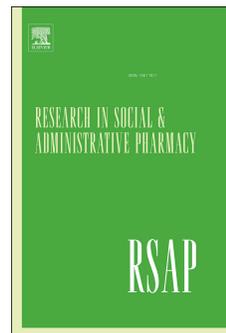


Journal Pre-proof

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Author contributions

VP was the principal investigator of the study. All study authors are members of the European Society of Clinical Pharmacy Research Committee and jointly led the conception of the study. All authors were involved in the data collection by conducting interviews and conducting analysis of the transcripts. VP and CC led the drafting of the manuscript to which all authors contributed through editing and revision. All authors had access to the data sets and agreed to the final version of the manuscript.

Journal Pre-proof

Provision of clinical pharmacy services during the COVID-19 pandemic: experiences of pharmacists from 16 European countries

Vibhu Paudyal*¹, Cathal Cadogan², Daniela Fialová^{3,4}, Martin C Henman⁵, Ankie Hazen⁶, Betul Okuyan⁷, Monika Lutters^{8,9}, Derek Stewart¹⁰

¹School of Pharmacy, University of Birmingham, Birmingham, United Kingdom

²School of Pharmacy and Biomolecular Sciences, Royal College of Surgeons in Ireland, Dublin, Republic of Ireland

³Department of Social and Clinical Pharmacy, Faculty of Pharmacy in Hradec Králové, Charles University, Czech Republic

⁴Department of Geriatrics and Gerontology, 1st Faculty of Medicine Charles University, Prague, Czech Republic

⁵School of Pharmacy and Pharmaceutical Sciences, Trinity College Dublin, Dublin, Republic of Ireland

⁶Centre for Pharmacy Postgraduate Education, University of Manchester, Manchester, United Kingdom

⁷Clinical Pharmacy Department, Faculty of Pharmacy, Marmara University, Istanbul, Turkey

⁸Clinical Pharmacy, Cantonal Hospital Baden, Baden, Switzerland

⁹Swiss Federal Institute of Technology, Zurich, Switzerland

¹⁰College of Pharmacy, QU Health, Qatar University, Doha, Qatar

*Correspondence

Vibhu Paudyal, PhD

School of Pharmacy, College of Medical and Dental Sciences

University of Birmingham, Edgbaston, Birmingham,

United Kingdom B15 2TT

Tel: 0044-121 4142538

E-mail: v.paudyal@bham.ac.uk

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There are no conflicts of interests to declare.

Provision of clinical pharmacy services during the COVID-19 pandemic: experiences of pharmacists from 16 European countries

Abstract

Background: The pharmacy profession has an important role in the frontline healthcare response to COVID-19 across all settings.

Objective: This study sought to explore the views and experiences of clinical pharmacists in relation to the provision of clinical pharmacy services during COVID-19.

Methods: Semi-structured qualitative interviews were conducted with pharmacists working in clinical roles in healthcare settings across Europe. Participants were recruited through professional organisations of clinical and hospital pharmacists combined with a snowballing technique. The Pharmacy Emergency Preparedness and Response Framework and Disaster Preparedness Framework for pharmacy services were used to generate data which were analysed using the thematic framework method.

Results: Twenty-two participants from 16 European countries described a range of measures to protect patients, public and healthcare staff against virus transmission including developing and disseminating educational materials. Most described their involvement in aspects of evidence provision such as facilitating clinical trials, gathering and appraising evidence and disseminating clinical information. Many hospital-based pharmacists were reassigned to new roles such as intensive care. Routine clinical services were extensively interrupted and remote forms of communication were used. Most were motivated by a strong sense of professionalism to continue delivering services. A number of facilitators and barriers to prevention, preparedness and response actions were identified which related to uptake of new roles, recognition of pharmacists roles in the healthcare team, information gathering, communication with patients and healthcare professionals, and provision of routine clinical services.

Conclusions: Participants in this multinational qualitative study described a range of service adaptations and adoption of novel roles to prevent and mitigate the public health impact of the pandemic. The study findings may help to inform governments, public health agencies and healthcare systems in harnessing ongoing service provision and adapt to any future interruptions.

Key words: COVID-19; Coronavirus; Pandemic; Pharmacist; Clinical Pharmacy; Pharmaceutical care

1 **Provision of clinical pharmacy services during the COVID-19 pandemic: experiences**
2 **of pharmacists from 16 European countries**

3
4 **INTRODUCTION**

5 COVID-19 is caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-
6 CoV-2) and has been recognised as a global pandemic.¹ Since the first case was reported in
7 the Wuhan province of China in December 2019, the virus has spread rapidly across the
8 world with devastating impact on practically every aspect of daily life. As of 11th of
9 September 2020, COVID-19 has infected over 28 million people worldwide and resulted in
10 more than 900,000 deaths.² High rates of infection and deaths have been reported globally
11 in many countries in Europe having experienced some of the highest mortality rates in the
12 world including Italy, France and the United Kingdom.²

13
14 Healthcare services across Europe have been severely impacted by COVID-19. At the early
15 stages of the pandemic, various health services including hospital, community and primary
16 care were restricted (e.g. non-urgent elective surgeries, routine health checks and
17 medication reviews) to ensure adequate resources were in place to deal with patients
18 presenting with COVID-19.^{3,4} Following public health measures to suppress the spread of
19 the virus (e.g. social distancing, wearing of face coverings), restrictions have now been
20 eased to some degree in many countries. An additional challenge for healthcare services is
21 dealing with the backlog of cases for non-COVID-19 related illnesses that did not present
22 during the most severe stages of lockdown.⁵⁻⁷ The delays caused by the pandemic to
23 patients in seeking timely medical intervention will have a profound negative impact on
24 health outcomes over the coming months and years. For example, a national population-
25 based modelling study in England estimated increases in deaths due to cancer up to five
26 years post-diagnosis ranging from 4.8% for lung cancer to 16.6% for colorectal cancer
27 compared to pre-pandemic figures.⁸

28
29 The pharmacy profession has had an important role in the frontline healthcare response to
30 COVID-19. For many individuals with COVID-19 related queries or health concerns,
31 community pharmacists may often be the first point of contact for reliable information and
32 advice.⁹ Community pharmacists have undertaken a range of roles and activities in response
33 to the pandemic which include providing public health advice, information and education on
34 personal and environmental hygiene, and making appropriate referrals in suspected cases of
35 COVID-19.¹⁰ Primary care-based pharmacists (i.e. those working in general practice) and
36 hospital pharmacists have also undertaken various roles and activities spanning disease

