients during this pandemic, and an abrupt change in mode of appointments compared to the same period 2018 and 2019. Those changes were in harmony with recommendations from health authorities.

The role of out-of-hours consultations in PHC is always of immense importance and in this pandemic it played even a more significant role as a part of the frontline health care responses.

Interestingly, there was an enormous rise in web-based consultations during the pandemic indicating that our traditional ways of assisting our patient, by either a face-to-face or a telephone conversation, have to be revised.[13-15]

Of special interest is the fact that in spite of the increase in web-based and telephone consultations instead of face-to face contacts, the number of antibiotic prescriptions remained constant compared to the years before. This indicates that covid-19-like symptoms and fear of superinfections had little impact on antibiotic prescriptions.[16]

Regarding the changes in the ten most common diagnoses it is of particular interest to observe the high number of individuals diagnosed with feared health complications in 2020. This undoubtedly indicated an area of worries in the community.

Our results show, as was expected that the list of the 10 most common diagnoses in the pandemic included diagnoses related to covid-19, but still common diagnoses as hypertension, anxiety, insomnia and pain are among the 10 most common diagnoses. However, diagnoses as depression, hypothyroidism and lumbago were not among 10 most common diagnoses during the epidemic. The decrease in the use of laboratory tests might indicate a change in ordinary patient care. Nevertheless, the number of drug prescriptions did not decrease and in fact increased slightly, suggesting that the prescription of continuous medication was not disrupted. Studies or reports on how general practice faced the covid-19 are scarce so comparison of our study with others is very limited.[10]

One of the main concerns of the health authorities in Iceland as well as elsewhere, was whether the hospitals, especially the intensive care units, would be overwhelmed. The number of respirators was the critical obstacle. Therefore the plan was, among other things, to delay the spread of the virus, thereby sharpening the gatekeeping role of the primary healthcare and spreading the workload.

Our study supports the experience from the coronavirus outbreak in China regarding the importance of PHC, especially that we will be 'first in and last out'.[17]

After the first wave of the covid-19 epidemic in Iceland, national data on 8 June show that 1 807 persons became infected with the SARS-CoV-2 virus (4.9/1 000) of whom

118 patients were hospitalised (or 6.5% of those infected) and of whom 30 needed intensive care. Ten people died (0.5% of those infected).[18] These figures are the lowest in the Nordic countries and also in comparison to others with similar age distribution and standard of living.[19]

History has told us that epidemics ultimately resolve and they usually follow a certain pattern and the first wave of covid-19 epidemic in Iceland appeared to do just that.[20] [21]

If the covid-19 pandemic continues for the next years the PHC has gained an important knowledge and experience on how to manage and optimise the care of their patients during such a serious outbreak.[22]

Conclusions and implications

We conclude that PHC in Iceland managed to accomplish its role as a first line gatekeeper and was able to change its strategy swiftly in an effort to deal with covid-19. At the same time the traditional maternity and well-child care was preserved. The use of PHC for non-COVID related issues decreased, indicating a substantial flexibility in the organisation. Whether and how new technology, such as web-based and video consultations will be taken into consideration as future option for PHC is a topic for further research and quality development.

Acknowledgements We thank the chief medical doctor at the Primary Health Care of the Capital Area, Reykjavik, the Primary Health Care of Hofdi, Reykjavik, the Primary Health Care of Lagmuli, Reykjavik, the Primary Health Care of Urdarhvarf, Reykjavik, the Primary Health Care of Salastodin, Reykjavik, and The Out-of-Hours Clinic in Reykjavik, Iceland.

Contributors: All authors contributed to the planning, conduct and reporting of the study. ES, JSJ, MOT, HH, KL worked on acquisition of the data. ES, ABB and JSJ drafted the manuscript with input from MOT, HH, KL and JAS which was critically reviewed by all the authors. HH performed the statistical analysis. ES, ABB, JSJ, MOT, HH, KL, JAS read and approved the final version of the manuscript.

Funding: This research was supported by the Research Fund of the Icelandic College of Family Physicians.

Competing interests: All authors declare no conflict of interests.

Ethical approval: The study was approved by The National Bioethics Committee and the Data Protection Authority in Iceland (VSN-20-095).

Data availability statement: The data was retrieved from a medical records database in the Primary Health Care of the Capital Area (PHCCA). The encrypted date is kept at the PHCCA and can be made available on a reasonable request if permitted by the above-mentioned health authorities.

1. Rasanathan JJK, Nolan T. A "Deep Breath In" for GPs. BMJ 2020;369:m1437. doi: 10.1136/bmj.m1437.

2. Kamerow D. Covid-19: Don't forget the impact on US family physicians. BMJ 2020;368:m1260. doi: 10.1136/bmj.m1260.

3. Fraher EP, Pittman P, Frogner BK, et al. Ensuring and Sustaining a Pandemic Workforce. New Engl J Med 2020;382(23):2181-83. doi: 10.1056/NEJMp2006376.

4. The Astana Declaration: the future of primary health care? Lancet 2018;392(10156):1369. doi: 10.1016/S0140-6736(18)32478-4.

5. Razai MS, Doerholt K, Ladhani S, et al. Coronavirus disease 2019 (covid-19): a guide for UK GPs. BMJ 2020;368:m800. doi: 10.1136/bmj.m800.

6. Greenhalgh T, Koh GCH, Car J. Covid-19: a remote assessment in primary care. BMJ 2 020;368:m1182. doi: 10.1136/bmj.m1182.

7. Landsáætlun CBRNE. Published by Iceland´s Chief Epidemiologist and the Icelandic Police´s Department of Civil Protection and Emergency Management, January 2020.

8. Heimsfaraldur – Landsáætlun edition 3.1. Published by Iceland´s Chief Epidemiologist and the Icelandic Police´s Department of Civil Protection and Emergency Management, May 25th 2020. (available at: https://www.landlaeknir.is/utgefid-efni/skjal/item29596/).

9. Gudbjartsson DF, Helgason A, Jonsson H, et al. Spread of SARS-CoV-2 in the Icelandic Population. N Engl J Med 2020 doi: 10.1056/NEJMoa2006100.

10. Mash B. Primary care management of the coronavirus (COVID-19). S Afr Fam Pract (2004) 2020;62(1):e1-e4. doi: 10.4102/safp.v62i1.5115.

11. Sigurgeirsdottir S, Waagfjoreth J, Maresso A. Iceland: health system review. Health Syst Transit 2014;16(6):1-182, xv.

12. Statistics Iceland. https://px.hagstofa.is/pxis/pxweb/is/?rxid=633839273-14c5-42ba-9a72-1d87b83270c4.

13. Keesara S, Jonas A, Schulman K. Covid-19 and Health Care's Digital Revolution. New Engl J Med 2020;382(23):e82. doi: 10.1056/NEJMp2005835.

14. Duffy S, Lee TH. In-Person Health Care as Option B. New Engl J Med 2018;378(2):104-06. doi: 10.1056/NEJMp1710735.

15. Ackerman SL, Dowdell K, Clebak KT, et al. Patients Assess an eConsult Model's Acceptability at 5 US Academic Medical Centers. Ann Fam Med 2020;18(1):35-41. doi: 10.1370/afm.2487.

16. Hsu J. How covid-19 is accelerating the threat of antimicrobial resistance. BMJ 2020;369:m1983. doi: 10.1136/bmj.m1983.

