

BJGP OPEN

Primary care gatekeeping during the Covid-19 pandemic: a survey of 1234 Norwegian regular GPs

Norberg, Børge Lønnebakke; Johnsen, Tor Magne; Kristiansen, Eli; Krogh, Frode Helgetun; Getz, Linn Okkenhaug; Austad, Bjarne

DOI: <https://doi.org/10.3399/BJGPO.2023.0095>

To access the most recent version of this article, please click the DOI URL in the line above.

Received 24 May 2023

Revised 23 July 2023

Accepted 21 August 2023

© 2023 The Author(s). This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>). Published by BJGP Open. For editorial process and policies, see: <https://bjgpopen.org/authors/bjgp-open-editorial-process-and-policies>

When citing this article please include the DOI provided above.

Author Accepted Manuscript

This is an 'author accepted manuscript': a manuscript that has been accepted for publication in BJGP Open, but which has not yet undergone subediting, typesetting, or correction. Errors discovered and corrected during this process may materially alter the content of this manuscript, and the latest published version (the Version of Record) should be used in preference to any preceding versions

Primary care gatekeeping during the Covid-19 pandemic:

A survey of 1234 Norwegian regular GPs

Børge Lønnebakke Norberg

General Practitioner (GP), Tiller Torget Medical Centre, Trondheim
Norwegian Centre for E-health Research (NSE) and General Practice Research Unit, Department of Public Health and Nursing, Norwegian University of Science and Technology (NTNU)
borge.lonnebakke.norberg@ehealthresearch.no

Tor Magne Johnsen

GP, Midtbyen Medical Centre, Trondheim
Norwegian Centre for E-health Research (NSE)

Eli Kristiansen

Norwegian Centre for E-health Research (NSE), PO Box 35, N-9038 Tromsø, Norway

Frode Helgetun Krogh

General Practice Research Unit, Department of Public Health and Nursing, Norwegian University of Science and Technology (NTNU), PO Box 8905, 7491 Trondheim, Norway

Linn Okkenhaug Getz

General Practice Research Unit, Department of Public Health and Nursing, Norwegian University of Science and Technology (NTNU), PO Box 8905, 7491 Trondheim, Norway

Bjarne Austad

General Practice Research Unit, Department of Public Health and Nursing, Norwegian University of Science and Technology (NTNU), PO Box 8905, 7491 Trondheim, Norway

Abstract

Background In the Nordic healthcare systems, general practitioners (GPs) regulate access to secondary health services as gatekeepers. Limited knowledge exists about the gatekeeper role of GPs during public health crises seen from the GPs' perspective.

Aim To document GPs' gatekeeper role and organisational changes during the initial Covid-19 lockdown in Norway.

Design and Setting A cross-sectional online survey was addressed to all regular Norwegian GPs (n = 4858) during pandemic lockdown in spring 2020.

Method Each GP documented how patients with potential Covid-19 disease were triaged and handled during a full regular workday. The survey also covered workload, organisational changes and views on advice given by the authorities.

Results A total of 1234 (25%) of Norway's GPs participated. Together, they documented nearly 18,000 consultations, of which 65 % were performed digitally (video, text, and telephone). Suspected Covid-19 symptoms were reported in 11% of the consultations. Nearly

all these patients were managed in primary care, either in regular GP offices (56%) or GP-run municipal respiratory clinics (41%), while 3.7% (n = 73) were admitted to hospitals. The GPs proactively contacted an average of 0.8 at-risk patients per day. While 84% were satisfied with the information provided by the medical authorities, only 20% were able to reorganise their practice in accordance with national recommendations.

Conclusion During the early stage of the Covid-19 pandemic in Norway, the vast majority of patients with Covid-19-suspected symptoms were handled in primary care. This is likely to have protected secondary health services from potentially detrimental exposure to contagion and breakdown of capacity limits.

Key Words General Practice, Family Medicine, Primary Health Care, Gatekeeping, Covid-19, Pandemic

How this fits in

GPs play an essential role as gatekeepers in protecting secondary health services in the Nordic healthcare system, but there is sparse research about this role during a public health crisis. This paper describes how GPs triaged and managed suspected Covid-19 patients and handled other patients during the first societal lockdown in Norway in Spring 2020. The vast majority were managed in primary care, and only 3.6% of suspected cases were admitted to hospitals, indicative of well-functioning protection of hospitals. In 9% of non-Covid-related consultations, the GPs were concerned about delayed treatment for patients with potential severe diseases. The findings highlight the relevance of strong and flexible primary health care.

