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Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-059765
Article Type:	Original research
Date Submitted by the Author:	01-Dec-2021
Complete List of Authors:	Michel, Janet; Inselspital Universitätsspital Bern, Department of Emergency Medicine Mettler, Annette; University of Bern, Department of Emergency Medicine Stuber, Raphael; University of Bern, Department of Emergency Medicine Müller, Martin; University of Bern, Department of Emergency Medicine Ricklin, Meret; University of Bern, Department of Emergency Medicine Jent, Philipp; University of Bern, Department of Infectious Diseases Hautz, Wolf; University of Bern, Department of Emergency Medicine; University of Oslo Sauter, Thomas; University of Bern, Department of Emergency Medicine
Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, QUALITATIVE RESEARCH, Telemedicine < BIOTECHNOLOGY & BIOINFORMATICS, EPIDEMIOLOGY

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Effects and utility of an online forward triage tool during the SARS-CoV-2 pandemic: patient perspectives

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39 76 **Word count 5 600**
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44 78 **Key words**

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46 79 online forward triage tool (OFTT), effects, utility, SARS-CoV-2, COVID-19, pandemic
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87 ABSTRACT

88 **Introduction:** Online forward triage tools (OFTT) are being widely used during this COVID-
89 19 pandemic. The effects and utility of such tools however, have not been widely assessed.

90 **Objective:** To assess the effects (quantitatively) and the utility (qualitatively) of a COVID-19
91 OFTT in a pandemic context, exploring patient perspectives as well as eliciting
92 recommendations for OFTT improvement.

93 **Methods:** We employed a mixed-method sequential explanatory study design. Quantitative
94 data of all users of the OFTT between March 2nd, 2020 and May 12th, 2020 were collected. A
95 follow-up survey of people who consented to participation was conducted. Secondly,
96 qualitative data was collected through key informant interviews (n=19) to explain the
97 quantitative findings, as well as explore tool utility, user experience and elicit
98 recommendations.

99 **Results:** In the study period, 6,272 users consulted our OFTT; 40.2% (1626/4049) would have
100 contacted a healthcare provider had the tool not existed. 560 participants consented to a follow-
101 up survey and provided a valid e-mail address. 31.4% (176/560) participants returned a
102 complete follow-up questionnaire. 84.7% (149/176) followed the recommendations given.
103 41.5% (73/176) reported that their fear was allayed after using tool. Qualitatively, seven
104 overarching themes emerged namely i) accessibility of tool, ii) user-friendliness of tool, iii)
105 utility of tool as an information source, iv) utility of tool in allaying fear and anxiety, v) utility
106 of tool in medical decision making vi) utility of tool in reducing the potential for onward
107 transmissions and vii) utility of tool in reducing health system burden.

108 **Conclusion:** Our findings demonstrated that a COVID-19 OFTT does not only reduce the
109 health system burden, but can also serve as an information source, reduce anxiety and fear,
110 reduce cross infections and facilitate medical decision making.

111 **Word count 277**

116 **Strengths and limitations**

117 Many online tools have been developed during the COVID-19 pandemic. The effects and utility
118 of these tools however have not been assessed.

- 119 • *Coronatest.ch* was one of the first COVID-19 OFTTs in Switzerland. Our study could
120 become the base line for studies that assess the effects and utility of such online tools.
121 The identified themes namely i) accessibility of tool, ii) user-friendliness of tool,
122 iii) utility of tool as an information source, iv) utility of tool in allaying fear and anxiety,
123 v) utility of tool in decision making (test or not to test), and vi) utility of tool in reducing
124 onward transmission-cross infection, vii) utility of tool in reducing health system
125 burden, could serve as a framework for assessing OFTT utility (follow-up paper). The
126 mixed method sequential explanatory design gave us a better understanding of OFTTs,
127 their effects measured quantitatively and utility explained with the aid of qualitative
128 findings. We did not simply report the effects but could also explain why the results
129 were that way, generating a holistic picture of the phenomenon.
- 130 • The selection of the participants in our study carries the risk of a selection bias.
131 Perspectives of those that do not use online tools are missing and should be explored in
132 further studies. In addition, only a limited number of OFTT users took part in our study.
133 This selection bias cannot, to the best of our knowledge, be prevented due to data

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3 134 protection regulations which impose a voluntary participation and prohibit a technically
4 135 possible automatic tracking of participants. Another way to avoid this possible selection
5 136 bias would be to make the use of such a tool conditional on participation in the study.
6 137 We have deliberately decided against this procedure for ethical reasons, in order to make
7 138 our OFTT accessible to as many users as possible and to keep barriers as low as possible.
8 139 In addition, mandatory entry of personal data in OFTT for study purposes would also
9 140 discourage individuals from using the tool and thus trigger a new bias. Our comparison
10 141 of overlapping questions between the OFTT and the follow-up survey can at least help
11 142 to estimate the similarities within the two groups. For both questions, the percentages
12 143 are comparable and can help in estimating the similarity of the groups.

- 13 144
- 14 145
- 15 146 • As with all online tools, we cannot confirm the accuracy of the data entered. In
16 147 particular, we cannot say for sure whether the OFTT users used the tool to assess own
17 148 symptoms or for other reasons, such as curiosity, fear or uncertainty about how to deal
18 149 with the novel infection. Likewise, multiple use, trial runs or use of tool by a health care
19 150 worker on behalf of patients, relatives and friends are all possible. Socio-economic
20 151 status might have introduced a selection bias in our study since most of the participants
21 152 had a higher education. Income emerged not to be a good proxy for assessing socio-
22 153 economic status. Other instruments, apart from income are therefore needed to assess
23 154 socio-economic status. Additionally, an on online assessment cannot fully replace a
24 155 (polymerase chain reaction) PCR test as some asymptomatic people might be positive
25 156 and those with COVID-19 specific symptoms might be suffering from a different
26 157 disease.⁵
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29 156 In our mind, the data still sheds light on the effects and utility of such an online tool and
30 157 the recommendations given could guide other OFTT developers as the third wave sweeps
31 158 across Europe. As the study was conducted with a specific OFTT, transferability of our
32 159 results to other OFTTs is not necessarily a given. Given the limited evidence on the use of
33 160 OFTTs, the results, in particular the qualitative component of the study, could be of value
34 161 to other OFTT developers, with particular regards to utility and accessibility issues. Further
35 162 studies with other OFTTs outside the COVID-19 context are recommended so as to increase
36 163 transferability and improve the utility of OFTTs in the current third wave, future pandemics
37 164 and other health care settings.
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What is already known

- Online forward triage tools (OFTT) are being widely used during this COVID-19 pandemic as misinformation and worry in the population abound. However, there is a dearth of studies on the effects and utility of these OFTTs to the end-users (patient voices missing).

What this study adds

- Several studies have revealed that OFTTs reduces the health system burden but the voices of the end-users on how useful these OFTTs are, are scant and missing. That makes our study one of the firsts in assessing the effects and utility of a COVID-19 OFTT utilizing a mixed method approach. The mixed method sequential explanatory design gives a better understanding of OFTTs, their effects measured quantitatively and utility explained with the aid of qualitative findings. We did not simply report the effects but could also explain why the results were that way, generating a holistic picture of the phenomenon.
- Over and above the agreed notion that OFTTs reduce the health system burden, our study provided further evidence for the utility of OFTTs to end users namely: serving as an information source, allaying fear and anxiety, reducing potential for onward transmission and facilitating decision making.

Policy implications

- Systems thinking-refers to the ability to see interconnectedness in a system with a dysfunction in one part affecting other parts and consequently outcomes. Our study revealed the reasons patients did not follow the OFTT recommendation to test, as multipronged. Attention has to be paid to supply chain issues, as test shortages affected outcomes. The cost of a test and the fear of a positive result additionally emerged as hindrances to testing. Noteworthy, is the reaction of GPs who labelled OFTT users who asked for a COVID-19 test as hysteric. This demonstrates the need to involve, collaborate with and win the local health care providers like GPs and Spitex (home based nursing)-policy implementers, in OFTT development to ensure buy in and positive outcomes when implementing such a tool. All the above calls for systems thinking in implementation.
- Many elderly people are willing to embrace telemedicine. Telephone and voice activated system for the older population or call centers to serve this group, are still needed during this transitional phase.

214 INTRODUCTION

215 The number of COVID-19 cases across the globe has surpassed 25 million and incident rates
216 are again on the rise as many European countries experience subsequent waves.¹⁻⁴ Many people
217 are seeking reliable information, recommendations on testing and management of COVID-19
218 as well as reassurance, adding to the health system burden. Online forward triage tools (OFTT)
219 are being widely used during this COVID-19 pandemic context⁵⁻⁸ as misinformation and worry
220 in the population abound. There is evidence from an earlier 2009 H1N1 influenza pandemic,
221 that online tools are effective and practical in reducing the health system burden.^{9,10} There is
222 also emerging evidence of this nature from the COVID-19 context.^{6,11-14} For example, OFTTs
223 help reduce exposure of worried but uninfected and infected persons, through avoidance of
224 hospitals and doctors' offices – enabling patients to access recommendations of what to do,
225 from the comfort of their own homes.^{10,11}

226 Using OFTTs is relatively easy to the computer literate. People respond to questions and upon
227 completion, recommendations are given, e.g., isolate, test, do not test etc. Existing evidence on
228 the effects and utility of OFTTs differ with possible implications on the quality of the symptom
229 assessment⁵. According to literature, the reasons patients use symptom checkers or OFTTs are
230 i) to understand the causes of their symptoms (76%), ii) to determine whether or not to seek
231 care (33%), and iii) where to seek care (21%).¹⁵ There is also evidence that patients that have
232 previously experienced a diagnostic error are more likely to use OFTT to search for where to
233 seek care¹⁵ than those that have not.

234 **Challenges with OFTT use and research gap**

235 In the European Union, 87% of people aged 75 years and above have never been online
236 according to a recent survey.¹⁶ That means the elderly, may be less inclined to use online tools
237 if not computer literate. This in turn shuts the elderly out from society, increasing isolation and
238 loneliness, not to mention the missed health benefits [10]. The digital divide is real¹⁷. How can
239 digital tools be designed to be more inclusive?¹⁸ Information on factors influencing the use of
240 OFTTs is scant and the validation of COVID-19 OFTTs like other OFTTs, seems neglected.
241^{15,19} That makes the quality assessment of these tools paramount⁵ as evidence on effects and
242 utility of OFTTs is limited.

244 **The aim of this study**

245 This study aimed at assessing the effects (quantitatively) and the utility (qualitatively) of a
246 COVID-19 OFTT during a pandemic context in Switzerland, exploring patient perspectives and
247 derive recommendations for tool improvement. We hypothesized that an OFTT adequately
248 reduces patient visits to the health care system and consequently reduces the health system
249 burden. We further explored qualitatively, for emergent themes, capturing the tool utility to this
250 population.

254 METHODS

255 **Study design and participants**

256 We employed a mixed-method sequential explanatory design to study the utility of the OFTT
257 and the effects of using such a tool. The rationale for mixing both kinds of data within one study
258 is that neither qualitative nor quantitative methods, are sufficient by themselves, to capture
259 details of a phenomenon. In combination, they complement each other, taking advantage of the
260 strengths of each. As in sequential explanatory designs, quantitative data collection was done
261 first, as a major component of our study to inform qualitative interviews, see Figure 1.

262 **About here Figure 1: Mixed-Methods Sequential Explanatory Study Design.**

263

264 **Online forward triage tool description and setting**

265 The working group e-emergency medicine at the emergency department (ED), Inselspital
266 University Hospital Bern, together with the Department of Infectious Diseases, Inselspital
267 University Hospital Bern, developed an online forward triage tool (OFTT) which was made
268 available online (*coronatest.ch*). To the best of our knowledge, this was one of the first COVID-
269 19 OFFTs set up in the German speaking part of Switzerland. In a skip-logic, the OFTT
270 displayed the current test recommendations of the Federal Office of Public Health (FOPH) on
271 whether someone needed testing for COVID-19 or not. No diagnosis was provided by the
272 OFTT.

273 The questions and the content of the OFTT represented the official FOPH recommendations at
274 the time. Thus, the OFTT was comparable in content to other OFTTs in Switzerland, which
275 were based on the FOPH guidelines within that time period. One additional non-mandatory
276 question, which did not affect the result, was integrated in our OFTT from the 11th March 2020,
277 namely the question "What would you do if this online test did not exist?"

278 There were two possible outcomes of the OFTT: "According to the criteria of the Federal Office
279 of Public Health (BAG), one meets or does not meet the criteria for a test for an infection with
280 the coronavirus, COVID-19". The results page was linked to the FOPH's official behavioural
281 recommendations and recommendations for the testing process. The average time to complete
282 the assessment was 75sec.

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284 **Quantitative data**

285 **Research participants and data collection**

286 Participants included all users above the age of 18 that used the OFTT between March 2nd, 2020
287 and May 12th, 2020. In this timeframe, the recommendations on COVID-19 frequently changed
288 in Switzerland and there was an initial lack of testing reagents and capacity as well as the risk
289 of overburdening the healthcare system. During the first few weeks of the pandemic, the Federal
290 Office of Public Health (FOPH) recommended testing only for symptomatic patients after travel
291 to high-risk countries (e.g., Italy and China) or symptomatic contacts of coronavirus patients.
292 In weeks that followed (as from the 20th March 2020), the strategy changed to testing of high-

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3 293 risk groups (older than 65 years, pre-existing conditions, and healthcare workers). The countries
4 294 and risk groups were regularly adjusted according to the spread of the virus and the findings
5 295 about risk groups but also the availability of testing capacity.

6 296 Due to the rapid spread of the virus in Switzerland, and broadly available testing capacities, a
7 297 universal test recommendation was made by the Federal Office of Public Health (FOPH)- on
8 298 April 27th, 2020. All symptomatic individuals were eligible to test. With this recommendation,
9 299 our OFTT provided less benefit to the user and was finally removed on May 12th 2020 from the
10 300 website paving the way to a second generation OFTT.

11 301
12 302 To minimise the barrier to the use of the OFTT and for legal data protection reasons, no personal
13 303 data was collected within the OFTT. Further data on the users of the OFTT was collected in a
14 304 second step, from participants who gave their explicit consent and provided their email
15 305 addresses to be contacted. This also made it possible to investigate the adherence to
16 306 recommendations and the test results. A non-mandatory additional question was built into the
17 307 OFTT from 11th March 2020.

18 308 A pretested online questionnaire (see supplementary info) was used to assess the

- 19 309 i) utilization of the OFTT, including way of referral to the tool, reasons for use and
20 310 information searched,
21 311 ii) additional factors, including influence of the media and influence of the OFTT on
22 312 fear and anxiety.

23 313 The database used is compliant with Swiss laws on the collection of personal health related
24 314 information. The follow-up questionnaire is available as supplementary information. Due to
25 315 ethical reasons, we included the option "not want to answer" as a choice in the questionnaire
26 316 for the socio-demographic data, in case the respondent did not want to give a statement on this
27 317 specific sensitive topic.

28 318 The qualitative interviews were conducted with purposefully selected key informants who gave
29 319 their consent during the survey (see below).

30 320 **Data analysis**

31 321 Quantitative data was analysed in Stata® 16.1 (StataCorp, The College Station, Texas, USA).
32 322 Descriptive statistics for all variables as mean and standard deviation or frequency as
33 323 determined by the type and distribution of the data were computed. Categorical variables
34 324 between two groups were compared using Chi-square statistics and the distribution of
35 325 continuous variables were compared using Wilcoxon rank sum test.

36 326 To assess the risk of selection bias and to estimate the similarity of the groups, we compared
37 327 responses to overlapping questions within the OFTT and the follow-up survey.

38 328 **Qualitative data**

39 329 To explain the quantitative results, we explored the experience of tool use by the patients
40 330 qualitatively. Following quantitative data analysis, an interview guide was created and adapted
41 331 iteratively.

42 332 **Purposeful and quota sampling**

43 333 We purposefully sampled participants from those that had firstly, utilized our OFTT, secondly,
44 334 had taken part in the follow-up survey and thirdly, had consented to a follow-up interview. We
45 335 included participants of all age groups (quota) to ensure inclusiveness.

46 336 **Sample Size**

337 Many experts suggest saturation as central to qualitative sampling²⁰. In this study we aimed for
 338 both data saturation and rich and detailed narratives and achieved this with 19 key informants
 339 from all age groups (see Table 1).

340

341 **Data collection**

342 Due to COVID-19 concerns, video rather than face to face interviews were held with most
 343 participants in September 2020. A combination of video and telephonic interviews were
 344 conducted with three participants who had technical challenges and a telephone only interview
 345 was held with one lady, aged above 65, who had no computer access. Three face to face
 346 interviews were held with three key informants: one that was a hospital health care worker, and
 347 two key informants who worked close to Bern university hospital. A semi-structured interview
 348 guide informed by the quantitative results was used (see supplementary info). This was adapted
 349 iteratively throughout the data collection period. Two qualitative researchers sat in each session
 350 fielding questions in turns. All interviews were conducted in German by two researchers fluent
 351 in both English and German. The interviews lasted between 45 minutes to one and a half hours.
 352 Two audio-recorders were used in each session. All participants gave individual written consent
 353 as well as oral consent to the recording at the beginning of each session. See Table 1 for
 354 summary of Key Informants.

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356

357 **Table 1. Key Informant summary**

Age-group	Males	Females	Total
18-29	1	2	3
30-45	2	2	4
46-64	3	4	7
65+	4	1	5
Total	10	9	19

358

359 **Data analysis**

360 Audio recordings were transcribed, analysed and triangulated with quantitative data results.
 361 Qualitative narratives were obtained to explain quantitative results as well as to explore utility
 362 of OFTT to patients as well as elicit recommendations to make online tools more useful and
 363 inclusive.

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3 364 **Measures to ensure trustworthiness of data:** To ensure dependability, data collection and
4 365 analysis were performed iteratively, continuously adjusting our interview guide to capture
5 366 newly emerging themes. Throughout data collection, two qualitative researchers kept reflexive
6 367 journals and debriefed at the end of each interview. To ensure transferability, a thick description
7 368 of participants, context and data collection process has been outlined. Data was managed and
8 369 analysed with the aid of MAXQDA2018.

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11 370 **Ethics approval**

12
13 371 The local ethics committee of the Canton of Bern, Switzerland, deemed this project a quality
14 372 evaluation study and waived the need for full ethical review (Req-2020-00289) on the 23rd of
15 373 March 2020.

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18 374 **Patients and Public Involvement statement**

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20 375 Patients and public were not involved in the design, conduct, reporting or dissemination of this
21 376 research since the OFTT was set up as an emergency response to the pandemic.
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377 RESULTS

378 Quantitative results

379 In total, n=6,272 completed assessments of the OFTT were recorded on the website during the
380 study period from March 2nd, 2020 to May 12th, 2020. This question asked OFTT users what
381 they would have done had the OFTT not existed. The question was answered by 97.6%
382 (3953/4049) of the users as follows: 40.2% (1626/4049) would have contacted the GP or visited
383 a hospital had the tool not existed; furthermore, 16.4% (665/4049) would have contacted a
384 hotline.

385 In the OFTT, 25.6% (1,608/6272) of assessments received a recommendation to test for
386 COVID-19 during the study period. In the follow-up survey question, "Did the online tool
387 recommend you to test for COVID-19?" -31.8% (56/176) answered, yes.

388 In the OFTT, 13.2% (564/4270) of OFTT users reported being over 65 years of age. The
389 variable age was only included and mandatory during some phases of the study period in
390 accordance with the FOPH guidelines, that changed frequently. This resulted in 4270
391 assessments with data on age. In the follow-up survey, 17.6% (31/176) reported being over 65
392 years.

393
394 A link to the online follow-up questionnaire was sent to 560 participants that consented to a
395 follow-up survey by providing a valid e-mail address. The online questionnaire was filled out
396 by 37.9% (212/560) of the participants; 31.4% (176/560) completed the whole questionnaire
397 and were included in the analysis (all 22 questions-see supplement). An overview of socio-
398 demographic characteristics of participants of the follow-up survey are presented in Table 2.