37 prevention and infection control, provision of patient care and support to other healthcare
38 professionals, as well sourcing and ensuring adequate supplies of medication.¹¹

39

40 Although the scope and nature of their roles and clinical activities varies across settings and
41 jurisdictions,¹²⁻¹⁴ pharmacists' ultimate focus is on providing effective pharmaceutical care to
42 improve health outcomes and quality of life for patients. In order to ensure evidence-based
43 responses to future public health crises, it is also important to explore how clinical pharmacy
44 services have adapted and responded to the pandemic.¹⁵ This will help in identifying and
45 sharing good practices, determining barriers and facilitators to service provision, as well as
46 any lessons that can be learnt for future public health crises. However, a recent scoping
47 review highlighted a deficit of studies to date examining core services provided by clinical
48 pharmacists in various health settings in Europe during the COVID-19 pandemic.¹¹ The aim
49 of this study was to explore the views and experiences of clinical pharmacists in Europe
50 regarding their provision of clinical pharmacy services during COVID-19 with focus on
51 prevention, preparedness and learning points for future public health crises.

52

53 **METHODS**

54 **Design**

55 This study consisted of semi-structured qualitative interviews with pharmacists working in
56 clinical roles in various healthcare settings across Europe. The study is reported in
57 accordance with the Consolidated Criteria for Reporting Qualitative studies (COREQ)
58 checklist [Electronic supplemental material 1].¹⁶

59

60 **Sampling and recruitment**

61 A multi-strand sampling method was employed. Firstly, email invitations to take part in the
62 study were issued to the membership of both the European Society of Clinical Pharmacy
63 (ESCP) and European Association of Hospital Pharmacy (EAHP), and study information also
64 included in the organisations' electronic newsletters. The ESCP is a professional network of
65 clinical pharmacists across Europe which aims to promote, support, implement and advance
66 education, practice and research in clinical pharmacy in order to optimise outcomes for
67 patients and society.¹⁷ The EAHP represents over 23,000 hospital pharmacists across
68 Europe and seeks to develop the hospital pharmacy profession in order to continually
69 improve the care and outcomes for patients in European hospitals.¹⁸ Secondly, a
70 snowballing technique was used to recruit additional participants known to ESCP and EAHP
71 members who responded to the original invitation. Finally, members of the research team
72 disseminated study information to their professional acquaintances with a view to achieving

73 a maximum variation sample in terms of practice setting (e.g. hospital, primary care) and
74 speciality (e.g. respiratory, critical care) and country of practice.

75

76 In order to meet inclusion criteria, individuals had to work as a pharmacist in a clinical role in
77 any healthcare setting in Europe. Individuals who were not practising as pharmacists in
78 clinical roles Europe or could not communicate in English were not eligible to take part in the
79 study. Pharmacists interested in participating in the study were asked to contact the principal
80 investigator (XX anonymised) who emailed a study information sheet and consent form and
81 arranged for a member of the research team to follow-up those agreeing to participate to
82 schedule an interview. Sampling and recruitment proceeded until data saturation was
83 achieved. No honorarium was provided for participating in the study.

84

85 **Data collection and analysis**

86 Interviews were conducted by members of the research team consisting of academic and
87 clinical pharmacists (all with PhD level qualification) with extensive qualitative research
88 experience. All interviews were conducted in English using online platforms Microsoft
89 Teams, Skype and Zoom) and took place over June- July 2020. With participants' consent,
90 each interview was digitally recorded and transcribed. Any identifiers were removed and an
91 anonymous code was assigned to each participant.

92

93 The interview schedule (Electronic supplemental material 2) was developed using a
94 combination of the Pharmacy Emergency Preparedness and Response (PEPR)
95 Framework¹⁹ and Disaster Preparedness Framework (DPF) for pharmacy services.^{20,21} Key
96 domains within the PEPR and DPF are defined under a) prevention/ mitigation actions to
97 minimise transmission and ensure patient and staff safety, and b) preparedness of clinical
98 pharmacy services to respond to the pandemic c) action-response and adjustments and d)
99 recovery. Topic guide questions under the four domains were then constructed according to
100 the research aim and objectives. The topic guide questions related to participant
101 perspectives on the impact of the pandemic on patient care and population health
102 interventions; adjustments and actions undertaken to mitigate the impact; knowledge and
103 skills required and gained; and any learning points for the future. The topic guide was refined
104 through discussions amongst the research team which included a range of clinical practice
105 and research experiences and represented seven different countries within Europe.

106

107 The analytical process commenced during the transcribing process by listening to interview
108 recordings and repeated reading of the transcripts, thereby allowing the researchers to
109 familiarise themselves with the data. Data analysis was conducted in accordance with the

110 framework method²² and adopted a deductive approach using pre-defined coding categories
111 with data categorized into a matrix system in Microsoft Excel based on emergent themes
112 and subthemes.²² The construction of the initial thematic framework was guided by the
113 PEPR and DPF.¹⁹⁻²¹ Transcribed data from the first two interviews were first coded using the
114 predefined coding framework. This framework was further refined through discussion within
115 the research team before a final agreed version was applied in the analysis of the remaining
116 transcripts. Key themes describing the data were listed in column headings within the Excel
117 spreadsheet with relevant quotes from participants presented across rows. Two researchers
118 independently analysed each transcript. The matrix system was reviewed in estimating the
119 point of data saturation (i.e. the point at which no new information was identified). We
120 focused on the range of experiences and stipulated examples on perceived impact on
121 practice, mitigation measures, and action response and adjustments when estimating data
122 saturation.

123

124 Ethical approval

125 Ethical approval was granted by the Ethics Review Panel, University of XXX (anonymised),
126 United Kingdom (ERN_20-0781).

127

128 **RESULTS**

129 Twenty-two pharmacists participated representing 16 different countries within Europe (table
130 1). Participants represented hospital, community and primary care settings. Those within the
131 hospital sector delivered a range of specialist clinical roles including intensive care medicine,
132 respiratory and transplant medicine. Practice experience (i.e. years qualified as a
133 pharmacist) ranged from 3 to 30 years (table1). Interviews lasted approximately 50 minutes
134 on average.

135

136 Results from the framework analysis of themes and illustrative quotes are presented under
137 the following key domains a) prevention/mitigation, b) preparedness c) action-response and
138 adjustments d) recovery and e) reflection of personal experience. Barriers and facilitators
139 specifically relating to ensuring adequate prevention/mitigation, preparedness and action-
140 response and adjustments are presented throughout and summarised in table 2.