Introduction

In Nordic healthcare systems, general practitioners (GPs) are assigned an essential role as gatekeepers in regulating access to secondary health services. Research on the gatekeeper function has mostly examined the role of GPs under stable societal conditions, affirming a relationship between a strong primary health care system and reduced morbidity, mortality, and even increased life expectancy [1, 2]. The Norwegian regular GP scheme is briefly described in Box 1.

Box 1 The Norwegian GP Scheme

The Norwegian health care system is based on the principles of universal access and continuity of care [3]. Since 2001, all Norwegian citizens may sign up with a GP (and change, if desired), and 99% have chosen to do so, although 250,000 people are currently on a waiting list. The system is financed by taxation, together with income-related employee and employer contributions and out-of-pocket payments (co-payments). Private medical insurance is limited. While national healthcare policy is controlled centrally, responsibility for the provision of primary health care is decentralised. GPs act as coordinators of municipal services and gatekeepers to specialised care. On average, a GP has a list of approximately 1050 patients and often provides other medical services in the municipality one day a week. In addition, GPs generally take part in 24-hour emergency care services and many voluntarily participated in municipal-run respiratory clinics during pandemic lockdown [4].

Earlier outbreaks of infectious diseases sparked interest in how the primary healthcare service is reorganised to optimise triage and avoid hospital overload during infectious health crises. It is recommended to deliver targeted preventive advice, inform patients about current public health guidelines, and reach out to vulnerable patients regarding the potential risk for contagion. Furthermore, it is essential to ensure that health care is provided to patients with other serious diseases as part of the general medical service during crises [5–7].

The Covid-19 outbreak in 2020 widely challenged primary healthcare services [8, 9] and reignited the discussion about the role of primary healthcare services in protecting hospitals from overload [10–13]. Areas with weak primary health care experienced hospital overload and increased mortality [10, 14]. In Italy, where early European cases of Covid-19 arose, a lack of trustful communication between the GP service and the authorities was reported [15]. While the healthcare system was dealing with a vast number of Covid-19 patients, other groups of patients chose to stay home. In England, fewer patients consulted GPs with symptoms that could potentially indicate cancer, giving rise to concerns about delayed diagnosis [16]. A recent Canadian study found that family physicians all over the country were not well incorporated into the Covid-19 pandemic response [17].

In Norway, several societal preconditions influenced the course of the Covid-19 pandemic (see Box 2). A first societal lockdown occurred between 12 March and 15 July 2020. Both the Norwegian authorities and the Norwegian Medical Association immediately established information channels to reach GPs. Many primary care practices stopped offering routine physical appointments. This was economically feasible, as the authorities introduced reimbursements for digital triage and consultations using telephone, video, and text-based e-consultations (i.e., freely formulated questions and answers). Within two months, more than

80% of GP practices had implemented digital consultations, and 6 of 10 consultations were performed digitally during the study uptake [18–20]. Most patients who attended physical consultations had either undergone digital triage or resided in geographical areas with a negligible risk of infection. A Norwegian study has documented that many GP offices lacked personal protective equipment to meet the Covid-19 pandemic so that the staff experienced fear of not being able to diagnose and treat patients safely [21].

In addition, GP-run respiratory clinics, also known as ‘fever clinics’, were rapidly established in most municipalities to offer safe clinical evaluations while minimising the spread of infection in general healthcare facilities. The respiratory clinics were mostly run by GPs pertaining to the regular GP scheme [20].

Box 2: Contextual factors affecting the course of the Covid-19 pandemic in Norway when our study was conducted.

- **An established welfare state and publicly organized healthcare:** Ensured rapid adaptation of healthcare reimbursement systems and implementation of digital care, paid sick-leave for registered workers in all sectors, support for financially threatened businesses, etc.
- **High public trust and social cohesion:** High public trust and social cohesion: As a nation, Norway is characterized by high trust in the authorities, social equalization and a tendency to follow expert advice [22].
- **Clear communication to the general public:** From the start of the pandemic, the Norwegian Ministry of Health established an authoritative and clear information strategy with providing advice on how to behave in the lockdown situation and tackle eventual symptoms.
- **Societal lockdown:** Closure of schools, working from home if possible, regulations regarding physical distancing, social gatherings and travel, etc.
- **Establishment of effective communication channels to the healthcare sector:** Both the Norwegian Ministry of Health and the Norwegian Medical Association rapidly developed systems for communicating updates and recommendations regarding handling of the Covid-19 pandemic. These systems were in place but not fully developed when data collection for the present study took place.
- **Demographic characteristics:** In a European perspective, Norway is an affluent country with a relatively dispersed population of ca. 5,4 million inhabitants, with 83% living in urban regions. The age distribution and proportion of immigrants is comparable to many European countries [23].

