JOURNAL OF Surgical Simulation

Journal of Surgical Simulation (2022) **9,** 57–66
DOI: https://doi.org/10.1102/2051-7726.2022.0008

ORIGINAL ARTICLE

Educating cardiothoracic health care practitioners during the COVID-19 pandemic: results from an online survey on a series of webinars

Bhuvaneswari Krishnamoorthy,[a,b,c,*] William R. Critchley,[d] Jeni Palima,[e] Rajesh Shah,[a] Simon Kendall,[f] Narain Moorjani,[g] Carol Tan[h] and Sridhar Rathinam[i]

[a]Department of Cardiothoracic Surgery, Manchester Foundation Trust, South Manchester, UK; [b]Department of Allied Health Professions, Faculty of Health and Social Service, Edgehill University, UK; [c]Department of Cardiovascular Sciences, Faculty of Health, Biology and Medicine, University of Manchester, UK; [d]Department of Endothelial Cell Biology Unit, School of Molecular and Cellular Biology, University of Leeds, Leeds, UK; [e]Department of Cardiothoracic surgery, Wolverhampton NHS Foundation trust, Wolverhampton, UK; [f]Department of Cardiothoracic surgery, South Teesside NHS Foundation trust, South Teesside, UK; [g]Department of Cardiothoracic Surgery, Royal Papworth Hospital, Cambridge, UK; [h]Department of Cardiothoracic Surgery, St. George's University Hospital, London, UK; [i]Department of Thoracic surgery, Glenfield Hospital, University Hospitals of Leicester NHS Trust, Leicester, UK

**Corresponding author at: Edgehill University, Manchester Foundation Trust, Manchester, M23 9PL, UK.*
Email: biblerab@edgehill.ac.uk

Date accepted for publication: 28 February 2022

Abstract

Background: The coronavirus pandemic (COVID-19) has disrupted and distorted the methodology of cardiothoracic teaching for health care practitioners in Great Britain and Ireland. The Society of Cardiothoracic Surgery and Association of Cardiothoracic Surgical Care Practitioners host a variety of continuous professional development courses on a quarterly basis. However, COVID-19 has significantly affected face-to-face teaching. We evaluated the impact of the cardiothoracic webinar series that we introduced as a means to continue the education programme for cardiothoracic health care practitioners. **Methods:** A series of 16 online educational webinars was designed and aligned with the current curriculum. The webinars took place from April 2020 to April 2021 and online feedback questionnaires were sent to and collected from all participants. Teaching was provided by national faculty from different parts of Great Britain and Ireland. The evaluation assessed the content, delivery, meeting expectations, as well as the platform. **Results:** Most of the online webinars were well attended when organized at the weekend (median, 76 attendees). The webinar scheduled on a weekday evening was less well attended (17 participants). The follow-up feedback from each webinar suggests that most attendees were positive about the sessions for all the parameters assessed. All webinars were well received but there was some variation in the responses given between subjects ($P < 0.0001$). **Conclusion:** Online webinars provide a means of continuous professional development for health care staff in challenging circumstances when regular teaching has been disrupted. Although they are unlikely to provide the same experience as face-to-face courses, they are a useful tool for delivering education.

Keywords: *webinar; cardiothoracic teaching; COVID-19 pandemic; surgical education; CT health care practitioner*

Introduction

The abrupt emergence of the coronavirus pandemic in 2019 (COVID-19) has significantly challenged health care services and had an impact on global day-to-day living. As part of the joint education strategy of our associations, the Society for Cardiothoracic Surgery in Great Britain and Ireland and the Association of Cardiothoracic Surgical Care Practitioners (ACT SCP), we routinely run quarterly educational face-to-face teaching around Great Britain. The COVID-19 pandemic affected this programme and left many with no professional continuous professional development (CPD) courses.

