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Patients' use and experiences with e-consultation and other digital health services with their general practitioner in Norway: results from an online survey

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1 2 3 1 **Patients' use and experiences with e-consultation and** 4 2 **other digital health services with their general** 5 3 **practitioner in Norway: results from an online survey** 6 7 8 9 4

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31 18 **ABSTRACT**

32 19 **Objectives:** To explore patients' use and experiences with four digital health services implemented
33 20 in Norway to enable electronic communication between patients and their GP: (1) electronic
34 21 booking of appointments; (2) electronic prescription renewal; (3) electronic contact with the GP
35 22 office for non-clinical inquiries; (4) e-consultation for clinical inquiries.

36 23 **Design:** An online survey consisting of quantitative data supplemented by qualitative information
37 24 was conducted to explore: (1) characteristics of the users; (2) use; (3) experiences, perceived
38 25 benefits and satisfaction; (4) time spent using the digital health services.
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26 **Setting:** Primary care.

27 **Participants:** 2,043 users of the digital health services answering the survey.

28 **Results:** There was a higher proportion of women, younger adults, and digitally active citizens with
29 high education. Electronic booking of appointments was the most used service (66.4%), followed
30 by electronic prescription renewal (54.3%). Most users (80%) could more easily and efficiently
31 book an appointment electronically than by phone. Over 90% of the respondents thought that it was
32 easier to renew a prescription electronically, 76% obtained a better overview of their medications
33 and 46% reported higher compliance. For non-clinical inquiries, most respondents (60%) thought
34 that it was easier to write electronic messages than communicate by phone. For clinical enquiries,
35 many patients agreed that e-consultation could lead to a better follow-up (72%) and improved

1
2 1 quality of treatment (58%). Users were highly satisfied with the services and recommended their
3
4 2 use to others. Time saving was the most evident benefit for patients. This was confirmed by the
5
6 3 differences in time spent using the digital health services compared to conventional approaches, all
7
8 4 found to be statistically significant.

9 5 **Conclusions:** Citizens using e-consultation and other digital health services with their GP in
10
11 6 Norway are satisfied and consider them as useful and efficient alternatives to conventional
12
13 7 approaches.
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15 8

16 9 **ARTICLE SUMMARY**

17 10 **Strengths and limitations of this study**

- 19 11 • One of the first examples of nationwide implementation of digital health services for citizens in
20
21 12 primary care
- 23 13 • The quantitative survey was supplemented by qualitative feedbacks with interesting insights and
24
25 14 useful suggestions for improvement
- 26 15 • High number of respondents considered to be representative of those who used the services
- 28 16 • Respondents were early adopters who could be have a more positive attitude
- 30 17 • Findings are relevant to citizens, general practitioners and policy-makers

1 **Background**

2 The increasing demand in primary care within a limited capacity and the need to improve patients'
3 access has prompted the consideration of alternative methods to provide consultations, such as email,
4 electronic messaging or Internet video [1]. Electronic communication between patients and
5 physicians has the potential to empower patients [2] and improve health care services [3]. There is
6 also growing recognition that many patient encounters do not require face-to-face contact, and the
7 increasing use of the Internet creates the opportunity for electronic consultations (e-consultations),
8 where the interaction between physician and patient is completely virtual [4].

9 In the early 2000s, a number of studies on e-mail communication between patients and General
10 Practitioner (GP) were conducted. Patients found e-mail communication easy to use [5,6] and
11 preferred it over phone calls for the communication of non-urgent problems [5,7,8], including updates
12 to the GP, prescription renewals, health questions, questions about test results or referrals,
13 appointments, and requests for non-health-related information [7,8,9]. However, the empirical
14 evidence for the use of email for clinical communication between patients and healthcare
15 professionals [10] and for the provision of information on disease prevention and health promotion
16 [11] is still limited. Despite email being commonly offered by GP offices for making appointments
17 and renewing prescriptions, its use for direct contact with the GP is not commonplace [12]. Moreover,
18 the security level for regular email is considered insufficient [3] and non-compliant to current
19 requirements for authentication and encryption [13].

20 Today, e-consultations are generally done in an asynchronous manner via a secure Internet portal [4].
21 Web messaging systems address issues around security and liability associated with conventional
22 email communication since they offer encryption capability and access controls [5,10]. E-
23 consultations have been considered by patients as equivalent or better than face-to-face visits [14]
24 and represent an appropriate and potentially cost-saving addition to in-person delivery of primary
25 care [14,15]. Furthermore, patients also experienced easier access to their GP for minor health

1
2 1 problems, and received quick responses to their requests [3]. E-consultations can also be conducted
3
4 2 through real-time video linkage with the patient [4]. Benefits of video consultations in primary care
5
6 3 compared to in-person encounters include convenience, efficiency, communication, privacy, and
7
8 4 comfort [16].
9

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11 5 A recent evaluation of an online consultation system that had undergone pilot testing in 36 general
12
13 6 practices in South West England found that the use of e-consultations was very low (2 e-consultations
14
15 7 per 1,000 patients per month), more common among women and working-age adults, and mostly
16
17 8 suitable for administrative requests, such as repeat prescriptions and test results [17]. Despite policy
18
19 9 pressure to introduce e-consultations by email, web messaging and video, there is a general reluctance
20
21 10 among GPs to implement alternatives to face-to-face consultations [1].
22
23

24 11 **Digital dialogue with the general practitioner in Norway**

25
26 12 The «Digital dialogue with the general practitioner» implemented in Norway is a suite of four e-
27
28 13 health services which enable secure communication between patients and their GP over the Internet.
29
30 14 The four digital services include: (1) an electronic booking service to make appointments with the
31
32 15 GP; (2) an electronic prescription service to request renewal of maintenance drugs, with direct
33
34 16 integration with the electronic prescription system of pharmacies; (3) a service for electronic contact
35
36 17 with the GP office for text-based non-clinical inquiries (e.g. opening hours, results from diagnostic
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38 18 tests) as an alternative to phone calling; (4) a service for e-consultation with the GP for clinical
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40 19 inquiries.
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47 20 These services are accessible to residents in Norway aged 16 years or older from the private section
48
49 21 of the national portal helsenorge.no available after login. The national health portal helsenorge.no
50
51 22 was established in 2011 to provide health information and accommodate digital health services
52
53 23 gathered in one place [18]. Secure access is obtained through a unique identification and
54
55 24 authentication procedure via a national ID portal with Security Level 4 (the same authentication
56
57 25 procedure used for Internet-banking). All the four services are integrated with the GP's electronic
58
59 26 patient record (EPR) system. The «Digital dialogue with the general practitioner» is still in its early
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1
2 1 implementation phase and its use by GPs is not mandatory. By December 2018, these services were
3
4 2 offered via the national health portal helsenorge.no by a total 293 GP offices (out of 1,542 offices)
5
6 3 which volunteered as early adopters [**Figure 1**]. GPs who adhere to this national initiative and offer
7
8 4 these services to their patients are able to receive and send sensitive information and communicate
9
10 5 digitally via their own EPR system, and the information exchange is documented in the journal. The
11
12 6 services can be activated and deactivated by each GP. This makes it possible to use only some of the
13
14 7 four services. The services are supported by the Norwegian Health Network and the EPR suppliers.
15
16 8 The presented suite of e-health services between patient and GP has the potential to improve the
17
18 9 accessibility, quality and efficiency of primary health care. According to the Norwegian Directorate
19
20 10 of Health, e-consultation and other digital health services with the GP might result in a number of
21
22 11 possible benefits for patients including: digital communication with their GP which ensures
23
24 12 confidentiality, information security and privacy; time savings (work, travel, waiting); faster
25
26 13 detection or treatment of serious diagnoses; possibility to contact their GP at any time, even when on
27
28 14 holiday; easier formulation of a request for health assistance or practical inquiry by written message
29
30 15 than by oral communication [19]. Despite these expected benefits, there is limited research-based
31
32 16 knowledge of the effects of the implementation of the «Digital dialogue with the general practitioner»
33
34 17 in Norway. Governments and vendors have been criticized for being overly optimistic about the
35
36 18 expected favorable outcomes from employing digital health services [20], and the realization of these
37
38 19 benefits has often been slower than anticipated [21]. There is a strong need for those undertaking the
39
40 20 implementation of e-health to understand factors that affect implementation [21]. However, to date,
41
42 21 no studies have been performed on large-scale implementation of digital health services for citizens
43
44 22 in primary care.

23 **Study aim**

24 The aim of the present study was to explore patients' use and experiences with e-consultation and
25 other digital health services with their GP implemented in Norway. A survey consisting of
26 quantitative data supplemented by qualitative information was conducted to explore: (1) the

1 characteristics of the users; (2) the use of e-consultation and other digital health services with the GP;
2 (3) experiences, perceived benefits and satisfaction with e-consultation and other digital health
3 services with the GP; and (4) time spent using e-consultation and other digital health services with
4 the GP compared to conventional methods (e.g. phone, office visit).

5 **Methods**

6 **Description of the digital health services**

7 The «Digital dialogue with the general practitioner» is a suite of four e-health services which enable
8 secure communication between patients and their GPs over the Internet.

9 *Electronic booking of appointments*

10 The service includes two possible options for electronic booking of appointments. The GP can make
11 time slots available for electronic booking via helsenorge.no. The patient can choose among the time
12 slots available in their GP's calendar and book an appointment directly through the
13 service. Alternatively, the patient can to send an electronic inquiry for an appointment with a text-
14 based message via the system without selecting a specific time slot. In this case, the GP office will
15 find a free time slot. This can be useful to book an appointment for children or other relatives who
16 are not digitally active. Once the patient has been assigned an appointment, the system sends out a
17 confirmation via SMS. The text message does not contain sensitive information. Each GP can decide
18 which times slots are made available for electronic booking. The GP can also decide which of the
19 two alternatives to offer to their patients. Normally, appointments can be made available four to five
20 weeks in advance.

21 *Electronic prescription renewal*

22 Patients can send a message to their GP and ask for a prescription renewal of maintenance
23 medications or medical equipment. The prescription service available via helsenorge.no provides an
24 overview of all prescriptions and which of them are active. The GP office receives a message from
25

1 the patient into the EPR system containing which prescriptions the patient wishes to renew. It is
2 possible to ask for renewal of multiple prescriptions within one request. GP offices have established
3 routines for which types of medications can be renewed without a face-to-face consultation (e.g. by
4 phone), and this also applies to the electronic prescription renewal service. The doctor who approves
5 an electronic prescription renewal must make an individual medical assessment of the validity of the
6 prescription. The most common routine today is to allow prescription renewals without a face-to-face
7 consultation when maintenance medications must be renewed before the patient is due for control
8 (with the exception of certain addictive prescription medications). The inquiry for an electronic
9 prescription renewal contains a free text field with the description of which medications the patient
10 wishes to renew (name, dosage form, dosage) and an additional comment field. The GP can accept
11 or reject the request. In both cases, a confirmation is sent to the patient.

12 ***Electronic contact with the GP office***

13 This service provides patients with a secure communication channel with the GP office. The service
14 can be used for text-based non-clinical inquiries (e.g. opening hours, results from diagnostic tests) as
15 an alternative to a phone call to the reception at the GP office. The service can also be utilized to send
16 mail digitally to the patient and can include attachments (PDF, JPG or PNG). The questions are
17 normally answered by the reception at the GP office. The service is not intended for providing health
18 assistance. Examples where the electronic contact with the GP office can be used include: booking
19 and confirmation (time, location) of patient transport otherwise done by phone; practical short
20 questions (e.g. holidays); practical questions before an appointment or clinical examination. Health
21 personnel can also initiate an electronic dialogue with the patient if the patient is digitally active
22 (marked in the EHR system). The service is free of charge for the patient. In case a patient should
23 improperly ask for health assistance via this service, the GP office will ask the patient to initiate an
24 e-consultation instead.

25 ***E-consultation***

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2 1 E-consultation is an online text-based clinical consultation with the GP conducted as alternative to a
3
4 2 face-to-face appointment. Patients pay the same out-of-pocket fee as for office visits (NOK 155,
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6 3 approximately € 15). To date, this service only applies to known health conditions, and only when
7
8 4 physical attendance is not required. Patients need to book a regular appointment if new symptoms or
9
10 5 health problems occurs. The service cannot be used for immediate assistance or emergency situations.
11
12 6 Examples of situations where e-consultation can be used safely include: follow-up of patients with
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14 7 chronic health conditions (e.g. worsening during treatment); follow-up questions about use of
15
16 8 medications (e.g. compliance, side effects, lack of effect); follow-up of mild mental disorders (e.g.
17
18 9 events that aggravate anxiety); requests for certificates and statements which do not require re-
19
20 10 examination; use of the written documentation from the e-consultation for referral to a specialist.
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22 11 Examples where use of e-consultation is not recommended include: provision of sick leave
23
24 12 certificates; assessment of acute exacerbations; occurrence of new health problems which require a
25
26 13 new examination (e.g. severe side effects after starting with a new medication); assessment of
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28 14 exacerbations requiring clinical examination (e.g. bothersome rashes and wounds, psychiatric issues
29
30 15 which require a dialogue); complex issues which require extensive measures (e.g. worsening of
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32 16 chronic illness with need to review medications in case of multimorbidity); issues unsuccessfully
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34 17 solved in previous e-consultations.
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41 18 The use of e-consultation does not change ordinary treatment liabilities for the GP. The GP must
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43 19 independently assess whether the information provided by the patient is sufficient to be able to
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45 20 provide proper health care. The GP must ask the patient to book an ordinary appointment if in doubt
46
47 21 about whether a request can be resolved through an e-consultation. A specific tariff for e-consultation
48
49 22 had been introduced since July 1st 2016. The e-consultation must include a medical assessment of the
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51 23 patient's request and is considered completed when the doctor has considered the inquiry and given
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53 24 the patient an answer. The GP is obliged to answer the patient's inquiry within 5 working days.
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58 25 **Study design**

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2 1 We conducted an open online survey of users who had activated their personal account at the national
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4 2 health portal helsenorge.no and accessed at least one of the four e-health services online. Only citizens
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6 3 with access to the services by November 2017 were invited to participate. The survey was available
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8 4 after secure login on the national health portal helsenorge.no. All active users who accessed one of
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10 5 the four digital health services with their GP received an invitation through a pop-up window with a
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12 6 brief description of the study and a link to the survey.
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16 7 The online survey included questions regarding demographic characteristics of the users and use of
17
18 8 the services. Moreover, for each of the four e-health services with the GP, respondents were asked
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20 9 about their experiences with the service and the time spent using the service compared to conventional
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22 10 methods (e.g. phone, office visit). Demographic characteristics of the users included information on
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24 11 gender, age, education level, health-related background, computer literacy, and work status. Use of
25
26 12 the services was explored through questions related to which of the four e-health services had been
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28 13 accessed by the respondents and, for electronic booking of appointments only, which of the two
29
30 14 possible options was used. Patients' experiences with the services were evaluated through a number
31
32 15 of questions concerning perceived benefits (quality of care, communication with the GP office,
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34 16 formulation of an inquiry, efficiency) and satisfaction (with technology, security, information and
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36 17 educational material, overall satisfaction, and future use).
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42 18 Questions on demographic characteristics and use of the services were multiple choice with a number
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44 19 of alternatives ranging from 2 to 8 depending on the questions. Questions concerning users'
45
46 20 experiences were scored on a 5-point Likert scale (1=strongly agree, 2=agree, 3=neutral, 4=disagree,
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48 21 5=strongly disagree). Respondents were also able to refrain from providing an answer by selecting
49
50 22 "no opinion". One non-mandatory open-ended question was also included for each of the four e-
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52 23 health services. The information was provided only by those respondents who were willing to provide
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54 24 additional feedbacks on their experience with the service.
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57

58 25 The online survey was developed by the Norwegian Centre for E-health Research in collaboration
59
60 26 with the Centre for Quality Improvement in Medical Practice (SKIL) and the Norwegian Directorate

1 of eHealth. The survey was published on the national portal helsenorge.no by the Norwegian
2 Directorate of eHealth. The link to the survey was available for a period of 2 weeks. All information
3 collected through the survey was anonymized and not personally identifiable. The Checklist for
4 Reporting Results of Internet E-Surveys (CHERRIES) was used to develop the survey and report its
5 results [22]. The online survey was developed with the online data collection solution Questback
6 Essentials (Oslo, Norway) and its technical functionality tested before being published.

7 **Data analysis**

8 Respondents were analyzed by gender and age according to the following groups: 16-24 year, 25-34
9 year, 35-44 year, 45-54 year, 55-64 year, and over 65 year. Population data for the year 2017 were
10 retrieved from Statistics Norway and used to compare the demographic characteristics of the users of
11 digital health services in primary care with patients attending their GP face-to-face and the general
12 population. Participation and completion rates were not reported as data on unique visitors were not
13 available. The selection of respondents to this survey was assumed to be representative of those who
14 actually used the services. Data on patients' use and experiences with the service were summarized
15 by descriptive statistics as well as by diagrams. In the analysis of the questions concerning users'
16 satisfaction with the service, results were summarized by the proportion of respondents who agreed
17 with a certain aspect (scores 1 and 2) and those who disagreed (scores 4 and 5). Differences between
18 time spent using e-consultation and other digital health services with the GP and time spent via
19 conventional methods (e.g. phone, office visit) were analyzed with the Wilcoxon signed-rank test. A
20 P-value < 0.05 was considered significant.