141

142 **A. Prevention/Mitigation**

143 **Reducing the health risks posed by COVID-19**

144 Participants described a range of prevention and mitigation measures to reduce the spread
145 of COVID-19. These included adoption of social distancing, increased sanitisation and hand
146 hygiene practices. Facilities were rearranged to ensure limited personnel and patients in
147 clinical and office spaces as well as waiting areas. For example, community pharmacies
148 described using 'night time' windows, purposefully-built hatches and cashless transactions to
149 serve patients and customers. Such adjustments were made using community pharmacy's
150 own resources as no external funding was received.

151 'Because when the pandemic started in Estonia, which was officially on March 12th we
152 decided to close the doors of the pharmacy and dispense the medications and consult
153 the patients through the small window like we do it at night.' Community pharmacist,
154 Estonia

155 Some participants from hospital settings described facing difficulties in adjusting the facilities to
156 ensure socially distanced services due to a lack of adequate space.

157 Patients were provided with protective masks upon entering clinical facilities. Some participants
158 noted that sanitizing chemicals, wipes and personal protective equipment (PPE) were not in
159 adequate supply at the beginning of the pandemic. Many pharmacists reported being unsure
160 about how to effectively use PPE which in a number of cases was attributed to a perceived lack
161 of training.

162 'The personal protective equipment was not enough and not adequate all the time. They
163 hadn't got enough quality [either] ... We did not know how to use the personal protective
164 equipment.' Clinical Pharmacy Resident, Hospital, Turkey

165 **Educating the public on reducing the spread of COVID-19**

166 Many participants described being actively involved in directly educating patients and
167 members of the public about social distancing, correct use of PPE and preventing the spread
168 of COVID-19. This included verbal advice, information provision through social media and
169 the development of educational material. Advice provision on the use of analgesics in
170 COVID-19 was frequently mentioned. Some participants however, described the challenges
171 they faced in educating the public.

172 'They thought we were exaggerating. And some of them even told me: "Why are you
173 spreading the panic?" I answered: "I am not spreading the panic; ...everybody should act
174 according to these rule". But you know, they did not perceive it as a threat at all. They
175 perceive it just as additional burden or something unnecessary.' Community pharmacist,
176 Croatia

177 B. Preparedness

178 Participants described a range of activities relating to preparedness for COVID-19. These
179 included measures to ensure that effective response systems were in place by adjusting the
180 physical layout and infrastructure including risk stratification, deployment of pharmacist
181 across clinical settings, adjustment of working hours, staff leave, testing staff for COVID-19
182 and utilising healthcare students to assist with the services.

183 Adjusting physical facilities

184 Participants from hospital pharmacy described the segregation of facilities to care for
185 COVID-19 patients, high risk patients and those who were non-infected or at of low risk. For
186 many, the early outbreak in Italy allowed some time to prepare and adjust their physical
187 facilities to respond to COVID-19. Examples of physical facility adjustments included a
188 separate hospital for COVID-19 patients, separate wards or even turning a cafeteria into an
189 intensive care unit (ICU).

190 '...so the hospital is divided into green, amber and red zones. ...Red section which would
191 be ICU and also anywhere there would be active aerosol generating procedures...and
192 that would be the full gown over your scrubs, hat, mask and visor... we closed our
193 canteen and turned it into a temporary ICU and we've put like a marquee at the front of
194 the hospital where everyone goes for food.' Cardiology pharmacist, hospital, Northern
195 Ireland

196 Maintaining safe staffing levels

197 Participants in the hospital sector described redeployment of clinical pharmacy staff from
198 other clinical areas to COVID-19 wards and ICUs. While some participants described
199 receiving some training prior to their deployment, others learnt while in practice.

200

201 'People just got on with it. More staff went into critical care and they needed training.'
202 Hospital pharmacist, cardiology and pharmacy management, Republic of Ireland

203

204 Some participants reported that accommodation and shuttle transport services were
205 provided to minimise transmission amongst healthcare staff. Some participants reported
206 being asked to work from home, particularly those with young children and vulnerable family
207 members. While this aimed to ensure social distancing and minimised transmission within
208 the clinical setting, some participants were unhappy with their new working arrangements.

209 'I was annoyed that I was not allowed to run an inter-professional clinical meeting
210 face to face in June. It had to be via Zoom. I was the only one from the practice that

211 was still working remotely from home. I felt lonely.’ Clinical pharmacist, Primary Care,
212 the Netherlands

213 Many participants described having their work hours adjusted including reduced number of
214 days but longer hours or alternate work days. Some noted that all annual leave was
215 cancelled and this often led to low staff morale.

216 ‘Not getting to take any annual leave and not getting a break would just cause a lot of
217 sickness and things like that. So the four days off (three days in) was good in terms of
218 maintaining resilience’ Specialist respiratory pharmacist, hospital, England

219 A community pharmacy owner reported that many locum pharmacists cancelled their shifts
220 which led to difficulty sourcing the required personnel to ensure safe operation of the
221 community pharmacy. Some participants described getting students to help out to ensuring
222 adequate staffing while others had to send students home to ensure safe staffing levels.

223 Participants from community pharmacy also described that adjustments in community
224 pharmacy opening hours were enabled by the government which allowed them to operate
225 limited hours to minimise staff burnout and fatigue. However, some primary care
226 pharmacists noted that this caused issues in timely supply of medicines to the patients

227 **Testing staff for COVID-19**

228 While participants noted that staff testing for COVID-19 was not made available at the earlier
229 stages of the pandemic, the situation was perceived to have improved over time. Many relied
230 on the emergence of symptoms before isolating.

231 ‘We had no tests, we had only a few testing sets. So, nobody knew the situation..... and
232 it did not allow us to really measure the risks and benefits of our interventions
233 [preventative measures].’ Intensive Care Unit, hospital, Czech Republic

234 **C. Actions –response and adjustments**

235 Various actions in relation to responses and adjustments to routine clinical practice were
236 described.

237

238 **Ensuring uninterrupted supply of medications and business continuity**

239 Most participants described shortages of medical supplies during the early phase of the
240 pandemic. Medical supply shortages in ICUs were a particular issue. Participants mentioned
241 borrowing stocks from other wards, departments, hospitals and other healthcare facilities.
242 Such stock transfer was often organized by professional organisations or governmental

243 bodies. Some used their aseptic laboratories to prepare formulations to make up for the
244 shortfall.

