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1 **A Local Dental Network approach to COVID-19 pandemic: innovation through**
2 **collaboration**

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24

25

26 Keywords

27 COVID-19; Dental Care; Leadership; Intersectoral Collaboration; Infection Control, Dental;

28

29

30 Learning objectives are below:

31

32 1. To understand how Donabedians' model can be adapted to evaluate urgent dental
33 care services.

34 2. To explore how various sources of clinical activity data could be used together with
35 local intelligence in setting up clusters of urgent care services

36 3. To understand the application of the principles of system leadership in facilitating
37 intersectoral collaboration across different organisations

38 4. To reflect on opportunities provided by developing systems that encourage
39 collaborative work across the entire spectrum of dental care services.

40

41 **Abstract**

42 The coronavirus pandemic has had significant effects on individuals, healthcare systems
43 and governments. In the UK, whilst routine dentistry was suspended an urgent dental care
44 system was required to support urgent patient need.

45 Using an adapted model of Donabedians' Framework a critical evaluation of the services
46 developed and implemented is provided and the various innovative approaches involved in
47 this work are discussed.

48 The three domains of the Framework are structure, process and outcome.

49 Structure: we present the principles for selecting and initiating hubs, the integration with
50 secondary care services and the supply of personal protective equipment.

51 Process: the main elements are communication, the development of referral processes to
52 manage complex cases and data collection.

53 Outcome: through work with local dental stakeholders 23 clusters and 36 hubs were set up
54 covering a large geographical area.

55 The integrated network of hubs and clusters has strengthened collaboration between
56 providers and policy makers. Various leadership approaches facilitated the readiness for the
57 transition to recovery. The new local collaborative structures could be used to support local
58 programmes such as flexible commissioning, peer-led learning and integration with Primary
59 Care Networks.

60
61
62

63 **Introduction**

64 The coronavirus pandemic had a significant impact on people's lives across the globe. To
65 date, the United Kingdom (UK) is one of the most affected countries in Europe with over
66 45,000 deaths (within 28 days of positive test of a positive test) registered by the end of
67 October 2020 (1, 2). The UK government introduced a set of lockdown regulations which
68 came into effect at the end of March 2020. These regulations included the suspension of all
69 routine dental care in England together with a set of restrictive measures which affected both
70 individuals and the society at large (3, 4). The intention behind these restrictions was to
71 reduce the spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2),
72 to prevent healthcare services from being overwhelmed with patients who require intensive
73 care beds and ultimately to protect lives (5).

74 Whilst routine dentistry was suspended, emergency dental services still needed to be
75 delivered, and NHS England set-up guidance for delivering these services (6). The first line
76 of action consisted of providing remote "AAA" - Advice, Analgesics and Antibiotics – as
77 clinically required. If the problem was not solved with AAA or if AAA was inappropriate and
78 the patient required a face to face appointment with a dentist, a safe approach was

79 necessary to address patients' needs. It soon became apparent that a "one size fits all
80 approach" was not possible considering the demographic diversity and the heterogeneity of
81 dental service provision across England. For example, within the NHS England region of
82 London, dental commissioning teams developed a centralised system using large secondary
83 care providers which were better suited for an area with high population density. This model
84 would have been difficult to implement in areas like North Yorkshire and the Humber (NY&H)
85 where the population density is significantly lower with several rural communities spread
86 across large geographical areas (INSERT FIGURE 1). The NY&H commissioning area
87 serves a population of around 1.4 million people and includes large and very different cities
88 such as Hull and York and less densely populated rural areas like the national parks and
89 coastal areas of the region. The area has pockets of serious deprivation with associated
90 inequalities and high burden of dental disease. The latest epidemiological data on caries
91 prevalence in 5 year old children shows variations from 31.4% in Hull to 11.3% in Ryedale
92 (7). Similar inequalities can be seen in the prevalence of caries in adults with 37.5% of
93 adults in East Riding of Yorkshire presenting active decay compared with only 7.9% in York
94 (8). The aim of this study is to describe the establishment of an integrated urgent dental care
95 network based on a hubs and clusters model in North Yorkshire and the Humber.

96

97 **Methods**

98 Using an adapted model of Donabedian's conceptual model for evaluating health services
99 we describe the methodology for developing a network of integrated urgent dental care hubs
100 and clusters in North Yorkshire and the Humber (9). A nested critical evaluation of this
101 process is presented, highlighting the potential of using the established networks for
102 facilitating transition to recovery. Quantitative data is provided about the type and amount of
103 urgent dental care activity delivered in primary care between May and July 2020 in The
104 North Yorkshire and the Humber commissioning area.