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425 **Table 2. Socio-demographic table of participants of follow-up survey**

	Total (n=176)	Female (n=101)	Male (n=75)	P-value*
Age [mean, SD]	50.1 [±15.4]	45.9 [±14.1]	55.7 [±15.4]	<0.001
Education				
Not want to answer	6 [3.4]	3 [3.0]	3 [4.0]	
University	120 [68.2]	67 [66.3]	53 [70.7]	
Higher secondary school	27 [15.3]	17 [16.8]	10 [13.3]	
Lower secondary school	23 [13.1]	14 [13.9]	9 [12.0]	0.871
Income per month				
Not want to answer	29 [16.5]	17 [16.8]	12 [16.0]	
<4000 CHF	26 [14.8]	20 [19.8]	6 [8.0]	
4000 - 6000	42 [23.9]	27 [26.7]	15 [20.0]	
>6000	79 [44.9]	37 [36.6]	42 [56.0]	0.037
Work				
Not want to answer	33 [18.8]	14 [13.9]	19 [25.3]	
Employed	106 [60.2]	64 [63.4]	42 [56.0]	
Self-employed	24 [13.6]	13 [12.9]	11 [14.7]	
Unemployed	3 [1.7]	3 [3.0]	0 [0.0]	
Lost work (Covid-19)	1 [0.6]	1 [1.0]	0 [0.0]	
Student/trainee	9 [5.1]	6 [5.9]	3 [4.0]	0.236
Insurance				
Don't know	5 [2.8]	3 [3.0]	2 [2.7]	
General	68 [38.6]	39 [38.6]	29 [38.7]	
Telemedicine	12 [6.8]	6 [5.9]	6 [8.0]	
GP	83 [47.2]	47 [46.5]	36 [48.0]	
Other	8 [4.5]	6 [5.9]	2 [2.7]	0.859
Nationality				
Not want to answer	1 [0.6]	1 [1.0]	0 [0.0]	
Switzerland	147 [83.5]	80 [79.2]	67 [89.3]	
Germany	13 [7.4]	8 [7.9]	5 [6.7]	
French	1 [0.6]	0 [0.0]	1 [1.3]	
Italy	3 [1.7]	2 [2.0]	1 [1.3]	
Other Europe	4 [2.3]	3 [3.0]	1 [1.3]	
Other	7 [4.0]	7 [6.9]	0 [0.0]	0.202

* Chi-squared for categorical variables and Wilcoxon rank sum test for continuous variables; data are total number and percentage if not mentioned otherwise

The survey revealed that 84.7% (149/176) followed the tool recommendations and stayed at home thereby reducing the work-load of GPs and hospitals. Information about the utilization of the OFTT, specifically which information was searched for, how subjects found the tool, and information about satisfaction with the tool is presented in Table 3.

Table 3. Online forward triage tool use

	Total (n=176)	[%]
Information searched		
Information on COVID-19 symptoms	97	[55.1]
How to cope with symptoms	4	[2.3]
To know when to consult a doctor	36	[20.5]
To know more on testing criteria	32	[18.2]
To know where to test	7	[4.0]
Mode of referral		
Referral by family doctor	9	[5.1]
Online search	113	[64.2]
Recommendation by peers	17	[9.7]
Hotline	2	[1.1]
Other	35	[19.9]
Satisfaction with information		
Helpful	154	[87.5]
Not comprehensive	17	[9.7]
Not clear	5	[2.8]

We present additional factors that may have influenced how individuals coped during the coronavirus pandemic, their use of the OFTT and adherence to OFTT recommendations. Overarching topics that were asked included the influence of the media, fear and uncertainty, and reasons for adherence to the recommendation (see table 4). All questions and answers from the follow-up questionnaire are attached. See supplement 1.

444 **Table 4. Additional factors**

	Total (n=176)	[%]
Estimated influence of media		
Helpful	81	[46.0]
Confusing	47	[26.7]
No trust in media as source of information	25	[14.2]
Other	23	[13.1]
Influence of OFTT on fear and anxieties		
Reassured	73	[41.5]
No reassurance	13	[7.4]
Increased fears and anxieties.	6	[3.4]
Not worried before OFTT use	84	[47.7]
Reasons for following the recommendation (n=149)		
Trust in tool	60	[40.3]
Information congruent with media	20	[13.4]
Comparison with FOPH recommendation	53	[35.6]
Reassurance by others	7	[4.7]
Other	9	[6.0]

445

446 **Qualitative findings**

447 Seven overarching themes on the utility of the OFTT emerged during the qualitative interviews.
 448 These are used to structure the report of our findings, i.e., i) accessibility of the tool, ii) user-
 449 friendliness of the tool, iii) utility of the tool as an information source, iv) utility of the tool in
 450 allaying fear and anxiety, v) utility of the tool in decision making (test or not to test), vi) utility
 451 of the tool in reducing onward transmission-cross infection, and vii) utility of the tool in
 452 reducing health system burden. The qualitative findings are summarised in Table 5.

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458 **Table 5. Summary of qualitative themes**

Theme	Category	Unit meaning
Accessibility	Online search	Appeared but not on the top of google search Advertise tool in future
	Unreachable for some	Include telephonic services to reach the elderly Tool buddies
Utility as a reliable information source	COVID-19 Symptoms	Cough was a main symptom Symptom description like type of cough and severity of fever etc. was not possible Test or do not test decision was arbitrary-how the decision was arrived at was not clear e.g., 95% probability test or 5% probability do not test
	Testing info and centres missing	Information on when to call doctor was not clear e.g., fever above 39 degrees for 4 days -call doctor List of where to test and contact numbers were missing
Utility in decision making	Followed recommendations	Trust- the university hospital is a trusted institution
	Did not follow recommendations	Fear of a positive result and the resultant consequences Cost of test Test shortage GP refusing patients to test -hysteria
Utility in allaying fear and anxiety	Reassured some	Fear and anxiety allayed after tool use
	Person contact	An online tool is still an online tool - recommendations seen as not having a lot of weight
	Testing	A talk with a general practitioner (GP)-debriefing after tool use could have put them at ease
	Friends and family as a resource	Testing in itself is reassuring -make test available to all who are anxious
	Increased anxiety in some	Many relied on family and friends to deal with fear- social circle still a major source of support

		High risk label unsettled some
Utility in reducing health system burden	Many stayed at home	Recommendations followed- stay at home Some called Insurance companies
Utility in reducing onward transmission	Call GP before a visit	Most called GP ahead of visit
Systems thinking	Utility of tool is dependent upon other health system and societal components Fear of a positive test -rather not know	Participants told by tool to test only to be told that there are no tests (shortages) Fear of a positive test Media misinformation of painful test influenced some not to test-work with media Economic factors like cost of test influenced some not to test A new life-threatening disease in a population is associated with psycho-social and behavioural issues that need to be taken into account

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460 **Theme 1: Accessibility of the tool**

461 The accessibility of the tool emerged as very important. Many participants suggested to
462 advertise the tool to make it more accessible as revealed below:

463 *“I did not know of the existence of tool (an accidental internet search led the key informant to
464 the tool). Please advertise tool on TV and to Insurance companies.”* -Key Informant 15

465 The older people seem willing to embrace technology and were prepared to use it. However,
466 they stated that they needed help with practical application at times as revealed below;

467 *“Provide telephone services for the elderly and a contact person, a GP so one can ask questions
468 if unsure.”* -Key Informant 14

470 **Theme 2: User-friendliness of the tool**

471 Most participants could not remember the tool immediately due to the time lapse from the tool
472 usage to interview. After being shown the tool once again, the header only, many cited it as
473 having been easy and simple to follow with the language being clear and the length acceptable.

474 **Theme 3: Utility of the tool as an information source**

475 The novel nature of COVID-19 infection left many scrambling for knowledge of the disease.
476 Many health care providers were inundated with phone calls. One participant said the following;

477 *“The tool provided information on symptoms but did not have a list of testing centers. The
478 recommendations said call GP before visit but there was no number to call.”* -Key Informant 1

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3 480 *“Telemedicine could play a better information spreading role – media spread fear and*
4 481 *misinformed people for example mask use vs no mask.” -Key Informant 15*
5 482

7 483 **Theme 4: Utility of the tool in allaying fear and anxiety**

9 484 Many participants interviewed reported being reassured after tool use. Others cited being more
10 485 anxious after tool use due to terminology and language and many suggested that a person, a
11 486 doctor be available after tool use for closure. Participants revealed the following;

13 487
14 488 *“Wording of tool could be adapted – a friend aged 65, a diabetic, became depressed after using*
15 489 *tool and getting the high-risk patient classification. He needed a psychiatrist to cope. Rather*
16 490 *ask how are you, do you take any medication, which ones? Mentioning conditions seem to*
17 491 *increase anxiety.” -Key Informant 17*
18 492

19 493 *“I felt discriminated against by tool-differentiate between a health 73-year-old with no chronic*
20 494 *illnesses and a 50-year overweight diabetic.” -Key Informant 13*
21 495

23 496 **Theme 5: Utility of the tool in decision making process (to test or not to test)**

25 497 Many participants cited trust in our university hospital (Insel) as one of the main reason
26 498 participants followed the recommendations. Some participants revealed the following;

28 499
29 500 *“Insel has a good name and trusted the tool.” -Key Informant 16*
30 501

31 502 *“Coordination is needed for FOPH and Insel to speak in one voice.” -Key Informant 17*
32 503

33 504 Juxtaposed and not necessarily contradicting the quantitative survey, where trust was reported
34 505 as the main reason for following the recommendations, most of the participants cited shortages
35 506 of tests, improved symptoms, cost of test, misinformation that the test was painful and fear of
36 507 a positive result as reasons for not testing. Of utmost importance were GPs who viewed the test
37 508 request by online tool users as being hysteric. Below is what some participants said:

39 509
40 510 *“I read scientific papers to inform oneself and then decided.” -Key Informant 8*
41 511

42 512 *“Remember recommendations from an online tool have less weight than recommendations from*
43 513 *a doctor – there is no person behind this and so many might have taken the tool and went further*
44 514 *to contact own GP”- Key Informant 8*
45 515

46 516 *“I wished to see an algorithm that said something like, “the probability of you having COVID-*
47 517 *19 is 75% test or 25% do not test.”-Key Informant 5*
48 518

50 519 **Theme 6: Utility in reducing the potential for onward transmission- cross infection**

51 520 The tool recommended all participants to call the health care provider ahead of visit and most
52 521 of them did. A reason some participants might not have called the testing centres ahead of a
53 522 visit could be that the tool itself did not provide a list of contact numbers-a short coming that
54 523 was rectified in the second generation OFTT.
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3 527 **Theme 7: Utility of tool in reducing health system burden**

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5 528 Social distancing, isolation and quarantine were among the recommendations made to reduce
6 529 the spread of COVID-19. Most of the participants stayed at home. One participant said the
7 530 following;

8 531
9 532 *“I followed recommendations and stayed at home. However, home testing should be provided*
10 533 *if people should stay at home. Engage Spitex [organization for outpatient and home-based care*
11 534 *in Switzerland] in future pandemics and work with them.” -Key Informant 6*

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DISCUSSION

This study quantitatively assessed the effects and confirmed the utility (qualitatively) of a COVID-19 online forward triage tool by exploring patient perspectives. We further elaborate on areas for improvement as well as share lessons learned for policy makers. Qualitatively, seven overarching themes emerged namely i) accessibility of tool, ii) user-friendliness of tool, iii) utility of tool as an information source, iv) utility of tool in allaying fear and anxiety, v) utility of tool in decision making (test or not to test), vi) utility of tool in reducing the potential for onward transmissions (preventing cross infection) and vii) utility of tool in reducing health system burden.

Accessibility of OFTT

One of the objectives of our OFTT was to provide an easily accessible, reliable and up to date information platform for professionals and the public. The tool was not advertised commercially; hence it did not appear at the top of the google search and many participants cited coming across the tool accidentally. Information about the tool was only disseminated via the hospital website and hospital communication to local doctors.

Despite the above -mentioned shortcoming, our findings revealed that the tool was accessible to both genders and all age groups including the elderly. In line with other studies,²¹ the elderly seem ready to embrace online tools, contradicting other studies.^{10,17} Contradicting our findings, one study revealed that it's the young and highly educated patients that tend to use symptom checkers or OFTTs.²²

Despite the revealed readiness of the elderly to embrace technology, key informants suggested keeping the use of telephonic services for the elderly as an option in telemedicine. Further supporting these findings, nurse triage lines (telephone) have been proven effective in this COVID-19 pandemic context in the US and in Canton Vaud, Switzerland.^{10,23} Others suggested having a list of tool buddies reachable by phone, that links people that have used the tool before and are willing to be contacted by a new user, that might be experiencing challenges in using the OFTT. With regards to reaching the low education and low-income group, additional studies need to be done as those who earned less than CHF 4000 were not necessarily lowly educated but PhD and post doc students, concurring with findings elsewhere.²⁴

User-friendliness of OFTT

Most of the participants could not recall tool, but after showing them tool header only, many cited tools as user-friendly, easy, with a clear language and an acceptable length, concurring with a study that was conducted elsewhere.²⁵ In support of our findings, online tools have been shown to be risk averse as compared to health care professionals and the users have expressed high levels of satisfaction.²² The optimal amount of time spent filling in OFTT questionnaires nor the optimal number of questions an OFTT should ask in general, is still unclear²⁶ and warrants further studies.

Utility of OFTT as an information source

Overall, the tool was very useful in providing information on signs and symptoms. Information on where to test (list with contact numbers), how to self-care, when to contact a GP were cited by some as shortcomings and ought to be included to make the tool comprehensive in future. Information challenges with OFTTs have also been reported elsewhere.^{27,28} This finding underlines the need to have an option to talk directly to a GP after OFTT use so as to debrief. Further information or links to comprehensive and reliable sources with information on how to self-care and when to contact a GP or health care centre emerged as gaps that need to be incorporated in COVID-19 OFTTs so as to increase their utility as information sources.

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3 583 The majority of our participants were highly educated, and this segment of the population seems
4 584 to inform itself, by consulting a variety of scientific sources as well as keeping abreast with the
5 585 FOPH announcements. In the context of a novel infection, where guidelines change quickly
6 586 and continuously, the credibility of the tool to the highly educated, could be enhanced by
7 587 stipulating sources of information and referencing and dating the FOPH criteria informing the
8 588 tool.

11 589 **Utility of OFTT in allaying fear and anxiety**

13 590 For most of the participants, the tool was effective in allaying their fear and anxiety. Many
14 591 wished a human presence, a doctor to debrief with after the online tool use as mentioned above.
15 592 There was however, a downside for some that felt labelled as being high risk. For this group,
16 593 the tool had a negative effect and increased their anxiety. Other studies have revealed similar
17 594 effects.^{29,30} This raises the issue of language and terminology use in such tools. Bearing in mind
18 595 that COVID-19 is a novel condition, not well understood and considered fatal, the impact of a
19 596 high-risk label should not be underestimated, including discrimination. Concurring with our
20 597 findings, COVID-19 stigma has been reported elsewhere³¹. Many participants reported fear of
21 598 a positive test result and the consequences thereof, concurring with findings from elsewhere.
22 599^{32,33} Further concurring with our findings, lasting psychological consequences that last beyond
23 600 the COVID-19 infection itself have also been revealed.³¹ This raises the question of
24 601 psychological readiness to deal with such a diagnosis. Emerging studies have reported COVID-
25 602 19 patients as having psychiatric related conditions post infection, further concurring with our
26 603 study.^{34,35}

31 604 **Utility of OFTT in facilitating decision making**

32 605 The tool was useful in assisting patients in decision making particularly not to test. Trust in the
33 606 institution proved pivotal as many followed recommendations simply because they trusted the
34 607 source of the tool, our university hospital. Studies elsewhere concur with our findings.^{36,37} On
35 608 the other hand, some of those that got the recommendation to test did not do so due to a myriad
36 609 of reasons as revealed above. In addition, the cost of the test (CHF 180 at the time), shortages
37 610 of tests and fear of a positive result and the resultant consequences of isolating, stigma etc.
38 611 further influenced decisions not to test. A low income was found not to be a reliable socio-
39 612 economic status proxy in our study. Most low-income participants were PhD students and post-
40 613 docs who cited various reasons for not following recommendations. Many told us how they
41 614 sought and read scientific evidence to inform themselves and this, rather than the
42 615 recommendations, guided their decision making. In line with our findings, salary is not a good
43 616 proxy for socio-economic status among online tool users.²⁴ A shortcoming in this regard, was
44 617 the missing information on how the tool arrived at the recommendation to test or not to test e.g.
45 618 algorithm used¹⁹ something some key informants wished to know. The issue of safety concerns
46 619 with regards to specificity of digital tool algorithms has also been reported elsewhere.³⁸

51 620 **Utility of OFTT in preventing onward transmission- cross infection**

52 621 The tool proved useful in preventing cross infection concurring with findings elsewhere.¹⁹ Most
53 622 participants who were told to stay at home did so, reducing mobility and exposure. Most of the
54 623 participants called the GP practice ahead of time. That gave the GP practices time to ensure that
55 624 the suspect patient did not mix with other patients, thereby reducing the potential for onward
56 625 transmission (cross infection).¹⁹

626 **Utility of OFTT in reducing health system burden**

Our primary hypothesis was that such an OFTT reduces the health system burden. Most of the participants who used the tool would have called their GP or visited the hospital. OFTT use effectively kept these worried participants at home and out of the doctors' offices and hospitals, effectively reducing the health system burden. Contradicting our findings, research from elsewhere has produced inconclusive and sometimes contradicting evidence.^{28,39} Further studies in different contexts are therefore called for. Further contradicting our findings,, another study reported that symptom checkers' triage capabilities are not greater than that of an average lay person.⁴⁰ In fact the convenience of telemedicine has also been associated with increased utilization of services, increasing work load and health care spending.⁴¹

Recommendations and lessons learned

Our study demonstrated the effects and utility of a COVID-19 OFTT. The assessment of an OFTT is important but not without challenges. Below are some of the lessons worth sharing with both health care providers and policy makers as subsequent waves sweep across Europe;

- Most of the participants had challenges remembering the tool. Immediate feedback e.g., in one minute, please rate this tool, or three open questions; please tell us how useful this tool was with regards to i) accessibility of tool, ii) utility of tool as an Information source, ii) utility of tool in facilitating your decision making could be more effective. Data protection concerns and the need to keep barriers to use as low as possible, could stand in the way of this approach.
- The tool simply instructed patients to test or not to test, an arbitrary decision, without shedding light on how the decision was made. Patients wish to see an algorithm that says something like, "*the probability of you having COVID-19 is 75% test or 25% do not test.*"
- Many participants said, "*bear in mind that online tool recommendations have less weight than recommendations from a GP.*" Additional caution is needed in language and terminology use as some patients that felt labelled by tool as high risk, had negative outcomes. Ensuring access to a doctor to debrief with after such tool use is advisable. Retired doctors who are still willing to make a contribution to the society, could play such a role.
- Many participants found the tool by accident; hence it is advisable to advertise tool on social media platforms, billboards, TV, radio and could make it appear at the top of google search. In addition, taking the tool to the people e.g., through road shows could be a useful strategy to reach the old people – if they do not come to the tool, take the tool to the people.
- Many participants compared the tool recommendations with what the Federal Office of Public Health (FOPH) recommended at the time. Having a tool link on FOPH website that stipulates and references the FOPH criteria informing the tool, could increase trust in tool and acceptability. Coordination between FOPH, university hospitals, and other medical professional bodies is recommended to further enhance trust in the tool.
- Many elderly people are willing to embrace telemedicine, but challenges persist. Telephone and voice activated system for the older population or call centers to serve this group, are still needed (taking heed of unreachable and unanswered calls) during this transitional phase.
- Most participants found media confusing – telemedicine could play a better information spreading role, sifting through the noise and offering scientific based recommendations. For many, the media spread fear and misinformed people in many instances.
- The OFTT lacked information on where to test (contact list of testing centres), how to self-care, how to manage symptoms and when to contact a doctor-

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3 677 addressing these shortcomings could improve the utility of OFTTs. Our results
4 678 underline the importance of not offering a telehealth tool as a stand-alone product,
5 679 but to integrate it into an overall concept with links to credible reliable sources.