245

246 'We had a brief moment where propofol was an issue because they used it a lot for the
247 corona [COVID-19] patients mostly in intensive care...but they managed to distribute
248 from the main pharmacy...I needed to call them every other day for propofol.' Pharmacy
249 department manager, hospital, Denmark

250

251 Some participants reported having had 'very good' business continuity plans and described
252 having received excellent support from their government in ensuring adequate medical
253 supplies and having 'never' faced shortages.

254

255 Hospital-based participants described ordering medicines such as hydroxychloroquine for
256 the first time and this led to procurement challenges. Rationing of medicinal supplies as well
257 as supplies of PPE and disinfectants was implemented throughout all stages.

258

259 Participants from community pharmacy described high demand for repeat prescriptions and
260 over the counter (OTC) analgesics, vitamins, particularly vitamin C and OTC products
261 claiming to boost the immune system. Temporary restrictions were implemented to address
262 the situation. Some community pharmacist participants described repackaging bigger packs
263 into smaller packs to ensure equitable supply. Some reported being allowed to extend the
264 supply of repeat prescriptions without needing additional authorisation from the prescriber.
265 Therapeutic substitutions were often exercised due to supply issues across all settings.

266

267 'People wanted the same brand name and we ran out. When the pandemic started
268 people were buying 10 packages or 100 tablets of paracetamol per person. And one
269 important change what was made in Estonia by our minister was that every person could
270 buy only 2 packages of OTC medication and people didn't understand why...Patients
271 were at first shocked [about therapeutic substitutions for prescribed medicines], but then
272 they became very cooperative.' Community pharmacist, Estonia

273

274 **Impact and adjustment of routine clinical practice**

275 Participants described the enormous impact of COVID-19 on routine clinical practice.
276 Routine and non-urgent appointments in hospitals were cancelled and participants described
277 seeing unusually low number of patients for routine admissions. Many deemed that patients
278 were often fearful of using healthcare services and that overcoming such fears was
279 challenging.

280

281 Participants in the primary care settings reported that they could no longer offer blood
282 pressure, temperature, oxygen saturation and cholesterol testing and had to advise patients
283 to buy home testing kits. Reductions and adjustments of routine activities such as medicine
284 use reviews and medicine reconciliations were noted and many were conducted over the
285 phone.

286

287 'I was used to do domiciliary reviews or to see the patients at the surgery and they often
288 brought their medicines with them. I was a bit pessimistic to start with. I thought that this
289 was not the way to do medication reviews. But actually, it is going really well via phone.
290 People can explain their symptoms very well over the phone, have their medications next
291 to them, and are surprisingly open about sensitive topics.' Clinical pharmacist, Primary
292 Care, the Netherlands

293

294 Many noted that the cancellation of routine clinical services created difficulties in ensuring
295 that patients received appropriate monitoring and follow up.

296

297 'The biggest change was the clinics, because I do asthma clinics, which are quite hands
298 on, checking their peak flow, doing spirometry, I'd be listening to their chest you think
299 they are having an exacerbation. When they come in it is all visual, you can see how they
300 walk how they talk, you observe them. And all these things are lost. I found that it was
301 really hard.' Clinical pharmacist, general practice, England.

302

303 **Communicating with patients and healthcare professionals**

304 Remote forms of communications including web-based services were used extensively by
305 participants to communicate with patients and other healthcare staff. Many however
306 described that online platforms were overloaded. Remote communications were deemed to
307 have caused issues in communicating with patients with low health literacy as well as older
308 and disabled patients, immigrant communities with interpreter needs and those without
309 access to the online communication facilities.

310

311 Many noted that PPE created communication challenges to offering the same level of patient
312 care and experience.

313

314 'Many patients are old, they have hearing problems, they have problems with their vision,
315 they do not understand what you are saying, especially when you wear masks and they

316 do not see your lips. So I had to write down what I wanted to say'. Community
317 pharmacist, Croatia

318 Some perceived remote forms of communications being less effective in providing
319 recommendations to doctors and some needed intensive follow up to make sure that their
320 advice was accepted by the doctors.

321
322 'I've realized that the acceptance rate of the interventions went down. I really had to
323 follow up on the patients to make sure that the interventions were accepted. That was
324 more time intensive.' Hospital pharmacist (general), Switzerland

325

326 **Advocating pharmacy's role and being a source of information for doctors**

327 Many participants reported offering information to doctors during the pandemic by searching
328 and appraising guidelines, particularly in relation to the experimental drug treatments
329 including hydroxychloroquine and remdesivir. Many described that the pandemic offered the
330 opportunity to showcase their expertise as pharmacists.

331

332 'Doctors/colleagues see me as someone who provides the medicine information and of
333 course critically appraise elevating literature, [e.g.] what is known about remdesivir etc.,
334 Although clinical pharmacists are not recognized enough in my country, I think this period
335 maybe will leave a better recognition for clinical pharmacists and pharmacists as
336 medicinal experts.' Liver transplant pharmacist, hospital, Serbia

337

338 However, not everyone agreed that pharmacists were well recognised. Participants
339 particularly from primary care felt that they were left out of care and planning activities during
340 initial phase of the crisis.

341

342 'The first two weeks were very unsettling. I felt like I was in a sort of identity crisis.' I felt
343 like we [primary care pharmacists] are useless, not necessary anymore. Everyone was
344 working around the clock at the front line, who cares about my job? But that turned out
345 differently, at least for patients. We developed protocols to provide care remotely and
346 patients really appreciated this.' Clinical pharmacist, general practice, the Netherlands.

347

348 One participant mentioned that the same PPE and colour of uniforms being worn during the
349 pandemic levelled the hierarchy and therefore everyone was 'seen as equal'.

350

351 **Taking care of COVID-19 patients**

352 Some participants described being directly involved in the care of COVID-19 patients.
353 Participants described a lack of information during the early phase of the pandemic and had
354 to extensively search the literature to source the information they were looking for. Many
355 reported attending several webinars in some days. Others described relying on medical
356 journals as well as World Health Organisation (WHO) and local hospital guidelines. Some
357 admired the promptness at which information was made available by the professional
358 societies (such as the EAHP) and public health agencies. However, some participants
359 described the confusion created by different guidelines and their interpretation by different
360 clinical departments.