17. Li DKT. Challenges and responsibilities of family doctors in the new global coronavirus outbreak. Fam Med Community He 2020;8(1) doi: UNSP e000333 10.1136/fmch-2020-000333.

18. The Directorate of Health and The Department of Civil Protection and Emergency Management. (Available from: https://www.covid.is/english).

19. Johns Hopkins University. COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE). 2020. https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6.

20. Rosenberg CE. What is an epidemic? AIDS in historical perspective. Daedalus 1989:1-17.

21. Jones DS. History in a Crisis - Lessons for Covid-19. N Engl J Med 2020;382(18):1681-83. doi: 10.1056/NEJMp2004361.

22. Rauh AL, Linder JA. Covid-19 care before, during, and beyond the hospital. BMJ 2020;369:m2035. doi: 10.1136/bmj.m2035.

Table 1 **Number and mode of consultation in primary healthcare centres and out-of-hours service during March and April 2018/19 vs 2020**

	PHC				OHS				Total			
	2018/19	2020			2018/19	2020			2018/19	2020		
	N	N	%	p	N	N	%	p	N	N	%	p
Telephone consultations	335	567	+69	*	125	320	+156	*	460	887	+93	*
Office visits	357	209	-41	*	69	37	-46	*	426	246	-42	*
Web-based consultation	88	275	+213	*					88	275	+213	*
Home visits					4	7	+75	*	4	7	+75	*

N Number per 1 000 inhabitants

*All changes are statistically significant p<0.001. Chi-square test.

PHC (Primary Health Care), OHS (Out-of-hours service).

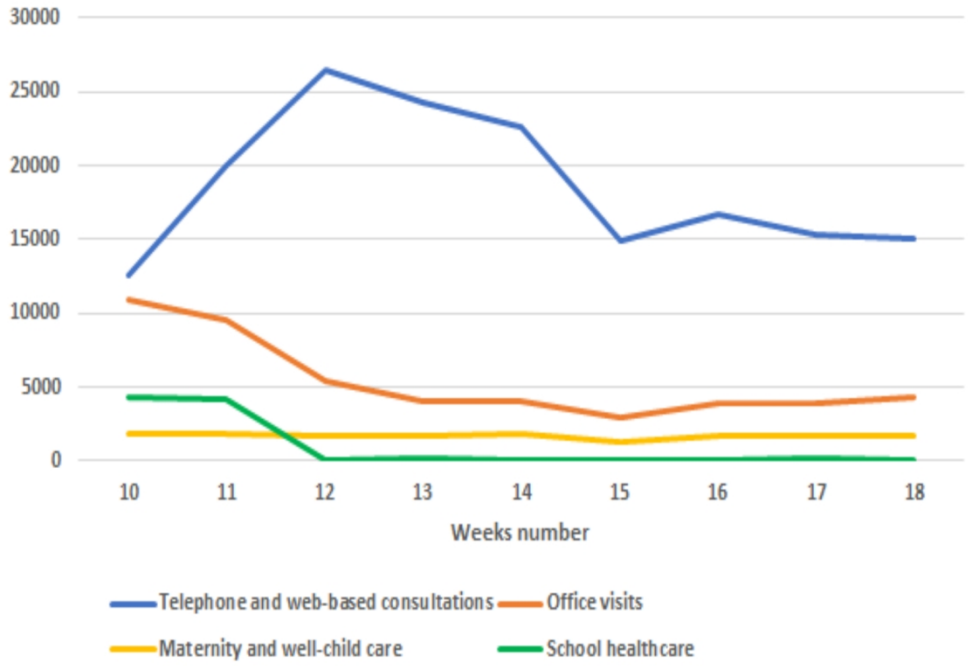
Figure legends:

Figure 1. The number of different daytime consultation modes for each week in March and April 2020.

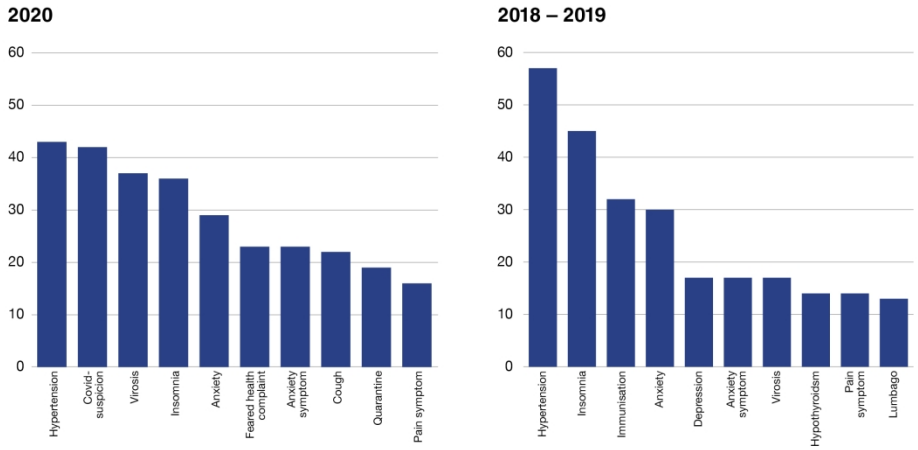
Figure 2. The ten most common diagnoses (ICD10) made in 2020 (left) and 2018/19 (right). Numbers are per 1 000 inhabitants.

Figure 3. The number of prescriptions/1 000 inhabitants in primary healthcare. Changes in the mode of patient contact during covid-19.

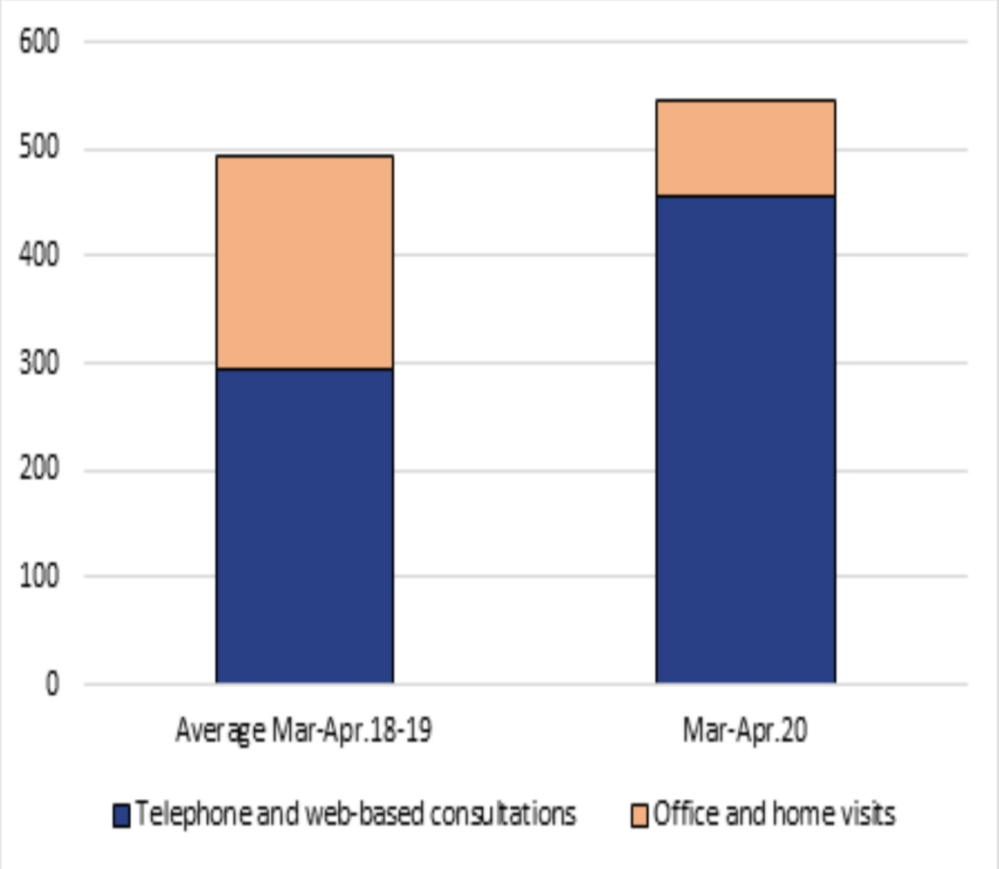
Figure 4. The number of antibiotic prescriptions/1 000 inhabitants in primary healthcare. Changes in the mode of patient contact during covid-19.