21 Qualitative data provided in the open text fields for each of the four e-health services were used to
22 support and supplement the quantitative data. The content of these answers was analyzed and
23 categorized into "positive" (e.g. perceived benefits, good user experiences), "neutral" or "negative"
24 (perceived disadvantages, poor user experiences, suggestions for service improvement). Answers
25 categorized as "negative" were further analyzed in detail as these were found to be more significant
26 and diverse than those categorized as "positive" (often described by short statements such as

1
2 1 “working fine for me”). Answers were subject to a content analysis [29] and summarized into two
3
4 2 levels: i) common opinions reported by several respondents, and ii) individual opinions containing
5
6 3 strong anecdotal experiences.
7
8

9 4 Data analysis was performed by the Norwegian Centre for E-health Research from January 2017 to
10
11 5 April 2018. Data were extracted in Excel and further analyzed in IBM SPSS Statistics (Version 25.0,
12
13 6 Armonk, NY: IBM Corp.).
14
15

16 7 **Patient and public involvement**

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18
19 8 The four e-health services evaluated in this study were part of a national initiative led by the
20
21 9 Norwegian Directorate of eHealth. The services were implemented on a large-scale and accessible to
22
23 10 residents in Norway from the national portal helsenorge.no. It was therefore not possible to involve
24
25 11 patients or the public in the design, conduct or reporting of our research. The results of this study,
26
27 12 however, will be disseminated to the public as well as to health authorities to support the further
28
29 13 development of these services and their features.
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34 14 **Results**

35 15 **Characteristics of the users**

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38 16 The online survey was available on the national portal helsenorge.no from 14th November 2017 to
39
40 17 28th November 2017. In total 2,043 users answered to the survey [Table 1]. There was a higher
41
42 18 proportion of women among users of digital health services in primary care (64.9%) compared to
43
44 19 citizens attending their GP face-to-face (59.4%) and the general population (49.8%). Users in all age
45
46 20 groups accessed the services. There was a higher proportion of younger users [Additional file 1]
47
48 21 compared to citizens attending their GP face-to-face [Additional file 2] and the general population
49
50 22 [Additional file 3]. Moreover, there were more women among younger users, while there were more
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52 23 men among older users.
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58

59 24 Over half of the users (59%) had an education at university level or higher. Only 5.8% of the
60
25 respondents had an education at primary or secondary school level. About a fourth of the respondents

1 had a background as health professionals. The vast majority of the respondents described their data
2 literacy as average or above average, while only 5.4% of the users had a low data literacy. Over half
3 of the respondents was working at the time they answered to this survey.

4 **Patients' use of the services**

5 Electronic booking of appointments was the most used of the four digital health services with the GP
6 (66.4%), followed by electronic prescription renewal (54.3%) [Table 2]. The two other services
7 which implied a dialogue the GP office were used to a lesser degree. Almost half of the respondents
8 accessed only one of the four digital health services, while only 7.6% of the respondents used all the
9 services. Electronic booking via the GP's calendar was the most commonly used option to book
10 appointments, while sending an electronic inquiry for an appointment with a text-based message was
11 reported as less used. About 20% of the respondents used both solutions.

12 **Electronic booking of appointments**

13 Over 80% of the respondents considered it easier to book an appointment through the electronic
14 service compared to booking via phone or SMS [Figure 2]. Over half of the users agreed that they
15 could book an appointment at a more appropriate time and within shorter time. Most users agreed
16 that the technology worked well (90%), that the service was safe (93%) and that the information
17 provided on how to use the service was sufficient (81%). Overall, the vast majority of the users were
18 satisfied with the service (90%) and would recommend its use to others (85%).

19 Over 80% of the respondents agreed that they saved time by booking an appointment electronically
20 [Figure 2]. Data showed that, while patients used on average 13.5 minutes to book an appointment
21 by phone, it took only 4.4 minutes to book an appointment electronically via helsenorge.no, meaning
22 a time saving of 9.1 minutes (-67.4%). The difference was statistically significant ($p < 0.001$).

23 **Electronic prescription renewal**

24 Over 90% of the respondents thought that it was easier to renew a prescription electronically than by
25 phone [Figure 2]. Most users (76%) agreed that they obtained a better overview of their medications

1
2 1 after using the service, and about half of the respondents (46%) reported that it was easier to follow
3
4 2 their doctors' advice on use of medications. Most users agreed that the technology worked well
5
6 3 (93%), that the service was safe (95%) and that the information provided on how to use the service
7
8 4 was sufficient (81%). Overall, respondents were highly satisfied with the service (93%) and would
9
10 5 recommend its use to others (88%).
11

12
13
14 6 Over 90% of the users agreed that they saved time by renewing a prescription electronically [**Figure**
15
16 7 **2**]. Patients saved, on average, 10.5 minutes (-70.9%) each time they renewed a prescription
17
18 8 electronically compared to a renewal by phone ($p<0.001$). While it took 14.8 minutes to request to
19
20 9 renew a prescription by phone, an electronic prescription renewal via helsenorge.no took only 4.3
21
22 10 minutes.
23

24 11 **Electronic contact with the GP office**

25
26 12 Over 80% of the respondents agreed that the service allowed for an easier communication with the
27
28 13 GP office [**Figure 2**]. In particular, 60% of the users thought that it was easier to send a written
29
30 14 inquiry electronically than by phone. The vast majority of the users agreed that the technology worked
31
32 15 well (87%) and that the service was safe (91%). While the majority of the users (69%) was satisfied
33
34 16 with the information provided on how to use the service, a higher percentage (11%) compared to the
35
36 17 other services thought that the information was not sufficient. Overall, most users were satisfied with
37
38 18 the service (82%) and would recommend its use to others (77%).
39

40
41
42 19 Three-fourths (76%) of the respondents agreed that they saved time by sending an electronic enquiry
43
44 20 to the GP office rather than taking contact by phone [**Figure 2**]. Data showed that, while patients used
45
46 21 on average 15.2 minutes to the GP office by phone, it took only 5.7 minutes to send an electronic
47
48 22 inquiry via helsenorge.no, with a consequent time saving of 9.5 minutes (-62.5%). The difference
49
50 23 was statistically significant ($p<0.001$).
51

52 24 **E-consultation**

1 Results showed that 72% of the respondents experienced a better follow-up by their GP as a
2 consequence of using e-consultation, and an additional 58% reported improved quality of their
3 treatment [Figure 2]. While 41% of the respondents agreed that it was easier to explain a clinical
4 problem by written message than by oral communication, 24% expressed their preference towards a
5 traditional face-to-face appointment. The out-of-pocket fee was deemed to be acceptable by 64% of
6 the respondents. Most users agreed that the technology worked well (92%) and that the service was
7 safe (92%). As for electronic contact with the GP office, 11% of the users thought that the information
8 provided on how to use the service was not sufficient. Overall, respondents were very satisfied with
9 the service (85%) and would recommend its use to others (81%).

10 Almost 90% of the users agreed that they saved time by sending a clinical inquiry via the service
11 compared to attending a face-to-face visit. [Figure 2]. Patients saved, on average, more than one hour
12 (72.3 minutes; -88.5%) each time they used an e-consultation instead of a face-to-face appointment
13 ($p < 0.001$). While it took, on average, 81.7 minutes for a face-to-face appointment (including travel
14 time, waiting time, and visit time), an online text-based clinical consultation with the GP took only
15 9.4 minutes.

16 **Qualitative feedback on the services**

17 A total of 656 comments were provided in the open text fields. Most of the comments concerned the
18 electronic booking of appointments, while e-consultation had the lowest number of answers. About
19 half of the comments were categorized as negative feedbacks describing perceived disadvantages,
20 poor user experiences, as well as suggestions for service improvement, such as new functionalities.
21 The most commonly occurring responses and some individual opinions were selected for each service
22 [Table 3]. Moreover, four common themes across services were identified.

23 *Safety and security*

1
2 1 Respondents pointed out that they were uncertain about who read the information they send (e.g.
3
4 2 receptionist, GP). Moreover, they indicated the need for a confirmation that the request was sent and
5
6 3 received by the GP office, and information on when they could expect an answer.
7
8

9 4 *User friendliness*

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12 5 Several respondents pointed out that the interface was generally slow and little intuitive, and that it
13
14 6 worked poorly on certain web browsers, operating systems and devices.
15
16

17 7 *Time utilization*

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19
20 8 Some respondents indicated that the time elapsed from when they contacted the GP office until they
21
22 9 received an answer was perceived as more important than the time spent in using the service,
23
24 10 depending on the nature of the problem, occupational status and personal characteristics. GP offices
25
26 11 tend to keep a few slots daily available for acute visits, which can only be booked by phone. On the
27
28 12 one hand, if patients wanted to visit their GP as soon as possible, they might prefer to book an
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30 13 appointment by phone. On the other hand, full-time workers who do not have urgent issues would
31
32 14 value the possibility of asynchronous communication and spend the least amount of time.
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36 15 *Functionality for parents*

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39 16 Many of the respondents pointed out the lack of a functionality to manage their children's medical
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41 17 contact through the services.
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44 18 **Discussion**

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48 19 The «Digital dialogue with the general practitioner» introduced in Norway since 2016 is one of the
49
50 20 first examples of nationwide implementation of digital health services for citizens in primary care.
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52 21 The current study provides evidence on patients' use and experiences with e-consultation and other
53
54 22 digital health services with their GP. Overall, the services have been used by early adopters
55
56 23 (approximately 20% of all GPs offices) and the trend over the first three years of implementation
57
58 24 showed a steadily growing nationwide adoption. According to the technology adoption curve [23],
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1
2 1 the majority of users is expected to adopt the services within the next few years. From January 2018
3
4 2 to October 2018, the use of e-consultations in Norway grew from 0.8% to 2.2% of the total number
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6 3 of consultations with the GP [24]. Future use of e-consultations is estimated to account to 30% of all
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8 4 consultations with the GP [24], and up to 40% if supported by apps and wearables [25]. Similarly,
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10 5 regions in Denmark have recently set a political ambition that one third of all consultations with the
11
12 6 GP will be digital [26]. While electronic booking of appointments and electronic prescription renewal
13
14 7 seem to be widely used by patients in Norway, e-consultation and electronic contact with the GP
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16 8 office are still used at a lower degree, as indicated in a recent qualitative study [27]. Our findings are
17
18 9 in line with other studies where the use of e-consultation was low and mostly suitable for
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20 10 administrative requests, such as repeat prescriptions and test results [6,17]. In our case, electronic
21
22 11 prescription renewal and electronic contact with the GP office were introduced as separate services
23
24 12 from e-consultation.

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30 13 Time saving (work, travel, waiting) represents the most evident benefit for patients. In a study on use
31
32 14 of e-mail communication with the GP, 95% of the users perceived it as more efficient than the phone
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34 15 [7]. In the current survey, the majority of patients (85%, 92%, 76% and 89% for electronic booking
35
36 16 of appointments, electronic prescription renewal, electronic contact with the GP office and e-
37
38 17 consultation, respectively) agreed that the services were time saving. This was confirmed by the
39
40 18 differences in time spent using the digital health services compared to conventional approaches, all
41
42 19 found to be statistically significant. The highest efficiency (-88.5%) was estimated for e-consultations
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44 20 compared to face-to-face appointments. However, some users indicated that the time elapsed from
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46 21 when they contacted the GP office until they received an answer was more important than the time
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48 22 spent in using the service. Response time is recognized as an important factor in the delivery of digital
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50 23 health services in primary care. Findings from previous studies reported that the majority of patients
51
52 24 received a response within 2 days [5,17] and that a slow response was the main reason for
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54 25 dissatisfaction [5]. Despite e-consultations implemented in Norway are used for non-urgent health
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2 1 issues only, and the GP is obliged to answer the patient's inquiry within 5 working days, quicker
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4 2 response times might further improve patient satisfaction.
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7 3 Most users seemed to acknowledge the practical utility of digital services with their GP. Patients
8
9 4 could easily and efficiently book an appointment electronically, at a time more appropriate to them
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11 5 and with a shorter waiting time compared to booking via phone. Electronic prescription renewals
12
13 6 were also preferred to renewals made at the GP office. Patients also recognized that they obtained a
14
15 7 better overview of their medications and even a higher compliance. For non-clinical inquiries, most
16
17 8 respondents thought that it was easier to write electronic messages to the GP office than communicate
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19 9 by phone. For clinical enquiries, many patients agreed that use of e-consultation could lead to a better
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21 10 follow-up and even to improved quality of treatment, as suggested by other studies [7]. These were,
22
23 11 however, perceived benefits. More systematic research is needed to measure objectively clinical and
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25 12 other outcomes of interest, including cost-effectiveness and health service resource use [12]. Users
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27 13 seemed to be generally satisfied with their ability to explain a problem via e-consultation. Compared
28
29 14 to oral communication, written communication has been considered more intimate [28], as patients
30
31 15 can feel more emboldened to ask questions electronically [7]. Moreover, electronic messages can
32
33 16 support patients aiding recall and providing evidence of the exchange [7,8]. However, it is important
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35 17 that messages are concise, formal, and medically relevant [6].
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42 18 The overall satisfaction expressed by the respondents of this survey with e-consultation and digital
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44 19 health services with their GP was very high. Such result is not surprising and confirms that patients
45
46 20 have a positive attitude towards e-health services in primary care. Electronic communication with the
47
48 21 GP office has been considered convenient [9,16,28,29], appropriate [6,14], accessible [3,5,28], and
49
50 22 easy to use [3,5] by patients. Moreover, despite providers' reluctance [1] and concerns about patients'
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52 23 inappropriate and inefficient use of the technology [6], patients find the electronic communication
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54 24 with their GPs efficient compared to phone or face-to-face contacts [5,7]. The results from our survey
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56 25 indicated that the information provided to patients on how to use the services was generally
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58 26 satisfactory, but could be improved. GPs previously reported that that the electronic contact with the
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2 1 GP office was sometimes confused by the patients with e-consultation [27]. Such confusion was also
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4 2 expressed by a number of respondents to this survey. Improved patient education is needed to avoid
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6 3 improper use and inefficiency [7]. Other suggestions were provided in the open text fields, which
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8 4 included mostly feedbacks from users who were somewhat dissatisfied. Some users expressed their
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10 5 wish to use the services on behalf of their children. Furthermore, the need for a receipt (e.g. that the
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12 6 request has been successfully delivered, read by the receiver or being handled) was in demand. As
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14 7 these services were new, the frustration caused by technical issues could make some people who try
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16 8 them for the first time to go back to the traditional alternatives. It is therefore important to make the
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18 9 services functional on all platforms and easily accessible to all users, as well as provide adequate
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20 10 training [30].
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25 11 The results from this survey confirm that users of digital health services in primary care are more
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27 12 likely to be women [17,24,31] and younger adults [4,7,24,31]. These services seem to be more
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29 13 attractive to digitally active users with a higher education, as also reported by other studies [7]. Over
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31 14 half of the users (59%) had an education at university level, which is high compared to the general
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33 15 population and those accessing their GP face-to-face. Data from Statistics Norway show that, in 2017,
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35 16 33.4% of the total population over 16 in Norway had an education at university level. Moreover, the
36
37 17 vast majority of the respondents (94.6%) described their data literacy as average or above average.
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39 18 Consequently, elderly and people with low computer literacy might still need traditional alternatives
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41 19 [26]. Despite these digital health services currently catering to competent health users, less competent
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43 20 users would still benefit indirectly if such services succeed in freeing up resources in primary care.
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45 21 Reduced phone load, increased efficiency, released time for medical assessments and less crowded
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47 22 waiting rooms are, for example, advantages for GP offices which have been acknowledged in a recent
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49 23 study conducted on GP's perceptions towards the use of "Digital dialogue with the General
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51 24 Practitioner" [27].
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58 25 ***Study strengths and limitations***
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2 1 GPs offering digital health services to citizens in Norway are early adopters. As a consequence, they
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4 2 might have a more positive attitude towards innovation than the general GP population and thus be
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6 3 more enthusiastic in inviting their patients to use these services. On the other hand, the services are
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8 4 initiated directly by patients who, as early adopters, could be more inclined to use the services. Since
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10 5 the survey was completely anonymous, the potential number of patients using digital services in
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12 6 primary care who could have answered this survey was unknown. As a consequence, it was not
13
14 7 possible to calculate a response rate. Despite this, the «Digital dialogue with the general practitioner»
15
16 8 is one of the first examples of nationwide implementation of digital health services for citizens in
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18 9 primary care, and the high number of respondents to this survey is considered to be representative of
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20 10 those who used the services.
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25 11 The comments provided in the open text fields were optional, and thus the qualitative results only
26
27 12 reflect the opinion of a minority of users who were sufficiently motivated to provide a feedback. As
28
29 13 such, these comments are not representative of all users of digital health services. However, they do
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31 14 provide interesting insights and useful suggestions for improvement.
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38 16 **Conclusions**

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41 17 Citizens using e-consultation and other digital health services with their GP in Norway are highly
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43 18 satisfied and consider them as useful and efficient alternatives to conventional approaches. These
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45 19 digital health services are currently catering to competent health users, mostly women, younger
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47 20 adults, and digitally active citizens with high education. It is important to make the services functional
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49 21 on all platforms and provide adequate information and training so that they become easily accessible
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51 22 to all users, including citizens who are not digitally active.
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58 24 **List of abbreviations**

59
60 25 **GP:** general practitioner

1
2 1 **E-consultation:** electronic consultation

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5 2 **EPR:** electronic patient record

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10 4 **Declarations**

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14 5 **Funding**

15
16 6 This study was funded by the Norwegian Centre for E-health Research as part of the project
17
18
19 7 “Nytteeffektene av digitale helsetjenester”.