- 6 680 ➤ Systems thinking-refers to the ability to see interconnectedness in a system with
7 681 a dysfunction in one part affecting other parts and consequently outcomes. Our
8 682 study revealed the reasons patients did not follow the recommendation to test, as
9 683 multipronged. Attention has to be paid to supply chain issues, as test shortages
10 684 affected outcomes. The cost of a test and the fear of a positive result additionally
11 685 emerged as hindrances to testing. This calls for systems thinking. Noteworthy, is
12 686 the reaction of GPs who labelled OFTT users who asked for a COVID-19 test as
13 687 hysteric. This does not only reveal that the pandemic caught everyone by surprise,
14 688 but also demonstrates the need to involve, collaborate with and win the local
15 689 health care providers-policy implementers, like GPs and Spitex (home based
16 690 nursing), to enhance tool utility as well as ensure positive outcomes
- 17 689 ➤ One key informant suggested having patients who had recovered from COVID-
18 690 19 act as champions to share their illness experience, and motivate the public to
19 691 take preventive measures and take the disease seriously-an approach that was also
20 692 effective in HIV prevention and coping strategies.
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4 696 CONCLUSION
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7 697 OFTT use has increased greatly during this pandemic. The effects and utility of such tools
8 698 however, have not been widely assessed. That makes our study, one of the firsts, in assessing
9 699 effects and utility of a COVID-19 OFTT. Our study revealed that an OFTT does not only reduce
10 700 the health system burden but can also serve as an information source, reduce anxiety and fear,
11 701 reduces potential for onward transmission and facilitate decision making.
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4 703 **DECLARATIONS**
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7 704 **Acknowledgement:** Emergency telemedicine at University of Bern, Switzerland is supported
8 705 by an endowed professorship by the Touring Club Switzerland.
9 706

10 707 **Author contributions:** Study design and idea: J.M., A.M, R.S, T.C.S., M.M, M.E.R, P.J,
11 708 W.E.H.; Data extraction and preparation: R.S., M.M, A.M; Qualitative interviews: J.M., R.S.,
12 709 A.M.; Statistical analysis: M.M.; Qualitative analysis: JM. Writing of first draft: J.M., A.M,
13 710 M.M.; Revision of the final draft and final approval: all authors; Supervision: T.C.S., W.E.H.;
14 711 Project administration: T.C.S., W.E.H.
15 712

16 713 **Category of article:** original article
17 714

18 715 **Running title:** Usage of online tools during the COVID-19 pandemic
19 716

20 717 **Source of funding:** Swiss National Science Foundation (Project ID: 196615)
21 718

22 719 **Conflict of interest:** This manuscript is partially funded by the Swiss National Science
23 720 Foundation (Project ID: 196615). The founder has no influence on the content of the manuscript
24 721 or the decision to publish it.
25 722

26 723 TCS holds the endowed professorship for emergency telemedicine at University of Bern,
27 724 Switzerland. The founder has no influence on the research performed, the content of any
28 725 manuscript or any decision to publish. All other authors have nothing to disclose.
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30 727 **Data sharing**
31 728

32 729 Due to the nature of the study (OFTT) participants did not agree for their data to be shared
33 publicly. The data to support findings are available. Please contact corresponding author JM.
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846 LIST OF FIGURES

847 **Figure 1: Mixed-Methods Sequential Explanatory Study Design**

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4 **Figure 1: Mixed-Methods Sequential Explanatory Study Design**
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Phase	Procedure	Product
Collection of clinical data	OFTT	Data about usage of the tool Contact data for later study phases
Quantitative data collection	Questionnaires	Numeric data
Quantitative data analysis	Statistical analysis	Descriptive statistics
Connecting quantitative and qualitative data	Purposefully selecting patients for interviews	Interview guide
Qualitative data collection	Individual in-depth interviews	Interview transcripts
Qualitative data analysis	Coding and thematic analysis	Codes and themes
Integration of qualitative and quantitative results	Interpretation and explanation of quantitative results with the aid of and qualitative findings	Implications for OFTT development

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Supporting information OFTT Questionnaire and results

Supporting information 1. Usage of online tools during the COVID-19 pandemic: email survey

v1	How did you get to this Online - Tool?		
	1 - My family doctor advised me to use this tool.	9	5.1%
	2 - I found the information on the Internet.	113	64.2%
	3 - The website was recommended to me by family/friends.	17	9.7%
	4 - Via a telephone hotline.	1	0.6%
	5 - Other (Free text)	35	19.9%
v2	Did you find the information that you needed?		
	1 - Yes	154	87.5%
	2 - No, because the information was not comprehensive.	17	9.7%
	3 - No, because the information was not clear.	5	2.8%
v3	What information did you search for? I wanted....		
	1 - ... more information on COVID-19 symptoms	97	55.1%
	2 - ... more information on how to cope with symptoms	4	2.3%
	3 - ... to know when to consult a doctor	36	20.5%
	4 - ... to know more on testing criteria	32	18.2%
	5 - ... to know where to test	7	4.0%
	6 - Other	-	-
v4	Did the online tool recommend you to test for COVID-19?		
	1 - Yes	56	31.8%
	2 - No	120	68.2%
v5	Did you stick to the recommendations?		
	1 - Yes	149	84.7%
	2 - No	27	15.3%
v6	If you followed the Online - Tool recommendations, what made you do so?		
	1 - I trust the website as a reliable information source.	60	34.1%
	2 - I compared the recommendations with recommendations from the media and took a decision.	20	11.4%
	3 - I compared the recommendations with those from FOPH (BAG) and took a decision.	53	30.1%
	4 - I sought advice from a person I trusted.	7	4.0%
	5 - Other, please specify: Free text	9	5.1%
v7	In case you did not follow the recommendations, why did you not		
	1 - I did not trust the website as a reliable source of information.	1	0.6%
	2 - The recommendations from the website differed from the media recommendations.	2	1.1%
	3 - I feared for my life and needed to consult a GP in person.	6	3.4%
	4 - Other, please specify: Free text	18	10.2%
v8	Were your fears and anxieties allayed after visiting the website?		
	1 - Yes, the information from the website reassured me.	73	41.5%
	2 - No, the information from the website did not reassure me.	13	7.4%

	3 - No, the information from the website increased my fears and anxieties.	6	3.4%
	4 - I was not worried.	84	47.7%
v9	How did you cope with your fears? What helped you cope?		
	1 - Free text	-	-
v10	In case you went to the GP, did you call ahead of time to notify them of your visit?		
	1 - Yes	115	65.3%
	2 - No	61	34.7%
v11	Did you get tested for Coronavirus (SARS-CoV-2 Swab)?		
	1 - Yes	48	27.3%
	2 - No	128	72.7%
v12	What was the result?		
	1 - Positive	3	1.7%
	2 - Negative	45	25.6%
v13	How did the media influence your decision making? The		
	1 - ... helpful	81	46.0%
	2 - ... confusing	47	26.7%
	3 - I do not rely on the media as an information source.	25	14.2%
	4 - Free text	23	13.1%
v14	How old are you?	Mean 50.5 (SD 15), range 18-82	
v15	What is your sex?		
	1 - Female	101	57.4%
	2 - Male	75	42.6%
	3 - Other	0	0.0%
v16	What is your nationality?		
	0 - Missing	0	0.0%
	1 - Swiss	147	83.5%
	2 - German	13	7.4%
	3 - French	1	0.6%
	4 - Italian	3	1.7%
	5 - Liechtenstein	0	0.0%
	6 - Greater Europe	4	2.3%
	7 - Free text	7	4.0%
v17	In which province do you live?		
	1 - Bern	108	61.4%
	2 - Zürich	12	6.8%
	3 - Luzern	10	5.7%
	4 - Uri	0	0.0%
	5 - Schwyz	1	0.6%
	6 - Obwalden	0	0.0%
	7 - Nidwalden	0	0.0%
	8 - Glarus	0	0.0%
	9 - Zug	2	1.1%
	10 - Fribourg	7	4.0%
	11 - Solothurn	3	1.7%
	12 - Basel-Stadt	2	1.1%
	13 - Basel-Landschaft	1	0.6%
	14 - Schaffhausen	0	0.0%

	15 - Appenzell Ausserrhoden	2	1.1%
	16 - Appenzell Innerrhoden	0	0.0%
	17 - St. Gallen	2	1.1%
	18 - Graubünden	3	1.7%
	19 - Aargau	9	5.1%
	20 - Thurgau	1	0.6%
	21 - Ticino	2	1.1%
	22 - Vaud	7	4.0%
	23 - Valais	0	0.0%
	24 - Neuchâtel	1	0.6%
	25 - Geneva	0	0.0%
	26 - Jura	0	0.0%
	27 - I do not live in Switzerland	3	1.7%
v18	What is your highest level of education?		
	0 - Missing	6	3.4%
	1 - Tertiary education (university degree, college of education)	120	68.2%
	2 - Upper secondary education (High School Graduation, FMS, EZF, EBA)	27	15.3%
	3 - Lower secondary education/ obligatory schooling completed	23	13.1%
	4 - No formal education		
v19	Are you currently...		
	0 - Missing	33	18.8%
	1 - Employed	106	60.2%
	2 - Self employed	24	13.6%
	3 - Unemployed already before the current pandemic	3	1.7%
	4 - I lost my job during the COVID-19 period	1	0.6%
	5 - Studying or in an apprenticeship	9	5.1%
v20	How much approximately do you earn per month? (net income in December 2019 including 1/12 of the 13th month salary.)		
	0 - Missing	29	16.5%
	1 - Less than 4'000 CHF	26	14.8%
	2 - Between 4'001 and 6'000 CHF	42	23.9%
	3 - Above 6'001 CHF	79	44.9%
v21	What type of health insurance do you have?		
	1 - General	68	38.6%
	2 - Telemedicine - Modell	12	6.8%
	3 - GP - Modell	83	47.2%
	4 - Another alternative model	8	4.5%
	5 - No insurance	5	2.8%
v22	In a second stage, we will interview individual participants of		
	1 - Yes, I consent to be contacted.	78	44.3%
	2 - No, please, no more interviews.	98	55.7%
	3 - Free text	-	-

Interview Guide: Coronatest.ch -Patients v 2

Rapport

0Describe yourself (prompts; nationality, occupation, living arrangements, employment status)

Accessibility

0How did you get to coronatest.ch website? (referred by ..., online search). What is your understanding of an OFTT?

0Did you consult BAG- was the information supplied by BAG understandable to you? In what way was it useful.

0Was the online digital tool easy for you to access? explain why or why not (easy to find on homepage, length of tool, clear and easy to follow instructions, language, sequence, when did you use the tool Monday, Tuesday, weekend or during the week and why)

0What information or components would have helped you better -what do you suggest needs to be done to make such an online too more accessible.

Utility as a reliable information source and decision making

0When you consulted the online digital tool; did you follow the recommended advice? Prompt (why and how socioeconomic status could have influenced the process)

0What made you follow the advice and recommendations? Prompt confirmation from friends, generally, the media influence your decision-making process?

0What made you disregard the advice and recommendations? (prompt for severity of symptoms, change of condition)

0We have noticed that people that earn below 4000 tend not to follow recommendations, why do you think it's like this, what can be done?

Utility in allaying fear and anxiety

0Describe how you felt after consulting the online digital tool with regards to feeling anxious and or confident that all was going to be well? (Did you feel reassured after visiting coronatest.ch)

0If your fears were not allayed, how did you deal with your fears? prompt on what increased confidence, what allayed your anxiety)

Illness and testing Experience

0Did you test for COVID-19, what test and experience? Did you experience COVID-19 symptoms? Explain

0Speaking of self-isolation. Please explain in more detail how you experienced this what worked and what did not work e.g. the need to go shopping, not going for a run or walk protecting others vs own needs, putting others first, dilemmas, challenges

0The road to recovery has been described by many as very cumbersome and long-what was your experience? Any psychiatric or other residual effects experienced-explain.

0What personal life lessons did you learn during this pandemic you would like to share and what personal changes do you foresee in future

0What health and health system related observations did you make and what changes do you fore see in future?

0What, socio-economic changes have you observed and do you foresee in the future as a result of COVID-19

Utility in preventing cross infection

0If you consulted a GP; did you call ahead of time?

0How did your GP/ health care provider react when you told him or her you suspected that you had COVID-19?

Recommendations

0In a future pandemic, what would you do?

0Is there any additional information you wish a site like corontest provides but was missing during COVID-19? What information did you search for but did not find?

0Are there other strategies (to allay fear, anxiety) you deem effective alone or in conjunction with online digital tools when faced with epidemics such as COVID-19 to make it accessible to the older generation?

0How can online tools like corontast be adapted to facilitate your decision making processes

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	7
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10
		(b) Describe any methods used to examine subgroups and interactions	10
		(c) Explain how missing data were addressed	10.11.12.13
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	

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(e) Describe any sensitivity analyses

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Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	11
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11
		(b) Indicate number of participants with missing data for each variable of interest	11
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	12.13.14
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	21
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24

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

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

BMJ Open

Effects and utility of an online forward triage tool during the SARS-CoV-2 pandemic: a mixed method study and patient perspectives, Switzerland

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-059765.R1
Article Type:	Original research
Date Submitted by the Author:	01-Apr-2022
Complete List of Authors:	Michel, Janet; Inselspital Universitätsspital Bern, Department of Emergency Medicine Mettler, Annette; University of Bern, Department of Emergency Medicine Stuber, Raphael; University of Bern, Department of Emergency Medicine Müller, Martin; University of Bern, Department of Emergency Medicine Ricklin, Meret; University of Bern, Department of Emergency Medicine Jent, Philipp; University of Bern, Department of Infectious Diseases Hautz, Wolf; University of Bern, Department of Emergency Medicine; University of Oslo Sauter, Thomas; University of Bern, Department of Emergency Medicine
Primary Subject Heading:	Emergency medicine
Secondary Subject Heading:	Health policy, Qualitative research, Public health, Emergency medicine
Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, QUALITATIVE RESEARCH, Telemedicine < BIOTECHNOLOGY & BIOINFORMATICS, EPIDEMIOLOGY

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Effects and utility of an online forward triage tool during the SARS-CoV-2 pandemic: a mixed method study and patient perspectives, Switzerland

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Word count 5 600

Key words

online forward triage tool (OFTT), effects, utility, SARS-CoV-2, COVID-19, pandemic

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For peer review only

88 **ABSTRACT**

89 **Introduction:** Online forward triage tools (OFTT) are being widely used during this COVID-
90 19 pandemic. The effects and utility of such tools however, have not been widely assessed.

91 **Objective:** To assess the effects (quantitatively) and the utility (qualitatively) of a COVID-19
92 OFTT in a pandemic context, exploring patient perspectives as well as eliciting
93 recommendations for OFTT improvement.

94 **Methods:** We employed a mixed-method sequential explanatory study design. Quantitative
95 data of all users of the OFTT between March 2nd, 2020 and May 12th, 2020 were collected. A
96 follow-up survey of people who consented to participation was conducted. Secondly,
97 qualitative data was collected through key informant interviews (n=19) to explain the
98 quantitative findings, as well as explore tool utility, user experience and elicit
99 recommendations.

100 **Results:** In the study period, 6,272 users consulted our OFTT; 40.2% (1626/4049) would have
101 contacted a healthcare provider had the tool not existed. 560 participants consented to a follow-
102 up survey and provided a valid e-mail address. 31.4% (176/560) participants returned a
103 complete follow-up questionnaire. 84.7% (149/176) followed the recommendations given.
104 41.5% (73/176) reported that their fear was allayed after using tool. Qualitatively, seven
105 overarching themes emerged namely i) accessibility of tool, ii) user-friendliness of tool, iii)
106 utility of tool as an information source, iv) utility of tool in allaying fear and anxiety, v) utility
107 of tool in medical decision making vi) utility of tool in reducing the potential for onward
108 transmissions and vii) utility of tool in reducing health system burden.

109 **Conclusion:** Our findings demonstrated that a COVID-19 OFTT does not only reduce the
110 health system burden, but can also serve as an information source, reduce anxiety and fear,
111 reduce cross infections and facilitate medical decision making.

112 **Word count 277**

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117 **Strengths and limitations**

118 Many online tools have been developed during the COVID-19 pandemic. The effects and utility
119 of these tools however have not been assessed.

- 120 • *Coronatest.ch* was one of the first COVID-19 OFTTs in Switzerland. Our study could
121 become the base line for studies that assess the effects and utility of such online tools.
122 The identified themes namely i) accessibility of tool, ii) user-friendliness of tool,
123 iii) utility of tool as an information source, iv) utility of tool in allaying fear and anxiety,
124 v) utility of tool in decision making (test or not to test), and vi) utility of tool in reducing
125 onward transmission-cross infection, vii) utility of tool in reducing health system
126 burden, could serve as a framework for assessing OFTT utility (follow-up paper). The
127 mixed method sequential explanatory design gave us a better understanding of OFTTs,
128 their effects measured quantitatively and utility explained with the aid of qualitative
129 findings. We did not simply report the effects but could also explain why the results
130 were that way, generating a holistic picture of the phenomenon.
- 131 • The selection of the participants in our study carries the risk of a selection bias.
132 Perspectives of those that do not use online tools are missing and should be explored in
133 further studies. In addition, only a limited number of OFTT users took part in our study.
134 This selection bias cannot, to the best of our knowledge, be prevented due to data

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3 135 protection regulations which impose a voluntary participation and prohibit a technically
4 136 possible automatic tracking of participants. Another way to avoid this possible selection
5 137 bias would be to make the use of such a tool conditional on participation in the study.
6 138 We have deliberately decided against this procedure for ethical reasons, in order to make
7 139 our OFTT accessible to as many users as possible and to keep barriers as low as possible.
8 140 In addition, mandatory entry of personal data in OFTT for study purposes would also
9 141 discourage individuals from using the tool and thus trigger a new bias. Our comparison
10 142 of overlapping questions between the OFTT and the follow-up survey can at least help
11 143 to estimate the similarities within the two groups. For both questions, the percentages
12 144 are comparable and can help in estimating the similarity of the groups.

- 15 145 • Another limit of our study is the relatively long duration between the use of tool and the
16 146 qualitative interviews. This could have introduced a certain degree of recall bias.
- 17 147 • As with all online tools, we cannot confirm the accuracy of the data entered. In
18 148 particular, we cannot say for sure whether the OFTT users used the tool to assess own
19 149 symptoms or for other reasons, such as curiosity, fear or uncertainty about how to deal
20 150 with the novel infection. Likewise, multiple use, trial runs or use of tool by a health care
21 151 worker on behalf of patients, relatives and friends are all possible. Socio-economic
22 152 status might have introduced a selection bias in our study since most of the participants
23 153 had a higher education. Income emerged not to be a good proxy for assessing socio-
24 154 economic status. Other instruments, apart from income are therefore needed to assess
25 155 socio-economic status. Additionally, an on online assessment cannot fully replace a
26 156 (polymerase chain reaction) PCR test as some asymptomatic people might be positive
27 157 and those with COVID-19 specific symptoms might be suffering from a different
28 158 disease.⁵
- 31 159 • In our mind, the data still sheds light on the effects and utility of such an online tool and
32 160 the recommendations given could guide other OFTT developers as the third wave
33 161 sweeps across Europe. As the study was conducted with a specific OFTT, transferability
34 162 of our results to other OFTTs is not necessarily a given. Given the limited evidence on
35 163 the use of OFTTs, the results, in particular the qualitative component of the study, could
36 164 be of value to other OFTT developers, with particular regards to utility and accessibility
37 165 issues. Further studies with other OFTTs outside the COVID-19 context are
38 166 recommended so as to increase transferability and improve the utility of OFTTs in the
39 167 current third wave, future pandemics and other health care settings.

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185 INTRODUCTION

186 The number of COVID-19 cases across the globe has surpassed 25 million and incident rates
187 are again on the rise as many European countries experience subsequent waves.¹⁻⁴ Many people
188 are seeking reliable information, recommendations on testing and management of COVID-19
189 as well as reassurance, adding to the health system burden. Online forward triage tools (OFTT)
190 are being widely used during this COVID-19 pandemic context⁵⁻⁸ as misinformation and worry
191 in the population abound. There is evidence from an earlier 2009 H1N1 influenza pandemic,
192 that online tools are effective and practical in reducing the health system burden.^{9,10} There is
193 also emerging evidence of this nature from the COVID-19 context.^{6,11-14} For example, OFTTs
194 help reduce exposure of worried but uninfected and infected persons, through avoidance of
195 hospitals and doctors' offices – enabling patients to access recommendations of what to do,
196 from the comfort of their own homes.^{10,11}

197 Using OFTTs is relatively easy to the computer literate. People respond to questions and upon
198 completion, recommendations are given, e.g., isolate, test, do not test etc. Existing evidence on
199 the effects and utility of OFTTs differ with possible implications on the quality of the symptom
200 assessment⁵. According to literature, the reasons patients use symptom checkers or OFTTs are
201 i) to understand the causes of their symptoms (76%), ii) to determine whether or not to seek
202 care (33%), and iii) where to seek care (21%).¹⁵ There is also evidence that patients that have
203 previously experienced a diagnostic error are more likely to use OFTT to search for where to
204 seek care¹⁵ than those that have not.

205 **Challenges with OFTT use and research gap**

206 In the European Union, 87% of people aged 75 years and above have never been online
207 according to a recent survey.¹⁶ That means the elderly, may be less inclined to use online tools
208 if not computer literate. This in turn shuts the elderly out from society, increasing isolation and
209 loneliness, not to mention the missed health benefits [10]. The digital divide is real¹⁷. How can
210 digital tools be designed to be more inclusive?¹⁸ Information on factors influencing the use of
211 OFTTs is scant and the validation of COVID-19 OFTTs like other OFTTs, seems neglected.
212^{15,19} That makes the quality assessment of these tools paramount⁵ as evidence on effects and
213 utility of OFTTs is limited.

215 **The aim of this study**

216 This study aimed at assessing the effects (quantitatively) and the utility (qualitatively) of a
217 COVID-19 OFTT during a pandemic context in Switzerland, exploring patient perspectives and
218 derive recommendations for tool improvement. We hypothesized that an OFTT adequately
219 reduces patient visits to the health care system and consequently reduces the health system
220 burden. We further explored qualitatively, for emergent themes, capturing the tool utility to this
221 population.