The United Kingdom and Irish governments' strategy to minimize COVID-19 transmission through national lockdown and travel restrictions in March 2020, as well as concerns about personal or family safety during the

pandemic,[1–3] drove the need to convert all teaching to web-based virtual webinars to keep us up to date with educational activities. Most of the cardiothoracic departments around the country had ceased elective surgeries and all study leave had been cancelled. Many of the health care practitioners who were not self-isolating or shielding were deployed to intensive care units or COVID-19 medical wards. Taking these vital factors into consideration, our organizations established a list of priorities to restructure the education programme during the pandemic (Table 1).

We reformatted our quarterly educational programme with a series of online webinars aligned with the health care practitioners CPD curriculum and core skills. A fully virtual platform was used to promote active learning and increase health care practitioner access to state-of-the-art teaching,[4] despite much reduced face-to-face education and departmental teaching.

Aims and objectives

The aim of this webinar study was to assess the value of and impact on the provision of a high-quality educational cardiothoracic curriculum-based teaching programme via an online platform during the COVID-19 pandemic, with the following objectives:

- To adapt our face-to-face cardiothoracic curriculum-based core surgical skills programme to online-based webinar sessions;
- To develop various webinar topics and validate the programme with the course directors and identify the expert faculties across Great Britain;
- To continue practitioners' CPD by providing educational teaching online during the strict government lockdown period;
- To create social interaction among experts in the cardiothoracic surgical field and isolated health care professionals;
- To obtain post-webinar feedback to assess the educational impact and to improve the online teaching session delivery and content.

Methods

Survey population

All basic demographics were collected during the registration process using the Cisco Webex platform. The participants voluntarily completed their details on the registration form. A total of 1202 participants attended the educational programme. The age of the participants ranged from 23 to 65 years, with different educational backgrounds. The participants comprised surgical care practitioners, trainees and nurse practitioners (35%), doctors in training (30%), medical students (15%), consultant surgeons (5%), physiotherapists (5%), university undergraduate and postgraduate students (5%) and perfusionists (5%). Participants attended from all over the world, with the majority from Great Britain and Ireland (50%). Other participants came from European countries (20%), North America (10%), South America (10%), Middle Eastern countries (5%) and Australia/New Zealand (5%).

Table 1. Restructuring of cardiothoracic surgery continuous professional educational during the COVID-19 pandemic

Allow cardiothoracic health care practitioners to speak up about the issues faced during the pandemic and benchmark them with their national peers
Sustain the mental health and wellbeing of cardiothoracic health care practitioners in Great Britain
Continue cardiothoracic surgical education with latest virtual technologies
Encourage cardiothoracic health care practitioners to teach and share their expertise during the crisis
Maintain online communication between the national/international cardiothoracic community

Sixty-four faculty members contributed to the programmes, including consultant cardiothoracic surgeons, consultant anaesthetists, consultant radiologists, consultant interventional cardiologists, consultant plastic and reconstructive surgeons, consultant vascular surgeons, surgical care practitioners, specialist nurse practitioners, surgical device company clinical trainers and perfusionists.

Aspects of webinar delivery

These webinars were designed with various cardiothoracic surgical topics ranging from the life of cardiothoracic practitioners during the COVID-19 pandemic to the impact on cardiac surgery during the COVID-19 pandemic. The mode of delivery was virtual using a commercial platform (Cisco Webex, US). The didactic/interactive teaching method was adapted with PowerPoint presentations followed by series of open discussion and question and answer sessions. Each webinar was allocated a 2.5 h time slot but 90% extended to 3 h. Each webinar session had five different topics in a chosen area delivered by appropriate health care practitioners with different educational backgrounds.

A link to an online survey (Appendix 1) was sent to all participants via email to complete between April 2020 and April 2021. The survey link was sent the day after each webinar session and participants had 2 weeks to complete the survey, which then closed automatically. Apart from the

initial email link for the survey, no further contact or reminder was sent to avoid disturbing participants during the pandemic crisis period. The survey was completely voluntary with no incentive offered, and the results were collated automatically on the online commercial platform. Only completed surveys were included for final analysis.