20
21
22 8 **Competing interests**

23
24
25 9 The authors declare that they have no competing interests.

26
27 10 **Authors’ contributions**

28
29
30 11 PZ contributed to the conception and design of the study, acquisition of data, analysis and
31
32
33 12 interpretation of data, drafting and revision of the manuscript. AJF contributed to the conception and
34
35 13 design of the study, analysis and interpretation of data, and revision of the manuscript. All authors
36
37 14 read and approved the final manuscript.

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39
40 15 **Ethics approval and consent to participate**

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42
43 16 All information collected through the survey was anonymous and not personally identifiable. The
44
45 17 participation to the survey was based on consent wherein the respondent could choose not to answer
46
47 18 the questionnaire. Ethics approval from the Regional Committees for Medical and Health Research
48
49
50 19 Ethics was not deemed necessary according to the Act on medical and health research (the Health
51
52 20 Research Act) entered into force in Norway in 2009.

53
54
55 21 **Data sharing**

56
57
58 22 The dataset analyzed during the current study is available from the corresponding author on
59
60 23 reasonable request.

1
2 1 **Acknowledgements**
3

4
5 2 We thank the Norwegian Directorate of eHealth for publishing the survey on the national portal
6
7 3 helsenorge.no.
8

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10 4 **Word count**
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13 5 5574 words.
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References

1. **Brant** H, Atherton H, Ziebland S, McKinstry B, Campbell JL, Salisbury C. Using alternatives to face-to-face consultations: a survey of prevalence and attitudes in general practice. *Br J Gen Pract*. 2016 Jul;66(648):e460-6. PMID: 27215571
2. **Santana** S, Lausen B, Bujnowska-Fedak M, Chronaki CE, Prokosch HU, Wynn R. Informed citizen and empowered citizen in health: results from an European survey. *BMC Fam Pract*. 2011 Apr 16;12:20. PMID: 21496309
3. **Tjora** A, Tran T, Faxvaag A. Privacy vs usability: a qualitative exploration of patients' experiences with secure Internet communication with their general practitioner. *J Med Internet Res*. 2005 May 31;7(2):e15. PMID: 15998606
4. **Mehrotra** A, Paone S, Martich GD, Albert SM, Shevchik GJ. Characteristics of patients who seek care via eVisits instead of office visits. *Telemed J E Health*. 2013 Jul;19(7):515-9. PMID: 23682589
5. **Liederman** EM, Morefield CS. Web messaging: a new tool for patient-physician communication. *J Am Med Inform Assoc*. 2003 May-Jun;10(3):260-70. PMID: J Am Med Inform Assoc. 2003 May-Jun;10(3):260-70. PMID: 12626378
6. **White** CB, Moyer CA, Stern DT, Katz SJ. A content analysis of e-mail communication between patients and their providers: patients get the message. *J Am Med Inform Assoc*. 2004 Jul-Aug;11(4):260-7. PMID: 15064295
7. **Houston** TK, Sands DZ, Jenckes MW, Ford DE. Experiences of patients who were early adopters of electronic communication with their physician: satisfaction, benefits, and concerns. *Am J Manag Care*. 2004 Sep;10(9):601-8. PMID: 15515992
8. **Car** J, Sheikh A. Email consultations in health care: 2--acceptability and safe application. *BMJ*. 2004 Aug 21;329(7463):439-42. PMID: BMJ. 2004 Aug 21;329(7463):439-42. PMID: 15321903
9. **Virji** A, Yarnall KS, Krause KM, Pollak KI, Scannell MA, Gradison M, Østbye T. Use of email in a family practice setting: opportunities and challenges in patient- and physician-initiated communication. *BMC Med*. 2006 Aug 15;4:18. PMID: 16911780
10. **Atherton** H, Sawmynaden P, Sheikh A, Majeed A, Car J. Email for clinical communication between patients/caregivers and healthcare professionals. *Cochrane Database Syst Rev*. 2012 Nov 14;11:CD007978. PMID: 23152249
11. **Sawmynaden** P, Atherton H, Majeed A, Car J. Email for the provision of information on disease prevention and health promotion. *Cochrane Database Syst Rev*. 2012 Nov 14;11:CD007982. PMID: 23152250
12. **Atherton** H. Use of email for consulting with patients in general practice. *Br J Gen Pract*. 2013 Mar;63(608):118-9. PMID: 23561755
13. **Helse- og omsorgsdepartementet**. Høring: Forslag til ny forskrift om pasientjournal (pasientjournalforskriften). 2018. https://www.regjeringen.no/contentassets/bc66ebd8e7714bf6b0f3753e7c1dcdca/hoerings_pasientjournalforskriften.pdf Accessed 20 May 2019.
14. **Albert** SM, Shevchik GJ, Paone S, Martich GD. Internet-based medical visit and diagnosis for common medical problems: experience of first user cohort. *Telemed J E Health*. 2011 May;17(4):304-8. PMID: 21457013
15. **Baker** L, Rideout J, Gertler P, Raube K. Effect of an Internet-based system for doctor-patient communication on health care spending. *J Am Med Inform Assoc*. 2005 Sep-Oct;12(5):530-6. PMID: 15905484
16. **Powell** RE, Henstenburg JM, Cooper G, Hollander JE, Rising KL. Patient Perceptions of Telehealth Primary Care Video Visits. *Ann Fam Med*. 2017 May;15(3):225-229. PMID: 28483887
17. **Edwards** HB, Marques E, Hollingworth W, Horwood J, Farr M1, Bernard E, Salisbury C, Northstone K. Use of a primary care online consultation system, by whom, when and why: evaluation of a pilot observational study in 36 general practices in South West England. *BMJ Open*. 2017 Nov 22;7(11):e016901. PMID: 29167106
18. **Sørensen** T, Johansen MA. Developing and Implementing Patients' Full-Scale Electronic Access to Their Health Record. *Stud Health Technol Inform*. 2016;228:85-9. PMID: 27577347
19. **Helsedirektoratet**. Digital dialog mellom pasient og fastlege: nåsituasjon. Delleveranse i arbeid med gevinstrealisering. 2014.
20. **Himmelstein** DU, Woolhandler S. Hope and hype: predicting the impact of electronic medical records. *Health Aff (Millwood)*. 2005 Sep-Oct;24(5):1121-3. PMID: 16162553
21. **Ross** J, Stevenson F, Lau R, Murray E. Factors that influence the implementation of e-health: a systematic review of systematic reviews (an update). *Implement Sci*. 2016 Oct 26;11(1):146. PMID: 27782832
22. **Eysenbach** G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res*. 2004 Sep 29;6(3):e34. PMID: 15471760
23. **Rogers** EM. Diffusion of innovations. New York: The Free Press; 1983.
24. **Helsedirektoratet**, Direktoratet for e-helse. E-konsultasjon hos fastlege og legevakt. Rapport til helse- og omsorgsdepartementet. 2018. <https://ehelse.no/Documents/Nasjonale%20utvalg/NUFA/Vedlegg%208A%20Sak%209-19%20E-Konsultasjon.pdf> Accessed 20 May 2019.
25. **Accenture**. Vårt nye digitale norge. Fremtidige muligheter og hva som kreves for å lykkes med digitalisering av offentlige tjenester. https://www.accenture.com/_acnmedia/PDF-59/Accenture-Digitale-Norge-2.pdf#zoom=50 Accessed 20 May 2019.
26. **Danske regioner**. Trygt, nært og nemt. Regionernes strategi for fremtidens sundhedsvæsen. 2018. <http://www.e-pages.dk/regioner/148/html5/> Accessed 20 May 2019.
27. **Fagerlund** AJ, Holm IM, Zanaboni P. General practitioners' perceptions towards the use of digital health services for citizens in primary care: a qualitative interview study. *BMJ Open*. 2019 May 5;9(5):e028251. PMID: 31061056
28. **Katz** SJ, Moyer CA, Cox DT, Stern DT. Effect of a triage-based E-mail system on clinic resource use and patient and physician satisfaction in primary care: a randomized controlled trial. *J Gen Intern Med*. 2003 Sep;18(9):736-44. PMID: 12950483
29. **Leong** SL, Gingrich D, Lewis PR, Mauger DT, George JH. Enhancing doctor-patient communication using email: a pilot study. *J Am Board Fam Pract*. 2005 May-Jun;18(3):180-8. PMID: 15879565
30. **Lugtenberg** M, Pasveer D, van der Weijden T, Westert GP, Kool RB. Exposure to and experiences with a computerized decision support intervention in primary care: results from a process evaluation. *BMC Fam Pract*. 2015 Oct 16;16:141. PMID: 26474603
31. **Socialstyrelsen**. Digitala vårdtjänster riktade till patienter. Kartläggning och uppföljning. 2018. <https://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/21111/2018-11-2.pdf> Accessed 20 May 2019.

Tables

Table 1. Demographic characteristics of the users.

Users (n)	2,043
Gender, n (%)	
Male	717 (35.1%)
Female	1326 (64.9%)
Age, n (%)	
16-24	153 (7.5%)
25-34	394 (19.3%)
35-44	350 (17.1%)
45-54	440 (21.5%)
55-64	387 (18.9%)
over 65	319 (15.6%)
Education, n (%)	
Primary school / lower secondary school	119 (5.8%)
High school (general)	407 (19.9%)
High school (vocational)	304 (14.9%)
University (3 years)	644 (31.5%)
University (more than 3 years)	569 (27.9%)
Health-related background, n (%)	
Yes	509 (24.9%)
No	1534 (75.1%)
Data literacy, n (%)	
Far below average	24 (1.2%)
Below average	86 (4.2%)
Average	984 (48.2%)
Above average	738 (36.1%)
Far above average	211 (10.3%)
Work status, n (%)	
Working	1159 (56.7%)
Homemaker	15 (0.7%)
Retired	266 (13.0%)
Unemployed	44 (2.2%)
Student	132 (6.5%)
Sick leave	187 (9.2%)
Disability pension	186 (9.1%)
Other	54 (2.6%)

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60**Table 2.** Patients' use of e-consultation and other digital health services with the GP.

Access to services, n (%)	
electronic booking of appointments	1356 (66.4%)
electronic prescription renewal	1109 (54.3%)
electronic contact with the GP office	528 (25.8%)
e-consultation	762 (37.3%)
Number of services accessed by respondents, n (%)	
1	982 (48.1%)
2	566 (27.7%)
3	339 (16.6%)
4	156 (7.6%)
Use of electronic booking of appointments, n (%)	
GP's calendar	793 (58.5%)
electronic inquiry	294 (21.7%)
both	269 (19.8%)

Table 3. Most commonly occurring responses and selected anecdotal statements the for the four e-health services.

Electronic booking of appointments	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Want to be able to book urgent appointments	The availability of bookable slots is poor
Want the possibility to book appointment for own children	Want the possibility to cancel appointments
Want to be able to attach a comment to the appointment enquiry	Want a mobile application with push notifications
Electronic prescription renewal	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Want a receipt that the enquiry is sent and estimated time to answer	Hard to spell the medical names correctly
Want a list of expired prescriptions with a "renew" button	Risk to mix up prescriptions (e.g. melting tablets, debot tablets)
Want the possibility to manage own children's prescriptions	Poor readability when lists are long and complicated
Electronic contact with the GP office	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Want a receipt that the message is read	Easier to call by phone than to write
Service can be confused with e-consultation	Uncertain about who reads the message
Service not easy to navigate	Want to send a message on behalf of own children
E-consultation	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Unreasonable that out-of-pocket payment is charged	Want a receipt that the message is read and estimated time to answer
The present limit of 1,000 characters for messages is too short	Want the possibility to write on behalf of own children
Want an autosave function so that the text is not lost while writing	Written communication is not suited for clinical contact

Figures

Figure 1. GP offices adopting the “Digital dialogue with the general practitioner”.

Figure 2. Patients’ experiences, perceived benefits and satisfaction with the four e-health services.

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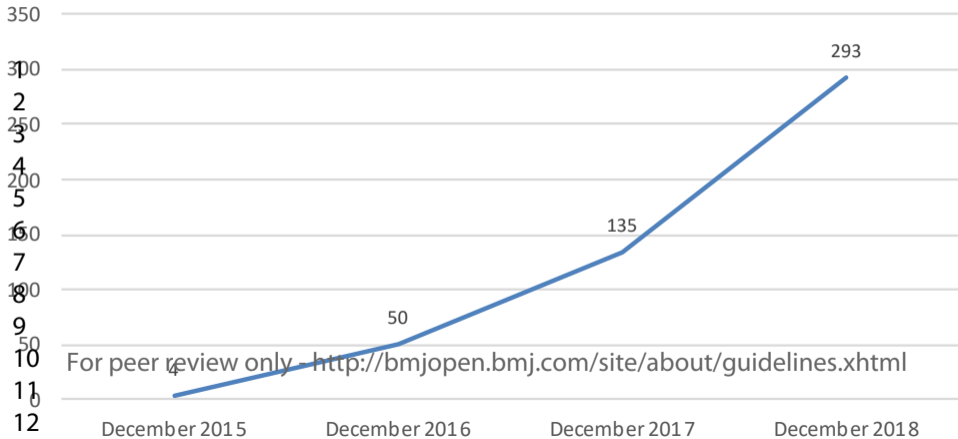
Supplementary files

Supplementary file 1. Distribution (%) of users of digital health services with the GP by gender and age groups.

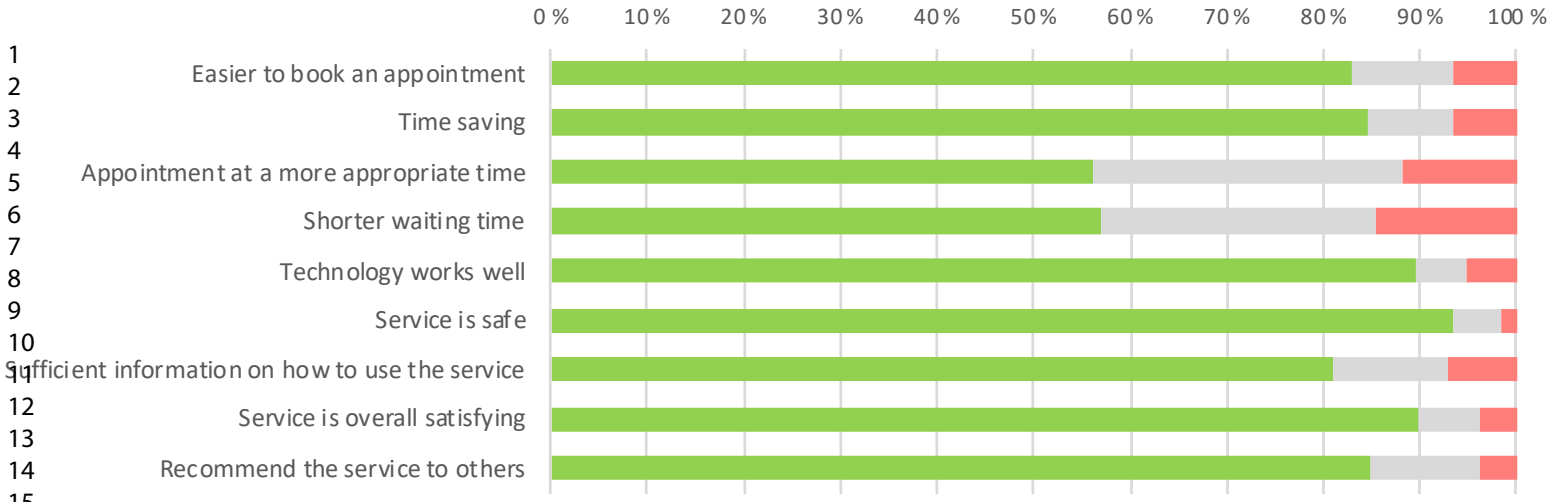
Supplementary file 2. Distribution (%) of face-to-face consultations with the GP by gender and age groups.

Supplementary file 3. Distribution (%) of the general population by gender and age groups.