225 METHODS

226 **Study design and participants**

227 We employed a mixed-method sequential explanatory design to study the utility of the OFTT
228 and the effects of using such a tool. The rationale for mixing both kinds of data within one study
229 is that neither qualitative nor quantitative methods, are sufficient by themselves, to capture
230 details of a phenomenon. In combination, they complement each other, taking advantage of the
231 strengths of each. As in sequential explanatory designs, quantitative data collection was done
232 first, as a major component of our study to inform qualitative interviews, see Figure 1.

233 **About here Figure 1: Mixed-Methods Sequential Explanatory Study Design.**

234 **Online forward triage tool description and setting**

235 The working group e-emergency medicine at the emergency department (ED), Inselspital
236 University Hospital Bern, together with the Department of Infectious Diseases, Inselspital
237 University Hospital Bern, developed an online forward triage tool (OFTT) which was made
238 available online (*coronatest.ch*). To the best of our knowledge, this was one of the first COVID-
239 19 OFTTs set up in the German speaking part of Switzerland. In a skip-logic, the OFTT
240 displayed the current test recommendations of the Federal Office of Public Health (FOPH) on
241 whether someone needed testing for COVID-19 or not. No diagnosis was provided by the
242 OFTT.

243 The questions and the content of the OFTT represented the official FOPH recommendations at
244 the time. Thus, the OFTT was comparable in content to other OFTTs in Switzerland, which
245 were based on the FOPH guidelines within that time period. One additional non-mandatory
246 question, which did not affect the result, was integrated in our OFTT from the 11th March 2020,
247 namely the question "What would you do if this online test did not exist?".

248 There were two possible outcomes of the OFTT: "According to the criteria of the Federal Office
249 of Public Health (BAG), one meets or does not meet the criteria for a test for an infection with
250 the coronavirus, COVID-19". The results page was linked to the FOPH's official behavioural
251 recommendations and recommendations for the testing process. The average time to complete
252 the assessment was 75sec.

253 **OFTT triage**

254 Details on the structure of the OFTT as well as screen shot are published in a separate
255 quantitative paper²⁰. The Federal office of public health (FOPH) national COVID-19 Swiss
256 testing criteria were transferred into a digital decision tree and adjusted promptly after the
257 criteria were adapted by the FOPH. During the first phase of the pandemic, the
258 recommendations for testing or not testing were mainly based on contact with an infected
259 person or a visit to a risk area and were then changed during the course of the pandemic to a
260 testing regime based on risk groups (healthcare professionals, patients >65 years and patients
261 with pre-existing conditions). With the general availability of the tests, the test
262 recommendations were extended to all symptomatic patients and our OFTT became obsolete.
263 Unlike other triage techniques performed on emergency patients, the aim of the OFTT was not
264 to make a COVID-19 diagnosis, assess the risk of severe COVID-19 progression or recommend
265 treatment. See Fig 2 below.

266 **About here Fig 2: OFTT triage**

267 **Quantitative data**

268 **Research participants and data collection**

269 Participants included all users above the age of 18 that used the OFTT between March 2nd, 2020
270 and May 12th, 2020. In this timeframe, the recommendations on COVID-19 frequently changed
271 in Switzerland and there was an initial lack of testing reagents and capacity as well as the risk
272 of overburdening the healthcare system. During the first few weeks of the pandemic, the Federal
273 Office of Public Health (FOPH) recommended testing only for symptomatic patients after travel
274 to high-risk countries (e.g., Italy and China) or symptomatic contacts of coronavirus patients.
275 In weeks that followed (as from the 20th March 2020), the strategy changed to testing of high-
276 risk groups (older than 65 years, pre-existing conditions, and healthcare workers). The countries
277 and risk groups were regularly adjusted according to the spread of the virus and the findings
278 about risk groups but also the availability of testing capacity.

279 Due to the rapid spread of the virus in Switzerland, and broadly available testing capacities, a
280 universal test recommendation was made by the Federal Office of Public Health (FOPH)- on
281 April 27th, 2020. All symptomatic individuals were eligible to test. With this recommendation,
282 our OFTT provided less benefit to the user and was finally removed on May 12th 2020 from the
283 website paving the way to a second generation OFTT.

284
285 To minimise the barrier to the use of the OFTT and for legal data protection reasons, no personal
286 data was collected within the OFTT. Further data on the users of the OFTT was collected in a
287 second step, from participants who gave their explicit consent and provided their email
288 addresses to be contacted. This also made it possible to investigate the adherence to
289 recommendations and the test results. A non-mandatory additional question was built into the
290 OFTT from 11th March 2020.

291 A pretested online questionnaire (see supplementary info) was used to assess the

- 292 i) utilization of the OFTT, including way of referral to the tool, reasons for use and
293 information searched,
- 294 ii) additional factors, including influence of the media and influence of the OFTT on
295 fear and anxiety.

296 The database used is compliant with Swiss laws on the collection of personal health related
297 information. The follow-up questionnaire is available as supplementary information. Due to
298 ethical reasons, we included the option "not want to answer" as a choice in the questionnaire
299 for the socio-demographic data, in case the respondent did not want to give a statement on this
300 specific sensitive topic.

301 The qualitative interviews were conducted with purposefully selected key informants who gave
302 their consent during the survey (see below).

303 **Data analysis**

304 Quantitative data was analysed in Stata® 16.1 (StataCorp, The College Station, Texas, USA).
305 Descriptive statistics for all variables as mean and standard deviation or frequency as
306 determined by the type and distribution of the data were computed. Categorical variables
307 between two groups were compared using Chi-square statistics and the distribution of
308 continuous variables were compared using Wilcoxon rank sum test.

309 To assess the risk of selection bias and to estimate the similarity of the groups, we compared
310 responses to overlapping questions within the OFTT and the follow-up survey.

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3 311 **Qualitative data**

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5 312 To explain the quantitative results, we explored the experience of tool use by the patients
6 313 qualitatively. Following quantitative data analysis, an interview guide was created and adapted
7 314 iteratively.

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9 315 **Purposeful and quota sampling**

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11 316 We purposefully sampled participants from those that had firstly, utilized our OFTT, secondly,
12 317 had taken part in the follow-up survey and thirdly, had consented to a follow-up interview. We
13 318 included participants of all age groups (quota) to ensure inclusiveness.

14
15 319 **Sample Size**

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17 320 Many experts suggest saturation as central to qualitative sampling²⁰. In this study we aimed for
18 321 both data saturation and rich and detailed narratives and achieved this with 19 key informants
19 322 from all age groups (see Table 1).

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23 324 **Data collection**

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25 325 Due to COVID-19 concerns, video rather than face to face interviews were held with most
26 326 participants in September 2020. A combination of video and telephonic interviews were
27 327 conducted with three participants who had technical challenges and a telephone only interview
28 328 was held with one lady, aged above 65, who had no computer access. Three face to face
29 329 interviews were held with three key informants: one that was a hospital health care worker, and
30 330 two key informants who worked close to Bern university hospital. A semi-structured interview
31 331 guide informed by the quantitative results was used (see supplementary info). This was adapted
32 332 iteratively throughout the data collection period. Two qualitative researchers sat in each session
33 333 fielding questions in turns. All interviews were conducted in German by two researchers fluent
34 334 in both English and German. The interviews lasted between 45 minutes to one and a half hours.
35 335 Two audio-recorders were used in each session. All participants gave individual written consent
36 336 as well as oral consent to the recording at the beginning of each session. See Table 1 for
37 337 summary of Key Informants.

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356 **Table 1. Key Informant summary**

Age-group	Males	Females	Total
18-29	1	2	3
30-45	2	2	4
46-64	3	4	7
65+	4	1	5
Total	10	9	19

357

358 **Data analysis**

359 Audio recordings were transcribed, analysed and triangulated with quantitative data results.
 360 Qualitative narratives were obtained to explain quantitative results as well as to explore utility
 361 of OFTT to patients as well as elicit recommendations to make online tools more useful and
 362 inclusive. A grounded theory approach was utilized. Concepts were identified from collected
 363 data and compared iteratively. These concepts were grouped into categories and culminated
 364 into the identified themes.

365
 366 **Measures to ensure trustworthiness of data:** To ensure dependability, data collection and
 367 analysis were performed iteratively, continuously adjusting our interview guide to capture
 368 newly emerging themes. Throughout data collection, two qualitative researchers kept reflexive
 369 journals and debriefed at the end of each interview. To ensure transferability, a thick description
 370 of participants, context and data collection process has been outlined. Data was managed and
 371 analysed with the aid of MAXQDA2018.

372 **Ethics approval**

373 The local ethics committee of the Canton of Bern, Switzerland, deemed this project a quality
 374 evaluation study and waived the need for full ethical review (Req-2020-00289) on the 23rd of
 375 March 2020.

376 **Patients and Public Involvement statement**

377 Patients and public were not involved in the design, conduct, reporting or dissemination of this
 378 research since the OFTT was set up as an emergency response to the pandemic.

379 RESULTS

380 Quantitative results

381 In total, n=6,272 completed assessments of the OFTT were recorded on the website during the
382 study period from March 2nd, 2020 to May 12th, 2020. This question asked OFTT users what
383 they would have done had the OFTT not existed. The question was answered by 97.6%
384 (3953/4049) of the users as follows: 40.2% (1626/4049) would have contacted the GP or visited
385 a hospital had the tool not existed; furthermore, 16.4% (665/4049) would have contacted a
386 hotline.

387 In the OFTT, 25.6% (1,608/6272) of assessments received a recommendation to test for
388 COVID-19 during the study period. In the follow-up survey question, "Did the online tool
389 recommend you to test for COVID-19?" -31.8% (56/176) answered, yes.

390 In the OFTT, 13.2% (564/4270) of OFTT users reported being over 65 years of age. The
391 variable age was only included and mandatory during some phases of the study period in
392 accordance with the FOPH guidelines, that changed frequently. This resulted in 4270
393 assessments with data on age. In the follow-up survey, 17.6% (31/176) reported being over 65
394 years.

396 A link to the online follow-up questionnaire was sent to 560 participants that consented to a
397 follow-up survey by providing a valid e-mail address. The online questionnaire was filled out
398 by 37.9% (212/560) of the participants; 31.4% (176/560) completed the whole questionnaire
399 and were included in the analysis (all 22 questions-see supplement). An overview of socio-
400 demographic characteristics of participants of the follow-up survey are presented in Table 2.

427 **Table 2. Socio-demographic table of participants of follow-up survey**

	Total (n=176)	Female (n=101)	Male (n=75)	P-value*
Age [mean, SD]	50.1 [±15.4]	45.9 [±14.1]	55.7 [±15.4]	<0.001
Education				
Not want to answer	6 [3.4]	3 [3.0]	3 [4.0]	
University	120 [68.2]	67 [66.3]	53 [70.7]	
Higher secondary school	27 [15.3]	17 [16.8]	10 [13.3]	
Lower secondary school	23 [13.1]	14 [13.9]	9 [12.0]	0.871
Income per month				
Not want to answer	29 [16.5]	17 [16.8]	12 [16.0]	
<4000 CHF	26 [14.8]	20 [19.8]	6 [8.0]	
4000 - 6000	42 [23.9]	27 [26.7]	15 [20.0]	
>6000	79 [44.9]	37 [36.6]	42 [56.0]	0.037
Work				
Not want to answer	33 [18.8]	14 [13.9]	19 [25.3]	
Employed	106 [60.2]	64 [63.4]	42 [56.0]	
Self-employed	24 [13.6]	13 [12.9]	11 [14.7]	
Unemployed	3 [1.7]	3 [3.0]	0 [0.0]	
Lost work (Covid-19)	1 [0.6]	1 [1.0]	0 [0.0]	
Student/trainee	9 [5.1]	6 [5.9]	3 [4.0]	0.236
Insurance				
Don't know	5 [2.8]	3 [3.0]	2 [2.7]	
General	68 [38.6]	39 [38.6]	29 [38.7]	
Telemedicine	12 [6.8]	6 [5.9]	6 [8.0]	
GP	83 [47.2]	47 [46.5]	36 [48.0]	
Other	8 [4.5]	6 [5.9]	2 [2.7]	0.859
Nationality				
Not want to answer	1 [0.6]	1 [1.0]	0 [0.0]	
Switzerland	147 [83.5]	80 [79.2]	67 [89.3]	
Germany	13 [7.4]	8 [7.9]	5 [6.7]	
French	1 [0.6]	0 [0.0]	1 [1.3]	
Italy	3 [1.7]	2 [2.0]	1 [1.3]	
Other Europe	4 [2.3]	3 [3.0]	1 [1.3]	
Other	7 [4.0]	7 [6.9]	0 [0.0]	0.202

* Chi-squared for categorical variables and Wilcoxon rank sum test for continuous variables; data are total number and percentage if not mentioned otherwise

The survey revealed that 84.7% (149/176) followed the tool recommendations and stayed at home thereby reducing the work-load of GPs and hospitals. Information about the utilization of the OFTT, specifically which information was searched for, how subjects found the tool, and information about satisfaction with the tool is presented in Table 3.

Table 3. Online forward triage tool use

	Total (n=176)	[%]
Information searched		
Information on COVID-19 symptoms	97	[55.1]
How to cope with symptoms	4	[2.3]
To know when to consult a doctor	36	[20.5]
To know more on testing criteria	32	[18.2]
To know where to test	7	[4.0]
Mode of referral		
Referral by family doctor	9	[5.1]
Online search	113	[64.2]
Recommendation by peers	17	[9.7]
Hotline	2	[1.1]
Other	35	[19.9]
Satisfaction with information		
Helpful	154	[87.5]
Not comprehensive	17	[9.7]
Not clear	5	[2.8]

We present additional factors that may have influenced how individuals coped during the coronavirus pandemic, their use of the OFTT and adherence to OFTT recommendations. Overarching topics that were asked included the influence of the media, fear and uncertainty, and reasons for adherence to the recommendation (see table 4). All questions and answers from the follow-up questionnaire are attached. See supplement 1.

446 **Table 4. Additional factors**

	Total (n=176)	[%]
Estimated influence of media		
Helpful	81	[46.0]
Confusing	47	[26.7]
No trust in media as source of information	25	[14.2]
Other	23	[13.1]
Influence of OFTT on fear and anxieties		
Reassured	73	[41.5]
No reassurance	13	[7.4]
Increased fears and anxieties.	6	[3.4]
Not worried before OFTT use	84	[47.7]
Reasons for following the recommendation (n=149)		
Trust in tool	60	[40.3]
Information congruent with media	20	[13.4]
Comparison with FOPH recommendation	53	[35.6]
Reassurance by others	7	[4.7]
Other	9	[6.0]

447

448 **Qualitative findings**

449 Seven overarching themes on the utility of the OFTT emerged during the qualitative interviews.
 450 These are used to structure the report of our findings, i.e., i) accessibility of the tool, ii) user-
 451 friendliness of the tool, iii) utility of the tool as an information source, iv) utility of the tool in
 452 allaying fear and anxiety, v) utility of the tool in decision making (test or not to test), vi) utility
 453 of the tool in reducing onward transmission-cross infection, and vii) utility of the tool in
 454 reducing health system burden. The qualitative findings are summarised in Table 5.

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460 **Table 5. Summary of qualitative themes**

Theme	Category	Unit meaning
Accessibility	Online search	Appeared but not on the top of google search Advertise tool in future
	Unreachable for some	Include telephonic services to reach the elderly Tool buddies
Utility as a reliable information source	COVID-19 Symptoms	Cough was a main symptom Symptom description like type of cough and severity of fever etc. was not possible Test or do not test decision was arbitrary-how the decision was arrived at was not clear e.g., 95% probability test or 5% probability do not test
	Testing info and centres missing	Information on when to call doctor was not clear e.g., fever above 39 degrees for 4 days -call doctor List of where to test and contact numbers were missing
Utility in decision making	Followed recommendations	Trust- the university hospital is a trusted institution
	Did not follow recommendations	Fear of a positive result and the resultant consequences Cost of test Test shortage GP refusing patients to test -hysteria
Utility in allaying fear and anxiety	Reassured some	Fear and anxiety allayed after tool use
	Person contact	An online tool is still an online tool - recommendations seen as not having a lot of weight
	Testing	A talk with a general practitioner (GP)-debriefing after tool use could have put them at ease
	Friends and family as a resource	Testing in itself is reassuring -make test available to all who are anxious
	Increased anxiety in some	Many relied on family and friends to deal with fear- social circle still a major source of support

		High risk label unsettled some
Utility in reducing health system burden	Many stayed at home	Recommendations followed- stay at home Some called Insurance companies
Utility in reducing onward transmission	Call GP before a visit	Most called GP ahead of visit
Systems thinking	Utility of tool is dependent upon other health system and societal components Fear of a positive test -rather not know	Participants told by tool to test only to be told that there are no tests (shortages) Fear of a positive test Media misinformation of painful test influenced some not to test-work with media Economic factors like cost of test influenced some not to test A new life-threatening disease in a population is associated with psycho-social and behavioural issues that need to be taken into account

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462 **Theme 1: Accessibility of the tool**

463 The accessibility of the tool emerged as very important. Many participants suggested to
464 advertise the tool to make it more accessible as revealed below:

465 *“I did not know of the existence of tool (an accidental internet search led the key*
466 *informant to the tool). Please advertise tool on TV and to Insurance companies.”* -Key
467 Informant 15

468 The older people seem willing to embrace technology and were prepared to use it. However,
469 they stated that they needed help with practical application at times as revealed below;

470
471 *“Provide telephone services for the elderly and a contact person, a GP so one can ask*
472 *questions if unsure.”* -Key Informant 14

473 **Theme 2: User-friendliness of the tool**

474 Most participants could not remember the tool immediately due to the time lapse from the tool
475 usage to interview. After being shown the tool once again, the header only, many cited it as
476 having been easy and simple to follow with the language being clear and the length acceptable.

477 **Theme 3: Utility of the tool as an information source**

478 The novel nature of COVID-19 infection left many scrambling for knowledge of the disease.
479 Many health care providers were inundated with phone calls. One participant said the following;

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3 480 *“The tool provided information on symptoms but did not have a list of testing centers.*
4 481 *The recommendations said call GP before visit but there was no number to call.” -Key*
5 482 *Informant 1*

6 483
7 484 *“Telemedicine could play a better information spreading role – media spread fear and*
8 485 *misinformed people for example mask use vs no mask.” -Key Informant 15*
9 486

12 487 **Theme 4: Utility of the tool in allaying fear and anxiety**

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14 488 Many participants interviewed reported being reassured after tool use. Others cited being more
15 489 anxious after tool use due to terminology and language and many suggested that a person, a
16 490 doctor be available after tool use for closure. Participants revealed the following;

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18 492 *“Wording of tool could be adapted – a friend aged 65, a diabetic, became depressed after*
19 493 *using tool and getting the high-risk patient classification. He needed a psychiatrist to*
20 494 *cope. Rather ask how are you, do you take any medication, which ones? Mentioning*
21 495 *conditions seem to increase anxiety.” -Key Informant 17*

22 496
23 497 *“I felt discriminated against by tool-differentiate between a health 73-year-old with no*
24 498 *chronic illnesses and a 50-year overweight diabetic.” -Key Informant 13*
25 499

28 500 **Theme 5: Utility of the tool in decision making process (to test or not to test)**

29 501 Many participants cited trust in our university hospital (Insel) as one of the main reason
30 502 participants followed the recommendations. Some participants revealed the following;

31 503
32 504 *“Insel has a good name and trusted the tool.” -Key Informant 16*
33 505

34 506 *“Coordination is needed for FOPH and Insel to speak in one voice.” -Key Informant 17*
35 507

36 508 Juxtaposed and not necessarily contradicting the quantitative survey, where trust was reported
37 509 as the main reason for following the recommendations, most of the participants cited shortages
38 510 of tests, improved symptoms, cost of test, misinformation that the test was painful and fear of
39 511 a positive result as reasons for not testing. Of utmost importance were GPs who viewed the test
40 512 request by online tool users as being hysteric. Below is what some participants said:

41 513
42 514 *“I read scientific papers to inform oneself and then decided.” -Key Informant 8*
43 515

44 516 *“Remember recommendations from an online tool have less weight than*
45 517 *recommendations from a doctor – there is no person behind this and so many might have*
46 518 *taken the tool and went further to contact own GP” - Key Informant 8*
47 519

48 520 *“I wished to see an algorithm that said something like, “the probability of you having*
49 521 *COVID-19 is 75% test or 25% do not test.” -Key Informant 5*
50 522

51 523 **Theme 6: Utility in reducing the potential for onward transmission- cross infection**

52 524 The tool recommended all participants to call the health care provider ahead of visit and most
53 525 of them did. A reason some participants might not have called the testing centres ahead of a
54 526 visit could be that the tool itself did not provide a list of contact numbers-a short coming that
55 527 was rectified in the second generation OFTT.