Eventually, most Norwegian GP practices adapted to the Covid-19 pandemic in terms of infection control measures and organisational changes [18]. During the whole period, consultations related to pandemic-related issues (Covid-suspected symptoms, concerns and infection control information regarding Covid-19) were free of charge for patients [24].

The early lockdown period in 2020, when digital consultations were used for an unprecedented, broad range of clinical problems, reflects a unique transition period in the delivery of primary health care [17]. Knowledge gathered during this period might have high future relevance for pandemics or other abrupt societal changes. To the best of our knowledge, our study is unique, as it builds on real-time data collected during lockdown.

The aim of the present study was to document the gatekeeper role of and organisational changes by GPs during the initial Covid-19 lockdown in Norway.

Methods

Setting, study design and data collection

A cross-sectional online survey was addressed to all Norwegian GPs (n = 4858) between 14 April and 3 May 2020 during the first national Covid-19 pandemic lockdown. The questionnaire contained 170 items. First, each respondent answered generic questions covering workload and change in practice organisation. Workload was measured by counting the number of consultations (physical, video, telephone and text-based freely formulated questions and answers). Organisational changes were measured through questions on the GPs' number of days in practice and conditions to reorganise working practices in accordance with the national recommendations. To investigate the GPs' situation during lockdown, we included questions regarding perceived information and recommendations from the health authorities, GPs' access to personal protective equipment and personal concerns regarding Covid-19-infection risk.

Then, the GPs were asked to document all clinical activities on one typical full workday at the GP office. To investigate the gatekeeper function, the number of patients with suspected Covid-19 symptoms was registered, together with information on whether the patient was handled locally by the GP, referred to a GP-run municipal respiratory clinic or admitted to a hospital. Furthermore, the GPs reported whether they proactively contacted vulnerable

patients due to risk of a serious course of eventual Covid-19, the number of patients/next of kin with questions and concerns about Covid-19 and the number of patients who received tailored advice related to Covid-19 in case of symptoms, concerns, or other needs for infection control information. The GPs also registered whether they were concerned about possible delayed somatic diagnosis or treatment (i.e., related to cancer) and about patients' lockdown-associated psychosocial difficulties. We consulted the Checklist for Reporting Results of Internet E-Surveys to develop the survey and report its results [25]. The survey was pilot tested by a panel of experienced GPs. It took approximately 90 minutes to complete the full survey. Two articles about the GPs' reported use of video consultations have been published from the same material [19, 26].

To reach respondents, we collaborated with Norwegian Health Informatics (NHI), a web-based portal that hosts an online clinical decision support product (NEL), to which approximately 98% of all Norwegian GPs subscribe [27]. An invitation was sent to all NEL subscribers including a unique e-mail link to the survey, ensuring both the authenticity and anonymity of the respondents. In addition, we used large social media groups of GPs to stimulate participation and invite GPs who did not receive a personal e-mail. Several reminders were sent by e-mail and social media. The survey was conducted through Netigate©, an application for Internet surveys.

Statistics

The data were analysed using SPSS Version 26.0 (IBM Corp). We excluded answers with extreme outliers that were most likely wrong (for example 141 consultations on a working day) (n=3). Questions eliciting GPs' viewpoints were scored on a 5-point Likert scale and then combined into three categories. More participants (1234) completed the generic questions, including workload estimation, than registration of the full working day (910). Therefore, we calculated the total number of consultations by multiplying the average consultations per day (19,7 based on all 1234) with the number of responses to the triage questions (901–910). We performed a multivariable regression analysis to investigate the effect of the GPs' gatekeeping in relation to experience, recourses to adaptation of practices according to the authorities' recommendations and how information from the authorities was received.

Results

Table 1. Characteristics of participating GPs (n = 1234).

Background characteristic	Participants
Gender	n (%)
Female	674 (55)
Male	550 (45)
Years of experience as a GP	
0–5 years	269 (22)
6–10 years	266 (22)
11–20 years	365 (30)
> 20 years	333 (27)
Citizens in the municipality of the practice	n (%)
< 10,000	212 (17)
10,000–50,000	439 (36)
50,000–100,000	199 (16)
100,000–500,000	283 (23)
> 500,000	100 (8)
Employment	
Self-employed	973 (79)
Self-employed with municipal support	99 (8)
Municipally employed	119 (10)
Other type	40 (3)
Number of patients on GP's list	
< 800	210 (17)
800–999	221 (18)
1000–1999	342 (28)
1200–1599	400 (33)
> 1600	57 (5)

In total, 1234 of the 4858 invited GPs (26%) participated and answered the generic questions. Of these, 910 (19%) completed registration of the working day, and we received answers from between 904 and 913 GPs to the questions concerning gatekeeping. The 1234 GPs

reported an average of 19.7 (95% CI 19.6–19.9) consultations per day. Our material of 901–910 responses therefore covers approximately 18,000 consultations (17767–17945). The characteristics of the respondents are presented in Table 1.