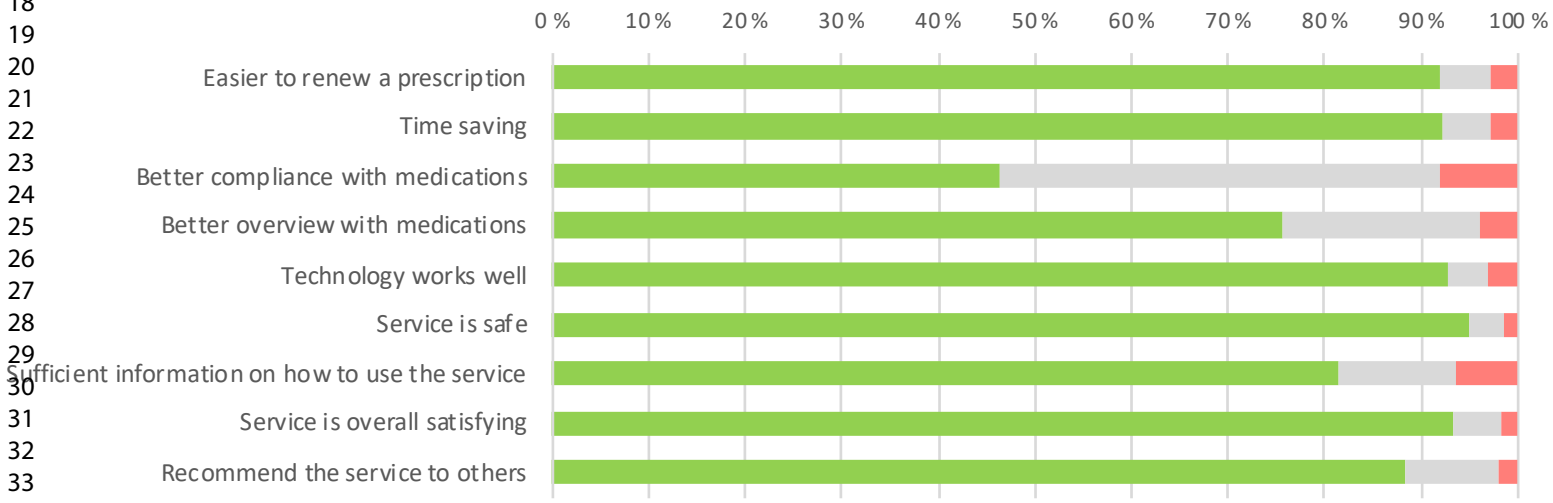
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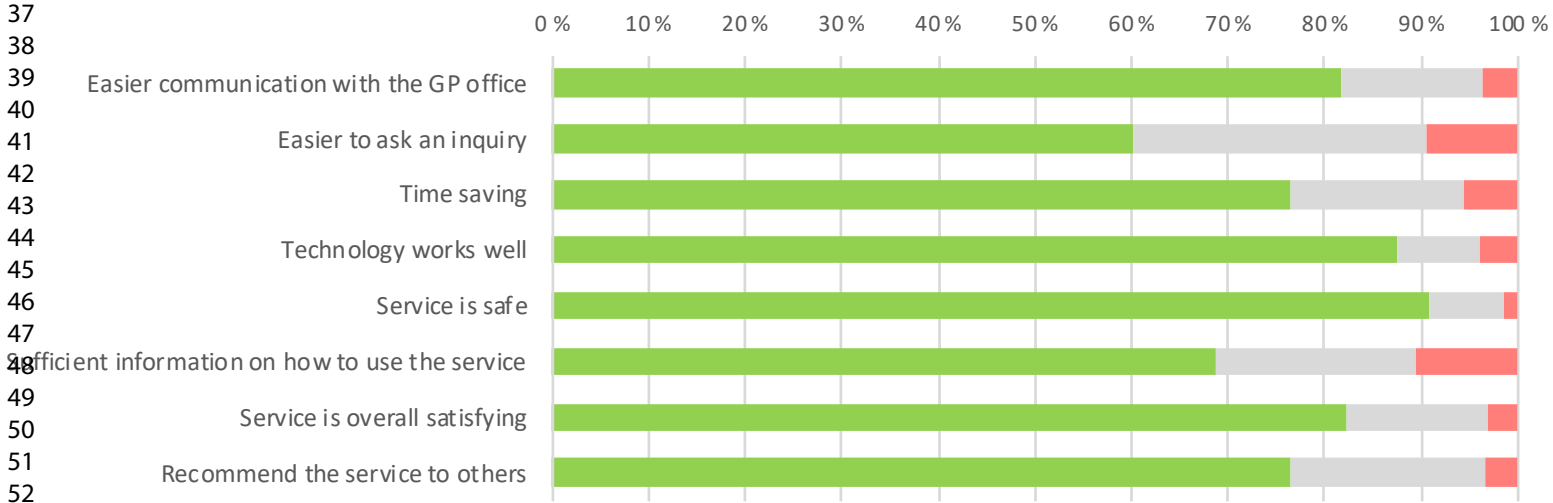
Electronic booking of appointments



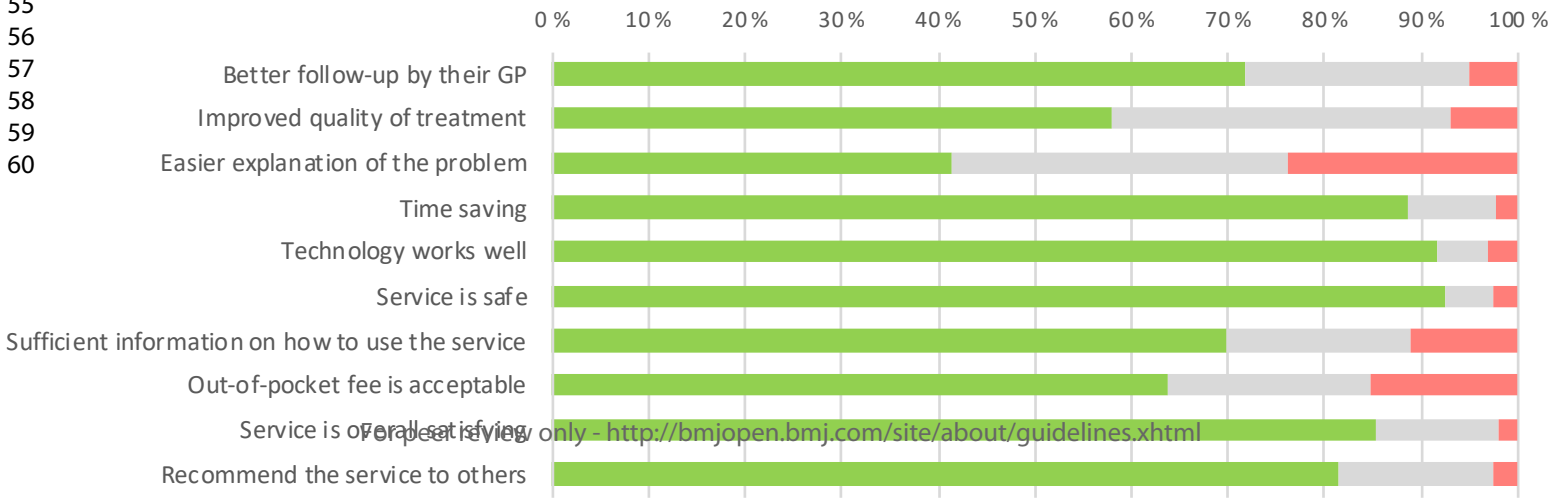
Electronic prescription renewal

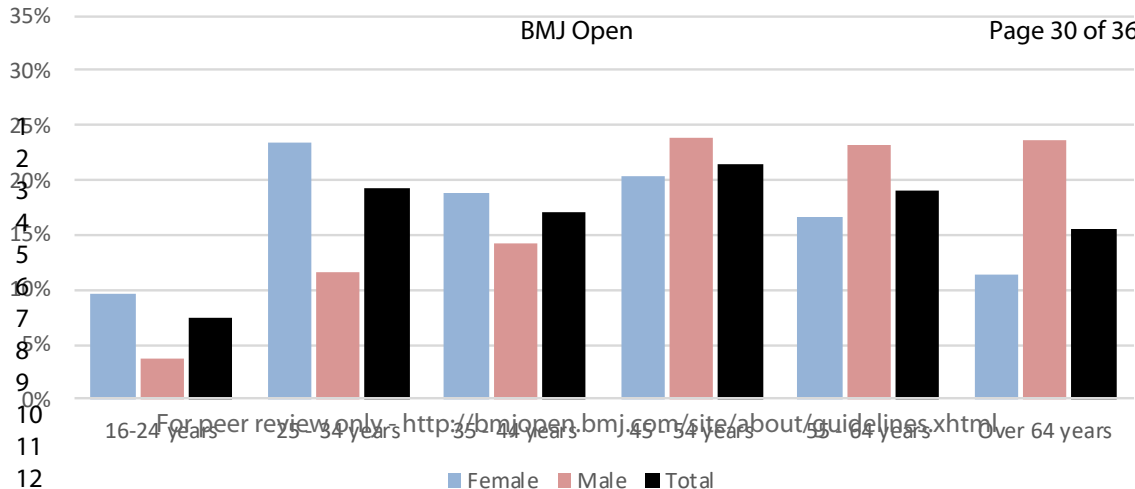


Electronic contact with the GP office



E-consultation





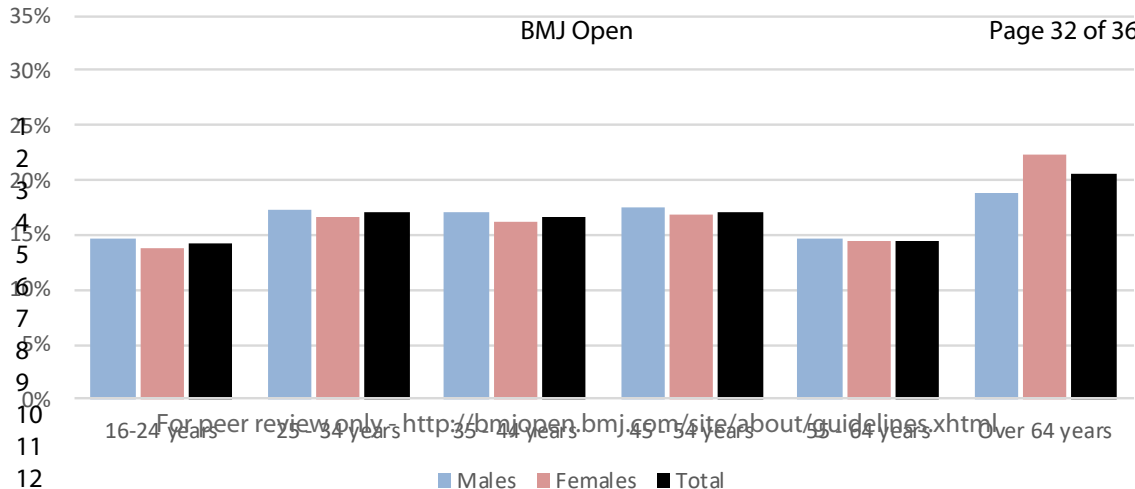
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Female Male Total

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Checklist for Reporting Results of Internet E-Surveys (CHERRIES)


**Checklist for Reporting Results of Internet E-Surveys
(CHERRIES)**

<i>Item Category</i>	<i>Checklist Item</i>	<i>Explanation</i>
Design	Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In “open” surveys this is most likely.)
IRB (Institutional Review Board) approval and informed consent process	IRB approval	Mention whether the study has been approved by an IRB.
	Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?
	Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.
Development and pre-testing	Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.
Recruitment process and description of the sample having access to the questionnaire	Open survey versus closed survey	An “open survey” is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).

Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?
Time/Date	In what timeframe were the data collected?
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.

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18 **Survey**
19 **administration**
20

1	Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.
2		
3	Number of screens	Over how many pages was the questionnaire distributed? The number of items is an
4	(pages)	important factor for the completion rate.
5		
6	Completeness check	It is technically possible to do consistency or
7		completeness checks before the
8		questionnaire is submitted. Was this done,
9		and if “yes”, how (usually JavaScript)? An
10		alternative is to check for completeness after
11		the questionnaire has been submitted (and
12		highlight mandatory items). If this has been
13		done, it should be reported. All items should
14		provide a non-response option such as “not
15		applicable” or “rather not say”, and selection
16		of one response option should be enforced.
17		
18	Review step	State whether respondents were able to
19		review and change their answers (eg,
20		through a Back button or a Review step
21		which displays a summary of the responses
22		and asks the respondents if they are correct).
23		
24		
25		
26		
27		

Response rates

28		
29	Unique site visitor	If you provide view rates or participation
30		rates, you need to define how you
31		determined a unique visitor. There are
32		different techniques available, based on IP
33		addresses or cookies or both.
34		
35	View rate (Ratio of	Requires counting unique visitors to the first
36	unique survey	page of the survey, divided by the number of
37	visitors/unique site	unique site visitors (not page views!). It is
38	visitors)	not unusual to have view rates of less than
39		0.1 % if the survey is voluntary.
40		
41	Participation rate	Count the unique number of people who
42	(Ratio of unique	filled in the first survey page (or agreed to
43	visitors who agreed to	participate, for example by checking a
44	participate/unique first	checkbox), divided by visitors who visit the
45	survey page visitors)	first page of the survey (or the informed
46		consents page, if present). This can also be
47		called “recruitment” rate.
48		
49	Completion rate	The number of people submitting the last
50	(Ratio of users who	questionnaire page, divided by the number of
51	finished the	people who agreed to participate (or
52	survey/users who	submitted the first survey page). This is only
53	agreed to participate)	relevant if there is a separate “informed
54		consent” page or if the survey goes over
55		several pages. This is a measure for attrition.
56		Note that “completion” can involve leaving
57		questionnaire items blank. This is not a
58		
59		
60		

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measure for how completely questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)

1
2
3 **Preventing multiple**
4 **entries from the**
5 **same individual**
6

7 Cookies used

8 Indicate whether cookies were used to assign
9 a unique user identifier to each client
10 computer. If so, mention the page on which
11 the cookie was set and read, and how long
12 the cookie was valid. Were duplicate entries
13 avoided by preventing users access to the
14 survey twice; or were duplicate database
15 entries having the same user ID eliminated
16 before analysis? In the latter case, which
17 entries were kept for analysis (eg, the first
18 entry or the most recent)?
19

20
21 IP check

22 Indicate whether the IP address of the client
23 computer was used to identify potential
24 duplicate entries from the same user. If so,
25 mention the period of time for which no two
26 entries from the same IP address were
27 allowed (eg, 24 hours). Were duplicate
28 entries avoided by preventing users with the
29 same IP address access to the survey twice;
30 or were duplicate database entries having the
31 same IP address within a given period of
32 time eliminated before analysis? If the latter,
33 which entries were kept for analysis (eg, the
34 first entry or the most recent)?
35

36
37 Log file analysis

38 Indicate whether other techniques to analyze
39 the log file for identification of multiple
40 entries were used. If so, please describe.

41 Registration

42 In “closed” (non-open) surveys, users need
43 to login first and it is easier to prevent
44 duplicate entries from the same user.
45 Describe how this was done. For example,
46 was the survey never displayed a second
47 time once the user had filled it in, or was the
48 username stored together with the survey
49 results and later eliminated? If the latter,
50 which entries were kept for analysis (eg, the
51 first entry or the most recent)?
52

53
54 **Analysis**
55

56 Handling of
57 incomplete
58 questionnaires

59 Were only completed questionnaires
60 analyzed? Were questionnaires which
terminated early (where, for example, users
did not go through all questionnaire pages)
also analyzed?

Questionnaires submitted with an atypical timestamp

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Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.

Statistical correction

Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.

For peer review only

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Patients' use and experiences with e-consultation and other digital health services with their general practitioner in Norway: results from an online survey

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1 Patients' use and experiences with e-consultation and 2 other digital health services with their general 3 practitioner in Norway: results from an online survey

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16 17 **ABSTRACT**

18 **Objectives:** To explore patients' use and experiences with four digital health services implemented
19 in Norway to enable electronic communication between patients and their GP: (1) electronic booking
20 of appointments; (2) electronic prescription renewal; (3) electronic contact with the GP office for
21 non-clinical inquiries; (4) e-consultation for clinical inquiries.

22 **Design:** An online survey consisting of quantitative data supplemented by qualitative information
23 was conducted to explore: (1) characteristics of the users; (2) use; (3) experiences, perceived benefits
24 and satisfaction; (4) time spent using the digital health services.

25 **Setting:** Primary care.

26 **Participants:** 2,043 users of the digital health services answering the survey.

27 **Results:** There was a higher proportion of women, younger adults, and digitally active citizens with
28 high education. Electronic booking of appointments was the most used service (66.4%), followed by
29 electronic prescription renewal (54.3%). Most users (80%) could more easily and efficiently book an
30 appointment electronically than by phone. Over 90% of the respondents thought that it was easier to
31 renew a prescription electronically, 76% obtained a better overview of their medications and 46%
32 reported higher compliance. For non-clinical inquiries, most respondents (60%) thought that it was
33 easier to write electronic messages than communicate by phone. For clinical enquiries, many patients
34 agreed that e-consultation could lead to a better follow-up (72%) and improved quality of treatment
35 (58%). Users were highly satisfied with the services and recommended their use to others. Time

1
2 1 saving was the most evident benefit for patients. This was confirmed by the differences in time spent
3
4 2 using the digital health services compared to conventional approaches, all found to be statistically
5
6 3 significant.

7 4 **Conclusions:** Citizens using e-consultation and other digital health services with their GP in Norway
8
9 5 are satisfied and consider them as useful and efficient alternatives to conventional approaches.