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3 527 **Theme 7: Utility of tool in reducing health system burden**

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5 528 Social distancing, isolation and quarantine were among the recommendations made to reduce
6 529 the spread of COVID-19. Most of the participants stayed at home. One participant said the
7 530 following;

8 531
9 532 *“I followed recommendations and stayed at home. However, home testing should be*
10 533 *provided if people should stay at home. Engage Spitex [organization for outpatient and*
11 534 *home-based care in Switzerland] in future pandemics and work with them.” -Key*
12 535 *Informant 6*

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DISCUSSION

This study quantitatively assessed the effects and confirmed the utility (qualitatively) of a COVID-19 online forward triage tool by exploring patient perspectives. We further elaborate on areas for improvement as well as share lessons learned for policy makers. Qualitatively, seven overarching themes emerged namely i) accessibility of tool, ii) user-friendliness of tool, iii) utility of tool as an information source, iv) utility of tool in allaying fear and anxiety, v) utility of tool in decision making (test or not to test), vi) utility of tool in reducing the potential for onward transmissions (preventing cross infection) and vii) utility of tool in reducing health system burden.

Accessibility of OFTT

One of the objectives of our OFTT was to provide an easily accessible, reliable and up to date information platform for professionals and the public. The tool was not advertised commercially; hence it did not appear at the top of the google search and many participants cited coming across the tool accidentally. Information about the tool was only disseminated via the hospital website and hospital communication to local doctors.

Despite the above -mentioned shortcoming, our findings revealed that the tool was accessible to both genders and all age groups including the elderly. In line with other studies,²¹ the elderly seem ready to embrace online tools, contradicting other studies.^{10,17} Contradicting our findings, one study revealed that it's the young and highly educated patients that tend to use symptom checkers or OFTTs.²²

Despite the revealed readiness of the elderly to embrace technology, key informants suggested keeping the use of telephonic services for the elderly as an option in telemedicine. Further supporting these findings, nurse triage lines (telephone) have been proven effective in this COVID-19 pandemic context in the US and in Canton Vaud, Switzerland.^{10,23} Others suggested having a list of tool buddies reachable by phone, that links people that have used the tool before and are willing to be contacted by a new user, that might be experiencing challenges in using the OFTT. With regards to reaching the low education and low-income group, additional studies need to be done as those who earned less than CHF 4000 were not necessarily lowly educated but PhD and post doc students, concurring with findings elsewhere.²⁴

User-friendliness of OFTT

Most of the participants could not recall tool, but after showing them tool header only, many cited tools as user-friendly, easy, with a clear language and an acceptable length, concurring with a study that was conducted elsewhere.²⁵ In support of our findings, online tools have been shown to be risk averse as compared to health care professionals and the users have expressed high levels of satisfaction.²² The optimal amount of time spent filling in OFTT questionnaires nor the optimal number of questions an OFTT should ask in general, is still unclear²⁶ and warrants further studies.

Utility of OFTT as an information source

Overall, the tool was very useful in providing information on signs and symptoms. Information on where to test (list with contact numbers), how to self-care, when to contact a GP were cited by some as shortcomings and ought to be included to make the tool comprehensive in future. Information challenges with OFTTs have also been reported elsewhere.^{27,28} This finding underlines the need to have an option to talk directly to a GP after OFTT use so as to debrief. Further information or links to comprehensive and reliable sources with information on how to self-care and when to contact a GP or health care centre emerged as gaps that need to be incorporated in COVID-19 OFTTs so as to increase their utility as information sources. The

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3 584 majority of our participants were highly educated, and this segment of the population seems to
4 585 inform itself, by consulting a variety of scientific sources as well as keeping abreast with the
5 586 FOPH announcements. In the context of a novel infection, where guidelines change quickly
6 587 and continuously, the credibility of the tool to the highly educated, could be enhanced by
7 588 stipulating sources of information and referencing and dating the FOPH criteria informing the
8 589 tool.

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11 590 *Utility of OFTT in allaying fear and anxiety*

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13 591 For most of the participants, the tool was effective in allaying their fear and anxiety. Many
14 592 wished a human presence, a doctor to debrief with after the online tool use as mentioned above.
15 593 There was however, a downside for some that felt labelled as being high risk. For this group,
16 594 the tool had a negative effect and increased their anxiety. Other studies have revealed similar
17 595 effects.^{29,30} This raises the issue of language and terminology use in such tools. Bearing in mind
18 596 that COVID-19 is a novel condition, not well understood and considered fatal, the impact of a
19 597 high-risk label should not be underestimated, including discrimination. Concurring with our
20 598 findings, COVID-19 stigma has been reported elsewhere³¹. Many participants reported fear of
21 599 a positive test result and the consequences thereof, concurring with findings from elsewhere.
22 600^{32,33} Further concurring with our findings, lasting psychological consequences that last beyond
23 601 the COVID-19 infection itself have also been revealed.³¹ This raises the question of
24 602 psychological readiness to deal with such a diagnosis. Emerging studies have reported COVID-
25 603 19 patients as having psychiatric related conditions post infection, further concurring with our
26 604 study.^{34,35}

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31 605 *Utility of OFTT in facilitating decision making*

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33 606 The tool was useful in assisting patients in decision making particularly not to test. Trust in the
34 607 institution proved pivotal as many followed recommendations simply because they trusted the
35 608 source of the tool, our university hospital. Studies elsewhere concur with our findings.^{36,37} On
36 609 the other hand, some of those that got the recommendation to test did not do so due to a myriad
37 610 of reasons as revealed above. In addition, the cost of the test (CHF 180 at the time), shortages
38 611 of tests and fear of a positive result and the resultant consequences of isolating, stigma etc.
39 612 further influenced decisions not to test. A low income was found not to be a reliable socio-
40 613 economic status proxy in our study. Most low-income participants were PhD students and post-
41 614 docs who cited various reasons for not following recommendations. Many told us how they
42 615 sought and read scientific evidence to inform themselves and this, rather than the
43 616 recommendations, guided their decision making. In line with our findings, salary is not a good
44 617 proxy for socio-economic status among online tool users.²⁴ A shortcoming in this regard, was
45 618 the missing information on how the tool arrived at the recommendation to test or not to test e.g.
46 619 algorithm used¹⁹ something some key informants wished to know. The issue of safety concerns
47 620 with regards to specificity of digital tool algorithms has also been reported elsewhere.³⁸

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51 621 *Utility of OFTT in preventing onward transmission- cross infection*

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53 622 The tool proved useful in preventing cross infection concurring with findings elsewhere.¹⁹ Most
54 623 participants who were told to stay at home did so, reducing mobility and exposure. Most of the
55 624 participants called the GP practice ahead of time. That gave the GP practices time to ensure that
56 625 the suspect patient did not mix with other patients, thereby reducing the potential for onward
57 626 transmission (cross infection).¹⁹

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629 *Utility of OFTT in reducing health system burden*

630 Our primary hypothesis was that such an OFTT reduces the health system burden. Most of the
631 participants who used the tool would have called their GP or visited the hospital. OFTT use
632 effectively kept these worried participants at home and out of the doctors' offices and hospitals,
633 effectively reducing the health system burden. Contradicting our findings, research from
634 elsewhere has produced inconclusive and sometimes contradicting evidence.^{28,39} Further
635 studies in different contexts are therefore called for. Further contradicting our findings,, another
636 study reported that symptom checkers' triage capabilities are not greater than that of an average
637 lay person.⁴⁰ In fact the convenience of telemedicine has also been associated with increased
638 utilization of services, increasing work load and health care spending.⁴¹

639 **Recommendations and lessons learned**

640 Our study demonstrated the effects and utility of a COVID-19 OFTT. The assessment of an
641 OFTT is important but not without challenges. Below are some of the lessons worth sharing
642 with both health care providers and policy makers as subsequent waves sweep across Europe;

- 643 ➤ Most of the participants had challenges remembering the tool. Immediate
644 feedback e.g., in one minute, please rate this tool, or three open questions; please
645 tell us how useful this tool was with regards to i) accessibility of tool, ii) utility
646 of tool as an Information source, ii) utility of tool in facilitating your decision
647 making could be more effective. Data protection concerns and the need to keep
648 barriers to use as low as possible, could stand in the way of this approach.
- 649 ➤ The tool simply instructed patients to test or not to test, an arbitrary decision,
650 without shedding light on how the decision was made. Patients wish to see an
651 algorithm that says something like, "*the probability of you having COVID-19 is*
652 *75% test or 25% do not test.*"
- 653 ➤ Many participants said, "*bear in mind that online tool recommendations have less*
654 *weight than recommendations from a GP.*" Additional caution is needed in
655 language and terminology use as some patients that felt labelled by tool as high
656 risk, had negative outcomes. Ensuring access to a doctor to debrief with after
657 such tool use is advisable. Retired doctors who are still willing to make a
658 contribution to the society, could play such a role.
- 659 ➤ Many participants found the tool by accident; hence it is advisable to advertise
660 tool on social media platforms, billboards, TV, radio and could make it appear at
661 the top of google search. In addition, taking the tool to the people e.g., through
662 road shows could be a useful strategy to reach the old people – if they do not
663 come to the tool, take the tool to the people.
- 664 ➤ Many participants compared the tool recommendations with what the Federal
665 Office of Public Health (FOPH) recommended at the time. Having a tool link on
666 FOPH website that stipulates and references the FOPH criteria informing the tool,
667 could increase trust in tool and acceptability. Coordination between FOPH,
668 university hospitals, and other medical professional bodies is recommended to
669 further enhance trust in the tool.
- 670 ➤ Many elderly people are willing to embrace telemedicine, but challenges persist.
671 Telephone and voice activated system for the older population or call centers to
672 serve this group, are still needed (taking heed of unreachable and unanswered
673 calls) during this transitional phase.
- 674 ➤ Most participants found media confusing – telemedicine could play a better
675 information spreading role, sifting through the noise and offering scientific based
676 recommendations. For many, the media spread fear and misinformed people in
677 many instances.

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- The OFTT lacked information on where to test (contact list of testing centres), how to self-care, how to manage symptoms and when to contact a doctor-addressing these shortcomings could improve the utility of OFTTs. Our results underline the importance of not offering a telehealth tool as a stand-alone product, but to integrate it into an overall concept with links to credible reliable sources.
 - Systems thinking-refers to the ability to see interconnectedness in a system with a dysfunction in one part affecting other parts and consequently outcomes. Our study revealed the reasons patients did not follow the recommendation to test, as multipronged. Attention has to be paid to supply chain issues, as test shortages affected outcomes. The cost of a test and the fear of a positive result additionally emerged as hindrances to testing. This calls for systems thinking. Noteworthy, is the reaction of GPs who labelled OFTT users who asked for a COVID-19 test as hysteric. This does not only reveal that the pandemic caught everyone by surprise, but also demonstrates the need to involve, collaborate with and win the local health care providers-policy implementers, like GPs and Spitex (home based nursing), to enhance tool utility as well as ensure positive outcomes
 - One key informant suggested having patients who had recovered from COVID-19 act as champions to share their illness experience, and motivate the public to take preventive measures and take the disease seriously-an approach that was also effective in HIV prevention and coping strategies.

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4 699 **CONCLUSION**
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7 700 OFTT use has increased greatly during this pandemic. The effects and utility of such tools
8 701 however, have not been widely assessed. That makes our study, one of the firsts, in assessing
9 702 effects and utility of a COVID-19 OFTT. Our study revealed that an OFTT does not only reduce
10 703 the health system burden but can also serve as an information source, reduce anxiety and fear,
11 704 reduces potential for onward transmission and facilitate decision making.
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4 706 **DECLARATIONS**
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7 707 **Acknowledgement:** Emergency telemedicine at University of Bern, Switzerland is supported
8 708 by an endowed professorship by the Touring Club Switzerland.
9

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11 710 **Author contributions:** Study design and idea: J.M., A.M, R.S, T.C.S., M.M, M.E.R, P.J,
12 711 W.E.H.; Data extraction and preparation: R.S., M.M, A.M; Qualitative interviews: J.M., R.S.,
13 712 A.M.; Statistical analysis: M.M.; Qualitative analysis: JM. Writing of first draft: J.M., A.M,
14 713 M.M.; Revision of the final draft and final approval: all authors; Supervision: T.C.S., W.E.H.;
15 714 Project administration: T.C.S., W.E.H.

16 715
17 716 **Category of article:** original article
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20 718 **Running title:** Usage of online tools during the COVID-19 pandemic
21 719

22 720 **Source of funding:** Swiss National Science Foundation (Project ID: 196615)
23 721

24 722 **Conflict of interest:** This manuscript is partially funded by the Swiss National Science
25 723 Foundation (Project ID: 196615). The founder has no influence on the content of the manuscript
26 724 or the decision to publish it.

27
28 725 TCS holds the endowed professorship for emergency telemedicine at University of Bern,
29 726 Switzerland. The founder has no influence on the research performed, the content of any
30 727 manuscript or any decision to publish. All other authors have nothing to disclose.
31 728

32 729 **Data sharing**

33 730 Due to the nature of the study (OFTT) participants did not agree for their data to be shared
34 731 publicly. The data to support findings are available. Please contact corresponding author JM.
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851 **Fig 2: OFTT triage**

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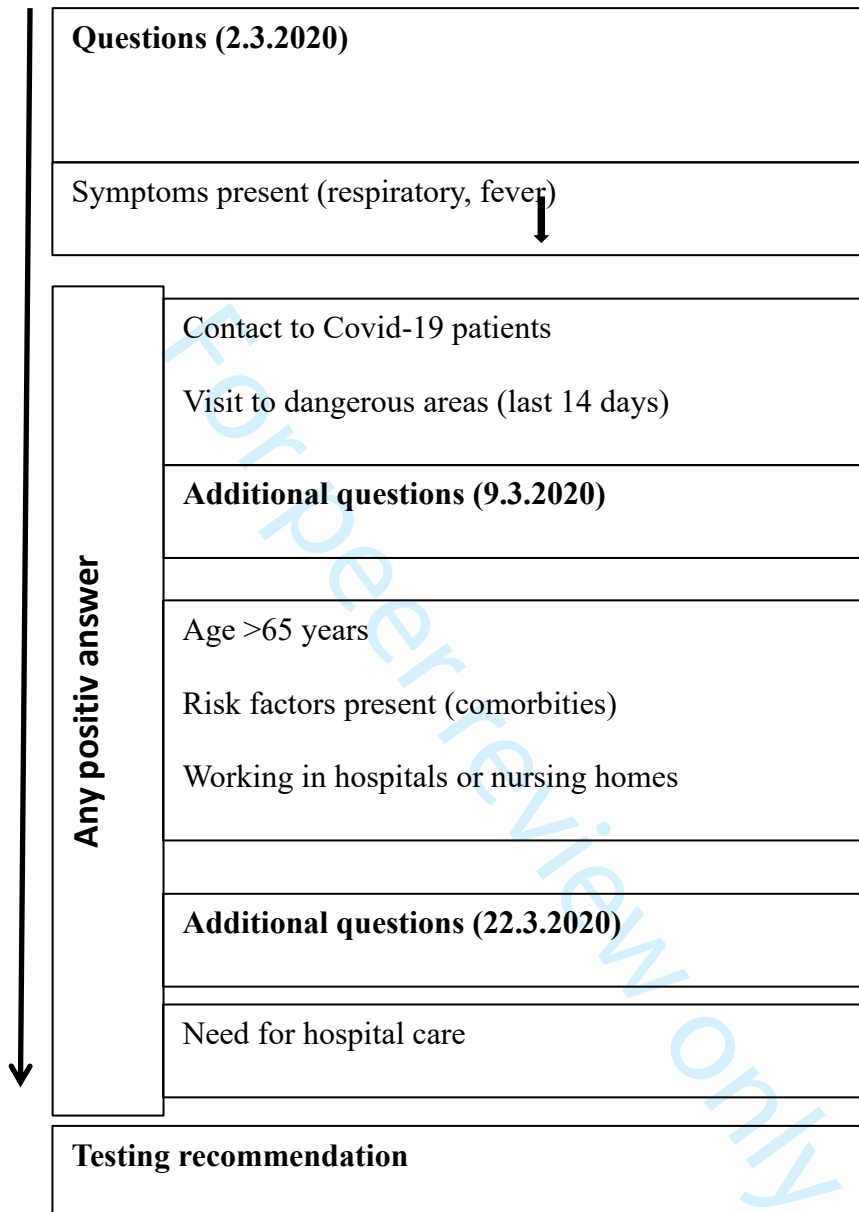
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Figure 1: Mixed-Methods Sequential Explanatory Study Design.

Phase	Procedure	Product
Collection of clinical data	OFTT	Data about usage of the tool Contact data for later study phases
Quantitative data collection	Questionnaires	Numeric data
Quantitative data analysis	Statistical analysis	Descriptive statistics
Connecting quantitative and qualitative data	Purposefully selecting patients for interviews	Interview guide
Qualitative data collection	Individual in-depth interviews	Interview transcripts
Qualitative data analysis	Coding and thematic analysis	Codes and themes
Integration of qualitative and quantitative results	Interpretation and explanation of quantitative results with the aid of and qualitative findings	Implications for OFTT development

Fig 2 OFTT triage



Supporting information OFTT Questionnaire and results

Supporting information 1. Usage of online tools during the COVID-19 pandemic: email survey

v1	How did you get to this Online - Tool?		
	1 - My family doctor advised me to use this tool.	9	5.1%
	2 - I found the information on the Internet.	113	64.2%
	3 - The website was recommended to me by family/friends.	17	9.7%
	4 - Via a telephone hotline.	1	0.6%
	5 - Other (Free text)	35	19.9%
v2	Did you find the information that you needed?		
	1 - Yes	154	87.5%
	2 - No, because the information was not comprehensive.	17	9.7%
	3 - No, because the information was not clear.	5	2.8%
v3	What information did you search for? I wanted....		
	1 - ... more information on COVID-19 symptoms	97	55.1%
	2 - ... more information on how to cope with symptoms	4	2.3%
	3 - ... to know when to consult a doctor	36	20.5%
	4 - ... to know more on testing criteria	32	18.2%
	5 - ... to know where to test	7	4.0%
	6 - Other	-	-
v4	Did the online tool recommend you to test for COVID-19?		
	1 - Yes	56	31.8%
	2 - No	120	68.2%
v5	Did you stick to the recommendations?		
	1 - Yes	149	84.7%
	2 - No	27	15.3%
v6	If you followed the Online - Tool recommendations, what made you do so?		
	1 - I trust the website as a reliable information source.	60	34.1%
	2 - I compared the recommendations with recommendations from the media and took a decision.	20	11.4%
	3 - I compared the recommendations with those from FOPH (BAG) and took a decision.	53	30.1%
	4 - I sought advice from a person I trusted.	7	4.0%
	5 - Other, please specify: Free text	9	5.1%
v7	In case you did not follow the recommendations, why did you not		
	1 - I did not trust the website as a reliable source of information.	1	0.6%
	2 - The recommendations from the website differed from the media recommendations.	2	1.1%
	3 - I feared for my life and needed to consult a GP in person.	6	3.4%
	4 - Other, please specify: Free text	18	10.2%
v8	Were your fears and anxieties allayed after visiting the website?		
	1 - Yes, the information from the website reassured me.	73	41.5%
	2 - No, the information from the website did not reassure me.	13	7.4%

	3 - No, the information from the website increased my fears and anxieties.	6	3.4%
	4 - I was not worried.	84	47.7%
v9	How did you cope with your fears? What helped you cope?		
	1 - Free text	-	-
v10	In case you went to the GP, did you call ahead of time to notify them of your visit?		
	1 - Yes	115	65.3%
	2 - No	61	34.7%
v11	Did you get tested for Coronavirus (SARS-CoV-2 Swab)?		
	1 - Yes	48	27.3%
	2 - No	128	72.7%
v12	What was the result?		
	1 - Positive	3	1.7%
	2 - Negative	45	25.6%
v13	How did the media influence your decision making? The		
	1 - ... helpful	81	46.0%
	2 - ... confusing	47	26.7%
	3 - I do not rely on the media as an information source.	25	14.2%
	4 - Free text	23	13.1%
v14	How old are you?	Mean 50.5 (SD 15), range 18-82	
v15	What is your sex?		
	1 - Female	101	57.4%
	2 - Male	75	42.6%
	3 - Other	0	0.0%
v16	What is your nationality?		
	0 - Missing	0	0.0%
	1 - Swiss	147	83.5%
	2 - German	13	7.4%
	3 - French	1	0.6%
	4 - Italian	3	1.7%
	5 - Liechtenstein	0	0.0%
	6 - Greater Europe	4	2.3%
	7 - Free text	7	4.0%
v17	In which province do you live?		
	1 - Bern	108	61.4%
	2 - Zürich	12	6.8%
	3 - Luzern	10	5.7%
	4 - Uri	0	0.0%
	5 - Schwyz	1	0.6%
	6 - Obwalden	0	0.0%
	7 - Nidwalden	0	0.0%
	8 - Glarus	0	0.0%
	9 - Zug	2	1.1%
	10 - Fribourg	7	4.0%
	11 - Solothurn	3	1.7%
	12 - Basel-Stadt	2	1.1%
	13 - Basel-Landschaft	1	0.6%
	14 - Schaffhausen	0	0.0%

	15 - Appenzell Ausserrhoden	2	1.1%
	16 - Appenzell Innerrhoden	0	0.0%
	17 - St. Gallen	2	1.1%
	18 - Graubünden	3	1.7%
	19 - Aargau	9	5.1%
	20 - Thurgau	1	0.6%
	21 - Ticino	2	1.1%
	22 - Vaud	7	4.0%
	23 - Valais	0	0.0%
	24 - Neuchâtel	1	0.6%
	25 - Geneva	0	0.0%
	26 - Jura	0	0.0%
	27 - I do not live in Switzerland	3	1.7%
v18	What is your highest level of education?		
	0 - Missing	6	3.4%
	1 - Tertiary education (university degree, college of education)	120	68.2%
	2 - Upper secondary education (High School Graduation, FMS, EZF, EBA)	27	15.3%
	3 - Lower secondary education/ obligatory schooling completed	23	13.1%
	4 - No formal education		
v19	Are you currently...		
	0 - Missing	33	18.8%
	1 - Employed	106	60.2%
	2 - Self employed	24	13.6%
	3 - Unemployed already before the current pandemic	3	1.7%
	4 - I lost my job during the COVID-19 period	1	0.6%
	5 - Studying or in an apprenticeship	9	5.1%
v20	How much approximately do you earn per month? (net income in December 2019 including 1/12 of the 13th month salary.)		
	0 - Missing	29	16.5%
	1 - Less than 4'000 CHF	26	14.8%
	2 - Between 4'001 and 6'000 CHF	42	23.9%
	3 - Above 6'001 CHF	79	44.9%
v21	What type of health insurance do you have?		
	1 - General	68	38.6%
	2 - Telemedicine - Modell	12	6.8%
	3 - GP - Modell	83	47.2%
	4 - Another alternative model	8	4.5%
	5 - No insurance	5	2.8%
v22	In a second stage, we will interview individual participants of		
	1 - Yes, I consent to be contacted.	78	44.3%
	2 - No, please, no more interviews.	98	55.7%
	3 - Free text	-	-

Interview Guide: Coronatest.ch -Patients v 2

Rapport

0Describe yourself (prompts; nationality, occupation, living arrangements, employment status)

Accessibility

0How did you get to coronatest.ch website? (referred by ..., online search). What is your understanding of an OFTT?