Triage and treatment of potentially infected patients

On their documented working day, 11% (n=1997) of the consultations were with patients with suspected Covid-19 symptoms. In Table 2, we show how these patients were handled. Of all the registered consultations, 3.7% (73/1997) were admitted to hospital, corresponding to 0.4% (73/17904) of the consultations.

Table 2. GPs' handling of the 1997 registered patients with suspected Covid-19 symptoms.

	Consultations (n) Total = 1997	Average occurrence per day* (95% CI)	Proportion of patients
Handled locally by the GP	1112	1.2 (1.1–1.4)	55.7%
Referred to and handled by GP-run municipal respiratory clinics**	812	0.9 (0.8–1.0)	40.7%
Admitted to hospital from the GP office	73	0.08 (0.06–0.10)	3.7%

* Based on an average of 19.7 consultations per day.

** Municipal respiratory clinics in primary care were run by GPs at suitable locations.

We performed a multivariable regression analysis to study whether admission rates to hospitals were affected by the GP's work experience (+/-5 years), financial and practical resources for adapting practice in accordance with the authorities' recommendations, and how information from the authorities was received (*See Supplementary S1*). We found no differences in referral rates, as these background variables explained only 0.3% of the variation in referral rates (R^2 0.003), and neither was statistically significant.

Medical help and preventive care for vulnerable patients

During lockdown, the GPs reported selected aspects regarding the composition of patients. In Table 3, we present different issues related to Covid-19. In 9% (1613/17866) of the consultations, the GPs reported concerns about potentially delayed diagnoses of serious non-Covid-related diseases, such as cancer. Twice as many people received ‘tailored advice’ concerning Covid-19 than the number who presented with suspected Covid symptoms (4.5 vs 2.2 per day), and the GPs proactively contacted on average one (0.8) at-risk patient per day. Concerns for lockdown-associated psychosocial difficulties were reported at 2.3 (95% CI 2.1–2.4) a day.

Table 3. Covid-related issues and concerns during a typical, full working day during the first societal lockdown in Norway.

Covid-19-related topic	Patients (n)	Average occurrence per day (95% CI)*	Proportion of all consultations (n = 17886)
Patients with suspected Covid-19 symptoms	1997	2.2 (2.0–2.4)	11.2%
Patients/next of kin with questions and worries about Covid-19	3330	3.7 (3.5–3.8)	18.6%
GPs concerned about possible delayed diagnosis or treatment of serious disease other than Covid-19	1613	1.8 (1.6–1.9)	9.0 %
GPs who gave tailored advice concerning Covid-19	4076	4.5 (4.2–4.8)	22.8%
GPs who proactively contacted patients at risk of a serious course of Covid-19	730	0.8 (0.7–0.9)	4.1 %
GPs concerned with patients’ lockdown-associated psychosocial difficulties	2048	2.3 (2.1–2.4)	11.4%

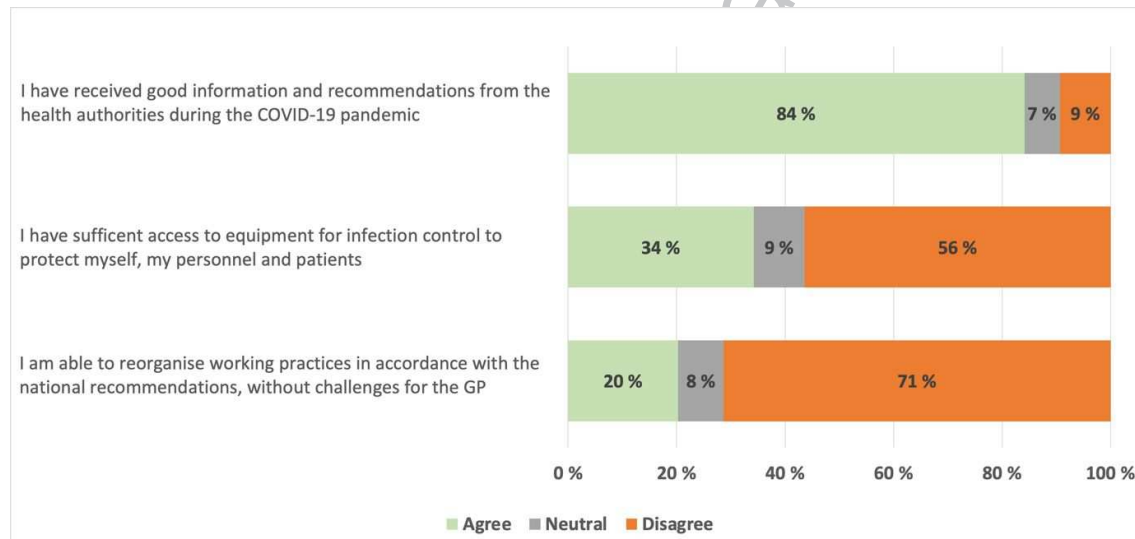
* Based on an average of 19.7 consultations per day.