10
11 6

12 7 **ARTICLE SUMMARY**

14 8 **Strengths and limitations of this study**

- 16 9 • One of the first examples of nationwide implementation of digital health services for citizens in
17 10 primary care
 - 19 11 • The quantitative survey was supplemented by qualitative feedbacks with interesting insights and
20 12 useful suggestions for improvement
 - 23 13 • High number of respondents considered to be representative of those who used the services
 - 25 14 • Respondents were early adopters who could be have a more positive attitude
 - 26 15 • Findings are relevant to citizens, general practitioners and policy-makers
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1 **Background**

2 The increasing demand in primary care within a limited capacity and the need to improve patients'
3 access has prompted the consideration of alternatives to face-to-face contacts with the General
4 Practitioner (GP), including telephone contacts as well as electronic communication, such as email,
5 electronic messaging via patient portals, or Internet video [1,2]. Electronic communication between
6 patients and physicians has the potential to empower patients [3] and improve health care services
7 [4]. There is also growing recognition that many patient encounters do not require face-to-face
8 contact, and the increasing use of the Internet creates the opportunity for remote consultations, where
9 the interaction between physician and patient is completely virtual [5].

10 In the early 2000s, a number of studies on e-mail communication between patients and GP were
11 conducted. Patients found e-mail communication easy to use [6,7] and preferred it over phone calls
12 for the communication of non-urgent problems [6,8,9], including updates to the GP, prescription
13 renewals, health questions, questions about test results or referrals, appointments, and requests for
14 non-health-related information [8,9,10]. However, the empirical evidence for the use of email for
15 clinical communication between patients and healthcare professionals [11] and for the provision of
16 information on disease prevention and health promotion [12] remains limited. Despite email being
17 commonly offered by GP offices for making appointments and renewing prescriptions, its use for
18 direct contact with the GP is not commonplace [13]. In a retrospective observational study, even
19 though email consultation was adopted by half of the general practices in the Netherlands in 2014, its
20 actual use was extremely low [14]. Moreover, the security level for regular email is considered
21 insufficient [4] and non-compliant to current requirements for authentication and encryption [15].

22 Today, the electronic communication between patients and GP is generally done in an asynchronous
23 manner via a secure electronic patient portal [5,16,17]. Web messaging systems address issues around
24 security and liability associated with conventional email communication since they offer encryption
25 capability and access controls [6,13]. The GP Online is a national programme introduced in the UK

1
2 1 in 2016 to offer online services to primary care patients in addition to the traditional telephone and
3
4 2 face-to-face means of interacting with a GP practice [18]. Patients can access online services through
5
6 3 patient portals, enabling them to book and manage appointments, order repeat prescriptions and view
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8 4 their GP medical records [19]. In 2019, the NHS app was introduced to contrast the slow progress in
9
10 5 widescale adoption of these services and provide a better solution to patients [20]. Through the NHS
11
12 6 app, citizens can now identify themselves through the national Citizen Identity tool and use additional
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14 7 facilities including a symptom checker and access to donor information [20]. Some private providers
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16 8 are also offering access to GP consultations via mobile or online triage platforms, including
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18 9 askmyGP, eConsult and Egton Online Triage [20,21]. Such forms of electronic communication have
19
20 10 been considered by patients as equivalent or better than face-to-face contacts [22] and represent an
21
22 11 appropriate and potentially cost-saving addition to in-person delivery of primary care [22,23].
23
24 12 Patients also experienced easier access to their GP for minor health problems, and received quick
25
26 13 responses to their requests [4]. A recent evaluation of an online consultation system tested in 36
27
28 14 general practices in South West England found that the use of online consultations was very low (2
29
30 15 per 1,000 patients per month), more common among women and working-age adults, and mostly
31
32 16 suitable for administrative requests, such as repeat prescriptions and test results [24]. According to
33
34 17 the recent NHS long term plan, all patients in England is expected to have access to online GP
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36 18 consultations by 2023-24 [25].

37
38 19 Electronic communication between patients and GP can also be conducted through real-time video
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40 20 linkage [5]. Benefits of video communication in primary care compared to in-person encounters
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42 21 include convenience, efficiency, communication, privacy, and comfort [26]. In 2014, the UK
43
44 22 government made a commitment to spend £3.6 million on the introduction of Skype video calling
45
46 23 consultations in general practice [27]. Evidence of the use and effects of video communication in
47
48 24 primary care is still scarce. Preliminary studies aimed at exploring the attitudes of GPs towards video
49
50 25 consultations in Australia and UK concluded that the majority of the GPs recognized potential
51
52 26 benefits but also expressed concerns [27,28].

Digital dialogue with the general practitioner in Norway

The «Digital dialogue with the general practitioner» implemented in Norway is a suite of four e-health services which enable secure communication between patients and their GP over the Internet.

The four digital services include: (1) an electronic booking service to make appointments with the GP; (2) an electronic prescription service to request renewal of maintenance drugs, with direct integration with the electronic prescription system of pharmacies; (3) a service for electronic contact with the GP office for text-based non-clinical inquiries (e.g. opening hours, results from diagnostic tests) as an alternative to phone calling; (4) a service for electronic consultation (e-consultation) with the GP for clinical inquiries. The distinction between e-consultation and electronic contact is that an e-consultation must include a medical evaluation equivalent to a face-to-face consultation [5].

The four services were introduced simultaneously in September 2014 and tested by selected GP offices. Following a pilot stage, the «Digital dialogue with the general practitioner» was implemented nationwide in 2016. Its use by GPs is not mandatory. By December 2019, these services were offered via the national health portal helsenorge.no by a total 386 GP offices (out of 1,542 offices) which volunteered as early adopters [Figure 1]. These services are accessible to residents in Norway aged 16 years or older from the private section of the national portal helsenorge.no available after login. The national health portal was established in 2011 to provide health information and accommodate digital health services gathered in one place [29]. Secure access is obtained through a unique identification and authentication procedure via a national ID portal with Security Level 4 (the same authentication procedure used for Internet-banking). All the four services are integrated with the GP's electronic patient record (EPR) system. GPs who adhere to this national initiative and offer these services to their patients are able to receive and send sensitive information and communicate digitally via their own EPR system, and the information exchange is documented in the journal. The services can be activated and deactivated by each GP. This makes it possible to use only some of the four services. The services are supported by the Norwegian Health Network and the EPR suppliers.

1
2 1 The presented suite of e-health services between patient and GP has the potential to improve the
3
4 2 accessibility, quality and efficiency of primary health care. According to the Norwegian Directorate
5
6 3 of Health, e-consultation and other digital health services with the GP might result in a number of
7
8 4 possible benefits for patients including: digital communication with their GP which ensures
9
10 5 confidentiality, information security and privacy; time savings (work, travel, waiting); faster
11
12 6 detection or treatment of serious diagnoses; possibility to contact their GP at any time, even when on
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14 7 holiday; easier formulation of a request for health assistance or practical inquiry by written message
15
16 8 than by oral communication [30]. Despite these expected benefits, there is limited research-based
17
18 9 knowledge of the effects of the implementation of the «Digital dialogue with the general practitioner»
19
20 10 in Norway. Governments and vendors have been criticized for being overly optimistic about the
21
22 11 expected favorable outcomes from employing digital health services [31], and the realization of these
23
24 12 benefits has often been slower than anticipated [32]. There is a strong need for those undertaking the
25
26 13 implementation of e-health to understand factors that affect implementation [32]. However, to date,
27
28 14 only few studies have been performed on large-scale implementation of digital health services for
29
30 15 citizens in primary care.

36 16 **Study aim**

37 17 The aim of the present study was to explore patients' use and experiences with e-consultation and
38
39 18 other digital health services with their GP implemented in Norway. A survey consisting of
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41 19 quantitative data supplemented by qualitative information was conducted to explore: (1) the
42
43 20 characteristics of the users; (2) the use of e-consultation and other digital health services with the GP;
44
45 21 (3) experiences, perceived benefits and satisfaction with e-consultation and other digital health
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47 22 services with the GP; and (4) time spent using e-consultation and other digital health services with
48
49 23 the GP compared to conventional methods (e.g. phone, office visit).

56 24 57 58 25 **Methods**

1 **Description of the digital health services**

2 The «Digital dialogue with the general practitioner» is a suite of four e-health services which enable
3 secure communication between patients and their GPs over the Internet.

4 ***Electronic booking of appointments***

5 The service includes two possible options for electronic booking of appointments. The GP can make
6 time slots available for electronic booking via helsenorge.no. The patient can choose among the time
7 slots available in their GP's calendar and book an appointment directly through the
8 service. Alternatively, the patient can to send an electronic inquiry for an appointment with a text-
9 based message via the system without selecting a specific time slot. In this case, the GP office will
10 find a free time slot. This can be useful to book an appointment for children or other relatives who
11 are not digitally active. Once the patient has been assigned an appointment, the system sends out a
12 confirmation via SMS. The text message does not contain sensitive information. Each GP can decide
13 which times slots are made available for electronic booking. The GP can also decide which of the
14 two alternatives to offer to their patients. Normally, appointments can be made available four to five
15 weeks in advance.

16 ***Electronic prescription renewal***

17 Patients can send a message to their GP and ask for a prescription renewal of maintenance
18 medications or medical equipment. The prescription service available via helsenorge.no provides an
19 overview of all prescriptions and which of them are active. The GP office receives a message from
20 the patient into the EPR system containing which prescriptions the patient wishes to renew. It is
21 possible to ask for renewal of multiple prescriptions within one request. GP offices have established
22 routines for which types of medications can be renewed without a face-to-face consultation (e.g. by
23 phone), and this also applies to the electronic prescription renewal service. The doctor who approves
24 an electronic prescription renewal must make an individual medical assessment of the validity of the
25 prescription. The most common routine today is to allow prescription renewals without a face-to-face

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2 1 consultation when maintenance medications must be renewed before the patient is due for control
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4 2 (with the exception of certain addictive prescription medications). The inquiry for an electronic
5
6 3 prescription renewal contains a free text field with the description of which medications the patient
7
8 4 wishes to renew (name, dosage form, dosage) and an additional comment field. The GP can accept
9
10
11 5 or reject the request. In both cases, a confirmation is sent to the patient.
12

13 14 6 ***Electronic contact with the GP office***

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16
17 7 This service provides patients with a secure communication channel with the GP office. The service
18
19 8 can be used for text-based non-clinical inquiries (e.g. opening hours, results from diagnostic tests) as
20
21 9 an alternative to a phone call to the reception at the GP office. The service can also be utilized to send
22
23 10 mail digitally to the patient and can include attachments (PDF, JPG or PNG). The questions are
24
25 11 normally answered by the reception at the GP office. The service is not intended for providing health
26
27 12 assistance. Examples where the electronic contact with the GP office can be used include: booking
28
29 13 and confirmation (time, location) of patient transport otherwise done by phone; practical short
30
31 14 questions (e.g. holidays); practical questions before an appointment or clinical examination. Health
32
33 15 personnel can also initiate an electronic dialogue with the patient if the patient is digitally active
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35 16 (marked in the EPR system). The service is free of charge for the patient. In case a patient should
36
37 17 improperly ask for health assistance via this service, the GP office will ask the patient to initiate an
38
39 18 e-consultation instead.
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45 19 ***E-consultation***

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47
48 20 The e-consultation service evaluated in the current study is an online text-based clinical consultation
49
50 21 with the GP conducted as alternative to a face-to-face appointment. Patients pay the same out-of-
51
52 22 pocket fee as for office visits (NOK 155, approximately € 15, in 2018). To date, this service only
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54 23 applies to known health conditions, and only when physical attendance is not required. Patients need
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56 24 to book a regular appointment if new symptoms or health problems occurs. The service cannot be
57
58 25 used for immediate assistance or emergency situations. Information on what e-consultation is suitable
59
60 26 for is provided on the national health portal. Examples of situations where e-consultation can be used

1 safely include: follow-up of patients with chronic health conditions (e.g. worsening during treatment);
2 follow-up questions about use of medications (e.g. compliance, side effects, lack of effect); follow-
3 up of mild mental disorders (e.g. events that aggravate anxiety); requests for certificates and
4 statements which do not require re-examination; use of the written documentation from the e-
5 consultation for referral to a specialist. Examples where use of e-consultation is not recommended
6 include: provision of sick leave certificates; assessment of acute exacerbations; occurrence of new
7 health problems which require a new examination (e.g. severe side effects after starting with a new
8 medication); assessment of exacerbations requiring clinical examination (e.g. bothersome rashes and
9 wounds, psychiatric issues which require a dialogue); complex issues which require extensive
10 measures (e.g. worsening of chronic illness with need to review medications in case of
11 multimorbidity); issues unsuccessfully solved in previous e-consultations.

12 The use of e-consultation does not change ordinary treatment liabilities for the GP. Patients should
13 use the service according to the information provided on the national health portal. The GP must
14 independently assess whether the information provided by the patient is sufficient to be able to deliver
15 proper health care. The GP must ask the patient to book an ordinary appointment if in doubt about
16 whether a request can be resolved through an e-consultation. A specific tariff for e-consultation had
17 been introduced since 2016. The e-consultation must include a medical assessment of the patient's
18 request and is considered completed when the doctor has processed the inquiry and given the patient
19 an answer. The GP is obliged to answer the patient's inquiry within 5 working days.

20 **Study design**

21 We conducted an online survey of citizens who had activated their personal account at the national
22 health portal helsenorge.no and accessed at least one of the digital health services with the GP by
23 November 2017. The survey was available after secure login on the national health portal
24 helsenorge.no from November 14, 2017 to November 28, 2017. All active users received an invitation
25 through a pop-up window with a brief description of the study and a link to the survey.

1
2 1 The online survey included a total of 29 questions distributed over six pages. All mandatory questions
3
4 2 had to be completed before moving to the next page. Questions regarding demographic characteristics
5
6 3 of the users and use of the services were presented in two different pages. Moreover, for each of the
7
8 4 four e-health services with the GP, respondents were asked about their experiences with the service
9
10 5 and the time spent using the service compared to conventional methods (e.g. phone, office visit).
11
12 6 Demographic characteristics of the users included information on gender, age, education level,
13
14 7 health-related background, computer literacy, and work status. Use of the services was explored
15
16 8 through questions related to which of the four e-health services had been accessed by the respondents
17
18 9 and, for electronic booking of appointments only, which of the two possible options was used.
19
20 10 Patients' experiences with the services were evaluated through a number of questions concerning
21
22 11 perceived benefits (quality of care, communication with the GP office, formulation of an inquiry,
23
24 12 efficiency) and satisfaction (with technology, security, information and educational material, overall
25
26 13 satisfaction, and future use).
27
28 14 Questions on demographic characteristics and use of the services were multiple choice with a number
29
30 15 of alternatives ranging from 2 to 8 depending on the questions. Questions concerning users'
31
32 16 experiences were scored on a 5-point Likert scale (1=strongly agree, 2=agree, 3=neutral, 4=disagree,
33
34 17 5=strongly disagree). Respondents were also able to refrain from providing an answer by selecting
35
36 18 "no opinion". Four non-mandatory open-ended questions were also included so that respondents
37
38 19 could provide additional feedbacks on their experience with each of the four e-health services.
39
40 20 The online survey was developed by the Norwegian Centre for E-health Research in collaboration
41
42 21 with the Centre for Quality Improvement in Medical Practice (SKIL) and the Norwegian Directorate
43
44 22 of eHealth. The survey was published on the national health portal helsenorge.no by the Norwegian
45
46 23 Directorate of eHealth. The link to the survey was available for a period of 2 weeks. All information
47
48 24 collected through the survey was anonymized and not personally identifiable. The Checklist for
49
50 25 Reporting Results of Internet E-Surveys (CHERRIES) was used to develop the survey and report its
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1 results [33]. The online survey was developed with the online data collection solution Questback
2 Essentials (Oslo, Norway) and its technical functionality tested before being published.

3 **Data analysis**

4 Data analysis was performed by the Norwegian Centre for E-health Research from January 2017 to
5 April 2018. All questionnaires received and analyzed were completed. Respondents were analyzed
6 by gender and age according to the following groups: 16-24 year, 25-34 year, 35-44 year, 45-54 year,
7 55-64 year, and over 65 year. Population data for the year 2017 were retrieved from Statistics Norway
8 and used to compare the demographic characteristics of the users of digital health services in primary
9 care with patients attending their GP face-to-face and the general population. Participation and
10 completion rates were not reported as data on unique visitors were not available. The selection of
11 respondents to this survey was assumed to be representative of those who actually used the services.
12 Data on patients' use and experiences with the service were summarized by descriptive statistics as
13 well as by diagrams. In the analysis of the questions concerning users' satisfaction with the service,
14 results were summarized by the proportion of respondents who agreed with a certain aspect (scores
15 1 and 2) and those who disagreed (scores 4 and 5). Differences between time spent using e-
16 consultation and other digital health services with the GP and time spent via conventional methods
17 (e.g. phone, office visit) were analyzed with the Wilcoxon signed-rank test. A P-value < 0.05 was
18 considered significant. Data were extracted in Excel and further analyzed in IBM SPSS Statistics
19 (Version 25.0, Armonk, NY: IBM Corp.).

20 Qualitative data provided in the open text fields for each of the four e-health services were used to
21 support and supplement the quantitative data. The content of these answers was analyzed and
22 categorized into "positive" (e.g. perceived benefits, good user experiences), "neutral" or "negative"
23 (perceived disadvantages, poor user experiences, suggestions for service improvement). Answers
24 categorized as "negative" were further analyzed in detail as these were found to be more significant
25 and diverse than those categorized as "positive" (often described by short statements such as
26 "working fine for me"). Answers were subject to a content analysis [34] and summarized into two

1
2 1 levels: i) common opinions reported by several respondents, and ii) individual opinions containing
3
4 2 strong anecdotal experiences.