0Did you consult BAG- was the information supplied by BAG understandable to you? In what way was it useful.

0Was the online digital tool easy for you to access? explain why or why not (easy to find on homepage, length of tool, clear and easy to follow instructions, language, sequence, when did you use the tool Monday, Tuesday, weekend or during the week and why)

0What information or components would have helped you better -what do you suggest needs to be done to make such an online too more accessible.

Utility as a reliable information source and decision making

0When you consulted the online digital tool; did you follow the recommended advice? Prompt (why and how socioeconomic status could have influenced the process)

0What made you follow the advice and recommendations? Prompt confirmation from friends, generally, the media influence your decision-making process?

0What made you disregard the advice and recommendations? (prompt for severity of symptoms, change of condition)

0We have noticed that people that earn below 4000 tend not to follow recommendations, why do you think it's like this, what can be done?

Utility in allaying fear and anxiety

0Describe how you felt after consulting the online digital tool with regards to feeling anxious and or confident that all was going to be well? (Did you feel reassured after visiting coronatest.ch)

0If your fears were not allayed, how did you deal with your fears? prompt on what increased confidence, what allayed your anxiety)

Illness and testing Experience

0Did you test for COVID-19, what test and experience? Did you experience COVID-19 symptoms? Explain

0Speaking of self-isolation. Please explain in more detail how you experienced this what worked and what did not work e.g. the need to go shopping, not going for a run or walk protecting others vs own needs, putting others first, dilemmas, challenges

0The road to recovery has been described by many as very cumbersome and long-what was your experience? Any psychiatric or other residual effects experienced-explain.

0What personal life lessons did you learn during this pandemic you would like to share and what personal changes do you foresee in future

0What health and health system related observations did you make and what changes do you fore see in future?

0What, socio-economic changes have you observed and do you foresee in the future as a result of COVID-19

Utility in preventing cross infection

0If you consulted a GP; did you call ahead of time?

0How did your GP/ health care provider react when you told him or her you suspected that you had COVID-19?

Recommendations

0In a future pandemic, what would you do?

0Is there any additional information you wish a site like corontest provides but was missing during COVID-19? What information did you search for but did not find?

0Are there other strategies (to allay fear, anxiety) you deem effective alone or in conjunction with online digital tools when faced with epidemics such as COVID-19 to make it accessible to the older generation?

0How can online tools like corontast be adapted to facilitate your decision making processes

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	7
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10
		(b) Describe any methods used to examine subgroups and interactions	10
		(c) Explain how missing data were addressed	10.11.12.13
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	

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(e) Describe any sensitivity analyses

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60**Results**

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	11		
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11		
		(b) Indicate number of participants with missing data for each variable of interest	11		
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)			
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time			
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure			
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures			
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	12.13.14		
		Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	

Discussion

Key results	18	Summarise key results with reference to study objectives	18
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	21

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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

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Effects and utility of an online forward triage tool during the SARS-CoV-2 pandemic: a mixed method study and patient perspectives, Switzerland

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-059765.R2
Article Type:	Original research
Date Submitted by the Author:	25-May-2022
Complete List of Authors:	Michel, Janet; Inselspital Universitätsspital Bern, Department of Emergency Medicine Mettler, Annette; University of Bern, Department of Emergency Medicine Stuber, Raphael; University of Bern, Department of Emergency Medicine Müller, Martin; University of Bern, Department of Emergency Medicine Ricklin, Meret; University of Bern, Department of Emergency Medicine Jent, Philipp; University of Bern, Department of Infectious Diseases Hautz, Wolf; University of Bern, Department of Emergency Medicine; University of Oslo Sauter, Thomas; University of Bern, Department of Emergency Medicine
Primary Subject Heading:	Emergency medicine
Secondary Subject Heading:	Health policy, Qualitative research, Public health, Emergency medicine
Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, QUALITATIVE RESEARCH, Telemedicine < BIOTECHNOLOGY & BIOINFORMATICS, EPIDEMIOLOGY

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Effects and utility of an online forward triage tool during the SARS-CoV-2 pandemic: a mixed method study and patient perspectives, Switzerland

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Word count 5 600

Key words

online forward triage tool (OFTT), effects, utility, SARS-CoV-2, COVID-19, pandemic

86 ABSTRACT

87 **Objective:** To assess the effects (quantitatively) and the utility (qualitatively) of a COVID-19
88 online forward triage tool (OFTT) in a pandemic context.

89 **Design:** A mixed-method sequential explanatory study was employed. Quantitative data of all
90 OFTT users, between March 2nd, 2020 and May 12th, 2020 were collected. Secondly, qualitative
91 data was collected through key informant interviews (n=19) to explain the quantitative findings,
92 explore tool utility, user experience and elicit recommendations.

93 **Setting:** The working group e-emergency medicine at the emergency department (ED),
94 developed an OFTT which was made available online

95 **Participants:** Participants included all users above the age of 18 that used the OFTT between
96 March 2nd, 2020 and May 12th, 2020

97 **Intervention:** An OFTT that displayed the current test recommendations of the Federal Office
98 of Public Health (FOPH) on whether someone needed testing for COVID-19 or not. No
99 diagnosis was provided

100 **Results:** In the study period, 6,272 users consulted our OFTT; 40.2% (1626/4049) would have
101 contacted a healthcare provider had the tool not existed. 560 participants consented to a follow-
102 up survey and provided a valid e-mail address. 31.4% (176/560) participants returned a
103 complete follow-up questionnaire. 84.7% (149/176) followed the recommendations given.
104 41.5% (73/176) reported that their fear was allayed after using tool. Qualitatively, seven
105 overarching themes emerged namely i) accessibility of tool, ii) user-friendliness of tool, iii)
106 utility of tool as an information source, iv) utility of tool in allaying fear and anxiety, v) utility
107 of tool in medical decision making vi) utility of tool in reducing the potential for onward
108 transmissions and vii) utility of tool in reducing health system burden.

109 **Conclusion:** Our findings demonstrated that a COVID-19 OFTT does not only reduce the
110 health system burden, but can also serve as an information source, reduce anxiety and fear,
111 reduce potential for cross infections and facilitate medical decision making.

112 **Word count 299**

115 Strengths and limitations

- 116 • The mixed method sequential explanatory design facilitated a holistic understanding of
117 OFTTs.
- 118 • Perspectives of those that do not use online tools are missing.
- 119 • The long duration between tool use and the qualitative interviews could have introduced
120 a certain degree of recall bias.
- 121 • Self-report bias cannot be ruled out.

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123

124 INTRODUCTION

125 The number of COVID-19 cases across the globe has surpassed 25 million and incident rates
126 are again on the rise as many European countries experience subsequent waves.¹⁻⁴ Many people
127 are seeking reliable information, recommendations on testing and management of COVID-19
128 as well as reassurance, adding to the health system burden. Online forward triage tools (OFTT)
129 are being widely used during this COVID-19 pandemic context⁵⁻⁸ as misinformation and worry
130 in the population abound. There is evidence from an earlier 2009 H1N1 influenza pandemic,
131 that online tools are effective and practical in reducing the health system burden.^{9,10} There is
132 also emerging evidence of this nature from the COVID-19 context.^{6,11-14} For example, OFTTs
133 help reduce exposure of worried but uninfected and infected persons, through avoidance of
134 hospitals and doctors' offices – enabling patients to access recommendations of what to do,
135 from the comfort of their own homes.^{10,11}

136 Using OFTTs is relatively easy to the computer literate. People respond to questions and upon
137 completion, recommendations are given, e.g., isolate, test, do not test etc. Existing evidence on
138 the effects and utility of OFTTs differ with possible implications on the quality of the symptom
139 assessment⁵. According to literature, the reasons patients use symptom checkers or OFTTs are
140 i) to understand the causes of their symptoms (76%), ii) to determine whether or not to seek
141 care (33%), and iii) where to seek care (21%).¹⁵ There is also evidence that patients that have
142 previously experienced a diagnostic error are more likely to use OFTT to search for where to
143 seek care¹⁵ than those that have not.

144 **Challenges with OFTT use and research gap**

145 In the European Union, 87% of people aged 75 years and above have never been online
146 according to a recent survey.¹⁶ That means the elderly, may be less inclined to use online tools
147 if not computer literate. This in turn shuts the elderly out from society, increasing isolation and
148 loneliness, not to mention the missed health benefits [10]. The digital divide is real¹⁷. How can
149 digital tools be designed to be more inclusive?¹⁸ Information on factors influencing the use of
150 OFTTs is scant and the validation of COVID-19 OFTTs like other OFTTs, seems neglected.
151^{15,19} That makes the quality assessment of these tools paramount⁵ as evidence on effects and
152 utility of OFTTs is limited.

154 **The aim of this study**

155 This study aimed at assessing the effects (quantitatively) and the utility (qualitatively) of a
156 COVID-19 OFTT during a pandemic context in Switzerland, exploring patient perspectives and
157 derive recommendations for tool improvement. We hypothesized that an OFTT adequately
158 reduces patient visits to the health care system and consequently reduces the health system
159 burden. We further explored qualitatively, for emergent themes, capturing the tool utility to this
160 population.

METHODS

Study design and participants

We employed a mixed-method sequential explanatory design to study the utility of the OFTT and the effects of using such a tool. The rationale for mixing both kinds of data within one study is that neither qualitative nor quantitative methods, are sufficient by themselves, to capture details of a phenomenon. In combination, they complement each other, taking advantage of the strengths of each. As in sequential explanatory designs, quantitative data collection was done first, as a major component of our study to inform qualitative interviews, see Figure 1.

About here Figure 1: Mixed-Methods Sequential Explanatory Study Design.

Online forward triage tool description and setting

The working group e-emergency medicine at the emergency department (ED), Inselspital University Hospital Bern, together with the Department of Infectious Diseases, Inselspital University Hospital Bern, developed an online forward triage tool (OFTT) which was made available online (*coronatest.ch*). To the best of our knowledge, this was one of the first COVID-19 OFTTs set up in the German speaking part of Switzerland. In a skip-logic, the OFTT displayed the current test recommendations of the Federal Office of Public Health (FOPH) on whether someone needed testing for COVID-19 or not. No diagnosis was provided by the OFTT.

The questions and the content of the OFTT represented the official FOPH recommendations at the time. Thus, the OFTT was comparable in content to other OFTTs in Switzerland, which were based on the FOPH guidelines within that time period. One additional non-mandatory question, which did not affect the result, was integrated in our OFTT from the 11th March 2020, namely the question "What would you do if this online test did not exist?".

There were two possible outcomes of the OFTT: "According to the criteria of the Federal Office of Public Health (BAG), one meets or does not meet the criteria for a test for an infection with the coronavirus, COVID-19". The results page was linked to the FOPH's official behavioural recommendations and recommendations for the testing process. The average time to complete the assessment was 75sec.

OFTT triage

Details on the structure of the OFTT as well as screen shot are published in a separate quantitative paper²⁰. The Federal office of public health (FOPH) national COVID-19 Swiss testing criteria were transferred into a digital decision tree and adjusted promptly after the criteria were adapted by the FOPH. During the first phase of the pandemic, the recommendations for testing or not testing were mainly based on contact with an infected person or a visit to a risk area and were then changed during the course of the pandemic to a testing regime based on risk groups (healthcare professionals, patients >65 years and patients with pre-existing conditions). With the general availability of the tests, the test recommendations were extended to all symptomatic patients and our OFTT became obsolete. Unlike other triage techniques performed on emergency patients, the aim of the OFTT was not to make a COVID-19 diagnosis, assess the risk of severe COVID-19 progression or recommend treatment. See Fig 2 below.

205 **About here Fig 2: OFTT triage**

206 **Quantitative data**

207 **Research participants and data collection**

208 Participants included all users above the age of 18 that used the OFTT between March 2nd, 2020
209 and May 12th, 2020. In this timeframe, the recommendations on COVID-19 frequently changed
210 in Switzerland and there was an initial lack of testing reagents and capacity as well as the risk
211 of overburdening the healthcare system. During the first few weeks of the pandemic, the Federal
212 Office of Public Health (FOPH) recommended testing only for symptomatic patients after travel
213 to high-risk countries (e.g., Italy and China) or symptomatic contacts of coronavirus patients.
214 In weeks that followed (as from the 20th March 2020), the strategy changed to testing of high-
215 risk groups (older than 65 years, pre-existing conditions, and healthcare workers). The countries
216 and risk groups were regularly adjusted according to the spread of the virus and the findings
217 about risk groups but also the availability of testing capacity.

218 Due to the rapid spread of the virus in Switzerland, and broadly available testing capacities, a
219 universal test recommendation was made by the Federal Office of Public Health (FOPH)- on
220 April 27th, 2020. All symptomatic individuals were eligible to test. With this recommendation,
221 our OFTT provided less benefit to the user and was finally removed on May 12th 2020 from the
222 website paving the way to a second generation OFTT.

224 To minimise the barrier to the use of the OFTT and for legal data protection reasons, no personal
225 data was collected within the OFTT. Further data on the users of the OFTT was collected in a
226 second step, from participants who gave their explicit consent and provided their email
227 addresses to be contacted. This also made it possible to investigate the adherence to
228 recommendations and the test results. A non-mandatory additional question was built into the
229 OFTT from 11th March 2020.

230 A pretested online questionnaire (see supplemental file 1) was used to assess the

- 231 i) utilization of the OFTT, including way of referral to the tool, reasons for use and
232 information searched,
- 233 ii) additional factors, including influence of the media and influence of the OFTT on
234 fear and anxiety.

235 The database used is compliant with Swiss laws on the collection of personal health related
236 information. The follow-up questionnaire is available as supplemental file 1. Due to ethical
237 reasons, we included the option "not want to answer" as a choice in the questionnaire for the
238 socio-demographic data, in case the respondent did not want to give a statement on this specific
239 sensitive topic.

240 The qualitative interviews were conducted with purposefully selected key informants who gave
241 their consent during the survey (see below).

242 **Data analysis**

243 Quantitative data was analysed in Stata® 16.1 (StataCorp, The College Station, Texas, USA).
244 Descriptive statistics for all variables as mean and standard deviation or frequency as
245 determined by the type and distribution of the data were computed. Categorical variables
246 between two groups were compared using Chi-square statistics and the distribution of
247 continuous variables were compared using Wilcoxon rank sum test.

248 To assess the risk of selection bias and to estimate the similarity of the groups, we compared
249 responses to overlapping questions within the OFTT and the follow-up survey.

250 **Qualitative data**

251 To explain the quantitative results, we explored the experience of tool use by the patients
252 qualitatively. Following quantitative data analysis, an interview guide was created and adapted
253 iteratively.

254 **Purposeful and quota sampling**

255 We purposefully sampled participants from those that had firstly, utilized our OFTT, secondly,
256 had taken part in the follow-up survey and thirdly, had consented to a follow-up interview. We
257 included participants of all age groups (quota) to ensure inclusiveness.

258 **Sample Size**

259 Many experts suggest saturation as central to qualitative sampling²⁰. In this study we aimed for
260 both data saturation and rich and detailed narratives and achieved this with 19 key informants
261 from all age groups (see Table 1).

262

263 **Data collection**

264 Due to COVID-19 concerns, video rather than face to face interviews were held with most
265 participants in September 2020. A combination of video and telephonic interviews were
266 conducted with three participants who had technical challenges and a telephone only interview
267 was held with one lady, aged above 65, who had no computer access. Three face to face
268 interviews were held with three key informants: one that was a hospital health care worker, and
269 two key informants who worked close to Bern university hospital. A semi-structured interview
270 guide informed by the quantitative results was used (see supplemental file 2). This was adapted
271 iteratively throughout the data collection period. Two qualitative researchers sat in each session
272 fielding questions in turns. All interviews were conducted in German by two researchers fluent
273 in both English and German. The interviews lasted between 45 minutes to one and a half hours.
274 Two audio-recorders were used in each session. All participants gave individual written consent
275 as well as oral consent to the recording at the beginning of each session. See Table 1 for
276 summary of Key Informants.

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295 **Table 1. Key Informant summary**

Age-group	Males	Females	Total
18-29	1	2	3
30-45	2	2	4
46-64	3	4	7
65+	4	1	5
Total	10	9	19

296

297 **Data analysis**

298 Audio recordings were transcribed, analysed and triangulated with quantitative data results.
 299 Qualitative narratives were obtained to explain quantitative results as well as to explore utility
 300 of OFTT to patients as well as elicit recommendations to make online tools more useful and
 301 inclusive. A grounded theory approach was utilized. Concepts were identified from collected
 302 data and compared iteratively. These concepts were grouped into categories and culminated
 303 into the identified themes.

304
 305 **Measures to ensure trustworthiness of data:** To ensure dependability, data collection and
 306 analysis were performed iteratively, continuously adjusting our interview guide to capture
 307 newly emerging themes. Throughout data collection, two qualitative researchers kept reflexive
 308 journals and debriefed at the end of each interview. To ensure transferability, a thick description
 309 of participants, context and data collection process has been outlined. Data was managed and
 310 analysed with the aid of MAXQDA2018.

311 **Ethics approval**

312 The local ethics committee of the Canton of Bern, Switzerland, deemed this project a quality
 313 evaluation study and waived the need for full ethical review (Req-2020-00289) on the 23rd of
 314 March 2020.

315 **Patients and Public Involvement statement**

316 Patients and public were not involved in the design, conduct, reporting or dissemination of this
 317 research since the OFTT was set up as an emergency response to the pandemic.

318 RESULTS

319 Quantitative results

320 In total, n=6,272 completed assessments of the OFTT were recorded on the website during the
321 study period from March 2nd, 2020 to May 12th, 2020. This question asked OFTT users what
322 they would have done had the OFTT not existed. The question was answered by 97.6%
323 (3953/4049) of the users as follows: 40.2% (1626/4049) would have contacted the GP or visited
324 a hospital had the tool not existed; furthermore, 16.4% (665/4049) would have contacted a
325 hotline.

326 In the OFTT, 25.6% (1,608/6272) of assessments received a recommendation to test for
327 COVID-19 during the study period. In the follow-up survey question, "Did the online tool
328 recommend you to test for COVID-19?" -31.8% (56/176) answered, yes.