Organisational changes

During the pandemic lockdown, the GPs reported a 12% increase in time devoted to direct patient contact (in contrast to municipal and administrative tasks, etc.) to a total of 4.6 weekdays: 3.5 days (95% CI 3.4–3.6) at the GP office and 1.1 days (95% CI 1.0–1.2) working from home.

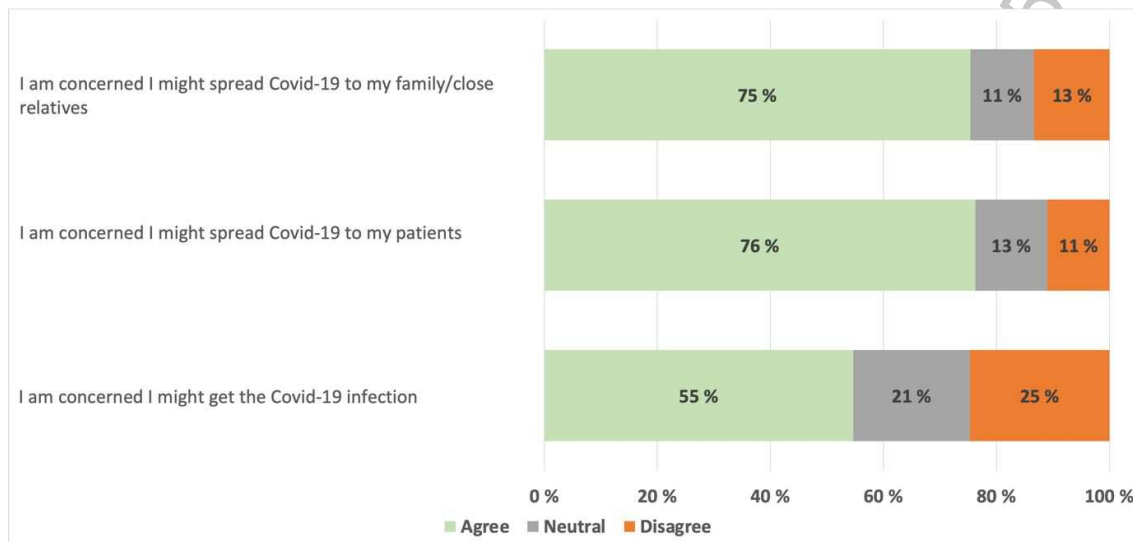
In Figure 1, we show that pandemic-related information provided by the Norwegian health authorities and the Norwegian Medical Association combined was regarded as satisfactory by 84% of the GPs. However, 56% disagreed that they had sufficient personal protective equipment, and only 20% were able to reorganise their practice in full accordance with the national recommendations at this early stage of the pandemic.

Figure 1. GPs' viewpoints on pandemic-related information, personal protective equipment, and reorganisation of their practices.



In Figure 2, we present GPs' personal concerns regarding Covid-19 infection in the early phase of the pandemic. While approximately 76% were worried that they could spread the virus to their patients or family, 55% were worried about becoming infected themselves.

Figure 2. GPs' concerns regarding infection risk.



Discussion

Summary

Our study indicates that Norwegian GPs handled nearly all patients in the general population who sought medical attention due to suspected Covid-19 symptoms during the pandemic. This reflects a clear gate-keeping function, suited to protect and diminish the pressure on hospitals. As responsible for defined patient lists, GPs proactively contacted vulnerable patients at particular risk of a serious course of Covid-19 whilst also striving to maintain healthcare for patients with severe non-Covid health problems. On a daily basis, GPs were concerned about delayed diagnosis and treatment due to lockdown. We found a high degree of trust in the national authorities' infection control advice, but only one in five GPs was able to reorganise their practices in accordance with national recommendations in the early stage of the pandemic.

Strengths and limitations

Despite the fact that participation in our study took up to 90 minutes, we recruited a quarter of all registered GPs in Norway during the exceptional period of pandemic societal lockdown. As previously published, our participants appear relatively representative of regular GPs in Norway [19]. Female and doctors below the age 30 were slightly overrepresented, as were GPs from Trøndelag County, where the research group is based.