105

106 **Results**

107 The main considerations behind setting up a network of urgent dental care hubs and clusters
108 in North Yorkshire and the Humber were based on the principles of protecting both patients
109 and members of the dental team. In order to achieve this, a close cooperation between
110 various organisations was necessary: NHS England local area team, the Local Dental
111 Network, Public Health England, Local Dental Committees and Health Education England.
112 The collaboration between these diverse stakeholders was based on the principles of
113 system leadership where organisations that work independently are able to successfully
114 cooperate under a shared vision and help each other to deliver their own objectives for the
115 benefit of the population they serve (10). In addition to this all members of the team,

116 regardless of their experience were encouraged to contribute to the decision-making
117 process and development of solutions. This collective leadership approach has been shown
118 to improve motivation and engagement and assist with achieving shared goals. This led to
119 rapid decision making, planning and implementation (11).

120 Based on Donabedian's conceptual model, the results section is structured in line with the
121 three main dimensions of care: structure, process and outcome.

122

123 **Structure**

124 The general principles for developing a network of urgent dental care hubs and clusters
125 were based around establishing an integrated system that ensured a widespread
126 geographical coverage and prioritised care to ensure that those patients who absolutely
127 required face to face care were able to receive it in a safe and timely manner.

128 The UDC system needed to be:

- 129 • Aligned to the principles of the delay phase set up by the UK Government, in order to
130 minimise unnecessary travel and exposure/transmission risk (5);
- 131 • Able to triage COVID-19 positive or suspicious cases;
- 132 • Able to triage and manage vulnerable and shielded groups;
- 133 • Accessible to all patients including irregular attenders and private patients;
- 134 • Able to prioritise urgent dental care (UDC) to manage capacity;
- 135 • Integrated in terms of urgent dental care hub (UDCH) delivery and UDC provided by
136 secondary care and the community dental service (CDS);
- 137 • Able to use simple, responsive and standardised systems;
- 138 • Compliant with the national standard operating procedure and guidance;
- 139 • Using open channels of communication to enable reporting and highlighting pressure
140 points in a rapidly changing environment;
- 141 • Available to support structures for practices.

142 A small working group was formed with stakeholders covering the North Yorkshire and
143 Humber area. These were the Chair Local Dental Network (LDN), officers of the Local
144 Dental Committee (LDC), NHSE dental practice advisor, Public Health England (PHE) dental
145 public health consultant and registrar with input from the NHSE commissioning team. The
146 group served as a strategic and operational team to support the practices and to report into
147 the wider Yorkshire and the Humber COVID-19 Operational Dental Cell which had overall
148 oversight of the operation. The command and control functions of the Yorkshire and the
149 Humber Operational Dental Cell ensured the consistency of the work across the
150 commissioning area and an integrated approach within the wider structures of NHS England
151 and NHS Improvement.

152 Clusters and Hubs

153 The hub and cluster selection utilised the PHE Shape Mapping Tool to identify practice
154 location (12) and local intelligence in terms of physical practice set-up and number of
155 surgeries available, including accessibility.

156 The hubs ideally needed to be larger practices located within each cluster with multiple
157 surgeries, separate entrances and exits, central locations and where possible parking
158 facilities. The members of the working group identified potential sites to serve as hubs and
159 practices around them to form a cluster.

160 In line with national guidance (13), a network of red, amber and blue sites was set-up in
161 each cluster:

- 162 • Red sites were for patients who were possible or confirmed COVID-19 patients,
163 including patients with symptoms, or those living in their household;
- 164 • Amber sites were for patients who were shielded, those who were at most significant
165 risk from COVID-19;
- 166 • Blue sites were for patients who did not fit in one of the above categories;
- 167 • Combined amber/blue sites allocated strategically based on a variety of different
168 factors including dental practice size and layout. Appointments were allocated in
169 such way that patients remained separated from each other in terms of scheduling
170 and surgery/waiting room allocation.