All 16 webinars were conducted with 2- to 3-week intervals on Saturday evenings to improve attendance and engagement of the participants. We did consider work and life balance and offered working week webinars, but our participants specifically voted for weekends (98%) rather than weekdays (2%). Our previous courses and surveys have demonstrated that our health care practitioners tend to be busier with work and family commitments during weekdays. This was confirmed when we allocated one of the webinars to take place on a Wednesday evening, where only 17 delegates attended compared with a median 81 attendees for the other webinars (Fig. 1).

Surgical webinar curriculum development

Each webinar was designed and aligned with the surgical curriculum by the chair and co-chair of the session and ratified by the multidisciplinary team[5] presenters. The individual content of each programme was discussed with every individual presenter to make sure that the learning outcomes were covered. The faculty members were identified from different parts of Great Britain and Ireland with greater focus on their expertise in the cardiothoracic speciality and they were invited to take part in these webinars. Once their participation was confirmed, the details of the webinar, topics, curriculum and learning outcomes were discussed via email correspondence. The details of the 16 topics are listed in Table 2.

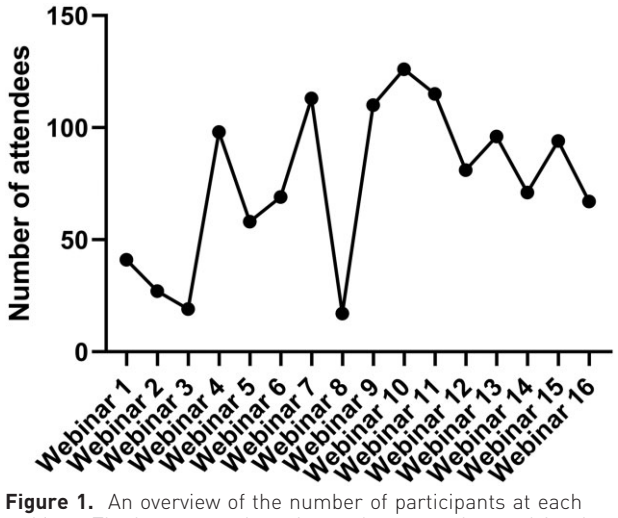

Figure 1. An overview of the number of participants at each webinar. The lowest number of attendees was observed for the single webinar scheduled on a weekday evening.

Ethical consideration and governance

Our teaching and surveys were designed and conducted as part of our associations' charitable educational purpose with no financial gain or profits. All the participants and faculties participated and registered on a voluntary basis with no contractual agreements. All the participants and faculties provided verbal consent to complete the survey after the webinar teaching. Verbal consent was also obtained to record the sessions and post them on various social media sites with no details identifying patients/participants.

All the recorded sessions were edited and any sensitive information that was discussed or presented during the webinar was removed. All the faculty members were instructed not to add any patient details or images with identifying details. The unpublished local departmental data presented during the webinar were removed during editing as per a request from the faculty.

To protect the details of all the participants in accordance with the Data Protection Act and General Data Protection Regulation guidelines (2018), all information was handled by the course director (B.K.). Details were stored on a commercial online platform (Cisco Webex and Survey Monkey), which was protected with usernames and passcodes. All the videos were edited by the honorary secretary of the ACT SCP (J.P.) and were rechecked by B.K. for accuracy and quality assurance.

Survey instrument

A 10-item survey instrument (Appendix 1) was designed to cover specific questions related to learning outcomes, structure of the didactic teaching, illustrative examples, teaching methods, interactive/communication, video quality, opportunity for delegates to ask questions and overall experience of the webinar. The survey questionnaire was designed and validated by five experienced practitioners. The survey time was kept short (<5 min) to maximize participation and minimize unresponsiveness during this global crisis. The median time for each person to complete the questionnaire was 2.35 min. The survey was designed (B.K., S.R.) on a secure electronic survey instrument commercial platform (Survey Monkey, US).