Collaboration with NHI gave all subscribers an e-mail with a unique link to our survey [27]. This method made it slightly less accessible for the approximately 2% of GPs who do not subscribe to NHI. The use of Netigate prevented multiple answers from the same source. Alternative recruitment methods (i.e., through the Norwegian Medical Association) would, however, have been associated with comparable weaknesses.

National Norwegian data show that the total number of admissions per day with suspected Covid-19 peaked at 325 per day during early lockdown and then gradually decreased [28]. Our findings of 73 admissions from one-fifth of Norway's GPs of suspected Covid-19 patients during early lockdown fits well with this, indicating reasonable representativeness of the entire population.

A few additional admissions directly from the respiratory clinics in these early weeks of lockdown, are not measured in this study, but can be considered negligible in number.

Comparison with existing literature

Our study adds to the evolving literature about the role of primary care during the Covid-19 pandemic [17, 18, 20, 26, 29]. By international comparison, Norway had very low and even sub-normal mortality rates during the pandemic [30]. This outcome has complex explanations [30], as outlined in Box 2 and a Norwegian report on the pandemic from 2022 [32]. It is beyond the scope of this paper to deliver exact estimates of the contribution of primary care. It is however relevant to note how the regular Norwegian GP scheme, based on continuity of care (Box 1), provided favourable premises for triage of Covid-suspect cases and preventive care for vulnerable patients in general, as recommended during infection outbreaks [5, 7]. Such emphasis was rapidly facilitated by Norwegian authorities through changes in the tariff system [24]. Our data indicates that one in five patients who consulted their GP received tailored advice. This equalled twice the number of patients with suspected Covid-19 symptoms, indicative of efforts among GPs to provide preventive medicine to their list population. In Norway, patient selection was carried out using the GP's electronic journals and various digital tools [24].

While there was a general drop in hospital admissions, data from Statistics Norway show that the number of consultations in primary care was maintained during the pandemic [32, 33].

This validates our findings that the average GP conducted around 20 consultations on a typical workday, similar to pre-pandemic levels [19, 33]. The high level of digital consultations among the respondents was similar to national numbers during this phase of the pandemic [33]. The increase in reported clinical working hours despite an unchanged number of consultations is most likely explained by time-consuming information updates from the authorities and implementation of infection control measures [34].

Our findings related to GPs' worries about overlooking or undertreating potentially serious illnesses can be readily explained by restrictions during lockdown. Many of the digital consultations would, under normal circumstances, have been physical with possibilities for ordinary clinical examinations. The high focus on Covid-19 might have discouraged patients from seeking help for other types of problems [16].

Trust in the medical authorities is central for a well-functioning healthcare system [32]. Associations between patient trust in governmental information and high compliance have previously been found [35, 36]. Our finding that Norwegian GPs generally trusted information from the medical authorities and their medical association can be seen to reflect a well-functioning system for crisis-related communication in the healthcare system.

Our findings of a lack of personal protective equipment and difficulties reorganising GP practices in the early phase of the pandemic have also been shown by others [18, 20]. Lack of equipment might explain why so many GPs were concerned that they might get infected and spread Covid-19 to their patients and families. With sufficient equipment in the early phase of the pandemic, GPs could have handled more patients in their own offices, reducing the need for GP-run respiratory clinics.

Previous studies have indicated that experienced GPs tend to admit fewer patients to hospitals than inexperienced colleagues [37, 38]. Our findings, however, indicate that for Covid-related admissions during the pandemic, this might not have been the case. One explanation could be that Covid-19 was a previously unknown disease and admissions were to a high extent guided by algorithmic recommendations with limited room for clinical deliberations [39].

Implications for research and practice

Our study highlights the value of strong primary health care during public health crises. It documents how regular GPs in Norway, based on defined patient list responsibility, could work effectively as gatekeepers to secondary care during a pandemic lockdown, while also remaining attentive to other patients' important but less acute needs. Our study further emphasises the need for useful information, trust in advice from the authorities, enough protective equipment, and resources to reorganise local GP practices. The findings have relevance for future health service planning with respect to public health crises.

Novelty statement

Norwegian GPs successfully fulfilled the gatekeeper role during a pandemic lockdown. They effectively triaged suspected Covid-19 patients, protecting hospitals from overload and contagion without losing sight of other patients. The findings highlight the value of strong primary health care.

Authors' contributions

BLN and TMJ developed the survey with LOG, FHK and BA. All authors contributed substantially to the data analysis, interpretation of the results and the writing. All authors have approved the final version of the article.