7 3 **Patient and public involvement**

8
9
10 4 The four e-health services evaluated in this study were part of a national initiative led by the
11
12 5 Norwegian Directorate of eHealth. The services were implemented on a large-scale and accessible to
13
14 6 residents in Norway from the national health portal helsenorge.no. Patient involvement in the design
15
16 7 and conduct of our research was beyond the scope of the study. The results of this study, however,
17
18 8 are intended to be disseminated to the public as well as to health authorities to support the further
19
20 9 development of these services and their features.

24 10 **Results**

28 11 **Characteristics of the users**

29
30 12 In total 2,043 users answered to the survey [**Table 1**]. There was a higher proportion of women among
31
32 13 users of digital health services in primary care (64.9%) compared to citizens attending their GP face-
33
34 14 to-face (59.4%) and the general population (49.8%). Users in all age groups accessed the services.
35
36 15 There was a higher proportion of younger users [**Supplementary file 1**] compared to citizens
37
38 16 attending their GP face-to-face [**Supplementary file 2**] and the general population [**Supplementary**
39
40 17 **file 3**]. Moreover, there were more women among younger users, while there were more men among
41
42 18 older users.

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44
45
46
47 19 Over half of the users (59%) had an education at university level or higher. Only 5.8% of the
48
49 20 respondents had an education at primary or secondary school level. About a fourth of the respondents
50
51 21 had a background as health professionals. The vast majority of the respondents described their data
52
53 22 literacy as average or above average, while only 5.4% of the users had a low data literacy. Over half
54
55 23 of the respondents was working at the time they answered to this survey.

59 24 **Patients' use of the services**

1
2 1 Electronic booking of appointments was the most used of the four digital health services with the GP
3
4 2 (66.4%), followed by electronic prescription renewal (54.3%) [Table 2]. The two other services
5
6 3 which implied a dialogue the GP office were used to a lesser degree. Almost half of the respondents
7
8 4 accessed only one of the four digital health services, while only 7.6% of the respondents used all the
9
10 5 services. Electronic booking via the GP's calendar was the most commonly used option to book
11
12 6 appointments, while sending an electronic inquiry for an appointment with a text-based message was
13
14 7 reported as less used. About 20% of the respondents used both solutions.
15
16
17

18 8 **Electronic booking of appointments**

19
20
21 9 Over 80% of the respondents considered it easier to book an appointment through the electronic
22
23 10 service compared to booking via phone or SMS [Figure 2]. Over half of the users agreed that they
24
25 11 could book an appointment at a more appropriate time and within shorter time. Most users agreed
26
27 12 that the technology worked well (90%), that the service was safe (93%) and that the information
28
29 13 provided on how to use the service was sufficient (81%). Overall, the vast majority of the users were
30
31 14 satisfied with the service (90%) and would recommend its use to others (85%).
32
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34

35
36 15 Over 80% of the respondents agreed that they saved time by booking an appointment electronically
37
38 16 [Figure 2]. Data showed that, while patients used on average 13.5 minutes (median 10 min) to book
39
40 17 an appointment by phone, it took only 4.4 minutes (median 4 min) to book an appointment
41
42 18 electronically via helsenorge.no, meaning a time saving of 9.1 minutes (-67.4%). The difference was
43
44 19 statistically significant ($p < 0.001$).
45
46
47

48 20 **Electronic prescription renewal**

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50 21 Over 90% of the respondents thought that it was easier to renew a prescription electronically than by
51
52 22 phone [Figure 2]. Most users (76%) agreed that they obtained a better overview of their medications
53
54 23 after using the service, and about half of the respondents (46%) reported that it was easier to follow
55
56 24 their doctors' advice on use of medications. Most users agreed that the technology worked well
57
58 25 (93%), that the service was safe (95%) and that the information provided on how to use the service
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1
2 1 was sufficient (81%). Overall, respondents were highly satisfied with the service (93%) and would
3
4 2 recommend its use to others (88%).
5

6
7 3 Over 90% of the users agreed that they saved time by renewing a prescription electronically [**Figure**
8
9 4 **2**]. Patients saved, on average, 10.5 minutes (-70.9%) each time they renewed a prescription
10
11 5 electronically compared to a renewal by phone ($p<0.001$). While it took 14.8 minutes (median 12.5
12
13 6 min) to request to renew a prescription by phone, an electronic prescription renewal via helsenorge.no
14
15 7 took only 4.3 minutes (median 3.5 min).
16
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18 19 8 **Electronic contact with the GP office**

20
21
22 9 Over 80% of the respondents agreed that the service allowed for an easier communication with the
23
24 10 GP office [**Figure 2**]. In particular, 60% of the users thought that it was easier to submit an inquiry
25
26 11 electronically than by phone. The vast majority of the users agreed that the technology worked well
27
28 12 (87%) and that the service was safe (91%). While the majority of the users (69%) was satisfied with
29
30 13 the information provided on how to use the service, a higher percentage (11%) compared to the other
31
32 14 services thought that the information was not sufficient. Overall, most users were satisfied with the
33
34 15 service (82%) and would recommend its use to others (77%).
35
36

37
38 16 Three-fourths (76%) of the respondents agreed that they saved time by sending an electronic enquiry
39
40 17 to the GP office rather than taking contact by phone [**Figure 2**]. Data showed that, while patients used
41
42 18 on average 15.2 minutes (median 12.5) to the GP office by phone, it took only 5.7 minutes (median
43
44 19 5 min) to send an electronic inquiry via helsenorge.no, with a consequent time saving of 9.5 minutes
45
46 20 (-62.5%). The difference was statistically significant ($p<0.001$).
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48

49 50 21 **E-consultation**

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52
53 22 Results showed that 72% of the respondents experienced a better follow-up by their GP as a
54
55 23 consequence of using e-consultation, and an additional 58% reported improved quality of their
56
57 24 treatment [**Figure 2**]. While 41% of the respondents agreed that it was easier to explain a clinical
58
59 25 problem by written message than by oral communication, 24% expressed their preference towards a
60

1
2 1 traditional face-to-face appointment. The out-of-pocket fee was deemed to be acceptable by 64% of
3
4 2 the respondents. Most users agreed that the technology worked well (92%) and that the service was
5
6 3 safe (92%). As for electronic contact with the GP office, 11% of the users thought that the information
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8 4 provided on how to use the service was not sufficient. Overall, respondents were very satisfied with
9
10 5 the service (85%) and would recommend its use to others (81%).

11
12
13
14 6 Almost 90% of the users agreed that they saved time by sending a clinical inquiry via the service
15
16 7 compared to attending a face-to-face visit. [Figure 2]. Patients saved, on average, more than one hour
17
18 8 (72.3 minutes; -88.5%) each time they used an e-consultation instead of a face-to-face appointment
19
20 9 (p<0.001). While it took, on average, 81.7 minutes (median 60 min) for a face-to-face appointment
21
22 10 (including travel time, waiting time, and visit time), an online text-based clinical consultation with
23
24 11 the GP took only 9.4 minutes (median 7.5 min).

25 26 27 28 12 **Qualitative feedback on the services**

29
30
31 13 A total of 656 comments were provided in the open text fields. Most of the comments concerned the
32
33 14 electronic booking of appointments, while e-consultation had the lowest number of answers. About
34
35 15 half of the comments were categorized as negative feedbacks describing perceived disadvantages,
36
37 16 poor user experiences, as well as suggestions for service improvement, such as new functionalities.
38
39 17 The most commonly occurring responses and some individual opinions were selected for each service
40
41 18 [Table 3]. Moreover, four common themes across services were identified.

42 43 44 45 19 *Safety and security*

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47
48 20 Respondents pointed out that they were uncertain about who read the information they submitted (e.g.
49
50 21 receptionist, GP). Moreover, they indicated the need for a confirmation that the request was sent and
51
52 22 received by the GP office, and information on when they could expect an answer.

53 54 55 23 *User friendliness*

56
57
58 24 Several respondents pointed out that the interface was generally slow and little intuitive, and that it
59
60 25 worked poorly on certain web browsers, operating systems and devices.

1 2 1 *Time utilization*

3
4
5 2 Some respondents indicated that the time elapsed from when they contacted the GP office until they
6
7 3 received an answer was perceived as more important than the time spent in using the service,
8
9 4 depending on the nature of the problem, occupational status and personal characteristics. GP offices
10
11 5 tend to keep a few slots daily available for acute visits, which can only be booked by phone. On the
12
13
14 6 one hand, if patients wanted to visit their GP as soon as possible, they might prefer to book an
15
16 7 appointment by phone. On the other hand, full-time workers who do not have urgent issues would
17
18 8 value the possibility of asynchronous communication and spend the least amount of time.

21 9 *Functionality for parents*

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24 10 Many of the respondents pointed out the lack of a functionality to manage their children's medical
25
26 11 contact through the services.

29 12 **Discussion**

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33 13 The «Digital dialogue with the general practitioner» introduced in Norway since 2016 is one of the
34
35 14 first examples of nationwide implementation of digital health services for citizens in primary care.
36
37 15 The current study provides evidence on patients' use and experiences with e-consultation and other
38
39 16 digital health services with their GP. Overall, the services have been used by early adopters
40
41
42 17 (approximately 25% of all GPs offices) and the trend over the first years of implementation shows a
43
44 18 steadily growing nationwide adoption [Figure 1]. According to the technology adoption curve [35],
45
46 19 the majority of users is expected to adopt the services within the next few years. From January 2018
47
48 20 to October 2018, the use of e-consultations in Norway grew from 0.8% to 2.2% of the total number
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50
51 21 of consultations with the GP [36], thus exceeding levels reported by other studies. In a retrospective
52
53 22 observational study, even though email consultation was adopted by 52.8% of the general practices
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55 23 in the Netherlands in 2014, only 0.7% of the GP consultations were by email [14]. Future use of e-
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57 24 consultations in Norway is estimated to account to 30% of all consultations with the GP [36], and up
58
59 25 to 40% if supported by apps and wearables [37]. Similarly, regions in Denmark have recently set a

1 political ambition that one third of all consultations with the GP will be digital [38]. While electronic
2 booking of appointments and electronic prescription renewal seem to be widely used by patients in
3 Norway, the e-consultation service for medical inquiries with the GP office is still used at a lower
4 degree, as indicated in a recent qualitative study [39]. Our findings are in line with other studies where
5 the use of e-consultation was low compared to use of electronic communication for administrative
6 requests, such as repeat prescriptions and test results [7,19,24]. In the UK, the low uptake of
7 alternatives to face-to-face consultations might be explained by the fact that users are still early
8 adopters [2].

9 Time saving (work, travel, waiting) represents the most evident benefit for patients. In a study on use
10 of e-mail communication with the GP, 95% of the users perceived it as more efficient than the phone
11 [8]. In the current survey, the majority of patients (85%, 92%, 76% and 89% for electronic booking
12 of appointments, electronic prescription renewal, electronic contact with the GP office and e-
13 consultation, respectively) agreed that the services were time saving. This was confirmed by the
14 differences in time spent using the digital health services compared to conventional approaches, all
15 found to be statistically significant. The highest efficiency (-88.5%) was estimated for e-consultations
16 compared to face-to-face appointments. However, some users indicated that the time elapsed from
17 when they contacted the GP office until they received an answer was more important than the time
18 spent in using the service. Response time is recognized as an important factor in the delivery of digital
19 health services in primary care. Findings from previous studies reported that the majority of patients
20 received a response within 2 days [6,24] and that a slow response was the main reason for
21 dissatisfaction [6]. Despite e-consultations implemented in Norway are used for non-urgent health
22 issues only, and the GP is obliged to answer the patient's inquiry within 5 working days, quicker
23 response times might further improve patient satisfaction.

24 Most users seemed to acknowledge the practical utility of digital services with their GP. Patients
25 could easily and efficiently book an appointment electronically, at a time more appropriate to them
26 and with a shorter waiting time compared to booking via phone. Electronic prescription renewals

1
2 1 were also preferred to renewals made at the GP office. Patients also recognized that they obtained a
3
4 2 better overview of their medications and even a higher compliance. For non-clinical inquiries, most
5
6 3 respondents thought that it was easier to write electronic messages to the GP office than communicate
7
8 4 by phone. For clinical enquiries, many patients agreed that use of e-consultation could lead to a better
9
10 5 follow-up and even to improved quality of treatment, as suggested by other studies [8]. These were,
11
12 6 however, perceived benefits. More systematic research is needed to measure objectively clinical and
13
14 7 other outcomes of interest, including cost-effectiveness and health service resource use [13]. Users
15
16 8 seemed to be generally satisfied with their ability to explain a problem via e-consultation. Compared
17
18 9 to oral communication, written communication has been considered more intimate [40], as patients
19
20 10 can feel more emboldened to ask questions electronically [8]. Moreover, electronic messages can
21
22 11 support patients aiding recall and providing evidence of the exchange [8,9]. However, it is important
23
24 12 that messages are concise, formal, and medically relevant [7].

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30 13 The overall satisfaction expressed by the respondents of this survey with e-consultation and digital
31
32 14 health services with their GP was very high. Such result is not surprising and confirms that patients
33
34 15 have a positive attitude towards e-health services in primary care [19]. Electronic communication
35
36 16 with the GP office has been considered convenient [2,10,26,40,41], appropriate [7,22], accessible
37
38 17 [4,6,40], and easy to use [4,6] by patients. Moreover, despite providers' reluctance [1] and concerns
39
40 18 about patients' inappropriate and inefficient use of the technology [7], patients find the electronic
41
42 19 communication with their GPs efficient compared to phone or face-to-face contacts [2,6,8]. The
43
44 20 results from our survey indicated that the information provided to patients on how to use the services
45
46 21 was generally satisfactory, but could be improved. GPs previously reported that the service designed
47
48 22 for administrative electronic communication with the GP office was sometimes confused by patients
49
50 23 with the medical e-consultation service [39]. Such confusion was also expressed by a number of
51
52 24 respondents to this survey. Improved patient education is needed to avoid improper use and
53
54 25 inefficiency [8]. Other suggestions were provided in the open text fields. Some users expressed their
55
56 26 wish to use the services on behalf of their children. Furthermore, the need for a receipt (e.g. that the

1
2 1 request has been successfully delivered, read by the receiver or being handled) was in demand. As
3
4 2 these services were new, the frustration caused by technical issues could make some people who try
5
6 3 them for the first time to go back to the traditional alternatives. It is therefore important to make the
7
8 4 services functional on all platforms and easily accessible to all users, as well as provide adequate
9
10 5 training [42].
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12

13
14 6 The results from this survey confirm that users of digital health services in primary care are more
15
16 7 likely to be women [21,24,36,43] and younger adults [2,5,8,17,21,36,43]. These services seem to be
17
18 8 more attractive to digitally active users with a higher education, as also reported by other studies [8].
19
20 9 Over half of the users (59%) had an education at university level, which is high compared to the
21
22 10 general population and those accessing their GP face-to-face. Data from Statistics Norway show that,
23
24 11 in 2017, 33.4% of the total population over 16 in Norway had an education at university level.
25
26 12 Moreover, the vast majority of the respondents (94.6%) described their data literacy as average or
27
28 13 above average. Consequently, elderly and people with low computer literacy might still need
29
30 14 traditional alternatives [38]. Despite these digital health services currently catering to competent
31
32 15 health users, less competent users would still benefit indirectly if such services succeed in freeing up
33
34 16 resources in primary care. Reduced phone load, increased efficiency, released time for medical
35
36 17 assessments and less crowded waiting rooms are, for example, advantages for GP offices which have
37
38 18 been acknowledged in a recent study conducted on GP's perceptions towards the use of "Digital
39
40 19 dialogue with the General Practitioner" [39]. In addition to the day-to-day efficiency gains, it is also
41
42 20 possible to envision that a robust and well-established suite of services for electronic communication
43
44 21 can be a useful tool for managing situations where in-person attendance to the GP office is less
45
46 22 desired, or when capacity needs to be reserved to critical cases, such as during pandemic outbreaks
47
48 23 or large-scale emergencies.
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55 24 *Study strengths and limitations*

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58 25 GPs and citizens using digital health services in Norway are early adopters who might have a more
59
60 26 positive attitude towards innovation than the general population and thus be more enthusiastic and

1
2 1 inclined to use the services. Moreover, respondents might overall have a better level of satisfaction
3
4 2 than non-respondents. The information regarding the number of unique users of the services was not
5
6 3 available due to privacy issues related to the national platform. As a consequence, the potential
7
8 4 number of patients who were eligible for this survey was unknown and it was not possible to calculate
9
10 5 a response rate. Despite this, the high number of respondents in this survey is considered to be
11
12 6 representative of those who used the services.
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14
15

16 7 The comments provided in the open text fields were optional, and thus the qualitative results only
17
18 8 reflect the opinion of a minority of users who were sufficiently motivated to provide a feedback. It is
19
20 9 also commonly observed that responses in open text fields can have a negativity bias compared to
21
22 10 structured surveys [44]. However, the open text responses in this study provided interesting insights
23
24 11 and useful suggestions for improvement.
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26
27

28 12 **Conclusions**

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32 13 Citizens using e-consultation and other digital health services with their GP in Norway are highly
33
34 14 satisfied and consider them as useful and efficient alternatives to conventional approaches. These
35
36 15 digital health services are currently catering to competent health users, mostly women, younger
37
38 16 adults, and digitally active citizens with high education. It is important to make the services functional
39
40 17 on all platforms and provide adequate information and training so that they become easily accessible
41
42 18 to all users, including citizens who are not digitally active.
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49 20 **List of abbreviations**

50
51 21 **GP:** general practitioner

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54 22 **E-consultation:** electronic consultation

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57 23 **EPR:** electronic patient record
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5 **Competing interests**

6 The authors declare that they have no competing interests.

7 **Authors' contributions**

8 PZ contributed to the conception and design of the study, acquisition of data, analysis and
9 interpretation of data, drafting and revision of the manuscript. AJF contributed to the conception and
10 design of the study, analysis and interpretation of data, and revision of the manuscript. All authors
11 read and approved the final manuscript.

