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1 **Two years on- what has COVID-19 taught us about online (telerehabilitation)**
2 **visual impairment teaching clinics?**

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27 Introduction

28 The COVID-19 pandemic has had a major impact on the optometry educational
29 landscape worldwide^{1,2} including education and training at the Department of
30 Optometry and Vision Sciences at City, University of London. The forced move to
31 synchronous (learning in real time with students and the teacher based in different
32 remote locations) and asynchronous (learning materials can be accessed at any time
33 according to the student's convenience e.g. a recorded lecture) teaching has given
34 many optometry academics at City the opportunity to experience online teaching and
35 reflect on what aspects might work well and what might not. Although online teaching
36 has been part of City's postgraduate educational provision for some time now it had not
37 gained widespread adoption on the undergraduate optometry provision. This changed
38 almost overnight as a result of the pandemic and there was rapid adoption of both
39 synchronous and asynchronous online teaching, and a much slower than anticipated
40 return to traditional on-campus face to face teaching even when COVID-19 restrictions
41 were eased. Perhaps this is unsurprising given the unpredictable nature of the
42 pandemic and is likely to represent a more general shift away from traditional teaching
43 methods.

44 One phrase that is becoming popular is the term '*hybrid*'. Synchronous hybrid learning
45 refers to learning where at least some individuals are based remotely (online) and
46 others on campus.³ This can take several forms including the '*remote classroom*' where
47 the teacher and some students are present on one campus, with additional students at
48 a second campus attending remotely. Raes et al also describe the '*hybrid virtual*
49 *classroom*' where some students are on campus with the teacher and others log in
50 remotely. Previous researchers have highlighted the benefits and pitfalls of
51 synchronous hybrid learning (for a comprehensive review refer to Raes et al, 2020).³
52 Organisational benefits include increased student numbers, prevention of duplication of
53 teaching where multiple campuses exist and increased flexibility which takes into
54 account student needs at different life stages. Pedagogical benefits include students
55 being able to interact with peers and teachers from across the globe. This creates a
56 richer learning experience and breaks down at least some inclusion barriers for
57 underrepresented groups and can also improve retention. Synchronous hybrid teaching
58 allows students to have better control over their learning as they can choose where to
59 learn from. Despite the advantages there are challenges. From the teacher's point of
60 view, this type of learning may necessitate radical changes to teaching to

61 accommodate the use of technology alongside ensuring that educational standards are
62 met. It requires proficiency with, and the availability of adequate technology. More time
63 and effort may be needed to run a session, which increases workload, and it may not
64 always be possible for the teacher to run a session alone. From a student's point of
65 view, engaging whilst online can be difficult and students may feel that on campus
66 students are given preferential treatment. Students may also have poor access to
67 technology and face technology disruptions which could hamper their learning
68 experience. Despite these challenges, academics, students and organisations are
69 likely to have experienced and appreciated some of the benefits of online learning as a
70 result of COVID-19 and may want to continue with at least some form of online
71 learning, especially hybrid learning, in the post-pandemic educational landscape.

72 Synchronous hybrid models have the potential to be adopted across a variety of
73 different teaching formats including lectures, tutorials and clinical teaching. This type of
74 instruction could benefit students as it would give them increased flexibility in their
75 learning, taking into account self-isolation, family and other commitments. There may
76 be particular benefits to utilising synchronous hybrid models in clinical optometry
77 teaching particularly with an increase in popularity of online/ remote (teleoptometry and
78 teleophthalmology) clinics, necessitating students to receive experience in all types of
79 clinics, both in person and online. Kilduff et al, 2020 found that running accident and
80 emergency ophthalmology consultations at Moorfields Eye Hospital (MEH) remotely
81 was both "*cost-effective and time-efficient for both patients and doctors*".⁴ As a result,
82 MEH is considering increasing the number of remote clinics. There is little evidence
83 addressing the effectiveness of online/remote teaching clinics although several
84 researchers have investigated other forms of online teaching such as tutorials (Raes et
85 al, 2020).³