Funding

After the survey was conducted, BLN and TMJ had salaried part-time positions at the Norwegian Centre for E-health Research in Tromsø, Norway. The Netigate licence was funded by the General Practice Research Unit at NTNU.

Ethics

Participation was voluntary and anonymous. We did not elicit sensitive information or demographic characteristics that could reveal the identity of the GPs or patients, such as patient age, sex, specific diagnoses, or other sensitive information. Distribution of the survey to GPs' e-mail addresses was handled by an independent party (Norwegian Health Informatics). No linkage key was established, and the participants' IP numbers were not accessible. Further approvals were thereby not required, according to Norwegian health research legislation and verified by the Norwegian Centre for Research Data (NSD).

Availability of data

The dataset generated and/or analysed during the current study is not publicly available but can be made available from the corresponding author on reasonable request.

Acknowledgements

Norwegian Health Informatics (nhi.no) made a crucial contribution with the dispatch of the survey through their subscriber e-mail list and website, free of charge. The Norwegian Directorate of eHealth and Confrere provided background data on video consultations.

Conflicts of interests

The authors declare no conflicts of interests.

List of abbreviations

GP: General practitioner

CI: confidence interval

References

1. Sandvik H, Hetlevik Ø, Blinkenberg J, Hunskaar S. Continuity in general practice as predictor of mortality, acute hospitalisation, and use of out-of-hours care: a registry-based observational study in Norway. *Br J Gen Pract.* 2022;72(715):e84-e90.
2. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q.* 2005;83(3):457-502.
3. Tikkanen R, Osborn R, Mossialos E, et al. International Health Care System Profiles – Norway. 2020. <https://www.commonwealthfund.org/international-health-policy-center/countries/norway> (accessed 21 April 2023).
4. Helsedirektoratet. <https://www.helsedirektoratet.no/statistikk/fastlegestatistikk> (accessed 21 April 2023).
5. Phillips CB, Patel MS, Glasgow N, et al. Australian general practice and pandemic influenza: models of clinical practice in an established pandemic. *Med J Aust.* 2007;186(7):355-8.
6. Runkle JD, Brock-Martin A, Karmaus W, Svendsen ER. Secondary surge capacity: a framework for understanding long-term access to primary care for medically vulnerable populations in disaster recovery. *Am J Public Health.* 2012;102(12):e24-32.
7. Simonsen KA, Hunskaar S, Sandvik H. Capacity and adaptations of general practice during an influenza pandemic. *PLoS One.* 2013;8(7): e69408.
8. Tsopra R, Frappe P, Streit S, et al. Reorganisation of GP surgeries during the COVID-19 outbreak: analysis of guidelines from 15 countries. *BMC Fam Pract.* 2021;22(1):96.
9. Saint-Lary O, Gautier S, Le Breton J, et al. How GPs adapted their practices and organisations at the beginning of COVID-19 outbreak: a French national observational survey. *BMJ Open.* 2020;10(12):e042119.
10. Goodyear-Smith F, Kinder K, Mannie C. Relationship between the perceived strength of countries' primary care system and COVID-19 mortality: an international survey study. *BJGP Open.* 2020;4(4).
11. Blake D TJ, Chamberlain K, McGuigan K. Accessing primary healthcare during COVID-19: health messaging during lockdown. *Kōtuitui* 2022;17(1):101-15.
12. Imlach F, McKinlay E, Kennedy J, et al. Seeking healthcare during lockdown: challenges, opportunities and lessons for the future. *Int J Health Policy Manag.* 2021 Apr 13;11(8):1316-1324. doi: 10.34172/ijhpm.2021.26.
13. Kinder K, Bazemore A, Taylor M, et al. Integrating primary care and public health to enhance response to a pandemic. *Prim Health Care Res Dev.* 2021;22:e27.
14. Barten DG, Latten GHP, van Osch FHM. Reduced emergency department utilization during the early phase of the COVID-19 pandemic: viral fear or lockdown effect? *Disaster Med Public Health Prep.* 2022;16(1):36-9.
15. Kurotschka PK, Serafini A, Demontis M, et al. General practitioners' experiences during the first phase of the COVID-19 pandemic in Italy: a critical incident technique study. *Front Public Health.* 2021;9:623904.
16. Scott LJ, Murphy M, Price S, et al. Changes in presentations with features potentially indicating cancer in primary care during the COVID-19 pandemic: a retrospective cohort study. *BMJ Open.* 2021;11(5):e050131.
17. Mathews M, Ryan D, Hedden L, et al. Strengthening the integration of primary care in pandemic response plans: a qualitative interview study of Canadian family physicians. *Br J Gen Pract.* 2023; 73(730): e348–e355. doi: 10.3399/BJGP.2022.0350