361
362 'It was also really hard to understand who is doing what and when due to guidelines
363 changing hour to hour...the physicians got one guideline then the nurses got another
364 then we got another and these guidelines didn't speak in the same direction at all so that
365 did something for the collaboration in multidisciplinary teams.' Pharmacy department
366 manager, hospital, Denmark

367

368 **D. Recovery and returning to normal**

369 Most participants were still adjusting and coping with the pandemic. However many noted
370 that they were anticipating that the virus would remain in the community for the foreseeable
371 future and that social distancing measures would remain common practice. Many believed
372 that telecommunications and web-based communications would remain part of work
373 practices in the future. Those working with high risk patients such as in the transplant and
374 immunotherapy departments considered that current social distancing measures shall
375 remain in place.

376

377 Community pharmacists identified opportunities for more clinical screening and interventions
378 in the future, particularly as many patients considered visiting their GPs less preferable.

379

380 'In Spain it is not really easy to go to the General Practitioner, so we have increased the
381 number of people who actually come to pharmacy to know their cardiovascular risk and
382 then we take more glycosylated haemoglobin, the lipid profile, the blood pressure and so.
383 I think that these services have gained importance and strengthen here the role of
384 pharmacists. We really want to keep these services in the future.' Community
385 pharmacist, Spain

386

387 Participants in the community also described their readiness to offer vaccinations for COVID-
388 19 once available/approved and other currently available vaccinations (e.g. influenza).

389

390 'pharmacist can be very important and active in promoting vaccination, for COVID or
391 other diseases.' Clinical Pharmacy healthcare solutions designer, Portugal

392

393 **E. Reflection on personal experience**

394 Most participants described feeling proud to serve their communities and countries at this
395 time of need. They considered it a professional and ethical responsibility.

396 'I felt it as my professional and human responsibility. I think it was something that was not
397 even negotiable, I felt this is my responsibility.' Liver transplant pharmacist, hospital,
398 Serbia

399 Measuring success and failures of responsive actions were often based on how such actions
400 helped patients and ensured a safe working environment for participants and other
401 healthcare professionals. Those directly responsible for the care of COVID-19 patients
402 reported that seeing patients being discharged from the hospital was a great motivation.

403

404 'So being able to help with that was really good and even little things like seeing how
405 many patients have been discharged from hospital with coronavirus compared to the
406 amount of deaths and was really good to see.' Specialist respiratory pharmacist, hospital,
407 England

408 Participants reflected on the experiences and skills developed during the crisis thus far. They
409 felt that the pandemic brought people from different disciplines and pharmacy colleagues
410 together to look after each other, as well as their patients.

411

412 'Used to high risk patients. Used to people dying. How fast it came and too much and too
413 little information at same time. Every day something changed...traumatic at speed of
414 complications and death of patients...uncertainty and worry about colleagues...trying to
415 look after each other all the time. Worried about ...bringing it [the virus] home to family.
416 Worried about staff member with four small children who caught it.' Cardiology
417 pharmacist, hospital, Republic of Ireland

418

419 All participants felt that providing care during the pandemic was challenging but rewarding.
420 Participants in the hospitals mentioned that they were able to develop new skills relating to
421 critical care, extemporaneous compounding and clinical trials medicine. Other skills
422 mentioned by participants included remote communications, time management, resilience
423 and the ability to work under pressure.

424

425 'Well, I would only say that providing limited clinical pharmacy services in my own
426 environment will be improved based on our current experience, which will basically be
427 focused on better communication, better supervision on treatments and maybe more
428 efficient communication, when there is another wave or another peak of Covid-19
429 pandemic.' Orthopaedic surgery pharmacist, hospital, Serbia

430

431 **DISCUSSION**

432 To our knowledge, this is the first multinational study on the delivery of clinical pharmacy
433 services, and associated adaptations, during the COVID-19 pandemic. Qualitative data were
434 obtained from 22 pharmacists from 16 different European countries representing a diverse
435 range of clinical settings, specialities and experiences in response to aspects of protection,
436 preparedness and planning during the ongoing pandemic. Pharmacists adapted their
437 existing roles and implemented innovations to existing work practices in order to counter the
438 challenges presented by COVID-19. Many described working to the best of their abilities to
439 ensure that clinical pharmacy services were uninterrupted insofar as possible at the time of
440 critical need. Many clinical pharmacists (particularly in primary care and community settings)
441 became the first point of contact for patients with the healthcare systems particularly where
442 GP services were operating at reduced capacity or even locally unavailable. Participants
443 described that they were motivated by a strong sense of professionalism and desire to
444 deliver services for the sake of humanity, taking pride in what they had achieved and the
445 value placed in them by patients and other health professionals.

446 Many measures were adopted in an attempt to protect against transmission of the virus. A
447 previous study in Kosovo involving community pharmacists reported that implementation of
448 preventative measures was associated with respondents' perception that pharmacists and
449 the pharmacy profession were valued more by patients and other health professionals.²³
450 However, pharmacies received no external funding support to adopt such preventative
451 measures, similar to the experiences faced by our study participants. Key barriers to
452 pharmacy activities included the requirements to restructure the physical environment to
453 ensure social distancing. Pharmacists described being involved in the development and
454 dissemination of educational materials and offering verbal advice to patients, members of
455 the public and health professionals.

456 Some described facing challenges to counter misinformation in social media as well as the
457 difficulty in dealing with constantly changing advice and evidence. While there have been
458 recent efforts by World Health Organisation working with technology companies in fighting

459 the 'infodemic'²⁴ pharmacists are likely to encounter patients who have been misinformed by
460 false information. A previous study conducted in the community pharmacy setting suggests
461 that vast majority of pharmacy clientele lack skills in critically interpreting information about
462 their illness and medicines.²⁵ In the context of new disease such as COVID-19, such
463 misinformation is likely to negatively influence patients' self-management and care seeking
464 behaviours. Pharmacists will have important roles in continuing to counter the misinformation
465 for the duration of the COVID-19 pandemic²⁶ including the development of credible and
466 reliable pandemic-specific information resources for the general public.²⁷

467 Many participants, particularly those from hospital settings, described being involved in the
468 delivery of new clinical roles. A number of participants were reallocated to the care of ICU
469 patients. While some received training, albeit limited, others had to learn and adapt as they
470 gained experience resulting in rapid expansion of their existing knowledge and skills. While
471 continuing professional development (CPD) is mandatory for pharmacist registration in many
472 countries, the planning of CPD is normally systematic and not time pressured.²⁸ Study
473 participants reported being able to adjust current clinical services and innovate where
474 necessary within a very short time period. This is an important learning point for future
475 service interruptions and adaptations, as well as the sustainability of such services.
476 Facilitation of clinical trials, intensive care medicine and extensive involvement in the
477 retrieval of evidence-based literature to inform clinical practice of their own and other
478 healthcare professionals were some of the stipulated examples.