86 **Novel methods**

87 As a result of the COVID-19 pandemic some clinical teaching on the undergraduate
88 optometry programme at City, University of London was moved to a synchronous
89 (online/remote) format. The undergraduate optometry programme at City is currently a
90 three-year programme. Although students learn practical clinical skills across all three
91 years, all clinical placements take place in the final year. Students are exposed to a
92 variety of clinics including primary care, binocular vision, paediatric and visual
93 impairment clinics. Synchronous (online/remote) clinics were predominantly run for
94 visual impairment via Zoom with the students, clinician and patient all in different

95 locations.⁵ For ease of understanding these clinics are referred to as '*traditional*
96 *synchronous clinics.*' At the time the decision to run traditional synchronous clinics
97 was made there was limited evidence⁶ in the literature about the effectiveness of these
98 clinics although the evidence continues to grow with several studies finding that
99 remote/online clinics are acceptable for initial low vision consultation⁷ and training
100 individuals with visual impairment to use a variety of different low vision aids such as
101 hand and stand magnifiers⁹ and head mounted devices¹⁰.

102 As visual impairment clinics at City are run using volunteer patients this made it easier
103 to move to a synchronous (online/remote) format as the clinic lead was familiar with the
104 patients and was able to contact a majority to arrange for them to attend remotely. Prior
105 to the synchronous session patients were offered a trial run so that the clinic lead could
106 explain the format of the clinic. Similarly, students received a tutorial about the format
107 of the clinic and expectations during the clinic. Students attended in small groups of up
108 to four students and took turns at doing history and symptoms. Habitual distance visual
109 acuity was measured using the Home Acuity Test¹¹ and Near Visual Acuity was
110 measured using the Optima near vision chart. Both were posted in advance to the
111 patient with a 1.5m long string to be used with the Home Acuity Test¹². The charts
112 were also used to measure acuity with the patient's existing low vision aids and helped
113 in determining magnification requirements. Following acuity measurements, advice was
114 given to the patients including discussing management options such as referral for a
115 face to face appointment if a refraction was deemed appropriate. Students were
116 provided with feedback following the session and were also required to fill out an online
117 form reflecting on the session including indicating strengths and weaknesses. In total
118 221 student reflections were received. Overall students reflected positively about the
119 sessions which provided them with a good learning opportunity although certain
120 procedures, such as refracting the patients, were not possible. No negative reflections
121 relating to the clinic were received.

122 Comments included:

123 *"As a first patient I was able to gain a lot of knowledge on how you would take history*
124 *and symptoms just general tests you can do over Zoom overall was an amazing first*
125 *experience."*

126 *"I've learnt how to successfully measure the VAs of the patient (distance and near)*
127 *virtually and what it means clinically"*

128 *"I think for my first low vision clinic it went smoother than expected. Considering it's the*
129 *first time I have ever done a virtual clinic I was able to communicate quite confidently*
130 *with the px. It wasn't as awkward as I thought it would be"*

131 Patient feedback was also sought. This was also positive and comments included:

132 *" Participating in the student clinics via Zoom is for me, incredibly convenient and I am*
133 *able to raise issues just as easily as if I was physically present"*

134 *"I find the sight tests and reading more realistic in my home setting than the contrived*
135 *environment of the clinics"*

136 As the COVID-19 situation improved patients were given the choice to attend remotely
137 with the students on campus in the clinic or in person. A majority (9 out of 10) preferred
138 to return to the clinics with approximately 10% (n=1) wanting to attend remotely.
139 Having the students and clinician in the clinic with the patient remotely (referred to as
140 *'traditional hybrid synchronous'*) worked well, although there were some challenges.
141 For example, due to the students wearing masks the patients could not always hear if
142 the students sat too far away from the computer. However, when the students moved
143 closer the patient was only able to view one student at a time. These types of
144 technological problems due to camera positioning, and the need for students to talk
145 into a microphone have been highlighted as potential barriers to the synchronous
146 learning experience.¹³ Despite these barriers, student reflection revealed that the
147 experience was positive. 37 traditional hybrid synchronous student reflections were
148 recorded. No negative comments were received. Comments included:

149 *"First virtual clinic- was very good experience"*

150 *"Good to learn how to do VA over video -useful"*

151 Although there was no difference between the tests carried out in both synchronous
152 formats because students were physically present (traditional hybrid synchronous) it
153 was easy to provide hands-on experience with low vision aids. This was not possible
154 when everyone was present remotely (traditional synchronous). Two sessions were
155 also run where one student and the patient were remote and a small group of students
156 were in the clinic (referred to as *'hybrid synchronous'*). This type of hybrid teaching was
157 more challenging to run than the traditional hybrid synchronous sessions although
158 again the tests carried out were the same. As well as the problems reported for
159 traditional hybrid synchronous teaching, other problems were encountered, for

160 example, when all the students were present in the room together it was easier for
161 them to work as a team. When there was a combination of remote and in-clinic
162 students, teamwork became more challenging and the remote student was sometimes
163 forgotten. Similarly, the clinician running the session found it difficult involving the
164 remote student in the discussions as they were not physically present in the room.
165 Huang et al (2017) highlighted that remote students can find it difficult to ask questions
166 and can feel excluded because they are physically separated from the session. ¹⁴
167 None of these barriers were highlighted in student reflections (n=8) and all students
168 including the remote students (n=2) provided positive comments including:

169 *“Much smoother history and symptoms and engagement with the patient, despite it*
170 *being a virtual appointment. Was able to use the home acuity test and be more flexible*
171 *in terms of testing”*

172 With hindsight and awareness of these challenges it is likely that they will be less of an
173 issue in the future.

174 **Discussion**

175 Having experienced visual impairment teaching clinics on campus and in different
176 synchronous online (telerehabilitation) formats (*traditional, traditional hybrid and hybrid*)
177 it is clear that each method has something to offer. For any type of synchronous clinic
178 to run well, everyone should be familiar with the technology being used, and
179 organisations should provide adequate support and training.¹⁵ There should be
180 recognition that synchronous teaching comes with an increased workload. ¹⁵ For
181 example, when clinics are run entirely on campus, it is possible to supervise two sets of
182 students simultaneously. With synchronous clinics it is generally only possible to
183 supervise one set of students, effectively doubling teaching commitment. Ideally when
184 running hybrid sessions, a remote facilitator should be available who can facilitate the
185 learning of remote students. This could to a large extent mitigate remote students
186 feeling less engaged and would also benefit the supervisor in the clinic. Expectations
187 about the session should be communicated through a briefing session prior to the
188 clinic. Remote students should understand what to do when technology goes wrong.
189 Teachers should provide alternative learning resources where practical hands-on
190 experience is unavailable to the remote students but is available to in-clinic students.
191 For example, when synchronous clinics ran at City students had access to a low vision
192 aids box and carried out a reflective exercise to complement the clinic.

193 There is no doubt that synchronous learning is likely to stay. Although conventional on
194 campus visual impairment teaching clinics give students hands-on experience of
195 interacting with patients and carrying out practical tests which cannot always be carried
196 out remotely, they do not allow students to interact with patients who are unable to
197 travel to the clinic. Online (telerehabilitation) teaching clinics can offer experiences with
198 a wide range of patients and can give students the flexibility to attend these clinics from
199 any location, allowing them to work around their individual circumstances.

200 **Conclusion**

201 To conclude, although COVID-19 has brought a great deal of hardship it has given
202 teaching staff the opportunity to think outside the box, try teaching methods that were
203 unlikely to have been considered previously, and take forward those which work best
204 for students. Those involved in clinical teaching, particularly visual impairment
205 teaching, should consider traditional and hybrid synchronous clinics alongside more
206 traditional on campus clinics to give students a variety of different experiences whilst
207 giving both the student and the patient increased flexibility.

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