12 **Ethics approval and consent to participate**

13 All information collected through the survey was anonymous and not personally identifiable. The
14 participation to the survey was based on consent wherein the respondent could choose not to answer
15 the questionnaire. Ethics approval from the Regional Committees for Medical and Health Research
16 Ethics was not deemed necessary according to the Act on medical and health research (the Health
17 Research Act) entered into force in Norway in 2009.

18 **Data sharing**

19 The dataset analyzed during the current study is available from the corresponding author on
20 reasonable request.

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1
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3
4 2 helsenorge.no. The publication charges for this article have been funded by a grant from the
5
6 3 publication fund of UiT The Arctic University of Norway.
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10 4 **Word count**
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13 5 6112 words.
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References

1. **Brant** H, Atherton H, Ziebland S, McKinstry B, Campbell JL, Salisbury C. Using alternatives to face-to-face consultations: a survey of prevalence and attitudes in general practice. *Br J Gen Pract*. 2016 Jul;66(648):e460-6. PMID: 27215571
2. **Atherton** H, Brant H, Ziebland S, Bikker A, Campbell J, Gibson A, McKinstry B, Porqueddu T, Salisbury C. The potential of alternatives to face-to-face consultation in general practice, and the impact on different patient groups: a mixed-methods case study. Southampton (UK): NIHR Journals Library; 2018 Jun. (Health Services and Delivery Research, No. 6.20.) Available from: <https://www.ncbi.nlm.nih.gov/books/NBK507060/>
3. **Santana** S, Lausen B, Bujnowska-Fedak M, Chronaki CE, Prokosch HU, Wynn R. Informed citizen and empowered citizen in health: results from an European survey. *BMC Fam Pract*. 2011 Apr 16;12:20. PMID: 21496309
4. **Tjora** A, Tran T, Faxvaag A. Privacy vs usability: a qualitative exploration of patients' experiences with secure Internet communication with their general practitioner. *J Med Internet Res*. 2005 May 31;7(2):e15. PMID: 15998606
5. **Mehrotra** A, Paone S, Martich GD, Albert SM, Shevchik GJ. Characteristics of patients who seek care via eVisits instead of office visits. *Telemed J E Health*. 2013 Jul;19(7):515-9. PMID: 23682589
6. **Liederman** EM, Morefield CS. Web messaging: a new tool for patient-physician communication. *J Am Med Inform Assoc*. 2003 May-Jun;10(3):260-70. PMID: J Am Med Inform Assoc. 2003 May-Jun;10(3):260-70. PMID: 12626378
7. **White** CB, Moyer CA, Stern DT, Katz SJ. A content analysis of e-mail communication between patients and their providers: patients get the message. *J Am Med Inform Assoc*. 2004 Jul-Aug;11(4):260-7. PMID: 15064295
8. **Houston** TK, Sands DZ, Jenckes MW, Ford DE. Experiences of patients who were early adopters of electronic communication with their physician: satisfaction, benefits, and concerns. *Am J Manag Care*. 2004 Sep;10(9):601-8. PMID: 15515992
9. **Car** J, Sheikh A. Email consultations in health care: 2--acceptability and safe application. *BMJ*. 2004 Aug 21;329(7463):439-42. PMID: BMJ. 2004 Aug 21;329(7463):439-42. PMID: 15321903
10. **Virji** A, Yarnall KS, Krause KM, Pollak KI, Scannell MA, Gradison M, Østbye T. Use of email in a family practice setting: opportunities and challenges in patient- and physician-initiated communication. *BMC Med*. 2006 Aug 15;4:18. PMID: 16911780
11. **Atherton** H, Sawmynaden P, Sheikh A, Majeed A, Car J. Email for clinical communication between patients/caregivers and healthcare professionals. *Cochrane Database Syst Rev*. 2012 Nov 14;11:CD007978. PMID: 23152249
12. **Sawmynaden** P, Atherton H, Majeed A, Car J. Email for the provision of information on disease prevention and health promotion. *Cochrane Database Syst Rev*. 2012 Nov 14;11:CD007982. PMID: 23152250
13. **Atherton** H. Use of email for consulting with patients in general practice. *Br J Gen Pract*. 2013 Mar;63(608):118-9. PMID: 23561755
14. **Huygens** MWJ, Swinkels ICS, Verheij RA, Friele RD, van Schayck OCP, de Witte LP. Understanding the use of email consultation in primary care using a retrospective observational study with data of Dutch electronic health records. *BMJ Open*. 2018 Jan 21;8(1):e019233. PMID: 29358442
15. **Helse- og omsorgsdepartementet**. Høring: Forslag til ny forskrift om pasientjournal (pasientjournalforskriften). 2018. https://www.regjeringen.no/contentassets/bc66ebd8e7714bf6b0f3753e7c1dcdca/hoerings_pasientjournalforskriften.pdf Accessed 21 February 2020
16. **Chan** B, Lyles C, Kaplan C, Lam R, Karliner L. A Comparison of Electronic Patient-Portal Use Among Patients with Resident and Attending Primary Care Providers. *J Gen Intern Med*. 2018 Dec;33(12):2085-2091. PMID: 30187376
17. **Van den Bulck** SA, Hermens R, Slegers K, Vandenberghe B, Goderis G, Vankrunkelsven P. Designing a Patient Portal for Patient-Centered Care: Cross-Sectional Survey. *J Med Internet Res*. 2018 Oct 1;20(10):e269. PMID: 30287416
18. **NHS UK**. About GP online services <https://www.england.nhs.uk/gp-online-services/about-the-prog/> Accessed 21 February 2020
19. **Mohammed** MA, Montague J, Faisal M, Lamming L. The value of a Patient Access Portal in primary care: a cross-sectional survey of 62,486 registered users in the UK. *Univ Access Inf Soc* 2019. <https://doi.org/10.1007/s10209-019-00693-8>
20. **Beaney** P, Odulaja A, Hadley A, Prince C, Obe RC. GP Online: turning expectations into reality with the new NHS app. *Br J Gen Pract*. 2019 Apr;69(681):172-173. PMID: 30745356
21. **Eccles** A, Hopper M, Turk A, Atherton H. Patient use of an online triage platform: a mixed-methods retrospective exploration in UK primary care. *Br J Gen Pract*. 2019 May;69(682):e336-e344. PMID: 30910874
22. **Albert** SM, Shevchik GJ, Paone S, Martich GD. Internet-based medical visit and diagnosis for common medical problems: experience of first user cohort. *Telemed J E Health*. 2011 May;17(4):304-8. PMID: 21457013
23. **Baker** L, Rideout J, Gertler P, Raube K. Effect of an Internet-based system for doctor-patient communication on health care spending. *J Am Med Inform Assoc*. 2005 Sep-Oct;12(5):530-6. PMID: 15905484
24. **Edwards** HB, Marques E, Hollingworth W, Horwood J, Farr MI, Bernard E, Salisbury C, Northstone K. Use of a primary care online consultation system, by whom, when and why: evaluation of a pilot observational study in 36 general practices in South West England. *BMJ Open*. 2017 Nov 22;7(11):e016901. PMID: 29167106
25. **Iacobucci** G. NHS long term plan: all patients to have access to online GP consultations by 2023-24. *BMJ*. 2019 Jan 8;364:187. PMID: BMJ. 2019 Jan 8;364:187.
26. **Powell** RE, Henstenburg JM, Cooper G, Hollander JE, Rising KL. Patient Perceptions of Telehealth Primary Care Video Visits. *Ann Fam Med*. 2017 May;15(3):225-229. PMID: 28483887
27. **Randhawa** RS, Chandan JS, Thomas T, Singh S. An exploration of the attitudes and views of general practitioners on the use of video consultations in a primary healthcare setting: a qualitative pilot study. *Prim Health Care Res Dev*. 2019 Jan;20:e5. PMID: 29909798
28. **Jiwa** M, Meng X. Video consultation use by Australian general practitioners: video vignette study. *J Med Internet Res*. 2013 Jun 19;15(6):e117. PMID: 23782753
29. **Sørensen** T, Johansen MA. Developing and Implementing Patients' Full-Scale Electronic Access to Their Health Record. *Stud Health Technol Inform*. 2016;228:85-9. PMID: 27577347
30. **Helsedirektoratet**. Digital dialog mellom pasient og fastlege: nåsituasjon. Delleveranse i arbeid med gevinstrealisering. 2014.
31. **Himmelstein** DU, Woolhandler S. Hope and hype: predicting the impact of electronic medical records. *Health Aff (Millwood)*. 2005 Sep-Oct;24(5):1121-3. PMID: 16162553

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32. **Ross** J, Stevenson F, Lau R, Murray E. Factors that influence the implementation of e-health: a systematic review of systematic reviews (an update). *Implement Sci*. 2016 Oct 26;11(1):146. PMID: 27782832
33. **Eysenbach** G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res*. 2004 Sep 29;6(3):e34. PMID: 15471760
34. **Hsieh** H, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res* 2005 Nov;15(9):1277-1288. PMID: 16204405
35. **Rogers** EM. *Diffusion of innovations*. New York: The Free Press; 1983.
36. **Helsedirektoratet**, Direktoratet for e-helse. E-konsultasjon hos fastlege og legevakt. Rapport til helse- og omsorgsdepartementet. 2018. https://www.helsedirektoratet.no/rapporter/e-konsultasjon-helsedirektoratet-og-direktoratet-for-e-helse/E-konsultasjon%20hos%20fastlege%20og%20legevakt%202018.pdf/_attachment/inline/8b3f4e77-4511-4500-8194-cb1a634c0c23:84604a3c7260d55cec2336507f3c7a504e5e29a7/E-konsultasjon%20hos%20fastlege%20og%20legevakt%202018.pdf Accessed 21 February 2020.
37. **Accenture**. Vårt nye digitale norge. Fremtidige muligheter og hva som kreves for å lykkes med digitalisering av offentlige tjenester. https://www.accenture.com/_acnmedia/PDF-59/Accenture-Digitale-Norge-2.pdf#zoom=50 Accessed 21 February 2020.
38. **Danske regioner**. Trygt, nært og nemt. Regionernes strategi for fremtidens sundhedsvæsen. 2018. <http://www.e-pages.dk/regioner/148/html5/> Accessed 21 February 2020.
39. **Fagerlund** AJ, Holm IM, Zanaboni P. General practitioners' perceptions towards the use of digital health services for citizens in primary care: a qualitative interview study. *BMJ Open*. 2019 May 5;9(5):e028251. PMID: 31061056
40. **Katz** SJ, Moyer CA, Cox DT, Stern DT. Effect of a triage-based E-mail system on clinic resource use and patient and physician satisfaction in primary care: a randomized controlled trial. *J Gen Intern Med*. 2003 Sep;18(9):736-44. PMID: 12950483
41. **Leong** SL, Gingrich D, Lewis PR, Mauger DT, George JH. Enhancing doctor-patient communication using email: a pilot study. *J Am Board Fam Pract*. 2005 May-Jun;18(3):180-8. PMID: 15879565
42. **Lugtenberg** M, Pasveer D, van der Weijden T, Westert GP, Kool RB. Exposure to and experiences with a computerized decision support intervention in primary care: results from a process evaluation. *BMC Fam Pract*. 2015 Oct 16;16:141. PMID: 26474603
43. **Socialstyrelsen**. Digitala vårdtjänster riktade till patienter. Kartläggning och uppföljning. 2018. <https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/ovrigt/2018-6-15.pdf> Accessed 21 February 2020.
44. **Poncheri** RM, Lindberg JT, Thompson LF, Surface EA. A Comment on Employee Surveys: Negativity Bias in Open-Ended Responses. *Organizational Research Methods*. 2008;11(3):614-630.

Tables

Table 1. Demographic characteristics of the users.

Users (n)	2,043
Gender, n (%)	
Male	717 (35.1%)
Female	1326 (64.9%)
Age, n (%)	
16-24	153 (7.5%)
25-34	394 (19.3%)
35-44	350 (17.1%)
45-54	440 (21.5%)
55-64	387 (18.9%)
over 65	319 (15.6%)
Education, n (%)	
Primary school / lower secondary school	119 (5.8%)
High school (general)	407 (19.9%)
High school (vocational)	304 (14.9%)
University (3 years)	644 (31.5%)
University (more than 3 years)	569 (27.9%)
Health-related background, n (%)	
Yes	509 (24.9%)
No	1534 (75.1%)
Data literacy, n (%)	
Far below average	24 (1.2%)
Below average	86 (4.2%)
Average	984 (48.2%)
Above average	738 (36.1%)
Far above average	211 (10.3%)
Work status, n (%)	
Working	1159 (56.7%)
Homemaker	15 (0.7%)
Retired	266 (13.0%)
Unemployed	44 (2.2%)
Student	132 (6.5%)
Sick leave	187 (9.2%)
Disability pension	186 (9.1%)
Other	54 (2.6%)

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Table 2. Patients' use of e-consultation and other digital health services with the GP.

Access to services, n (%)	
electronic booking of appointments	1356 (66.4%)
electronic prescription renewal	1109 (54.3%)
electronic contact with the GP office	528 (25.8%)
e-consultation	762 (37.3%)
Number of services accessed by respondents, n (%)	
1	982 (48.1%)
2	566 (27.7%)
3	339 (16.6%)
4	156 (7.6%)
Use of electronic booking of appointments, n (%)	
GP's calendar	793 (58.5%)
electronic inquiry	294 (21.7%)
both	269 (19.8%)

Table 3. Most commonly occurring responses and selected anecdotal statements the for the four e-health services.

Electronic booking of appointments	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Want to be able to book urgent appointments	The availability of bookable slots is poor
Want the possibility to book appointment for own children	Want the possibility to cancel appointments
Want to be able to attach a comment to the appointment enquiry	Want a mobile application with push notifications
Electronic prescription renewal	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Want a receipt that the enquiry is sent and estimated time to answer	Hard to spell the medical names correctly
Want a list of expired prescriptions with a "renew" button	Risk to mix up prescriptions (e.g. melting tablets, debot tablets)
Want the possibility to manage own children's prescriptions	Poor readability when lists are long and complicated
Electronic contact with the GP office	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Want a receipt that the message is read	Easier to call by phone than to write
Service can be confused with e-consultation	Uncertain about who reads the message
Service not easy to navigate	Want to send a message on behalf of own children
E-consultation	
<i>Common responses</i>	<i>Selected anecdotal responses</i>
Unreasonable that out-of-pocket payment is charged	Want a receipt that the message is read and estimated time to answer
The present limit of 1,000 characters for messages is too short	Want the possibility to write on behalf of own children
Want an autosave function so that the text is not lost while writing	Written communication is not suited for clinical contact

Figures

Figure 1. GP offices adopting the “Digital dialogue with the general practitioner”.

Figure 2. Patients’ experiences, perceived benefits and satisfaction with the four e-health services.

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Supplementary files

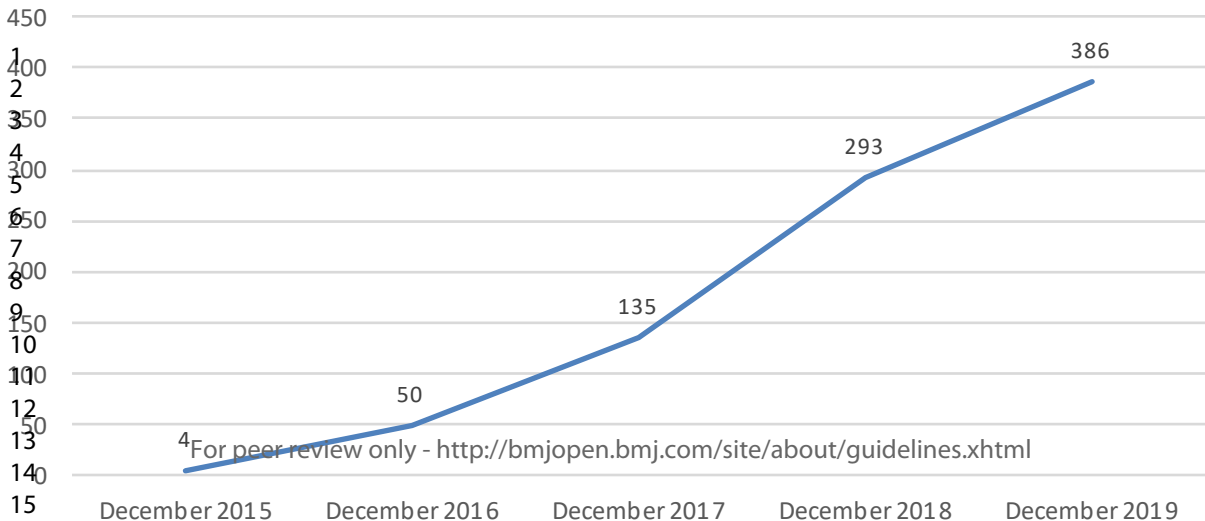
Supplementary file 1. Distribution (%) of users of digital health services with the GP by gender and age groups.