171 The clusters were set up consisting of 4 to 12 sites in each cluster depending on density of
172 population and geography. Each cluster had one or two designated receiving treatment hubs
173 for face to face care. This networked system lent itself to the management of urgent dental
174 care (UDC) through a two-stage triage system with triage 1 being conducted by the cluster
175 sites and triage 2 being delivered at the hubs. This double triage system ensured that in
176 most cases only those patients requiring face to face care received urgent treatment.
177 Additionally, the system had the advantage of sharing workforce, personal protective
178 equipment (PPE) and information through the cluster groups with associated wider
179 understanding of the protocols.

180 Community Dental Services (CDS) and Secondary Care

181 To ensure that the system could support effective management of patients requiring UDC in
182 an integrated way, dental commissioners and the LDN chair worked with CDS providers and
183 secondary care providers to develop effective referral process into these services. A detailed
184 directory of services was supplied to all hubs with the email address and phone numbers for
185 advice and, where necessary, onward referral of more complex cases. The new system
186 allowed the hubs to access specialist advice and care quickly. Urgent minor oral surgery
187 was added as an additional service based on hub feedback.

188

189 Personal Protective Equipment (PPE)

190 Initially, the availability of PPE represented a significant challenge for urgent dental care
191 providers.

192 A modelling tool developed by PHE was utilised to estimate the weekly demand for FFP3
193 respirators for urgent dental care sites providing aerosol generating procedures (AGPs). The
194 model used NHS data for band 1 urgent courses of treatment (all ages) derived from FP17
195 data in 2018/19 (14). Assumptions were applied to the data to arrive at an estimate of
196 demand for PPE. Variables in the model for triage and the pandemic converted to 15% of
197 urgent cases likely to require an appointment. As AGPs were to be avoided unless
198 necessary and not all urgent appointments would require one, this number was further
199 adjusted to 25%. The figure was then doubled to allow for the number of staff requiring level
200 3 PPE (dentist plus one nurse).

201 This modelling was then confirmed as reasonably valid based on the overall activity data:
202 24% of patients calling at triage one required face to face care. Of these patients only 14%
203 required AGP.

204 The commissioning team developed and strengthened relationships with the local resilience
205 forums to overcome initial problems with dental access to PPE and to enable supply and
206 weekly re-supply of PPE to urgent dental care hubs. A standard re-supply order was
207 calculated with drops to 8 strategic centres from which the PPE was distributed to all hubs.
208 Resilience plans were developed with the aim of ensuring two weeks supply of PPE for each
209 hub in case that they would resume as central providers of care in the event of a local
210 lockdown.

211 PHE initially organised fit test training of a small group of volunteer dentists to enable fit
212 testing of FFP3 respirators for practices providing aerosol generating procedures. The fit
213 testing team has provided testing and re-testing for staff in multiple practices over a wide
214 geographical area. Initially, this work was further challenged by inconsistent supply of
215 respirator models requiring re-fit testing. Later on, fit testing kits were made available
216 nationally via the NHS supply chain and have been distributed strategically to support this
217 function. In addition, HEE have organised a series of fit test training courses for dental
218 practices, to increase the number of trained individuals to support the return to providing
219 AGP care safely.

220

221 Process

222 A single standardised referral proforma was developed to be used throughout the urgent
223 dental care system for all referrals into hubs and any onward referrals to more specialist
224 services. Hubs were allocated an NHS email address to facilitate secure information and

225 referral details exchange between providers. Private practices were also able to obtain an
226 NHS email address to aid communication and referrals into the system facilitating the
227 delivery of urgent dental care across NHS and non-NHS sectors.

228 A standardised discharge proforma was also used, to allow hubs to outline the follow-up
229 care required. This was emailed back to the referring cluster practice with handover
230 information.

231 Communication

232 Developing new systems requires excellent communication if systems are to be effective in
233 meeting their objectives (15). Communication was via a series of methods. More formal
234 communication was undertaken through the hubs bespoke NHS.net email platform.

235 Providers were aware that any communication to these addresses would be related to
236 urgent dental care (UDC). In addition, an encrypted messaging service using WhatsApp®
237 groups was used for rapid communication between hubs and clusters for discussing any
238 issues around new guidance and to answer questions immediately. During this period, it was
239 not unusual to have several guidance documents published weekly. Dental practices could
240 use this as an important resource and for rapid peer advice.

241 The effective communication in the system enabled dynamic problem solving and rapid
242 adaptation of the UDC response. At times there were also challenges as misunderstanding
243 could also be disseminated and so oversight by the LDN chair and HEE leadership fellow
244 was needed to moderate information and signpost to resources. The LDN chair hosted
245 weekly Zoom® meetings for UDC hub teams to address potential problems with collective
246 solutions and to share latest resources.