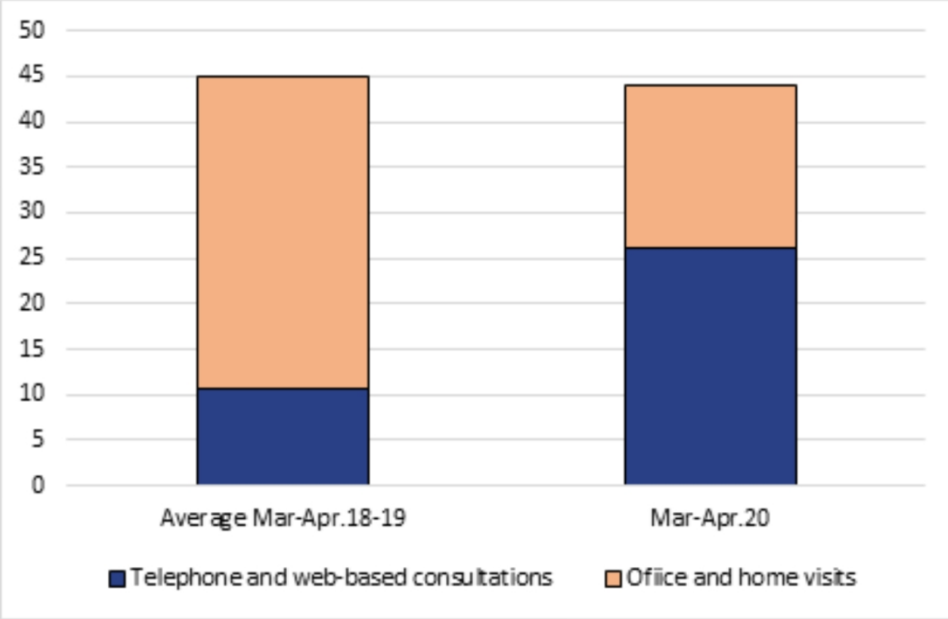
439x381mm (96 x 96 DPI)



656x312mm (96 x 96 DPI)



439x381mm (96 x 96 DPI)



439x381mm (96 x 96 DPI)

STROBE Statement—checklist of items that should be included in reports of observational studies
Sigurdsson EL et al: How primary healthcare in Iceland swiftly changed its strategy….

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found a) See abstract line 23-24 b) fulfilled, line 34- 45.
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Fulfilled, lines 66- 96
Objectives	3	State specific objectives, including any prespecified hypotheses, line 104-105.
Methods		
Study design	4	Present key elements of study design early in the paper 127
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Setting and locations l17-122. Dates line 145.
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants. Lines w141- 148.
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable. Line 141-143.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group lines 141-148.
Bias	9	Describe any efforts to address potential sources of bias. Not done
Study size	10	Explain how the study size was arrived at lines 141- 148.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why lines 151-153.
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding lines 151-153.
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed

	Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy
	(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures lines 173-253.
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included. Not applicable
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives line 256- 262
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias. Lines 53-60
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. Lines 296-302.
Generalisability	21	Discuss the generalisability (external validity) of the study results 314-316.
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based line 331-332.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

HOW PRIMARY HEALTHCARE IN ICELAND SWIFTLY CHANGED ITS STRATEGY IN RESPONSE TO THE COVID-19 PANDEMIC

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-043151.R2
Article Type:	Original research
Date Submitted by the Author:	21-Nov-2020
Complete List of Authors:	Sigurdsson, Emil; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Blondal, Anna; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Jonsson, Jon; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Tomasdottir, Margret; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Hrafnkelsson, Hannes; University of Iceland School of Health Sciences, Department of Family Medicine, Faculty of Medicine; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Linnet, Kristjan; Primary Health Care of the Capital Area, Development Centre for Primary Healthcare in Iceland Sigurdsson, Johann ; Haskoli Islands, Department of Family Medicine; NTNU Det Medisinske Fakultet DMF, Department of Public Health and General Practice
Primary Subject Heading:	General practice / Family practice
Secondary Subject Heading:	Epidemiology, Infectious diseases
Keywords:	PRIMARY CARE, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, COVID-19, INFECTIOUS DISEASES, Epidemiology < INFECTIOUS DISEASES

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

HOW PRIMARY HEALTHCARE IN ICELAND SWIFTLY CHANGED ITS STRATEGY IN RESPONSE TO THE COVID-19 PANDEMIC

Keywords: Covid-19 pandemic, triage, primary healthcare, organisation, teamwork.

Emil L. Sigurdsson (correspondence author)[1,2] emilsig@hi.is

Anna B. Blondal[2,3,4]

Jon S. Jonsson[1,2]

Margret O. Tomasdottir[1,2]

Hannes Hrafnkelsson[1,4]

Kristjan Linnet[2,4]

Johann A. Sigurdsson[4,5]

Author affiliations

[1]Department of Family Medicine, University of Iceland. [2]Development Centre for Primary Healthcare in Iceland. [3]Faculty of Pharmaceutical Science, University of Iceland. [4]Primary Health Care of the Capital Area, Reykjavik, Iceland. [5]Faculty of Medicine, Department of Public Health and Nursing/General Practice Research Unit, Norwegian University of Science and Technology (NTNU), Trondheim, Norway.

ABSTRACT

OBJECTIVE

To describe how the primary healthcare (PHC) in Iceland changed its strategy to handle the coronavirus pandemic 2019 (covid-19).

DESIGN

Descriptive observational study.

SETTING

Reykjavik, the capital of Iceland.

POPULATION

The Reykjavik area has a total of 233 000 inhabitants.

MAIN OUTCOME MEASURES

The number and the mode of consultations carried out. Drug prescriptions and changes in the ten most common diagnoses made in the PHC. Laboratory tests including covid-19 tests. Average numbers in March and April 2020 compared to the same months in 2018 and 2019.