479 Service adaptation to the pandemic had major consequences for routine clinical services
480 across all settings. Many described that patient care could not be provided to groups of
481 patients and that for others there were adaptations to specific activities such as routine
482 monitoring of clinical biomarkers. However, several participants highlighted opportunities to
483 enhance their clinical services as many patients were reluctant to use primary care general
484 practice services due to fear of being contracting the virus. This increased focus on
485 community pharmacy based clinical care is in line with the strategic developments in
486 countries such as the UK.¹⁷

487 Most participants considered that other healthcare professionals appreciated and valued
488 pharmacists' expertise and skills in their contributions to the clinical care of COVID-19
489 patients or for other associated responses. Many described that the pandemic offered the
490 opportunity to showcase the profession to other healthcare professionals particularly their
491 expertise in the provision of new clinically relevant information, adjustments of clinical
492 pharmacy services to accommodate digital communication as well as better prioritization of
493 patients in need of relevant services. Previous literature suggests that the opportunity for

494 physicians and pharmacists to work together in a ward is an important facilitator for
495 interprofessional collaboration.²⁹

496 The use of remote communications to provide clinical services, both with patient and other
497 healthcare professionals was also a key adjustment to the delivery of pharmacy services.
498 Many valued the opportunities to communicate remotely through telephone and digital
499 services. However, others reported that remote communication methods did not offer the
500 same opportunity to interact with and monitor patients. Previous systematic reviews suggest
501 that clinical pharmacist-led telemedicine services can improve clinical outcomes in patients
502 with chronic disease³⁰ and effectively deliver public health services such as vaccinations,
503 smoking cessation, hypertension management, and medication adherence and
504 counselling.³¹ Given that many participants in this study identified that there will be greater
505 utilisation of remote communications in the future, healthcare systems should look into
506 investing in digital communications and telemedicine platforms in the context of clinical
507 pharmacy services.

508 Strengths and limitations

509 To our knowledge, this is the first multi-national study investigating pharmacists' experiences
510 of their responses to COVID-19. The study addresses a recognised gap in the literature.¹⁵
511 The interview topic guide was developed using the PEPRF¹⁹ and DPF²⁰ for pharmacy
512 services. This enabled a detailed exploration of pharmacists' preparation and response
513 activities in relation to COVID-19. Participants represented a range of practice setting,
514 clinical expertise and experiences. Although our recruitment strategy did not aim for a quota
515 sampling, diverse range of countries in relation to demography, timing of the first wave of
516 COVID-19 pandemic (i.e. early vs late) and mortality rates were represented. Data analysis
517 was conducted independently by two members of the research team using the framework
518 method²² which ensured a comprehensive and robust analysis, as well as the
519 trustworthiness of the findings.³² In terms of limitations, it must be noted that due to the
520 adoption of qualitative design, the study findings may not be generalizable to all pharmacists
521 and pharmacy services. The study did not investigate in-depth, the impact of national or local
522 healthcare systems on participant responses to the pandemic and as such country specific
523 research to promote best practices is needed. Due to time constraints, the interview
524 schedule was not piloted or externally validated. However, the research team included a
525 range of clinical practice and research experiences across seven different countries within
526 Europe which allowed evaluation of face and content validity of the interview schedule within
527 the research team. In addition, while estimating data saturation, we primarily focused on the
528 range of examples in relation preparedness, prevention, actions response and adjustments.

529 Our approach to estimation of data saturation did not cover clinical setting specific barriers
530 and facilitators.

531 Recommendations for practice and research

532 The facilitators and barriers to effective preparedness and response to the pandemic as
533 identified in this study needs to be harnessed and addressed respectively. Pharmacists in
534 diverse clinical settings can benefit from training to deliver pharmaceutical care services in
535 critical care areas in preparedness to public health crises such as the ongoing pandemic as
536 many participants had to undertake new roles without adequate education and training.
537 Facilitators and barriers of practice changes as reported in the context of other clinical
538 pharmacy services such as provision of public health interventions and supply of newly
539 approved medicines in clinical practice are likely to be applicable.^{33,34} Pharmacy
540 educational curricula should also incorporate aspects of global health and pandemic
541 preparedness.³⁵ Pharmacists' expertise and skills should be harnessed to enable them to
542 source and critically appraise evidence-based information by providing relevant continuous
543 professional development opportunities. While accessing and interpreting information from
544 established drug information sources are recognised and expected skills of pharmacists,
545 sourcing information from research databases and journals may often not be routine
546 practice. A list of recommendations for health systems and services have been summarised
547 and presented in table 3.

548 Participants reported that clinical pharmacy services including medicines were rationed to
549 address staff shortages during the pandemic. Developing strategies to protect supply levels
550 in anticipation of the future public health crises would benefit practice and patients.
551 Governments and healthcare agencies should utilise clinical pharmacists in gathering
552 intelligence around the lists of medicines that are at risk of shortages. Pharmacists should be
553 trained to enable therapeutic substitutions at the time of medicines shortages.

554 Remote communication systems need to be strengthened to allow better communication
555 between pharmacists and patients, as well as other health care professionals. Remote
556 means of communications and telemedicine should cater for patients with low literacy, low
557 cognitive functions, older patients and those with the need for interpreters as indicated by
558 many participants in this study. Novel technologies should be harnessed to facilitate effective
559 communications while pharmacists are using PPE.

560 Government and healthcare agencies should utilise pharmacists in the delivery of
561 vaccinations and new medicines to provide protection and treatment. Pharmacists' routine
562 clinical services such as provision of information on effective, cost-effective and safe drug

563 use, dispensing of medicines, minor ailments services and prescribing activities should be
564 supported during the ongoing pandemic. In addition, government and healthcare agencies
565 should ensure that the new knowledge and skills gained during the pandemic should be
566 maintained and passed on to new practitioners.

567 Future research should identify the impact of the pandemic on clinical pharmacy services on
568 patients, healthcare resources and cost-related outcomes. Further in-depth studies need to
569 be conducted in various settings to identify context specific facilitators and barriers to clinical
570 pharmacy service provision. Case study investigations should be conducted to identify and
571 share best practices.