247 Data Collection

248 The purpose for data collection was to gather information about service demand, availability,
249 provision, challenges and quickly identify potential hot spots and trends. It was important to
250 collect only the data that was essential to avoid unnecessary work for providers. The
251 decision was made to only collect data on:

- 252 1. Numbers of referrals
- 253 2. Numbers of face to face appointments both for aerosol generating procedures (AGP)
254 and non-AGP
- 255 3. RAG (Red-Amber-Green) rating of the service limiting factors, including PPE,
256 workforce and capacity of appointments to enable flagging of pressure points in the
257 system.

258 A data collection tool was piloted and distributed to all hubs. The final version was used to
259 collect weekly activity data via secure NHS.net email over a period of 11 weeks. The

260 administration was undertaken by two foundation dentists who completed an audit report.
261 The overall return rate was over 90%.

262 Support Structures

263 Changes in practice require support in order to deliver effective outcomes (15, 16). It was
264 important to ensure that the communication was bidirectional between the strategic
265 oversight group and providers.

266 Based on feedback from hubs and clusters the working group established a single point of
267 access as a website for all the relevant guidance, information and support around the
268 development of local standard operating procedures (SOPs) hosted by Health Education
269 England (HEE) Yorkshire and the Humber (17). Besides the documents, a peer led video
270 presenting a step by step approach on how to set up an urgent dental care hub was
271 presented. This video was widely shared and was referenced in the National Urgent Dental
272 Care SOP (18). As of 27th of July it was viewed by 19,500 people.

273 The resources were regularly updated. As national guidance was published, the new
274 sections were added and updated with changes highlighted.

275 Webinars are an effective way of communicating with large numbers of people (19). To
276 support the educational element for the pandemic response, HEE locally along with LDN
277 representation and local practitioners worked closely with a private company (Pro
278 DentalCPD) to rapidly develop an online education module (20). The module provided up to
279 date guidance about: surgery set-up, patient and staff flow, infection control and
280 decontamination. This was launched with a webinar attended by over 1,300 participants.
281 The webinar was recorded and later viewed by over 3,000 people (21). Initially, the
282 production expenses of the module were funded by local LDCs but following crowd funding
283 through LDCs this course is now free to access (20). To date over 55,000 people have
284 completed the online education module (22).

285 Feedback from providers highlighted that peer led learning has been an essential part of the
286 UDC response. To support the development of local standard operating procedures (SOPs),
287 practices were invited to share details about their individual procedures and patient
288 pathways using short videos. Effective communication between members of the clusters
289 enabled a new collaborative approach to dental care by allowing the dental practices within
290 a locality to connect in a constructive way, share best practice and support each other. Peer
291 led learning has been recognised as an effective quality improvement tool (23, 24). It also
292 enabled practical support for cluster practices as they transitioned to recovery of provision of
293 clinical services (18).

294

295 **Outcome**

296 The North Yorkshire and the Humber urgent dental care network was designed around 23
297 clusters and 36 hubs (INSERT FIGURE 1).

298 In the 11 weeks between 4th of May and 19th of July 2020, the clusters triaged 5,474 patients
299 and the hubs provided face to face care for 7,257 patients, of which 1,027 (14%) required
300 aerosol generating procedures (INSERT FIGURE 2).

301 The potential reason for the larger number of face to face appointments compared with the
302 number of triaged patients could be due to the fact that practices recorded non-AGP and
303 AGP activity related to non-urgent care delivery post 8th of June 8, when dental practices
304 were permitted to gradually reopen.

305 In the same time frame, there were 31,412 telephone triage appointments delivered in North
306 Yorkshire commissioning area (INSERT FIGURE 3).

307 The data suggests that urgent dental care referrals peaked in week 3, followed by a drop in
308 the numbers of patients and then followed by a steady increase up to week 9. Week 6
309 corresponds to the beginning of reopening of dental practices.

310 With regards to transition to recovery by the 21st of July, 96% of all practices from the region
311 were opened for face to face appointments and 67% had capacity to deliver aerosol
312 generating procedures.

313 **Discussion**

314 The North Yorkshire urgent dental care system based on a cluster/hub model was set-up to
315 meet the needs of the local population during the COVID-19 pandemic. The guiding principle
316 was to provide a safe system both for patients and staff that meets clinical needs in line with
317 national guidance. It has fostered collaboration between various organisations and
318 encouraged the co-design of new, creative ways of working. Before the pandemic,
319 communication between practices in a geographical area was often limited and they
320 generally considered themselves as individual treatment providers and not a collective local
321 treatment system.