RESULTS

Pragmatic strategies and new tasks were rapidly applied to the clinical work to meet the foreseen health care needs caused by the pandemic. The number of daytime consultations increased by 35% or from 780 to 1 051/1 000 inhabitants ($p<0.001$) during the study period. Telephone and web-based consultations increased by 127% ($p<0.001$). The same tendency was observed in out-of-hours services. The number of consultations in maternity and well-child care decreased only by 4% ($p=0.003$). Changes were seen in the ten most common diagnoses. Most noteworthy, apart from a high number of covid-19 suspected disease, was that immunisation, depression, hypothyroidism and lumbago were not among the top ten diagnoses during the epidemic period. The number of drug prescriptions increased by 10.3% (from 494 to 545 per 1 000 inhabitants, $p<0.001$). The number of prescriptions from telephone and web-based consultations rose by 55.6%. No changes were observed in antibiotics prescriptions.

CONCLUSIONS

As the first point of contact in the covid-19 pandemic, the PHC in Iceland managed to change its strategy swiftly while preserving traditional maternity and well-child care, indicating a very solid PHC with substantial flexibility in its organisation.

Strengths and limitations of this study

- The data is based on medical records of all contacts to the primary health-care centres.
- The PHC in the research area serve the whole capital area which counts two thirds of the population of Iceland.
- The contact register information is very reliable and comprehensive.
- Due to the short study period, i.e. two months, we were not able to depict the long-term changes in health care services.
- The consequences of postponing regular health-care service are not presented.

Box 1 Preparation and implementation of tasks in primary care during covid-19

Preparation (January 2020)

- Educating staff about covid-19 disease and the use of personal protective equipment (PPE).
- Providing and ordering appropriate materials and supplies.
- Educating staff about alternative management plans at work.

Testing and treatment

- Patients with symptoms compatible with those of covid-19 were offered a nasopharyngeal and throat testing with specimens collected by doctors and nurses wearing PPE.
- All primary healthcare centres (PHCCs) had daily testing outside their premises, with samples collected while patients were sitting in their cars. At the weekends, the covid-19 sample collections were centralised at a single place.
- A specially equipped car was used for home visits to those who were too ill to get tested at a drive-through centre.
- Covid-19 positive patients received follow-up care by an outpatient clinic staffed by Landspitali – The National University Hospital of Iceland.

The shift in workload management

Patient flow systems

- Patients were advised to call in advance before arriving at the PHCCs.
- Telephone consultations were offered instead of appointments.
- The maternity and well-child care consultations were carried out as scheduled.
- Those with symptoms of respiratory tract infections were given appointments at the healthcare centre, which did not overlap with maternity and well-child care consultations.
- New PHCCs bookings were scheduled through telephone screening by a nurse or a doctor.

PHC preparedness

- The PHC personnel were divided into two groups: those working at the PHCC and the others at home carrying out phone and consultations on the web.
- The PHCCs were separated into two areas, one for patients with respiratory tract infections and the other one for patients without them. Patients with respiratory symptoms were scheduled for the end of the day.
- PHC personnel prioritised work related to covid-19. Non-urgent appointments were rescheduled, and all group activities cancelled.
- The access of patients was increased through telephone consultations and web chat. For example, school nurses were released from their routine duties so they could conduct telephone covid-19 consultations.

Introduction

The COVID-19 pandemic caused by SARS-COV-2 has challenged the structure, organisation and flexibility of healthcare systems worldwide and has in a certain way led to rebooting of the general practice.[1-3] In the global health policy, primary healthcare (PHC) is the cornerstone of healthcare and the first point of contact.[4] In epidemics and a pandemic, as the first line of defence, the role of PHC in the healthcare system is more important than ever. Whereas the hospitals have to concentrate on the disease, people-centred PHC has to focus on the patients as well as the health of the whole community at a population health level. In such situations, triage and gatekeeping play a central role. Firstly, the task is to protect the healthcare professionals in the first line of defence from becoming infected. Other important responsibilities include informing the population, identifying and protecting individuals and groups of vulnerable people from getting infected, and last but not least, protecting the tertiary care level, the hospitals so they would not become overwhelmed or out of function because of infected staff and too many covid-19 cases. Some guidelines have been published to assist general practitioners (GPs) how to act on covid-19.[5,6]

Soon after the information about the spreading of the Coronavirus from Wuhan in China in late 2019, Iceland like other countries started to prepare for an epidemic (Box 1). Before covid-19 was diagnosed in Iceland the Directorate of Health had published a Pandemic National Response Plan.[7] The plan was updated during the pandemic and adapted to these special circumstances.[8] After the first case was diagnosed, Iceland´s Director of Health, Iceland´s Chief Epidemiologist and the National Commissioner of the Icelandic Police´s Department of Civil Protection and Emergency Management held daily public meetings with updates on the state of the pandemic and government reactions. Already on 6 March, the team declared the highest alert level, an emergency phase, as a result of the outbreak.

During this pandemic, the PHC in Iceland has had the role as the first point of contact for people with symptoms of the respiratory tract including covid-19 -like symptoms. Directions or indications for tests were published and promoted by the Directorate of Health. Most of the tests for covid-19 in clinical situations were taken in primary healthcare centres (PHCCs). Patient with confirmed covid-19 infection were taken care of by a special unit at Landspitali-The National University Hospital of Iceland. People in quarantine were cared for by the PHC.

The organisation of PHC in Iceland was rapidly and substantively changed in order to meet the demands posed by the pandemic.

Thus, when the first case of covid-19 was diagnosed in Iceland on the 28 February 2020, the PHC sector was confronted with an entirely new and unprecedented disease and the PHC preparations and actions taken were accelerated (Box1). To face those challenges, our PHCCs had to adapt swiftly on a much larger scale than ever before, and completely alter their tasks to defeat the enormous and acute encounter ahead. The spread of covid-19 in Iceland has already been described.[9] To date, information on the role of PHC in the covid-19 pandemic is lacking and only a few reports have been published on that matter.[10]
The aim of this paper is to describe the changes in PHC in Iceland during the covid-19 pandemic, especially in the mode of service and in certain measures of outcomes.

Methods

Setting

The Icelandic healthcare system, like other Nordic welfare systems, is based on solidarity and equitable distribution of services. It is mainly financed through public funds, even though the patient pays some minor fees at the time of service.[11] The general tasks of the PHCCs are defined by laws and regulations, and their administration is under the auspices of the health authorities. Thus, the management decisions are made locally in accordance with government policy. The health care offered by the PHCCs is based on holistic approach thereby including general practice, maternity care, well-child care, school health care, minor surgery and emergency care.

The Capital Region of Iceland had approximately 233 000 inhabitants at the beginning of 2020, or almost 2/3 of the total 364 000 inhabitants.[12] The PHC in Reykjavik, the capital area, has 19 PHCCs. The PHCCs are staffed by GPs, midwives, nurses, psychologists and other personnel. The Capital Region has PHC out-of-hours service, and a walk-in clinic which also provides home visits for those too sick to attend the clinic. Additionally, PHC operates a web chat for all residents.

The access to PHCCs is through pre-booked face-to-face consultations, phone consultations, web-based consultations and home visits. Furthermore, a walk-in service at the PHCCs is available during daytime for more acute needs.

It was clear from the beginning of the pandemic that through advertisements in the media and on-site posters in PHCCs, that triage was needed. A week later, all patients with a pre-booked appointment were offered a phone consultation instead of an in-person visit.