329 In the OFTT, 13.2% (564/4270) of OFTT users reported being over 65 years of age. The
330 variable age was only included and mandatory during some phases of the study period in
331 accordance with the FOPH guidelines, that changed frequently. This resulted in 4270
332 assessments with data on age. In the follow-up survey, 17.6% (31/176) reported being over 65
333 years.

334
335 A link to the online follow-up questionnaire was sent to 560 participants that consented to a
336 follow-up survey by providing a valid e-mail address. The online questionnaire was filled out
337 by 37.9% (212/560) of the participants; 31.4% (176/560) completed the whole questionnaire
338 and were included in the analysis (all 22 questions-see supplement). An overview of socio-
339 demographic characteristics of participants of the follow-up survey are presented in Table 2.

	Total (n=176)	Female (n=101)	Male (n=75)	P-value*
Age [mean, SD]	50.1 [±15.4]	45.9 [±14.1]	55.7 [±15.4]	<0.001
Education				
Not want to answer	6 [3.4]	3 [3.0]	3 [4.0]	
University	120 [68.2]	67 [66.3]	53 [70.7]	
Higher secondary school	27 [15.3]	17 [16.8]	10 [13.3]	
Lower secondary school	23 [13.1]	14 [13.9]	9 [12.0]	0.871
Income per month				
Not want to answer	29 [16.5]	17 [16.8]	12 [16.0]	
<4000 CHF	26 [14.8]	20 [19.8]	6 [8.0]	
4000 - 6000	42 [23.9]	27 [26.7]	15 [20.0]	
>6000	79 [44.9]	37 [36.6]	42 [56.0]	0.037
Work				
Not want to answer	33 [18.8]	14 [13.9]	19 [25.3]	
Employed	106 [60.2]	64 [63.4]	42 [56.0]	
Self-employed	24 [13.6]	13 [12.9]	11 [14.7]	
Unemployed	3 [1.7]	3 [3.0]	0 [0.0]	
Lost work (Covid-19)	1 [0.6]	1 [1.0]	0 [0.0]	
Student/trainee	9 [5.1]	6 [5.9]	3 [4.0]	0.236
Insurance				
Don't know	5 [2.8]	3 [3.0]	2 [2.7]	
General	68 [38.6]	39 [38.6]	29 [38.7]	
Telemedicine	12 [6.8]	6 [5.9]	6 [8.0]	
GP	83 [47.2]	47 [46.5]	36 [48.0]	
Other	8 [4.5]	6 [5.9]	2 [2.7]	0.859
Nationality				
Not want to answer	1 [0.6]	1 [1.0]	0 [0.0]	
Switzerland	147 [83.5]	80 [79.2]	67 [89.3]	
Germany	13 [7.4]	8 [7.9]	5 [6.7]	
French	1 [0.6]	0 [0.0]	1 [1.3]	

Italy	3 [1.7]	2 [2.0]	1 [1.3]	
Other Europe	4 [2.3]	3 [3.0]	1 [1.3]	
Other	7 [4.0]	7 [6.9]	0 [0.0]	0.202

362 **Table 2. Socio-demographic table of participants of follow-up survey**

363 * Chi-squared for categorical variables and Wilcoxon rank sum test for continuous variables;
364 data are total number and percentage if not mentioned otherwise

365
366 The survey revealed that 84.7% (149/176) followed the tool recommendations and stayed at
367 home thereby reducing the work-load of GPs and hospitals. Information about the utilization of
368 the OFTT, specifically which information was searched for, how subjects found the tool, and
369 information about satisfaction with the tool is presented in Table 3.

371 **Table 3. Online forward triage tool use**

	Total (n=176)	[%]
Information searched		
Information on COVID-19 symptoms	97	[55.1]
How to cope with symptoms	4	[2.3]
To know when to consult a doctor	36	[20.5]
To know more on testing criteria	32	[18.2]
To know where to test	7	[4.0]
Mode of referral		
Referral by family doctor	9	[5.1]
Online search	113	[64.2]
Recommendation by peers	17	[9.7]
Hotline	2	[1.1]
Other	35	[19.9]
Satisfaction with information		
Helpful	154	[87.5]
Not comprehensive	17	[9.7]
Not clear	5	[2.8]

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375 We present additional factors that may have influenced how individuals coped during the
376 coronavirus pandemic, their use of the OFTT and adherence to OFTT recommendations.
377 Overarching topics that were asked included the influence of the media, fear and uncertainty,

378 and reasons for adherence to the recommendation (see table 4). All questions and answers from
379 the follow-up questionnaire are attached. See supplemental file 1.

380

381

382 **Table 4. Additional factors**

	Total (n=176)	[%]
Estimated influence of media		
Helpful	81	[46.0]
Confusing	47	[26.7]
No trust in media as source of information	25	[14.2]
Other	23	[13.1]
Influence of OFTT on fear and anxieties		
Reassured	73	[41.5]
No reassurance	13	[7.4]
Increased fears and anxieties.	6	[3.4]
Not worried before OFTT use	84	[47.7]
Reasons for following the recommendation (n=149)		
Trust in tool	60	[40.3]
Information congruent with media	20	[13.4]
Comparison with FOPH recommendation	53	[35.6]
Reassurance by others	7	[4.7]
Other	9	[6.0]

383

384 **Qualitative findings**

385 Seven overarching themes on the utility of the OFTT emerged during the qualitative interviews.
386 These are used to structure the report of our findings, i.e., i) accessibility of the tool, ii) user-
387 friendliness of the tool, iii) utility of the tool as an information source, iv) utility of the tool in
388 allaying fear and anxiety, v) utility of the tool in decision making (test or not to test), vi) utility
389 of the tool in reducing onward transmission-cross infection, and vii) utility of the tool in
390 reducing health system burden. The qualitative findings are summarised in Table 5.

391

392 **Table 5. Summary of qualitative themes**

Theme	Category	Unit meaning
Accessibility	Online search	Appeared but not on the top of google search Advertise tool in future
	Unreachable for some	Include telephonic services to reach the elderly Tool buddies
Utility as a reliable information source	COVID-19 Symptoms	Cough was a main symptom Symptom description like type of cough and severity of fever etc. was not possible Test or do not test decision was arbitrary-how the decision was arrived at was not clear e.g., 95% probability test or 5% probability do not test
	Testing info and centres missing	Information on when to call doctor was not clear e.g., fever above 39 degrees for 4 days -call doctor List of where to test and contact numbers were missing
Utility in decision making	Followed recommendations	Trust- the university hospital is a trusted institution
	Did not follow recommendations	Fear of a positive result and the resultant consequences Cost of test Test shortage GP refusing patients to test -hysteria
Utility in allaying fear and anxiety	Reassured some	Fear and anxiety allayed after tool use
	Person contact	An online tool is still an online tool - recommendations seen as not having a lot of weight
	Testing	A talk with a general practitioner (GP)-debriefing after tool use could have put them at ease
	Friends and family as a resource	Testing in itself is reassuring -make test available to all who are anxious
	Increased anxiety in some	Many relied on family and friends to deal with fear- social circle still a major source of support

		High risk label unsettled some
Utility in reducing health system burden	Many stayed at home	Recommendations followed- stay at home Some called Insurance companies
Utility in reducing onward transmission	Call GP before a visit	Most called GP ahead of visit
Systems thinking	Utility of tool is dependent upon other health system and societal components Fear of a positive test -rather not know	Participants told by tool to test only to be told that there are no tests (shortages) Fear of a positive test Media misinformation of painful test influenced some not to test-work with media Economic factors like cost of test influenced some not to test A new life-threatening disease in a population is associated with psycho-social and behavioural issues that need to be taken into account

393

394 **Theme 1: Accessibility of the tool**

395 The accessibility of the tool emerged as very important. Many participants suggested to
396 advertise the tool to make it more accessible as revealed below:

397 *“I did not know of the existence of tool (an accidental internet search led the key
398 informant to the tool). Please advertise tool on TV and to Insurance companies.”* -Key
399 Informant 15

400 The older people seem willing to embrace technology and were prepared to use it. However,
401 they stated that they needed help with practical application at times as revealed below;

402
403 *“Provide telephone services for the elderly and a contact person, a GP so one can ask
404 questions if unsure.”* -Key Informant 14

405 **Theme 2: User-friendliness of the tool**

406 Most participants could not remember the tool immediately due to the time lapse from the tool
407 usage to interview. After being shown the tool once again, the header only, many cited it as
408 having been easy and simple to follow with the language being clear and the length acceptable.

409 **Theme 3: Utility of the tool as an information source**

410 The novel nature of COVID-19 infection left many scrambling for knowledge of the disease.
411 Many health care providers were inundated with phone calls. One participant said the following;

1
2
3 412 *“The tool provided information on symptoms but did not have a list of testing centers.*
4 413 *The recommendations said call GP before visit but there was no number to call.” -Key*
5 414 *Informant 1*

6 415
7 416 *“Telemedicine could play a better information spreading role – media spread fear and*
8 417 *misinformed people for example mask use vs no mask.” -Key Informant 15*
9 418

11 12 419 **Theme 4: Utility of the tool in allaying fear and anxiety**

13
14 420 Many participants interviewed reported being reassured after tool use. Others cited being more
15 421 anxious after tool use due to terminology and language and many suggested that a person, a
16 422 doctor be available after tool use for closure. Participants revealed the following;

17 423
18 424 *“Wording of tool could be adapted – a friend aged 65, a diabetic, became depressed after*
19 425 *using tool and getting the high-risk patient classification. He needed a psychiatrist to*
20 426 *cope. Rather ask how are you, do you take any medication, which ones? Mentioning*
21 427 *conditions seem to increase anxiety.” -Key Informant 17*

22 428
23 429 *“I felt discriminated against by tool-differentiate between a health 73-year-old with no*
24 430 *chronic illnesses and a 50-year overweight diabetic.” -Key Informant 13*
25 431

26 432 **Theme 5: Utility of the tool in decision making process (to test or not to test)**

27 433 Many participants cited trust in our university hospital (Insel) as one of the main reason
28 434 participants followed the recommendations. Some participants revealed the following;

29 435
30 436 *“Insel has a good name and trusted the tool.” -Key Informant 16*

31 437
32 438 *“Coordination is needed for FOPH and Insel to speak in one voice.” -Key Informant 17*
33 439

34 440 Juxtaposed and not necessarily contradicting the quantitative survey, where trust was reported
35 441 as the main reason for following the recommendations, most of the participants cited shortages
36 442 of tests, improved symptoms, cost of test, misinformation that the test was painful and fear of
37 443 a positive result as reasons for not testing. Of utmost importance were GPs who viewed the test
38 444 request by online tool users as being hysteric. Below is what some participants said:

39 445
40 446 *“I read scientific papers to inform oneself and then decided.” -Key Informant 8*
41 447

42 448 *“Remember recommendations from an online tool have less weight than*
43 449 *recommendations from a doctor – there is no person behind this and so many might have*
44 450 *taken the tool and went further to contact own GP” - Key Informant 8*

45 451
46 452 *“I wished to see an algorithm that said something like, “the probability of you having*
47 453 *COVID-19 is 75% test or 25% do not test.” -Key Informant 5*

48 454 **Theme 6: Utility in reducing the potential for onward transmission- cross infection**

49 455 The tool recommended all participants to call the health care provider ahead of visit and most
50 456 of them did. A reason some participants might not have called the testing centres ahead of a
51 457 visit could be that the tool itself did not provide a list of contact numbers-a short coming that
52 458 was rectified in the second generation OFTT.

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3 459 **Theme 7: Utility of tool in reducing health system burden**

4
5 460 Social distancing, isolation and quarantine were among the recommendations made to reduce
6 461 the spread of COVID-19. Most of the participants stayed at home. One participant said the
7 462 following;

8 463
9 464 *“I followed recommendations and stayed at home. However, home testing should be*
10 465 *provided if people should stay at home. Engage Spitex [organization for outpatient and*
11 466 *home-based care in Switzerland] in future pandemics and work with them.” -Key*
12 467 *Informant 6*

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DISCUSSION

This study quantitatively assessed the effects and confirmed the utility (qualitatively) of a COVID-19 online forward triage tool by exploring patient perspectives. We further elaborate on areas for improvement as well as share lessons learned for policy makers. Qualitatively, seven overarching themes emerged namely i) accessibility of tool, ii) user-friendliness of tool, iii) utility of tool as an information source, iv) utility of tool in allaying fear and anxiety, v) utility of tool in decision making (test or not to test), vi) utility of tool in reducing the potential for onward transmissions (preventing cross infection) and vii) utility of tool in reducing health system burden.

Accessibility of OFTT

One of the objectives of our OFTT was to provide an easily accessible, reliable and up to date information platform for professionals and the public. The tool was not advertised commercially; hence it did not appear at the top of the google search and many participants cited coming across the tool accidentally. Information about the tool was only disseminated via the hospital website and hospital communication to local doctors.

Despite the above -mentioned shortcoming, our findings revealed that the tool was accessible to both genders and all age groups including the elderly. In line with other studies,²¹ the elderly seem ready to embrace online tools, contradicting other studies.^{10,17} Contradicting our findings, one study revealed that it's the young and highly educated patients that tend to use symptom checkers or OFTTs.²²

Despite the revealed readiness of the elderly to embrace technology, key informants suggested keeping the use of telephonic services for the elderly as an option in telemedicine. Further supporting these findings, nurse triage lines (telephone) have been proven effective in this COVID-19 pandemic context in the US and in Canton Vaud, Switzerland.^{10,23} Others suggested having a list of tool buddies reachable by phone, that links people that have used the tool before and are willing to be contacted by a new user, that might be experiencing challenges in using the OFTT. With regards to reaching the low education and low-income group, additional studies need to be done as those who earned less than CHF 4000 were not necessarily lowly educated but PhD and post doc students, concurring with findings elsewhere.²⁴

User-friendliness of OFTT

Most of the participants could not recall tool, but after showing them tool header only, many cited tools as user-friendly, easy, with a clear language and an acceptable length, concurring with a study that was conducted elsewhere.²⁵ In support of our findings, online tools have been shown to be risk averse as compared to health care professionals and the users have expressed high levels of satisfaction.²² The optimal amount of time spent filling in OFTT questionnaires nor the optimal number of questions an OFTT should ask in general, is still unclear²⁶ and warrants further studies.

Utility of OFTT as an information source

Overall, the tool was very useful in providing information on signs and symptoms. Information on where to test (list with contact numbers), how to self-care, when to contact a GP were cited by some as shortcomings and ought to be included to make the tool comprehensive in future. Information challenges with OFTTs have also been reported elsewhere.^{27,28} This finding underlines the need to have an option to talk directly to a GP after OFTT use so as to debrief. Further information or links to comprehensive and reliable sources with information on how to self-care and when to contact a GP or health care centre emerged as gaps that need to be incorporated in COVID-19 OFTTs so as to increase their utility as information sources. The

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3 516 majority of our participants were highly educated, and this segment of the population seems to
4 517 inform itself, by consulting a variety of scientific sources as well as keeping abreast with the
5 518 FOPH announcements. In the context of a novel infection, where guidelines change quickly
6 519 and continuously, the credibility of the tool to the highly educated, could be enhanced by
7 520 stipulating sources of information and referencing and dating the FOPH criteria informing the
8 521 tool.

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11 522 *Utility of OFTT in allaying fear and anxiety*

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13 523 For most of the participants, the tool was effective in allaying their fear and anxiety. Many
14 524 wished a human presence, a doctor to debrief with after the online tool use as mentioned above.
15 525 There was however, a downside for some that felt labelled as being high risk. For this group,
16 526 the tool had a negative effect and increased their anxiety. Other studies have revealed similar
17 527 effects.^{29,30} This raises the issue of language and terminology use in such tools. Bearing in mind
18 528 that COVID-19 is a novel condition, not well understood and considered fatal, the impact of a
19 529 high-risk label should not be underestimated, including discrimination. Concurring with our
20 530 findings, COVID-19 stigma has been reported elsewhere³¹. Many participants reported fear of
21 531 a positive test result and the consequences thereof, concurring with findings from elsewhere.
22 532^{32,33} Further concurring with our findings, lasting psychological consequences that last beyond
23 533 the COVID-19 infection itself have also been revealed.³¹ This raises the question of
24 534 psychological readiness to deal with such a diagnosis. Emerging studies have reported COVID-
25 535 19 patients as having psychiatric related conditions post infection, further concurring with our
26 536 study.^{34,35}

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31 537 *Utility of OFTT in facilitating decision making*

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33 538 The tool was useful in assisting patients in decision making particularly not to test. Trust in the
34 539 institution proved pivotal as many followed recommendations simply because they trusted the
35 540 source of the tool, our university hospital. Studies elsewhere concur with our findings.^{36,37} On
36 541 the other hand, some of those that got the recommendation to test did not do so due to a myriad
37 542 of reasons as revealed above. In addition, the cost of the test (CHF 180 at the time), shortages
38 543 of tests and fear of a positive result and the resultant consequences of isolating, stigma etc.
39 544 further influenced decisions not to test. A low income was found not to be a reliable socio-
40 545 economic status proxy in our study. Most low-income participants were PhD students and post-
41 546 docs who cited various reasons for not following recommendations. Many told us how they
42 547 sought and read scientific evidence to inform themselves and this, rather than the
43 548 recommendations, guided their decision making. In line with our findings, salary is not a good
44 549 proxy for socio-economic status among online tool users.²⁴ A shortcoming in this regard, was
45 550 the missing information on how the tool arrived at the recommendation to test or not to test e.g.
46 551 algorithm used¹⁹ something some key informants wished to know. The issue of safety concerns
47 552 with regards to specificity of digital tool algorithms has also been reported elsewhere.³⁸

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51 553 *Utility of OFTT in preventing onward transmission- cross infection*

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53 554 The tool proved useful in preventing cross infection concurring with findings elsewhere.¹⁹ Most
54 555 participants who were told to stay at home did so, reducing mobility and exposure. Most of the
55 556 participants called the GP practice ahead of time. That gave the GP practices time to ensure that
56 557 the suspect patient did not mix with other patients, thereby reducing the potential for onward
57 558 transmission (cross infection).¹⁹

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561 *Utility of OFTT in reducing health system burden*

562 Our primary hypothesis was that such an OFTT reduces the health system burden. Most of the
563 participants who used the tool would have called their GP or visited the hospital. OFTT use
564 effectively kept these worried participants at home and out of the doctors' offices and hospitals,
565 effectively reducing the health system burden. Contradicting our findings, research from
566 elsewhere has produced inconclusive and sometimes contradicting evidence.^{28,39} Further
567 studies in different contexts are therefore called for. Further contradicting our findings,, another
568 study reported that symptom checkers' triage capabilities are not greater than that of an average
569 lay person.⁴⁰ In fact the convenience of telemedicine has also been associated with increased
570 utilization of services, increasing work load and health care spending.⁴¹

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573 **Recommendations and lessons learned**

574 Our study demonstrated the effects and utility of a COVID-19 OFTT. The assessment of an
575 OFTT is important but not without challenges. Below are some of the lessons worth sharing
576 with both health care providers and policy makers as subsequent waves sweep across Europe;

- 577 ➤ Most of the participants had challenges remembering the tool. Immediate
578 feedback e.g., in one minute, please rate this tool, or three open questions; please
579 tell us how useful this tool was with regards to i) accessibility of tool, ii) utility
580 of tool as an Information source, ii) utility of tool in facilitating your decision
581 making could be more effective. Data protection concerns and the need to keep
582 barriers to use as low as possible, could stand in the way of this approach.
- 583 ➤ The tool simply instructed patients to test or not to test, an arbitrary decision,
584 without shedding light on how the decision was made. Patients wish to see an
585 algorithm that says something like, "*the probability of you having COVID-19 is*
586 *75% test or 25% do not test.*"
- 587 ➤ Many participants said, "*bear in mind that online tool recommendations have less*
588 *weight than recommendations from a GP.*" Additional caution is needed in
589 language and terminology use as some patients that felt labelled by tool as high
590 risk, had negative outcomes. Ensuring access to a doctor to debrief with after
591 such tool use is advisable. Retired doctors who are still willing to make a
592 contribution to the society, could play such a role.
- 593 ➤ Many participants found the tool by accident; hence it is advisable to advertise
594 tool on social media platforms, billboards, TV, radio and could make it appear at
595 the top of google search. In addition, taking the tool to the people e.g., through
596 road shows could be a useful strategy to reach the old people – if they do not
597 come to the tool, take the tool to the people.
- 598 ➤ Many participants compared the tool recommendations with what the Federal
599 Office of Public Health (FOPH) recommended at the time. Having a tool link on
600 FOPH website that stipulates and references the FOPH criteria informing the tool,
601 could increase trust in tool and acceptability. Coordination between FOPH,
602 university hospitals, and other medical professional bodies is recommended to
603 further enhance trust in the tool.
- 604 ➤ Many elderly people are willing to embrace telemedicine, but challenges persist.
605 Telephone and voice activated system for the older population or call centers to
606 serve this group, are still needed (taking heed of unreachable and unanswered
607 calls) during this transitional phase.
- 608 ➤ Most participants found media confusing – telemedicine could play a better
609 information spreading role, sifting through the noise and offering scientific based

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3 610 recommendations. For many, the media spread fear and misinformed people in
4 611 many instances.