572 **Conclusions**

573 This multi-national study of clinical pharmacists' views and experience around prevention,
574 preparedness and response to COVID-19 has identified pharmacists' diverse contributions
575 to patient care and the education of other healthcare professionals and members of public.
576 Key clinical pharmacy contribution areas include direct clinical care of COVID-19 patients;
577 gathering and appraising evidence to inform patients and healthcare professionals; ensuring
578 uninterrupted supply of medicines in the hospitals and community through effective
579 procurement, planning, dispensing and supply of medicines, and by making therapeutic
580 substitutions where necessary; providing clinical pharmacy services to high-risk populations;
581 and adopting new digital communication with healthcare professionals and patients.
582 Government and public health agencies should harness the facilitators and address the
583 barriers to the provision of clinical pharmacy services as reported in this study. Future
584 research should include outcome evaluations to examine the effectiveness of adapted and
585 novel services in the context of the pandemic, including remote clinical pharmacy services.

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Table 1: Participant demographics

SN	Country	Practice setting	Speciality	Job title	Years qualified as a pharmacist
1	Belgium	Hospital	Clinical pharmacy	Responsible clinical pharmacist	25
2	Croatia	Community pharmacy	Community pharmacy	Community pharmacist	16
3	Czech Republic	Hospital	Intensive Care Unit	Clinical pharmacist	19
4	Denmark	Hospital pharmacy	Hospital pharmacy	Head of hospital pharmacy	6
5	England	Primary care	Respiratory	Clinical pharmacist	21
6	England	Hospital pharmacy	Respiratory	Specialist clinical pharmacist	7
7	England	Community pharmacy	Community pharmacy/ Primary care	Manager/owner of a community pharmacy and part time in primary care	15
8	Estonia	Community pharmacy	Community pharmacy	Community pharmacist	3
9	France	Hospital	Hospital pharmacy	Pharmacist supervisor	20
10	France	Hospital	Hospital pharmacy	Hospital pharmacist	4
11	Republic of Ireland	Hospital	Cardiology and pharmacy management	Pharmacy education and research	28
12	Republic of Ireland	Community pharmacy	Community pharmacy	Superintendent and supervising	30
13	Italy	Hospital	Hospital pharmacy	Hospital pharmacist	8
14	Netherlands	Primary care	Elderly and polypharmacy	General practice pharmacist	9
15	Northern Ireland	Hospital	Cardiology	Senior hospital pharmacist	20
16	Portugal	Other	Consultancy- pharmaceutical care	Healthcare solutions designer	5
17	Serbia	Hospital	Liver transplant	Consultant clinical pharmacist	15
18	Serbia	Hospital	Orthopaedic surgery	Clinical pharmacist	16
19	Spain	Community pharmacy	Community pharmacy	Manager of a community pharmacy	28
20	Switzerland	Hospital	General hospital	Clinical pharmacist	5
21	Turkey	Hospital	Oncology	Clinical pharmacy Manager	10
22	Turkey	Hospital	Clinical Pharmacy	Clinical pharmacist Resident	3

Table 2 Thematic framework of analysis

Domain	Themes	Subthemes (where available)	Facilitators	Barriers
Reducing the health risks posed by COVID-19	Minimising the spread of COVID-19 in the workplace	Social distancing	-Organisational and estates arrangements to allow social distancing -Resources to build facilities in pharmacy to allow social distancing	-Physical facilities not allowing social distancing
		Risk stratification of patients in the clinical setting	-Availability of facilities to segregate patients as per risks	-
		Availability of PPE	-Availability of PPE	-Lack of access to good quality personal protective equipment -Lack of adequate personal protective equipment -Lack of resources to buy PPE
		Knowledge about correct use of PPE	-Training on how to use PPE	-Lack of training and knowledge about how to use PPE
		Sanitisation and hygiene practices	-Availability of chemicals and equipment for sanitisation	-Inadequate supply of sanitising chemicals
	Educating the public on reducing the spread of COVID-19	Actions undertaken to educate the public (such as provision of information around transmission risks)	-Resources to develop educational materials -Time to develop educational resources and provision of advice	-Lack of public acceptance of advice -False information available from other sources
Preparedness	Ensuring timely and effective response systems are in place	Adjustment of physical layout and infrastructure	-Organisational preparedness in adjusting clinical facilities -Availability of spaces to build temporary critical care units	-
	Maintaining safe staffing levels	Adjusting pharmacist distribution across clinical settings	-Readiness of pharmacists to practice in a new clinical setting	-Lack of training -Lack of knowledge and understanding of clinical

			<ul style="list-style-type: none"> -Training to adapt new roles -Staff readiness to commit to new roles -Creation of new teams -Readiness to cover for new staff 	<ul style="list-style-type: none"> procedures and drugs in a new setting -Lack of willingness to work from home -Lack of access to clinical records from home
		Adjustment of leave and staff absences	<ul style="list-style-type: none"> -provision of accommodation and shuttle services for staff -Flexibility to work from home -Remote access to clinical records when working from home -Government decisions to restrict opening hours of community pharmacy 	<ul style="list-style-type: none"> -Burnout and fatigue -Difficulty sourcing locums
		Getting students to help out	<ul style="list-style-type: none"> -Availability of space to accommodate students 	<ul style="list-style-type: none"> -Social distancing measures limiting the number of staff in a clinical setting
	Testing staff for Covid-19	Access and availability of COVID-19 test facilities	<ul style="list-style-type: none"> -Early testing and isolation practices 	<ul style="list-style-type: none"> -Lack of access to testing
Action-response and adjustment	Ensuring uninterrupted supply of medications and ensuring business continuity plans	Sourcing and ordering medicines	<ul style="list-style-type: none"> -Government support to source medicines -Good procurement services in the clinical setting -Ordering medicines to ensure business continuity 	<ul style="list-style-type: none"> -Lack of availability of medicines for intensive care medicine
		Rationing of medicines and medical supplies	<ul style="list-style-type: none"> -Time and resource to repackage and label -Availability of alternative brands and products -Patient acceptance of alternative brands and smaller pack sizes 	-
		Making therapeutic substitutions	<ul style="list-style-type: none"> -Doctor's acceptance of therapeutic substitutions 	-
		Extending repeat prescriptions without	<ul style="list-style-type: none"> -Flexibility in legislations to allow special supply 	<ul style="list-style-type: none"> -Lack of availability of medicines to ensure seamless supply

	doctors' agreements	provisions	
Impact and adjustment of routine clinical practice	Low use of healthcare services by patients	-	-Patient fears about the use of healthcare settings
	Cancelled elective appointments in hospitals	-	-Patient fears about the use of healthcare settings
	Interruption to routine clinical pharmacy services such as blood pressure checks and cholesterol testing	-Patient acceptance and understanding to reduced services	-Lack of coordination between primary care and community pharmacy -Lack of ability to conduct appropriate monitoring of disease and medicines use
	Offering home testing kits for disease monitoring	-Patient resources to buy home testing kits	-
	Providing care plan for the patients to care at home	-Family/carer support for patients at home	-
	Communicating with patients and healthcare professionals	Use of telephone, video and social media	-Availability of appropriate digital platform
Ensuring effective remote communications		-Patient access to digital platforms -Patient confidence to use digital platform -Family and carer support to patients for the use of digital platform	-Patient lack of access to digital platform -Patients with reduced cognitive states facing difficulty with digital platforms -Lack of time to set up digital communications -Difficulty persuading patients to adhere to their medicines when communicating remotely
Barriers to effective communications due to PPE		-	-Interference with voice and body language due to pharmacist use of PPE