At the beginning of March, patients with symptoms compatible with those of covid-19 were offered a test. All PHCCs had daily testing outside their healthcare premises, with samples collected through the windows of the patients' cars. Doctors and nurses wearing all the necessary personal protective equipment, collected nasopharyngeal and throat samples from patients. During the weekends, covid-19 virus testing was centralised in one place. Moreover, during the day and out-of-hours, a specially equipped car was used for home visits to those too sick to get tested at a drive-through centre. In these visits, samples were collected and people were assessed for the need of hospital admission. Covid-19 positive patients received follow-up care by an outpatient clinic operated by Landspitali- The National University Hospital of Iceland.

Data source

Data were extracted from the medical records database of the PHC in Iceland. The PHC has a common medical records database that is accessible by the PHCCs. The number of contacts to PHC, types of contact, most common diagnoses according to ICD-10 version of the classification system for diagnoses and medical prescriptions were observed for March and April in the years 2018, 2019 and 2020. The number of blood and urine tests was gathered from the laboratory at Landspitali- The National University Hospital of Iceland. Furthermore, the number of covid-19 tests performed in March and April 2020 was obtained from the Directorate of Health.

Data analyses

The data analyses are descriptive and analytical, centering on changes in the services provided during these periods. All P-values are two-sided and the statistical significance was considered at p-values less than 0.05, using a exact test based on the Poisson distribution for rates. Results are presented per 1 000 inhabitants. R statistical software was used for analysis.

Patient and public involvement:

No patient involved.

Results

Implementation of tasks and shift in workload management are shown in Box 1. From the beginning, the PHC prioritised work related to covid-19, and matters that could wait were set aside. School nurses were called in to do phone consultations related to covid-19. New PHC appointments were booked through telephone screening by a nurse or a doctor and great emphasis was put on providing maternity and well-child care.

The healthcare centres were also divided into two areas, either for patients with or without symptoms of respiratory tract infection (RTI).

As of the middle of March, the PHCCs and the after-hours service designated special rooms in their premises for patients with possible infections and all staff wore masks and gloves for general consultations. From the very beginning it was emphasised that people should call ahead to the PHCC in order to get permission to present there. This message was driven home with increased intensity as the pandemic approached its culmination. Furthermore, when receptionists at the PHCC contacted clients who had appointments in order to offer a telephone consultation, they were asked either to call in advance or refrain from turning up if any common cold symptoms should arise in the meantime.

Consultation rates and modalities

On average during the two periods, March/April 2018 and 2019, the number of daytime consultations were 780/1 000 inhabitants. In the same period in 2020 the consultations were 1 051/1 000 inhabitants which is a 35% ($p<0.001$) increase from the average number per 2018 and 2019 (table 1). Telephone consultations increased by 69% ($p<0.001$), web-based consultations by 213% ($p<0.001$) and office visits decreased by 41% ($p<0.001$) (table 1). Total number of consultations in maternity and well-child care (telephone, office and home visits) decreased from 67.5/1 000 inhabitants 2018/2019 to 65/1 000 inhabitants 2020 or only by 4% ($p=0.001$).

Out-of-hours consultations

Telephone consultations increased from 125/1 000 inhabitants in 2018/2019 to 320/1 000 inhabitants in 2020, an increase by 156% (p< 0.001). Home visits increased also from 4/1 000 inhabitants to 7/1 000 inhabitants a 75% increase. However, the number of office visits decreased from 69/1 000 inhabitants to 37/1 000 inhabitants a 46% decrease (p< 0.001) (table 1).

Table 1 here:

Through March and April 2020 there was a rise in telephone and web-based consultations, while office visits decreased. School healthcare service was stopped but maternity and well-child care services remained stable (fig 1).

Fig 1 here:

Fig 1 The number of different daytime consultation modes for each week in March and April 2020.

Web chat

In 2018 a web-chat room was established in PHC where people could seek advice and guidance. In March/April 2018 and 2019 there were 2 contacts/1 000 inhabitants but in the same period 2020 they were 93/1 000 inhabitants (p<0.0001).

Tests for covid-19

During the two-month period, a total of 10 162 samples were collected at the PHCCs and examined in the Department of Clinical Microbiology, Landspitali - The National University Hospital of Iceland. That is 43 samples per 1 000 inhabitants. Of those tests 1 089 (11%) turned out positive.

Laboratory tests

The number of laboratory tests in prenatal care increased by 10% (p< 0.001) between the years 2018/2019 and 2020. The number of laboratory tests in general was 335/1 000 inhabitants in the years 2018/2019 but in 2020 it was 244/1 000 inhabitants, a 27% decrease (p< 0.001). The most common blood tests in both periods were blood count, thyroid

stimulating hormone, vitamin B12. The most common test in 2020 was test for covid-19 from throat and nasopharynx swabs.

Most common diagnoses

During the pandemic, the 10 most common diagnoses were substantially different from the most common diagnoses in the same months the two years before. Common diagnoses like immunisation, depression, hypothyroidism and lumbago are not among the most common diagnoses in the pandemic period (fig 2).

Fig 2 here:

Fig 2 The ten most common diagnoses (ICD10) made in 2020 (left) and 2018/19 (right). Numbers are per 1 000 inhabitants.

Changes in the mode of patient contact leading to prescriptions and their number

All prescriptions

In March/April 2018-2019, there was an average of 494 prescriptions issued by GPs per 1 000 inhabitants and a total of 545 prescriptions per 1 000 inhabitants in March/April 2020 ($p< 0.001$), an increase of 10.3%. The number of prescriptions from telephone and web-based consultations rose by 55.6% from 293 per 1 000 inhabitants in 2018/2019 to 456 in 2020 ($p<0.001$). At the same time, prescriptions issued by GPs during office visits, plummeted as the standard care during covid-19 by 56.2% from 201/1 000 to 88/1 000 inhabitants in 2020 ($p< 0.001$) (fig 3).

Fig 3 here:

Fig 3 The number of prescriptions/1 000 inhabitants in primary healthcare.
Changes in the mode of patient contact during covid-19.

Antibiotic prescriptions

The average number of antibiotic prescriptions was 45 per 1 000 inhabitants in March/April 2018-2019, and a total of 44 per 1 000 inhabitants in March/April 2020 ($p=0.1$). However, results also display an increase in telephone and web-based consultation prescriptions in 2020

(136.4%) compared to more traditional direct office visits contacts, from 11/1 000 inhabitants to 26/1000 inhabitants in 2020 (p< 0.001). Meanwhile, prescriptions issued after office visits were reduced from the average in 2018 and 2019 to 2020 by almost half (47.1%) from 34/1 000 inhabitants to 18/1 000 inhabitants (p< 0.001) (fig 4).

Fig 4 here:

Fig 4 The number of antibiotic prescriptions/1 000 inhabitants in primary healthcare. Changes in the mode of patient contact during covid-19.

Discussion

Our study illustrates the importance of well-established PHC as the place of first contact during the covid-19 pandemic 2020. By prompt detection and effective triage of potentially infected patients the PHC managed to establish levels of care. Furthermore, our study shows the capacity and flexibility of the comprehensive service of primary care in the capital area of Reykjavík, Iceland. The size of the PHCCs, the number of professionals as well as teamwork allowed dividing up areas and services according to risk estimates, keeping the maternity care and well-child care almost at the same level as before. However, the increase in the frequency of feared health complaints (ICD-10 Z71.1) and lack of face-to-face contacts during this period, indicates a longer lasting follow-up as a consequence of this pandemic.