Statistical analysis

All recorded survey responses were compiled, and descriptive information presented as a percentage of the respondents. For each question, ordinal answer options were provided on a Likert scale from strongly disagree to strongly agree. The proportion of each response was calculated for

Table 2. List of topics and subtopics in each webinar

Topics	Subtopics
Webinar 1: Life and role of cardiothoracic practitioners during the COVID-19 pandemic	Experience of working as a nurse in an intensive therapy unit and as a consultant cardiothoracic surgeon Working in London and my experiences during COVID-19, the hard-hit city in the UK Working in an intensive care unit and fear of family life Experiences of deployment and working in the occupational health department Experience and personal instability of working in COVID wards
Webinar 2: Thoracic surgery during COVID-19	Radiological implications and findings on patients with COVID-19 Anaesthetic considerations and treatment plan for patients with COVID-19 Surgical consideration on thoracic surgery patients who are having surgery during the COVID-19 pandemic Nursing challenges and care of thoracic patients during COVID-19
Webinar 3: Mental health and wellbeing for cardiothoracic health care practitioners during COVID-19	Destressing with virtual yoga and mindfulness during COVID-19 (theory and practical) Tai chi and acupuncture session during COVID-19 (theory and practical)
Webinar 4: Cardiac surgery during the COVID-19 pandemic	Incidence of coronary stenting and cardiology workload during COVID-19 Perspectives of cardiac surgery during COVID-19 National impact on cardiac surgery Cardiac surgery national workload and staff deployment
Webinar 5: Endoscopic vein harvesting and fear of aerosol generation during the COVID-19 pandemic	UK concerns about minimally invasive surgery and aerosol generation during COVID-19 National impact of endoscopic vein harvesting during the COVID pandemic Benefits of endoscopic vein harvesting during the COVID-19 pandemic Current guidelines of minimally invasive surgery
Webinar 6: Atrial fibrillation	Surgical atrial ablation Perspective of a thoracic surgeon on left atrial appendage management Perspectives of a cardiologist on atrial fibrillation diagnosis and management Perspectives of an AtriCure device specialist and national/international guidelines/data
Webinar 7: Research and audit in cardiothoracic surgery during the COVID-19 pandemic	Why respiratory researchers are asked to keep a diary during COVID-19 pandemic Importance of clinical research in cardiothoracic surgery Impact of COVID-19 on student research: a discussion from postdoctoral researcher, MSc researcher, MCh and PhD researcher Importance of COVID and non-COVID research during the pandemic
Webinar 8: Extra-corporeal membrane oxygenation (ECMO) during the COVID-19 pandemic	The incidence and management of veno-venous ECMO Veno-arterial ECMO Perspectives of a perfusionist on ECMO intervention during COVID-19 Nursing perspectives on ECMO intervention on patients with COVID-19 National/international guidelines and perspectives on ECMO during the COVID-19 pandemic
Webinar 9: Major wound complications and management in cardiac surgery	Chest wall reconstruction for deep sternal wound infections Importance of national surgical site infection audit in cardiac surgery Non-healing leg wound ulcers after vein harvesting on donor legs Use of PICO dressing as a preventive measure on sternal and leg wound infections Preoperative review of cardiac patients at risk of wound complications
Webinar 10: Common thoracic surgical procedures	Preoperative pulmonary function tests and objective functional testing Endobronchial interventions: dilatation, debulking and stenting VATS vs, open lobectomy: indications, benefits, and drawbacks Intraoperative mediastinal lymph node strategies Different types of guns, staplers in thoracic surgery: preferences, complications, tips and pitfalls
Webinar 11: Aortic dissection and thoracoabdominal surgery	Type A aortic dissection surgery in the 21st century Acute type B dissection management Long-term thoracoabdominal sequelae of the dissected aorta The role of the advanced practitioner in the aortic surveillance clinic
Webinar 12: Robotic thoracic surgery	Tips and tricks for a successful robotic thoracic programme Anaesthetic considerations for robotic thoracic surgical procedures Video-assisted thoracoscopic surgery vs. robotic lobectomy The role of the surgical care practitioner in robotic surgery
Webinar 13: Thoracic chest wall reconstruction surgery	Role of the plastic surgeon on thoracic chest wall reconstruction Anaesthetic considerations for a chest wall reconstruction procedure Surgical management of thoracic chest wall reconstruction Thoracic chest wall tumours
Webinar 14: Human factors and physiotherapy in cardiothoracic surgery	Patient safety and human factors in cardiothoracic surgery Human factors in the perioperative environment Development of physiotherapy and rehabilitation in cardiothoracic surgery Role of physiotherapy and rehabilitation in thoracic surgery
Webinar 15: Non-medical prescribing in cardiothoracic surgery	Role of non-medical prescribing Secondary prevention medication in cardiac surgery Pain management and current guidelines in cardiothoracic surgery Pharmacist audit on recurrent mistakes and most common questions
Webinar 16: Tracheal surgery in the 21st century	State-of-the-art tracheal surgery in the 21st century Tracheal resection and reconstruction Tracheomalacia: an overview Nursing challenges and management of patients