322 The pandemic highlighted that national guidance is required around managing scenarios
323 where provision of dental care is restricted. As a consequence, the urgent dental care
324 commissioning standard is currently being revised as a response.

325 The Flexible Commissioning approach developed in 2019 to an extent began a process of
326 increased communication between the LDN and practices. In addition the NY&H LDN has
327 worked on innovative collaborative commissioning programmes such as the In Practice
328 Prevention Programme (25). This pre-existing relationship building may have facilitated the
329 rapid set up of the UDC systems. Anecdotal evidence suggests that, the networked UDC

330 model appears to have led to a faster transition to recovery compared to other models
331 nationally.

332 Local LDC leadership was a strong factor in urgent dental care rollout with many key
333 members actively becoming involved as innovators and early adopters championing the
334 model of care amongst peers (26).

335 Going forward, it has been recognised by both commissioners and providers that it will take
336 some time before returning to the levels of activity seen before COVID-19 lockdown in
337 England in March 2020. The additional requirements around fallow time between patients
338 and the use of additional pieces of protective equipment means that there is going to be a
339 drop in the number of patients that could be seen per day. In order to adapt to these new
340 realities, commissioners and policy makers will have to ensure new, creative ways of
341 measuring and remunerating dental activity (27).

342 Certain areas, including Yorkshire and the Humber have attempted to support a flexible
343 commissioning approach by “flexing” a certain percentage of the contract value away from
344 units of dental activity (UDA’s) towards other activities that are more prevention focused.
345 Collaboration between dental commissioning teams and local authorities helped to identify
346 local priority groups which could benefit from targeted prevention and treatment using
347 flexible commissioning (28).

348 Additionally, an integrated approach between dental care providers, general practitioners,
349 pharmacy teams and local authority public health teams could provide opportunities for more
350 integrated ways of working to meet local healthcare needs.

351 Further examples of opportunities of a cluster/hub model might suggest:

- 352 • The development of targeted pathways for vulnerable groups, delivered by specific
353 practices in the cluster for example for homeless people or people requiring
354 domiciliary care;
- 355 • Enabling shared learning and peer review between dental practices;
- 356 • Utilising shared learning from existing medical and dental Primary Care Networks
357 (PCNs) to enable greater collaborative working;
- 358 • Maximising on the broader public health skillset of the dental profession. This would
359 be in line with the high level ambitions for further intergration of medical and dental
360 systems as suggested by the Chief Dental Officer for England (29). Examples could
361 include:
 - 362 ○ Contribution to screening and immunisation programmes. To reduce the
363 numbers of interactions between patients and healthcare workers by
364 providing opportunities for dentists to deliver other healthcare services such

365 as blood pressure checks or routine vaccinations (subject to training,
366 commissioning and regulatory approvals) (30, 31).
367 ○ Support and signposting into public health services commissioned by local
368 authorities such as advice for healthy weight programmes and signposting to
369 smoking cessation services (32).
370

371 **Conclusion**

372 In a rapidly changing environment stakeholders in North Yorkshire and the Humber have
373 been working collaboratively to create a network of hubs and clusters in challenging
374 circumstances within a short period of time. Working closely with service providers, LDCs
375 Commissioning Teams, LDNs, PHE and HEE have developed and supported a network of
376 practices delivering urgent dental care services that were able to adapt quickly in a dynamic
377 environment with significant fluctuations in demand. This was possible through applying a
378 variety of leadership strategies and providing opportunities for communication and support
379 between stakeholders. Practices within the cluster groups formed functional triage and face
380 to face referral networks. The collaborative networks forged for urgent dental care
381 arrangements might present opportunities for building a community of care model in the
382 transition to recovery of dental services.
383

384 **Acknowledgements**

385 It must be recognised that at the point in time when the hubs and clusters were delivering
386 their peak levels of activity, abatement was not yet confirmed and there was no financial
387 incentive. Cooperation was based on good will and good relationships between
388 stakeholders.

389 This work would not have been possible without the support and dedication of our
390 colleagues from NHS England Dental Commissioning Team and those working in primary
391 dental care practices, community dental services, secondary care services, ProDental CPD
392 and the fit testing teams in Yorkshire and the Humber.
393

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