Our data show a substantial increase in number of contacts with our patients during this pandemic, and an abrupt change in mode of appointments compared to the same period 2018 and 2019. Those changes were in harmony with recommendations from health authorities.

The role of out-of-hours consultations in PHC is always of immense importance and in this pandemic it played even a more significant role as a part of the frontline health care responses.

Interestingly, there was an enormous rise in web-based consultations during the pandemic indicating that our traditional ways of assisting our patient, by either a face-to-face or a telephone conversation, have to be revised.[13-15]

Of special interest is the fact that in spite of the increase in web-based and telephone consultations instead of face-to face contacts, the number of antibiotic prescriptions remained constant compared to the years before. This indicates that covid-19-like symptoms and fear of superinfections had little impact on antibiotic prescriptions.[16]

Regarding the changes in the ten most common diagnoses it is of particular interest to observe the high number of individuals diagnosed with feared health complications in 2020. This undoubtedly indicated an area of worries in the community.

Our results show, as was expected that the list of the 10 most common diagnoses in the pandemic included diagnoses related to covid-19, but still common diagnoses as hypertension, anxiety, insomnia and pain are among the 10 most common diagnoses. However, diagnoses as depression, hypothyroidism and lumbago were not among 10 most common diagnoses during the epidemic. The decrease in the use of laboratory tests might indicate a change in ordinary patient care. Nevertheless, the number of drug prescriptions did not decrease and in fact increased slightly, suggesting that the prescription of continuous medication was not disrupted. Studies or reports on how general practice faced the covid-19 are scarce so comparison of our study with others is very limited.[10]

One of the main concerns of the health authorities in Iceland as well as elsewhere, was whether the hospitals, especially the intensive care units, would be overwhelmed. The number of respirators was the critical obstacle. Therefore, the plan was, among other things, to delay the spread of the virus, thereby sharpening the gatekeeping role of the primary healthcare and spreading the workload.

Numerous studies have been published on secondary care and hospitals' approach to the care of covid-19 patients during the pandemic, but studies in primary care are still scarce . At present most of the literature published on the effect on primary care are reports from opinion leaders, describing the actions to be taken and confirming the importance of primary care as the first contact of care. [1-3,17,18,19,20]

Furthermore, the importance of telemedicine (audio and or video consultations) has been acknowledged.[21] Our results are in agreement with recent comprehensive quantitative study from USA showing changes in structure of the primary care delivery, especially with regard to telemedicine encounters.[22] Although not directly comparable to our results a recent study from Belgium, based on qualitative interviews with GPs, illustrates that the sudden shift in the health care delivery has a profound impact on the core competencies of

primary care.[23] A quantitative analysis of primary care medical records in a deprived area in the UK showed that the indirect effect of the covid-19 pandemic in that area was a decrease in common diagnoses such as diabetes, indicating large number of patients having underdiagnosed conditions.[24] Our study also showed changes in the diagnosis pattern and indicated that the flexibility in our PHC could preserve preventive measures and probably the most common diagnoses. Moreover, our study supports the experience from the coronavirus outbreak in China regarding the importance of PHC, especially that we will be 'first in and last out'.[17]

After the first wave of the covid-19 epidemic in Iceland, national data on 8 June show that 1 807 persons became infected with the SARS-CoV-2 virus (4.9/1 000) of whom 118 patients were hospitalised (or 6.5% of those infected) and of whom 30 needed intensive care. Ten people died (0.5% of those infected).[25] These figures are the lowest in the Nordic countries and also in comparison to others with similar age distribution and standard of living.[26]

History has told us that epidemics ultimately resolve and they usually follow a certain pattern and the first wave of covid-19 epidemic in Iceland appeared to do just that.[27,28] If the covid-19 pandemic continues for the next years the PHC has gained an important knowledge and experience on how to manage and optimise the care of their patients during such a serious outbreak.[29] However, due to the methodological design of this study we were not able to explore the possible long term effects of changing the strategy in PHC which is definitely something future researches must investigate.

Conclusions and implications

We conclude that PHC in Iceland managed to accomplish its role as a first line gatekeeper and was able to change its strategy swiftly in an effort to deal with covid-19. At the same time the traditional maternity and well-child care was preserved. The use of PHC for non-COVID related issues decreased, indicating a substantial flexibility in the organisation. Whether and how new technology, such as web-based and video consultations will be taken into consideration as future option for PHC is a topic for further research and quality development.

Acknowledgements We thank the chief medical doctor at the Primary Health Care of the Capital Area, Reykjavik, the Primary Health Care of Hofdi, Reykjavik, the Primary Health Care of Lagmuli, Reykjavik, the Primary Health Care of Urdarhvarf, Reykjavik, the Primary Health Care of Salastodin, Reykjavik, and The Out-of-Hours Clinic in Reykjavik, Iceland.

Contributors: All authors contributed to the planning, conduct and reporting of the study. ES, JSJ, MOT, HH, KL worked on acquisition of the data. ES, ABB and JSJ drafted the manuscript with input from MOT, HH, KL and JAS which was critically reviewed by all the authors. HH performed the statistical analysis. ES, ABB, JSJ, MOT, HH, KL, JAS read and approved the final version of the manuscript.

Funding: This research was supported by the Research Fund of the Icelandic College of Family Physicians.

Competing interests: All authors declare no conflict of interests.

Ethical approval: The study was approved by The National Bioethics Committee and the Data Protection Authority in Iceland (VSN-20-095).

Data availability statement: The data was retrieved from a medical records database in the Primary Health Care of the Capital Area (PHCCA). The encrypted date is kept at the PHCCA and can be made available on a reasonable request if permitted by the above-mentioned health authorities.

1. Rasanathan JJK, Nolan T. A "Deep Breath In" for GPs. BMJ 2020;369:m1437. doi: 10.1136/bmj.m1437.
2. Kamerow D. Covid-19: Don't forget the impact on US family physicians. BMJ 2020;368:m1260. doi: 10.1136/bmj.m1260.
3. Fraher EP, Pittman P, Frogner BK, et al. Ensuring and Sustaining a Pandemic Workforce. New Engl J Med 2020;382(23):2181-83. doi: 10.1056/NEJMp2006376.
4. The Astana Declaration: the future of primary health care? Lancet 2018;392(10156):1369. doi: 10.1016/S0140-6736(18)32478-4.
5. Razai MS, Doerholt K, Ladhani S, et al. Coronavirus disease 2019 (covid-19): a guide for UK GPs. BMJ 2020;368:m800. doi: 10.1136/bmj.m800.

6. Greenhalgh T, Koh GCH, Car J. Covid-19: a remote assessment in primary care. BMJ 2020;368:m1182. doi: 10.1136/bmj.m1182.

7. Landsáætlun CBRNE. Published by Iceland´s Chief Epidemiologist and the Icelandic Police´s Department of Civil Protection and Emergency Management, January 2020.

8. Heimsfaraldur – Landsáætlun edition 3.1. Published by Iceland´s Chief Epidemiologist and the Icelandic Police´s Department of Civil Protection and Emergency Management, May 25th 2020. (available at: https://www.landlaeknir.is/utgefid-efni/skjal/item29596/).