18. Renaa T, Brekke M. Restructuring in a GP practice during the COVID-19 pandemic - a focus-group study. *Tidsskr Nor Laegeforen*. 2021;141(2).
19. Johnsen TM, Norberg BL, Kristiansen E, et al. Suitability of video consultations during the COVID-19 pandemic lockdown: cross-sectional survey among Norwegian general practitioners, *JMIR*. 2020; 2021;23(2):e26433. doi: 10.2196/26433.
20. Alsnes IV, Munkvik M, Flanders WD. How well did Norwegian general practice prepare to address the COVID-19 pandemic? *Fam Med Community Health*. 2020;8(4).
21. Groenewegen P, Van Poel E, Spreeuwenberg P, et al. Has the COVID-19 pandemic led to changes in the tasks of the primary care workforce? An international survey among general practices in 38 countries (PRICOV-19). *Int J Environ Res Public Health*. 2022;19(22):15329.
22. <https://www.digdir.no/rikets-digitale-tilstand/tillit-i-befolkningen-og-til-det-offentlige/4060>, accessed July 2023
23. World Data. The average age in global comparison <https://www.worlddata.info/average-age.php>, accessed July 2023.
24. The Norwegian medical association. <https://normaltariffen.legeforeningen.no>, accessed July 2023
25. Eysenbach G. Improving the quality of web surveys: the checklist for reporting results of internet e-surveys (CHERRIES). *J Med Internet Res*. 2004;6(3):e34.
26. Norberg BL, Getz LO, Johnsen T, et al. General practitioners' experiences with potentials and pitfalls of video consultations in Norway during the COVID-19 lockdown: qualitative analysis of free-text survey answers. *JMIR*. 2023; 2023;25:e45812 doi: 10.2196/45812
27. Johannessen T. <https://legehandboka.no>; Om NEL, accessed Aug 2022.
28. Helsedirektoratet. Covid-19 - antall innlagte pasienter på sykehus. <https://www.helsedirektoratet.no/statistikk/antall-innlagte-pasienter-pa-sykehus-med-pavist-covid-19> (accessed 21 April 2023).
29. Sigurdsson EL, Blondal AB, Jonsson JS, et al. How primary healthcare in Iceland swiftly changed its strategy in response to the COVID-19 pandemic. *BMJ Open*. 2020;10(12):e043151.
30. Juul FE, Jodal HC, Barua I, et al. Mortality in Norway and Sweden during the COVID-19 pandemic. *Scand J Public Health*. 2022;50(1):38-45. doi: 10.1177/14034948211047137.
31. Chang, D., Chang, X., He, Y. *et al*. The determinants of COVID-19 morbidity and mortality across countries. *Sci Rep*. 2022. doi.org/10.1038/s41598-022-09783-9
32. Government Norway. NOU 2022: 5. The Norwegian Government's Management of the Coronavirus Pandemic – Part 2 — Summary in English. <https://www.regjeringen.no/en/dokumenter/nou-2022-5/id2910055/>
33. Helsedirektoratet. E-konsultasjoner hos fastleger. 2020. <https://www.helsedirektoratet.no/statistikk/statistikk-om-allmennelegetjenester/e-konsultasjoner-hos-fastleger> (accessed 21 April 2023).
34. Statistisk Sentralbyrå. <https://www.ssb.no/helse/faktaside/konsekvenser-av-korona> (accessed 21 April 2023).
35. Gjerstad B, Nødland SI, Teig IL. Trust building in a Norwegian municipal acute ward. *J Health Organ Manag*. 2020; ahead-of-print(ahead-of-print). doi: 10.1108/JHOM-11-2019-0334.
36. Bargain O, Ulugbek A. Trust and compliance to public health policies in times of COVID-19. *J. Public Econ*. 2020;192: 104316. doi: 10.1016/j.jpubeco.2020.104316.
37. Svedahl ER, Pape K, Austad B, et al. Effects of GP characteristics on unplanned hospital admissions and patient safety. A 9-year follow-up of all Norwegian out-of-hours contacts. *Fam Pract*. 2022;39(3):381-8.
38. Glette MK, Kringeland TÅ, Røise O, et al. Exploring physicians' decision-making in hospital readmission processes - a comparative case study. *BMC Health Serv.Res*. 2018;18:725. doi: 10.1186/s12913-018-3538-3
39. <https://www.helsedirektoratet.no/veiledere/koronavirus/testing-isolasjon-smittesporing-og-kanantene>, Beredkapsplanlegging, pandemiberedskap og tilsyn, accessed 21 April 2023.