				-Patients with sensory disabilities, different first language and reduced cognitive functions not able to understand masked communications
		Impact on inter-professional communications	-	-Reduced rate of acceptance of pharmacists' interventions when made remotely (compared to face to face)
Advocating pharmacy's role and being source of information to doctors	Searching and appraising information and evidence		-Access to online resources and journals	-
	Professional role and identity		-Recognition of pharmacists' expertise and knowledge by senior management and other healthcare professionals -Use of same uniform and PPE by all healthcare professional leading to lack of professional hierarchy	-Lack of recognition of pharmacists' expertise and knowledge by senior management and other healthcare professionals
Taking care of COVID-19 patients	Sourcing and appraising information		-Access to online resources and journals	-
	Availability and access to guidelines from professional societies and public health agencies		-Availability of clinical guidelines -Availability of training opportunities and webinars -Access to peer reviewed journals	-Mismatch of information across guidelines -Conflicting advice from various clinical disciplines in practice
	Monitoring safety and effectiveness of new drugs		-Ability to monitor patients on new drugs	-Lack of knowledge about the experimental drugs
Recovery and returning to normal	Sustainability of social distancing measures	-	-Benefits to high risk patients such as in transplant care	-

	Greater use of technology in communications and clinical care	-	-Availability of effective and efficient digital platforms	-
	Extended roles for pharmacy profession	--	-Other healthcare professionals' recognition and acceptance of pharmacists' clinical roles -Patient reluctance to use general practice services -Pharmacists' confidence to offer extended services	-
	Readiness to offer vaccination for COVID-19	-	-Pharmacists' readiness to deliver new services	-
Reflection of personal experience, attitudes and behaviours	Personal experiences and coping strategies	-	-Pride in serving patients and humanity -Professional pride -Being able to help others -Being able to look after each other in the healthcare team	-
	Motivation	-	-Professional pride -Service to humanity -Seeing COVID-19 patients discharged and returning home -Looking after patients and each other -Effective clinical leadership	-
	Measuring successes and failures	-	-Being able to measure patient outcomes -Being able to keeping themselves and staff safe	-Lack of benchmarks to measure successes or failures
	Knowledge and skills learnt [e.g. - critical care,	-	-Readiness of pharmacists to practice new skills and in a new clinical setting	-Lack of recognition of pharmacists' skills and expertise from other healthcare

	extemporaneous dispensing, use of telecommunications and telemedicine, clinical trials, resilience and adaptability]			professionals
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COVID-19: Coronavirus Disease; PPE: Personal Protective Equipment

Journal Pre-proof

Table 3: Recommendations for health systems and pharmacy services**Prevention**

1. Government and healthcare agencies should make adequate provision of PPEs and sanitising chemicals
2. Government and healthcare agencies should prepare pharmacists to provide training on correct use of PPEs to other healthcare staff
3. Government and healthcare agencies should promote pharmacists to develop and disseminate evidence based information to the general public and patients about control measures and mitigating the risks of pandemic
4. Education of pharmacists in the professional pharmacy curriculum should incorporate aspects of prevention and mitigation of pandemics

Preparedness

1. Pharmacists should be given key decision making roles in relation to stratification of risks in clinical areas
2. Pharmacists in diverse clinical settings should receive training to deliver pharmaceutical care services in critical care areas in preparedness of the pandemic
3. Pharmacists' expertise and skills should be harnessed to enable them source and critically appraise evidence based information i
4. Pharmacists should receive adequate continuous professional development opportunities to source and appraise evidence based information
5. Healthcare services should identify measures to ration clinical pharmacy services to address staff shortages during the time of pandemic
6. Government and healthcare agencies should build strategies around how to best use student pharmacist resources at the time of pandemic

Action-response

1. Pharmacists should be trained to enable efficient procurement practices to ensure adequate supply of medicines
2. Government and healthcare agencies should utilise clinical pharmacists in gathering intelligence around the list of medicines that are likely to face shortages at the time of pandemic and ensure adequate planning to counter shortages
3. Pharmacists should be trained to enable therapeutic substitutions at the time of medicines shortages
4. Government and healthcare agencies should promote the potential clinical pharmacy can offer during the time of pandemic
5. Government and healthcare agencies should provide resources to pharmacists to ensure clinical pharmacy services are not interrupted at the time of pandemic, such as sourcing additional staff, customising facilities and availability of equipment to monitor disease status and drug safety and effectiveness
6. Remote means of communications and telemedicine need to be strengthened to allow better and effective communications between pharmacists and patients as well as other health care professionals.
7. Remote means of communications and telemedicine should cater for patients with low literacy, low cognitive functions, elderly and those with the need for language interpretation

8. Novel technologies should be harnessed to facilitate effective communications while pharmacists are on PPE
9. Government and healthcare agencies should utilise pharmacists in the delivery of vaccinations and new medicines to provide protection and treatment
10. Pharmacists routine activities such as dispensing of medicines, minor ailments services and prescribing activities should be harnessed to ensure clinical services provision from diverse settings
11. Government and healthcare agencies should ensure that the new knowledge and skills gained during the pandemic should be maintained and passed on to new practitioners

PPE: Personal Protective Equipment

Highlights

- Clinical pharmacists in diverse settings adapted current services and adopted novel roles during the COVID-19 pandemic
- Clinical pharmacists facilitated clinical trials, gathered and appraised evidence and disseminated information to patients and other healthcare professionals
- Pharmacists ensured uninterrupted supply of medicines through innovation and provided frontline advice to patients
- Routine clinical services were extensively interrupted and remote forms of communication were used
- Barriers to prevention, preparedness and response actions to pandemic needs to be addressed by governments and health systems