9. Gudbjartsson DF, Helgason A, Jonsson H, et al. Spread of SARS-CoV-2 in the Icelandic Population. N Engl J Med 2020 doi: 10.1056/NEJMoa2006100.

10. Mash B. Primary care management of the coronavirus (COVID-19). S Afr Fam Pract (2004) 2020;62(1):e1-e4. doi: 10.4102/safp.v62i1.5115.

11. Sigurgeirsdottir S, Waagfjoreth J, Maresso A. Iceland: health system review. Health Syst Transit 2014;16(6):1-182, xv.

12. Statistics Iceland. https://px.hagstofa.is/pxis/pxweb/is/?rxid=633839273-14c5-42ba-9a72-1d87b83270c4.

13. Keesara S, Jonas A, Schulman K. Covid-19 and Health Care's Digital Revolution. New Engl J Med 2020;382(23):e82. doi: 10.1056/NEJMp2005835.

14. Duffy S, Lee TH. In-Person Health Care as Option B. New Engl J Med 2018;378(2):104-06. doi: 10.1056/NEJMp1710735.

15. Ackerman SL, Dowdell K, Clebak KT, et al. Patients Assess an eConsult Model's Acceptability at 5 US Academic Medical Centers. Ann Fam Med 2020;18(1):35-41. doi: 10.1370/afm.2487.

16. Hsu J. How covid-19 is accelerating the threat of antimicrobial resistance. BMJ 2020;369:m1983. doi: 10.1136/bmj.m1983.

17. Li DKT. Challenges and responsibilities of family doctors in the new global coronavirus outbreak. Fam Med Community He 2020;8(1) doi: UNSP e000333 10.1136/fmch-2020-000333.

18. Kidd MR. Five principles for pandemic preparedness: lessons from the Australian COVID-19 primary care response. Br J Gen Pract. 2020;70(696):316-7.

19. Desborough J, Hall Dykgraaf S, de Toca L, Davis S, Roberts L, Kelaher C, et al. Australia's national COVID-19 primary care response. Med J Aust. 2020;213(3):104-6 e1.

20. Huston P, Campbell J, Russell G, Goodyear-Smith F, Phillips RL, Jr., van Weel C, et al. COVID-19 and primary care in six countries. BJGP Open. 2020;4(4).

21. Greenhalgh T, Wherton J, Shaw S, Morrison C. Video consultations for covid-19. BMJ. 2020;368:m998.

22. Alexander GC, Tajanlangit M, Heyward J, Mansour O, Qato DM, Stafford RS. Use and Content of Primary Care Office-Based vs Telemedicine Care Visits During the COVID-19 Pandemic in the US. JAMA Netw Open. 2020;3(10):e2021476.

23. Verhoeven V, Tsakitzidis G, Philips H, Van Royen P. Impact of the COVID-19 pandemic on the core functions of primary care: will the cure be worse than the disease? A qualitative interview study in Flemish GPs. BMJ Open. 2020;10(6):e039674.

24. Williams R, Jenkins DA, Ashcroft DM, Brown B, Campbell S, Carr MJ, et al. Diagnosis of physical and mental health conditions in primary care during the COVID-19 pandemic: a retrospective cohort study. Lancet Public Health. 2020;5(10):e543-e50.

25. The Directorate of Health and The Department of Civil Protection and Emergency Management. (Available from: https://www.covid.is/english).

26. Johns Hopkins University. COVID-19 Dashboard by the Center for Systems Science and
Engineering (CSSE). 2020. https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6.

27. Rosenberg CE. What is an epidemic? AIDS in historical perspective. Daedalus 1989:1-17.

28. Jones DS. History in a Crisis - Lessons for Covid-19. N Engl J Med 2020;382(18):1681-83. doi: 10.1056/NEJMp2004361.

29. Rauh AL, Linder JA. Covid-19 care before, during, and beyond the hospital. BMJ 2020;369:m2035. doi: 10.1136/bmj.m2035.

Table 1 **Number and mode of consultation in primary healthcare centres and out-of-hours service during March and April 2018/19 vs 2020**

	PHC				OHS				Total			
	2018/19	2020			2018/19	2020			2018/19	2020		
	N	N	%	p	N	N	%	p	N	N	%	p
Telephone consultations	335	567	+69	*	125	320	+156	*	460	887	+93	*
Office visits	357	209	-41	*	69	37	-46	*	426	246	-42	*
Web-based consultation	88	275	+213	*					88	275	+213	*
Home visits					4	7	+75	*	4	7	+75	*

N Number per 1 000 inhabitants

*All changes are statistically significant p<0.001. Chi-square test.

PHC (Primary Health Care), OHS (Out-of-hours service).

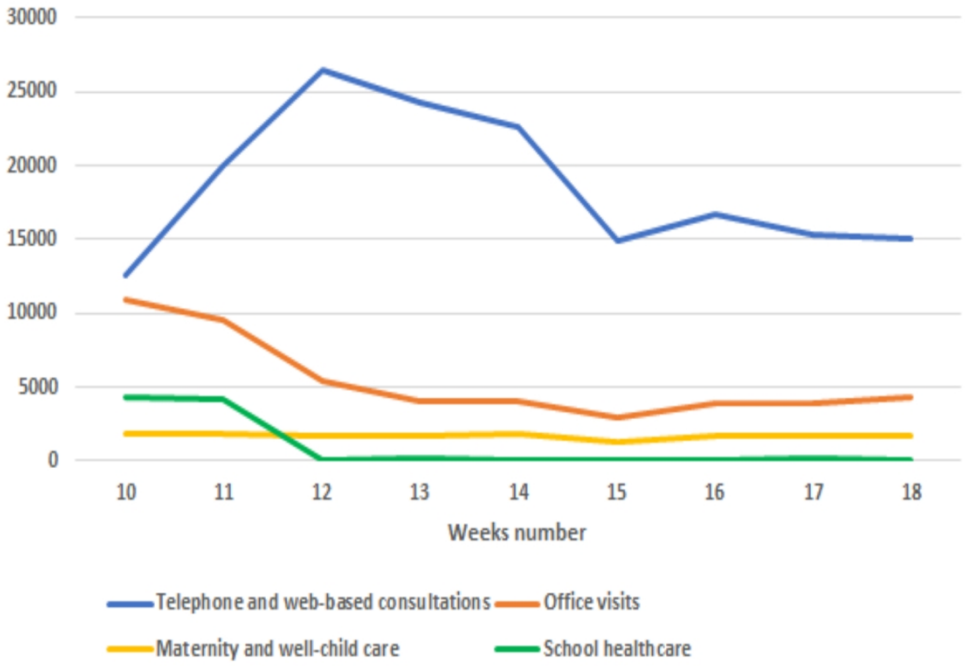
Figure legends:

Figure 1. The number of different daytime consultation modes for each week in March and April 2020.