- 5 612 ➤ The OFTT lacked information on where to test (contact list of testing centres),
6 613 how to self-care, how to manage symptoms and when to contact a doctor-
7 614 addressing these shortcomings could improve the utility of OFTTs. Our results
8 615 underline the importance of not offering a telehealth tool as a stand-alone product,
9 616 but to integrate it into an overall concept with links to credible reliable sources.
10 617 ➤ Systems thinking-refers to the ability to see interconnectedness in a system with
11 618 a dysfunction in one part affecting other parts and consequently outcomes. Our
12 619 study revealed the reasons patients did not follow the recommendation to test, as
13 620 multipronged. Attention has to be paid to supply chain issues, as test shortages
14 621 affected outcomes. The cost of a test and the fear of a positive result additionally
15 622 emerged as hindrances to testing. This calls for systems thinking. Noteworthy, is
16 623 the reaction of GPs who labelled OFTT users who asked for a COVID-19 test as
17 624 hysteric. This does not only reveal that the pandemic caught everyone by surprise,
18 625 but also demonstrates the need to involve, collaborate with and win the local
19 626 health care providers-policy implementers, like GPs and Spitex (home based
20 627 nursing), to enhance tool utility as well as ensure positive outcomes
21 628 ➤ One key informant suggested having patients who had recovered from COVID-
22 629 19 act as champions to share their illness experience, and motivate the public to
23 630 take preventive measures and take the disease seriously-an approach that was also
24 631 effective in HIV prevention and coping strategies.

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33 634 **Strengths and limitations**

34 635 Many online tools have been developed during the COVID-19 pandemic. The effects and utility
35 636 of these tools however have not been assessed. *Coronatest.ch* was one of the first COVID-19
36 637 OFTTs in Switzerland. Our study could become the base line for studies that assess the effects
37 638 and utility of such online tools. The identified themes namely i) accessibility of tool, ii) user-
38 639 friendliness of tool, iii) utility of tool as an information source, iv) utility of tool in allaying fear
39 640 and anxiety, v) utility of tool in decision making (test or not to test), and vi) utility of tool in
40 641 reducing onward transmission-cross infection, vii) utility of tool in reducing health system
41 642 burden, could serve as a framework for assessing OFTT utility (follow-up paper). The mixed
42 643 method sequential explanatory design gave us a better understanding of OFTTs, their effects
43 644 measured quantitatively and utility explained with the aid of qualitative findings. We did not
44 645 simply report the effects but could also explain why the results were that way, generating a
45 646 holistic picture of the phenomenon.

46 647 The selection of the participants in our study carries the risk of a selection bias. Perspectives of
47 648 those that do not use online tools are missing and should be explored in further studies. In
48 649 addition, only a limited number of OFTT users took part in our study. This selection bias cannot,
49 650 to the best of our knowledge, be prevented due to data protection regulations which impose a
50 651 voluntary participation and prohibit a technically possible automatic tracking of participants.
51 652 Another way to avoid this possible selection bias would be to make the use of such a tool
52 653 conditional on participation in the study. We have deliberately decided against this procedure
53 654 for ethical reasons, in order to make our OFTT accessible to as many users as possible and to
54 655 keep barriers as low as possible. In addition, mandatory entry of personal data in OFTT for
55 656 study purposes would also discourage individuals from using the tool and thus trigger a new
56 657 bias. Our comparison of overlapping questions between the OFTT and the follow-up survey

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3 658 can at least help to estimate the similarities within the two groups. For both questions, the
4 659 percentages are comparable and can help in estimating the similarity of the groups.
5 660 Another limit of our study is the relatively long duration between the use of tool and the
6 661 qualitative interviews. This could have introduced a certain degree of recall bias. As with all
7 662 online tools, we cannot confirm the accuracy of the data entered. In particular, we cannot say
8 663 for sure whether the OFTT users used the tool to assess own symptoms or for other reasons,
9 664 such as curiosity, fear or uncertainty about how to deal with the novel infection. Likewise,
10 665 multiple use, trial runs or use of tool by a health care worker on behalf of patients, relatives and
11 666 friends are all possible. Socio-economic status might have introduced a selection bias in our
12 667 study since most of the participants had a higher education. Income emerged not to be a good
13 668 proxy for assessing socio-economic status. Other instruments, apart from income are therefore
14 669 needed to assess socio-economic status. Additionally, an on online assessment cannot fully
15 670 replace a (polymerase chain reaction) PCR test as some asymptomatic people might be positive
16 671 and those with COVID-19 specific symptoms might be suffering from a different disease.⁵ In
17 672 our mind, the data still sheds light on the effects and utility of such an online tool and the
18 673 recommendations given could guide other OFTT developers as the third wave sweeps across
19 674 Europe. As the study was conducted with a specific OFTT, transferability of our results to other
20 675 OFTTs is not necessarily a given. Given the limited evidence on the use of OFTTs, the results,
21 676 in particular the qualitative component of the study, could be of value to other OFTT
22 677 developers, with particular regards to utility and accessibility issues. Further studies with other
23 678 OFTTs outside the COVID-19 context are recommended so as to increase transferability and
24 679 improve the utility of OFTTs in the current third wave, future pandemics and other health care
25 680 settings.

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4 686 **CONCLUSION**
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7 687 OFTT use has increased greatly during this pandemic. The effects and utility of such tools
8 688 however, have not been widely assessed. That makes our study, one of the firsts, in assessing
9 689 effects and utility of a COVID-19 OFTT. Our study revealed that an OFTT does not only reduce
10 690 the health system burden but can also serve as an information source, reduce anxiety and fear,
11 691 reduces potential for onward transmission and facilitate decision making.
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4 693 **DECLARATIONS**
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7 694 **Acknowledgement:** Emergency telemedicine at University of Bern, Switzerland is supported
8 695 by an endowed professorship by the Touring Club Switzerland.
9 696

10 697 **Author contributions:** Study design and idea: J.M., A.M, R.S, T.C.S., M.M, M.E.R, P.J,
11 698 W.E.H.; Data extraction and preparation: R.S., M.M, A.M; Qualitative interviews: J.M., R.S.,
12 699 A.M.; Statistical analysis: M.M.; Qualitative analysis: JM. Writing of first draft: J.M., A.M,
13 700 M.M.; Revision of the final draft and final approval: all authors; Supervision: T.C.S., W.E.H.;
14 701 Project administration: T.C.S., W.E.H.
15 702

16 703 **Category of article:** original article
17 704

18 705 **Running title:** Usage of online tools during the COVID-19 pandemic
19 706

20 707 **Source of funding:** Swiss National Science Foundation (Project ID: 196615)
21 708

22 709 **Conflict of interest:** This manuscript is partially funded by the Swiss National Science
23 710 Foundation (Project ID: 196615). The founder has no influence on the content of the manuscript
24 711 or the decision to publish it.

25 712 TCS holds the endowed professorship for emergency telemedicine at University of Bern,
26 713 Switzerland. The founder has no influence on the research performed, the content of any
27 714 manuscript or any decision to publish. All other authors have nothing to disclose.
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29 716 **Data sharing**

30 717 Due to the nature of the study (OFTT) participants did not agree for their data to be shared
31 718 publicly. The data to support findings are available. Please contact corresponding author JM.
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7 837 **Figure 1: Mixed-Methods Sequential Explanatory Study Design**
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10 838 **Fig 2: OFTT triage**
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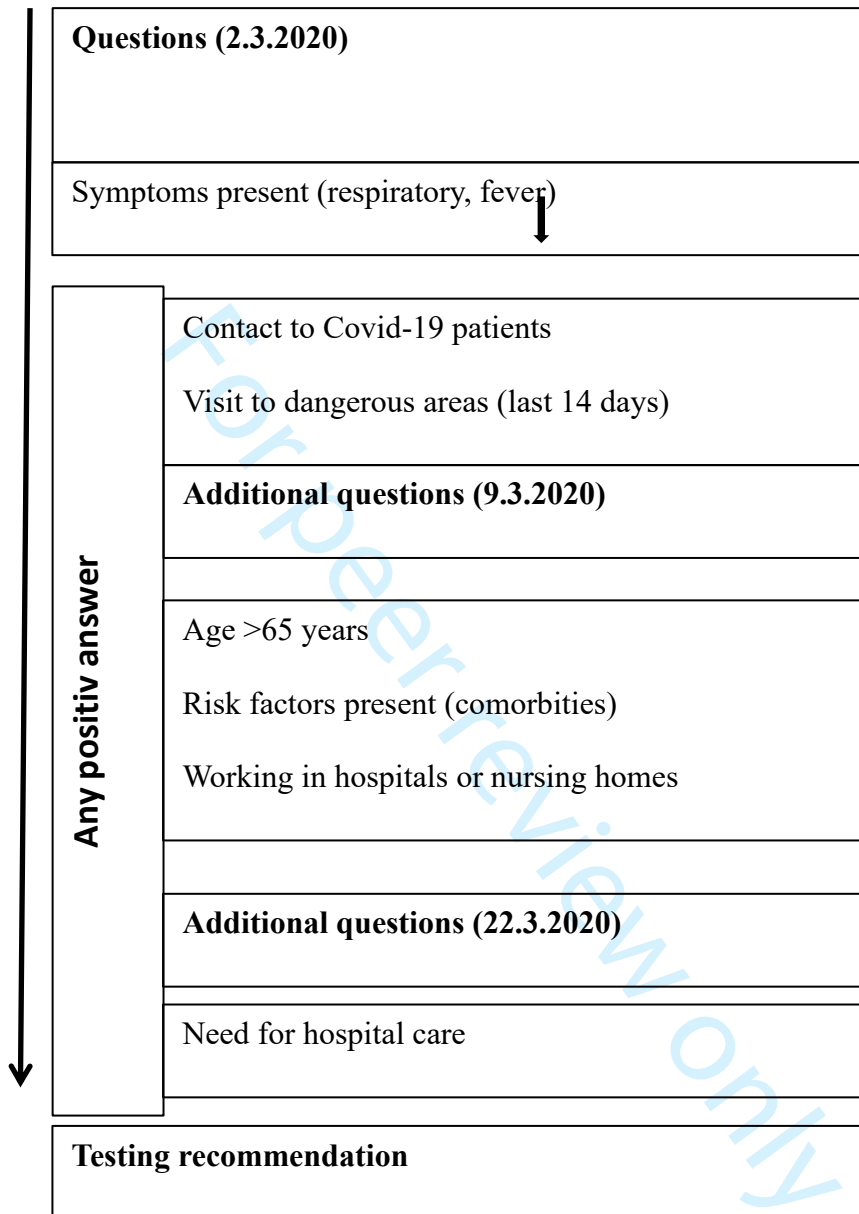
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Figure 1: Mixed-Methods Sequential Explanatory Study Design.

Phase	Procedure	Product
Collection of clinical data	OFTT	Data about usage of the tool Contact data for later study phases
Quantitative data collection	Questionnaires	Numeric data
Quantitative data analysis	Statistical analysis	Descriptive statistics
Connecting quantitative and qualitative data	Purposefully selecting patients for interviews	Interview guide
Qualitative data collection	Individual in-depth interviews	Interview transcripts
Qualitative data analysis	Coding and thematic analysis	Codes and themes
Integration of qualitative and quantitative results	Interpretation and explanation of quantitative results with the aid of and qualitative findings	Implications for OFTT development

Fig 2 OFTT triage



Supporting information OFTT Questionnaire and results

Supporting information 1. Usage of online tools during the COVID-19 pandemic: email survey

v1	How did you get to this Online - Tool?		
	1 - My family doctor advised me to use this tool.	9	5.1%
	2 - I found the information on the Internet.	113	64.2%
	3 - The website was recommended to me by family/friends.	17	9.7%
	4 - Via a telephone hotline.	1	0.6%
	5 - Other (Free text)	35	19.9%
v2	Did you find the information that you needed?		
	1 - Yes	154	87.5%
	2 - No, because the information was not comprehensive.	17	9.7%
	3 - No, because the information was not clear.	5	2.8%
v3	What information did you search for? I wanted....		
	1 - ... more information on COVID-19 symptoms	97	55.1%
	2 - ... more information on how to cope with symptoms	4	2.3%
	3 - ... to know when to consult a doctor	36	20.5%
	4 - ... to know more on testing criteria	32	18.2%
	5 - ... to know where to test	7	4.0%
	6 - Other	-	-
v4	Did the online tool recommend you to test for COVID-19?		
	1 - Yes	56	31.8%
	2 - No	120	68.2%
v5	Did you stick to the recommendations?		
	1 - Yes	149	84.7%
	2 - No	27	15.3%
v6	If you followed the Online - Tool recommendations, what made you do so?		
	1 - I trust the website as a reliable information source.	60	34.1%
	2 - I compared the recommendations with recommendations from the media and took a decision.	20	11.4%
	3 - I compared the recommendations with those from FOPH (BAG) and took a decision.	53	30.1%
	4 - I sought advice from a person I trusted.	7	4.0%
	5 - Other, please specify: Free text	9	5.1%
v7	In case you did not follow the recommendations, why did you not		
	1 - I did not trust the website as a reliable source of information.	1	0.6%
	2 - The recommendations from the website differed from the media recommendations.	2	1.1%
	3 - I feared for my life and needed to consult a GP in person.	6	3.4%
	4 - Other, please specify: Free text	18	10.2%
v8	Were your fears and anxieties allayed after visiting the website?		
	1 - Yes, the information from the website reassured me.	73	41.5%
	2 - No, the information from the website did not reassure me.	13	7.4%

	3 - No, the information from the website increased my fears and anxieties.	6	3.4%
	4 - I was not worried.	84	47.7%
v9	How did you cope with your fears? What helped you cope?		
	1 - Free text	-	-
v10	In case you went to the GP, did you call ahead of time to notify them of your visit?		
	1 - Yes	115	65.3%
	2 - No	61	34.7%
v11	Did you get tested for Coronavirus (SARS-CoV-2 Swab)?		
	1 - Yes	48	27.3%
	2 - No	128	72.7%
v12	What was the result?		
	1 - Positive	3	1.7%
	2 - Negative	45	25.6%
v13	How did the media influence your decision making? The		
	1 - ... helpful	81	46.0%
	2 - ... confusing	47	26.7%
	3 - I do not rely on the media as an information source.	25	14.2%
	4 - Free text	23	13.1%
v14	How old are you?	Mean 50.5 (SD 15), range 18-82	
v15	What is your sex?		
	1 - Female	101	57.4%
	2 - Male	75	42.6%
	3 - Other	0	0.0%
v16	What is your nationality?		
	0 - Missing	0	0.0%
	1 - Swiss	147	83.5%
	2 - German	13	7.4%
	3 - French	1	0.6%
	4 - Italian	3	1.7%
	5 - Liechtenstein	0	0.0%
	6 - Greater Europe	4	2.3%
	7 - Free text	7	4.0%
v17	In which province do you live?		
	1 - Bern	108	61.4%
	2 - Zürich	12	6.8%
	3 - Luzern	10	5.7%
	4 - Uri	0	0.0%
	5 - Schwyz	1	0.6%
	6 - Obwalden	0	0.0%
	7 - Nidwalden	0	0.0%
	8 - Glarus	0	0.0%
	9 - Zug	2	1.1%
	10 - Fribourg	7	4.0%
	11 - Solothurn	3	1.7%
	12 - Basel-Stadt	2	1.1%
	13 - Basel-Landschaft	1	0.6%
	14 - Schaffhausen	0	0.0%

	15 - Appenzell Ausserrhoden	2	1.1%
	16 - Appenzell Innerrhoden	0	0.0%
	17 - St. Gallen	2	1.1%
	18 - Graubünden	3	1.7%
	19 - Aargau	9	5.1%
	20 - Thurgau	1	0.6%
	21 - Ticino	2	1.1%
	22 - Vaud	7	4.0%
	23 - Valais	0	0.0%
	24 - Neuchâtel	1	0.6%
	25 - Geneva	0	0.0%
	26 - Jura	0	0.0%
	27 - I do not live in Switzerland	3	1.7%
v18	What is your highest level of education?		
	0 - Missing	6	3.4%
	1 - Tertiary education (university degree, college of education)	120	68.2%
	2 - Upper secondary education (High School Graduation, FMS, EZF, EBA)	27	15.3%
	3 - Lower secondary education/ obligatory schooling completed	23	13.1%
	4 - No formal education		
v19	Are you currently...		
	0 - Missing	33	18.8%
	1 - Employed	106	60.2%
	2 - Self employed	24	13.6%
	3 - Unemployed already before the current pandemic	3	1.7%
	4 - I lost my job during the COVID-19 period	1	0.6%
	5 - Studying or in an apprenticeship	9	5.1%
v20	How much approximately do you earn per month? (net income in December 2019 including 1/12 of the 13th month salary.)		
	0 - Missing	29	16.5%
	1 - Less than 4'000 CHF	26	14.8%
	2 - Between 4'001 and 6'000 CHF	42	23.9%
	3 - Above 6'001 CHF	79	44.9%
v21	What type of health insurance do you have?		
	1 - General	68	38.6%
	2 - Telemedicine - Modell	12	6.8%
	3 - GP - Modell	83	47.2%
	4 - Another alternative model	8	4.5%
	5 - No insurance	5	2.8%
v22	In a second stage, we will interview individual participants of		
	1 - Yes, I consent to be contacted.	78	44.3%
	2 - No, please, no more interviews.	98	55.7%
	3 - Free text	-	-

Interview Guide: Coronatest.ch -Patients v 2

Rapport

0Describe yourself (prompts; nationality, occupation, living arrangements, employment status)

Accessibility

0How did you get to coronatest.ch website? (referred by ..., online search). What is your understanding of an OFTT?

0Did you consult BAG- was the information supplied by BAG understandable to you? In what way was it useful.

0Was the online digital tool easy for you to access? explain why or why not (easy to find on homepage, length of tool, clear and easy to follow instructions, language, sequence, when did you use the tool Monday, Tuesday, weekend or during the week and why)

0What information or components would have helped you better -what do you suggest needs to be done to make such an online too more accessible.

Utility as a reliable information source and decision making

0When you consulted the online digital tool; did you follow the recommended advice? Prompt (why and how socioeconomic status could have influenced the process)

0What made you follow the advice and recommendations? Prompt confirmation from friends, generally, the media influence your decision-making process?

0What made you disregard the advice and recommendations? (prompt for severity of symptoms, change of condition)

0We have noticed that people that earn below 4000 tend not to follow recommendations, why do you think it's like this, what can be done?

Utility in allaying fear and anxiety

0Describe how you felt after consulting the online digital tool with regards to feeling anxious and or confident that all was going to be well? (Did you feel reassured after visiting coronatest.ch)

0If your fears were not allayed, how did you deal with your fears? prompt on what increased confidence, what allayed your anxiety)

Illness and testing Experience

0Did you test for COVID-19, what test and experience? Did you experience COVID-19 symptoms? Explain

0Speaking of self-isolation. Please explain in more detail how you experienced this what worked and what did not work e.g. the need to go shopping, not going for a run or walk protecting others vs own needs, putting others first, dilemmas, challenges

0The road to recovery has been described by many as very cumbersome and long-what was your experience? Any psychiatric or other residual effects experienced-explain.

0What personal life lessons did you learn during this pandemic you would like to share and what personal changes do you foresee in future

0What health and health system related observations did you make and what changes do you fore see in future?

0What, socio-economic changes have you observed and do you foresee in the future as a result of COVID-19

Utility in preventing cross infection

0If you consulted a GP; did you call ahead of time?

0How did your GP/ health care provider react when you told him or her you suspected that you had COVID-19?

Recommendations

0In a future pandemic, what would you do?

0Is there any additional information you wish a site like corontest provides but was missing during COVID-19? What information did you search for but did not find?

0Are there other strategies (to allay fear, anxiety) you deem effective alone or in conjunction with online digital tools when faced with epidemics such as COVID-19 to make it accessible to the older generation?

0How can online tools like corontast be adapted to facilitate your decision making processes

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	7
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10
		(b) Describe any methods used to examine subgroups and interactions	10
		(c) Explain how missing data were addressed	10.11.12.13
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	

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(e) Describe any sensitivity analyses

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Results					
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	11		
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11		
		(b) Indicate number of participants with missing data for each variable of interest	11		
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)			
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time			
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure			
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures			
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	12.13.14		
		Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
		Discussion			
Key results	18	Summarise key results with reference to study objectives	18		
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	21		
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20		
Generalisability	21	Discuss the generalisability (external validity) of the study results	21		
Other information					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24		

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

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