Supplementary file 2. Distribution (%) of face-to-face consultations with the GP by gender and age groups.

Supplementary file 3. Distribution (%) of the general population by gender and age groups.

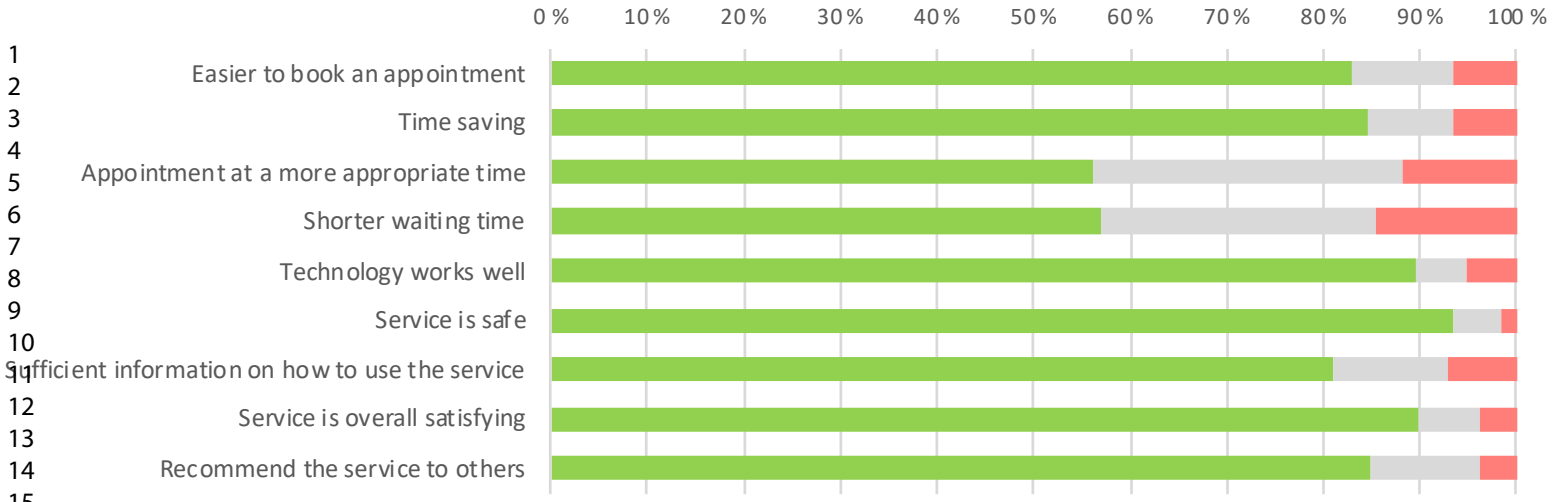
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GP offices adopting digital dialogue

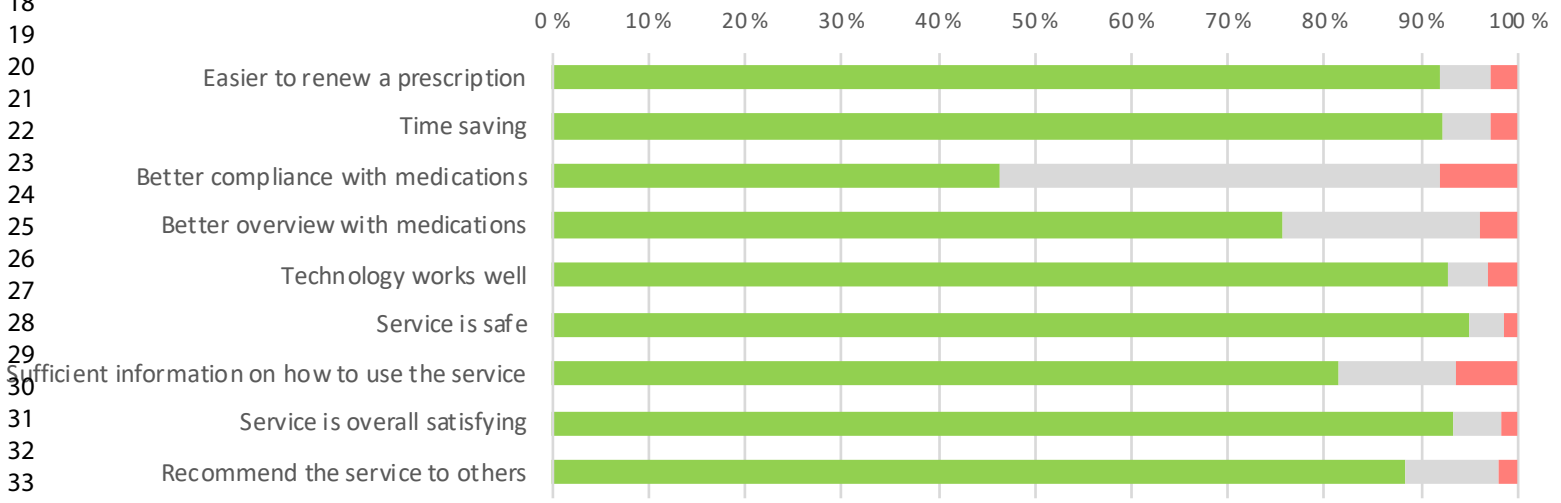


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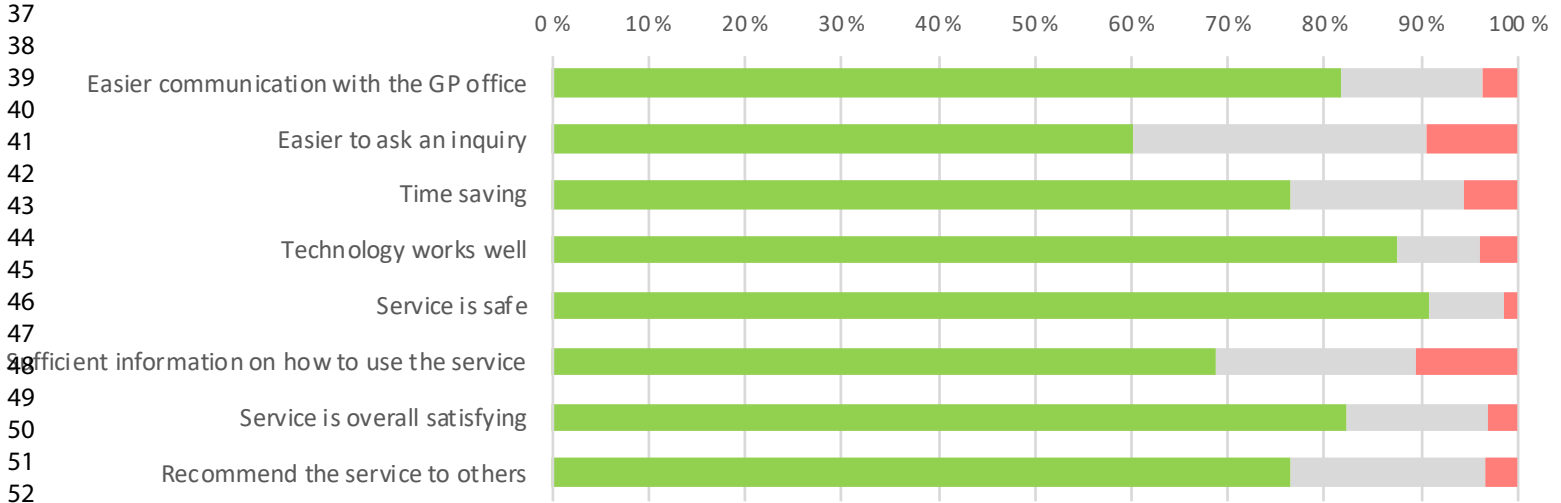
Electronic booking of appointments



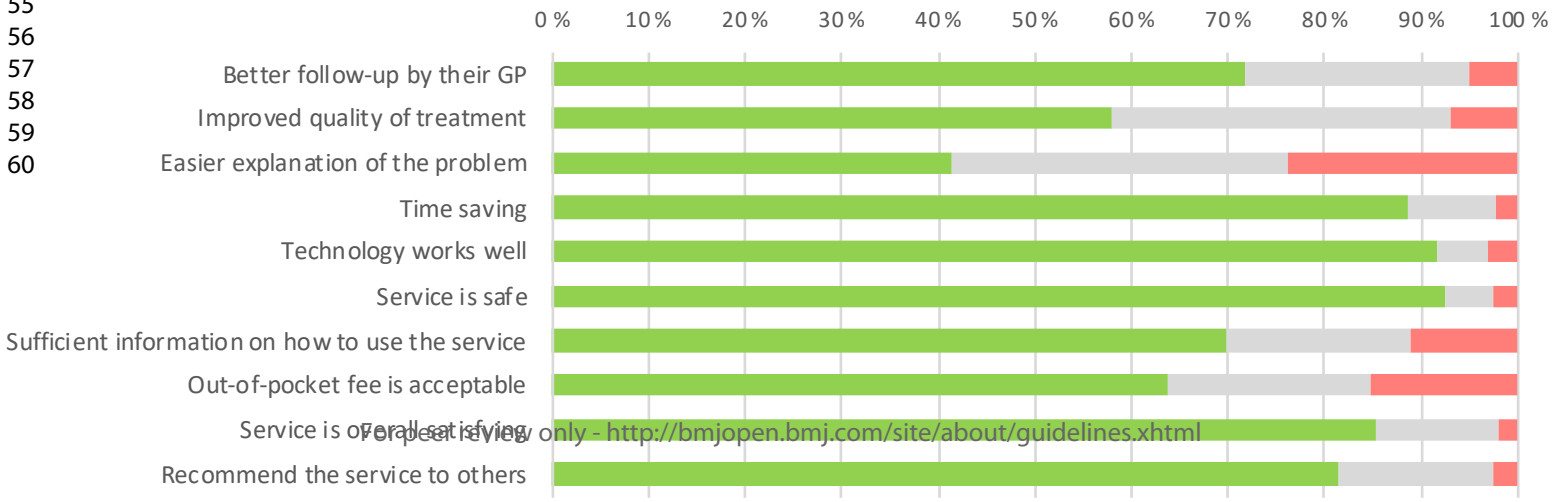
Electronic prescription renewal

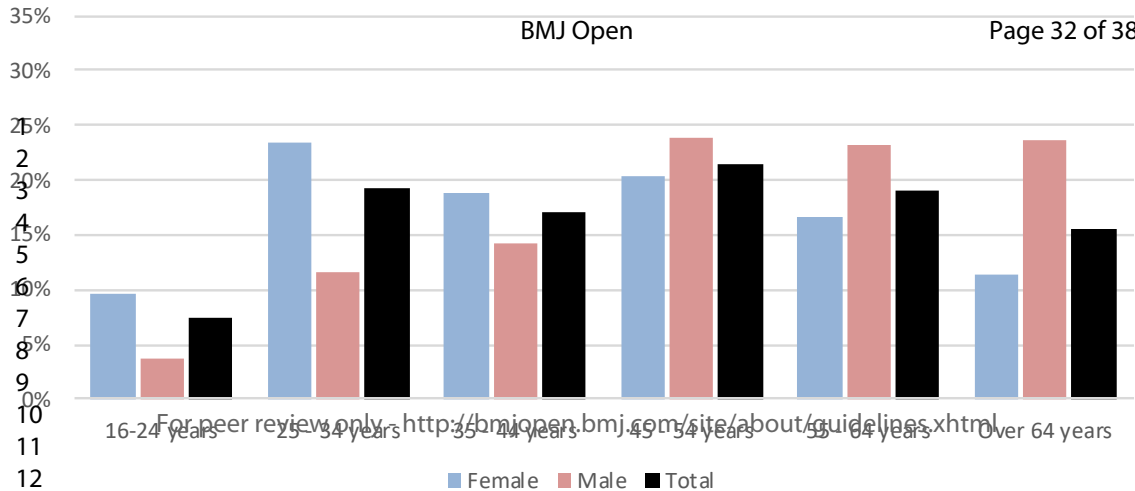


Electronic contact with the GP office

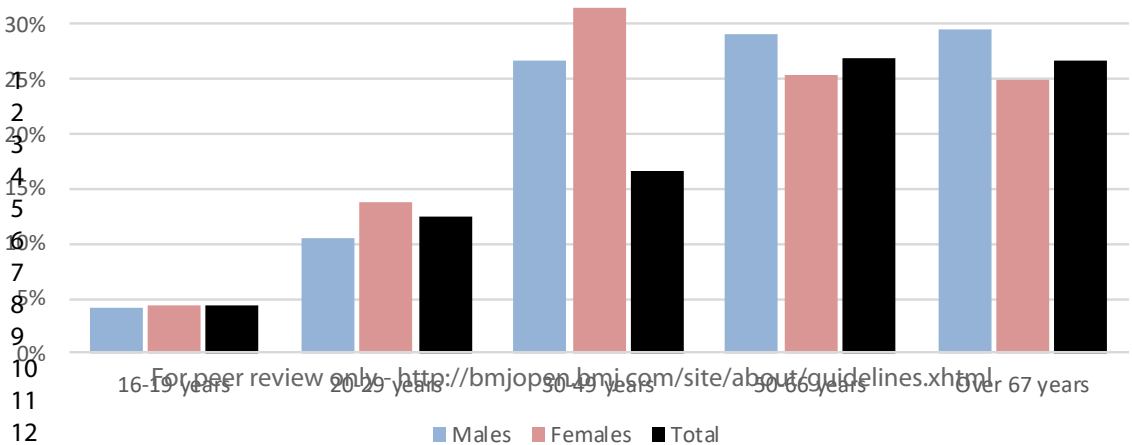


E-consultation

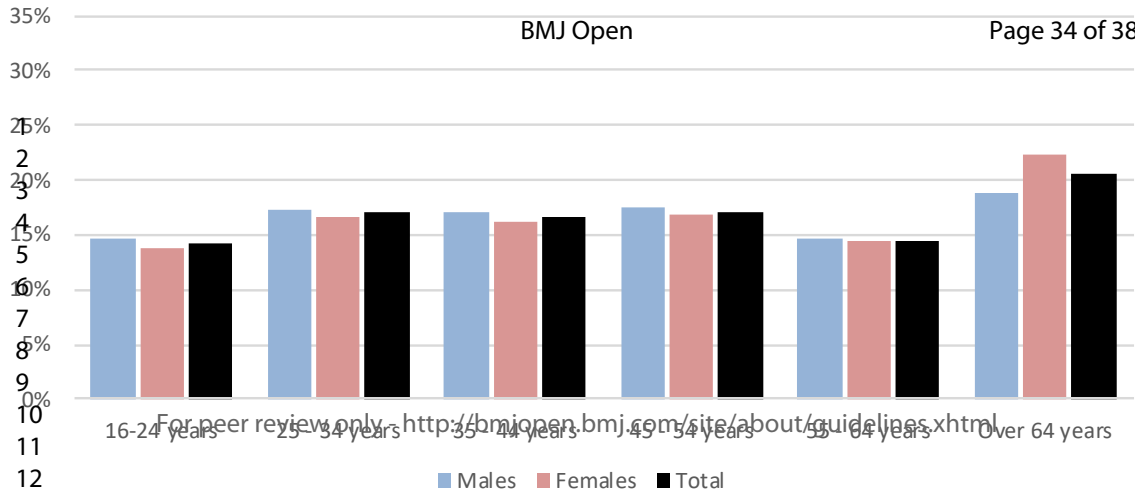




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■ Males ■ Females ■ Total

Checklist for Reporting Results of Internet E-Surveys (CHERRIES)


**Checklist for Reporting Results of Internet E-Surveys
(CHERRIES)**

<i>Item Category</i>	<i>Checklist Item</i>	<i>Explanation</i>	<i>Page no.</i>
Design	Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In “open” surveys this is most likely.)	9
IRB (Institutional Review Board) approval and informed consent process	IRB approval	Mention whether the study has been approved by an IRB.	21
	Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	21
	Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	N/A
Development and pre-testing	Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	10
Recruitment process and description of the sample having access to the questionnaire	Open survey versus closed survey	An “open survey” is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	

Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	9
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	9
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	9
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	10
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	9
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	N/A
Time/Date	In what timeframe were the data collected?	9
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	N/A
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	N/A

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18 **Survey**
19 **administration**
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1	Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	10
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3	Number of screens	Over how many pages was the questionnaire distributed? The number of items is an	10
4	(pages)	important factor for the completion rate.	
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7	Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JavaScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.	10
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21	Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	N/A
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28	Response rates		
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30	Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	11
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37	View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	N/A
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43	Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate.	11
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52	Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a	11
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**Preventing multiple
 entries from the
 same individual**

Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	N/A
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	N/A
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	N/A
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	9
Analysis Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	11

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Questionnaires submitted with an atypical timestamp	<p>BMJ Open</p> <p>Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.</p>	N/A
Statistical correction	<p>Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.</p>	N/A

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