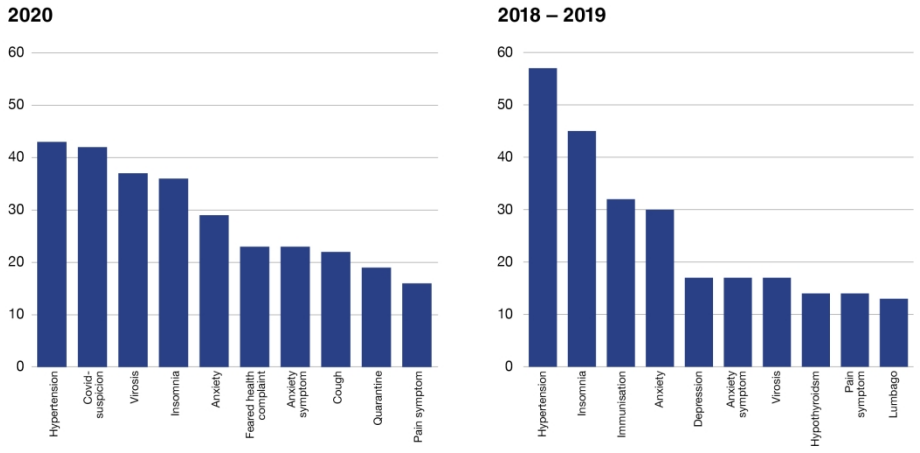
Figure 2. The ten most common diagnoses (ICD10) made in 2020 (left) and 2018/19 (right). Numbers are per 1 000 inhabitants.

Figure 3. The number of prescriptions/1 000 inhabitants in primary healthcare. Changes in the mode of patient contact during covid-19.

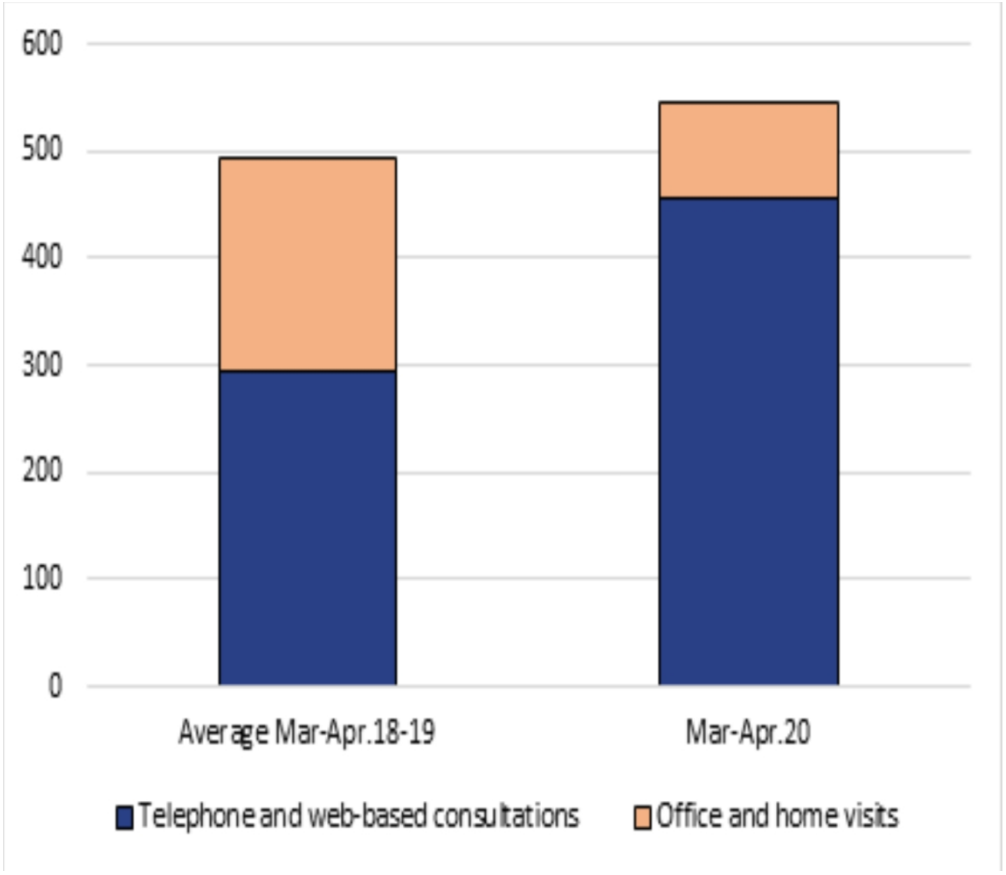
Figure 4. The number of antibiotic prescriptions/1 000 inhabitants in primary healthcare. Changes in the mode of patient contact during covid-19.



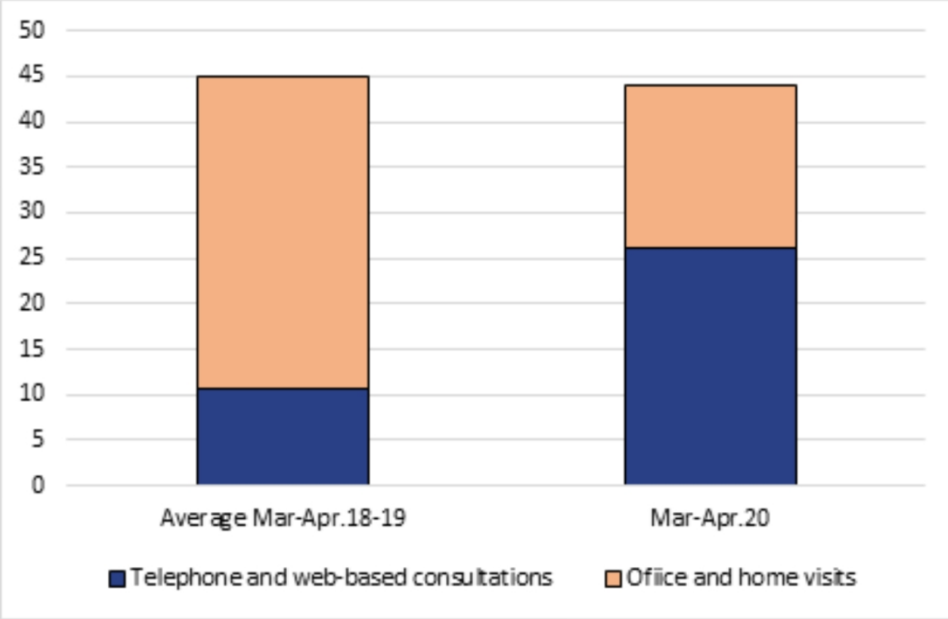
439x381mm (96 x 96 DPI)



656x312mm (96 x 96 DPI)



439x381mm (96 x 96 DPI)



439x381mm (96 x 96 DPI)

STROBE Statement—checklist of items that should be included in reports of observational studies
Sigurdsson EL et al: How primary healthcare in Iceland swiftly changed its strategy….

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found a) See abstract line 23-24 b) fulfilled, line 34- 45.
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported Fulfilled, lines 66- 96
Objectives	3	State specific objectives, including any prespecified hypotheses, line 104-105.
Methods		
Study design	4	Present key elements of study design early in the paper 127
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection Setting and locations l17-122. Dates line 145.
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants. Lines w141- 148.
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable. Line 141-143.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group lines 141-148.
Bias	9	Describe any efforts to address potential sources of bias. Not done
Study size	10	Explain how the study size was arrived at lines 141- 148.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why lines 151-153.
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding lines 151-153.
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed

	Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy
	(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures lines 173-253.
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included. Not applicable
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives line 256- 262
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias. Lines 53-60
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. Lines 296-302.
Generalisability	21	Discuss the generalisability (external validity) of the study results 314-316.
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based line 331-332.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.