each individual webinar and compared between sessions using the χ^2 test. The total number of views on social media platforms was also recorded and is displayed as raw value.

Results

Structure of the webinar

Participants were asked to consider whether the webinar sessions were clearly structured. Survey respondents were largely in strong agreement that the webinars were indeed well structured (79.0% strongly agree vs. 17.0% agree vs. 3.2% neither agree nor disagree vs. 0.7% disagree vs. 0.1% strongly disagree). However, the proportion of each response did vary between webinars ($P < 0.0001$, Fig. 2).

Communication

In response to the question "was the information about crucial aspects of the topic communicated clearly in the webinar?", most of the respondents were again in strong agreement (81.7% strongly agree, 15.0% agree, 2.6% neither agree nor disagree, 0.4% disagree and 0.4% strongly disagree). Again, there was a difference in the proportion of each response between the different webinars ($P < 0.0001$, Fig. 2).

Learning outcomes

Most of the respondents strongly agreed that the webinars provided clear learning points for participants. The overall combined breakdown of responses from participants was as follows: 74.8% strongly agree, 21.6% agree, 3.2% neither agree nor disagree, 0.4% disagree and 0.1% strongly disagree. Again, there was a significant difference in the responses between webinars ($P < 0.0001$, Fig 2), although most were in agreement or strong agreement.

Illustrative examples on the topic

The response to the question "was there good use of illustrative examples?" was found to be one of strong agreement. Most respondents either agreed or strongly agreed with the question (75.1% strongly agree, 23.1% agree, 1.5% neither agree nor disagree, 0.1% disagree and 0.1% strongly disagree). Although the overall response was highly positive, there was some variation in the proportion of each response between webinars ($P < 0.0001$, Fig. 2).

Teaching methods

The participants were asked to consider whether the teaching and presentation methods were appropriate. Again, there was strong support for the methods used, with 84.1% saying they strongly agree, 14.4% agree, 1.2% neither agree nor disagree, 0.3% disagree and 0.3% strongly disagree. Again, there was variation in the proportion of agreement between webinars, although this fluctuation was observed between those who agreed versus strongly agreed ($P < 0.0001$, Fig. 2).

Was the webinar video clear?

The lowest level of agreement was observed for the question of whether the webinar video was clear, although most still agreed (57.7% stated that they would strongly agree, 37.0% agree, 4.7% neither agree nor disagree, 1.0% disagree and 0.3% strongly disagree). There was some variation in the proportion of each answer between webinars ($P < 0.0001$, Fig. 3).

Presentation pace, timing and speaker

The pace of the presentation, timing and the speaker presentation (clear and concise) was rated as strong agreement (78.8% strongly agree, 18.3% agree, 2.0% neither agree nor disagree, 0.3% disagree and 0.1% strongly disagree). The responses differed significantly between webinars but again only with respect to the proportion responding agree or strongly agree ($P < 0.0001$, Fig. 3).

Participants given enough time to ask questions

In response to the question "were all delegates given adequate opportunity to ask questions?", most either agreed or strongly agreed (90.8% strongly agree, 7.9% agree, 0.9% neither agree nor disagree, 0.0% disagree vs. 0.4% strongly disagree). No χ^2 test could be performed due to the lack of positive responses in the "disagree" column.

Questions answered appropriately by the speaker

Most participants who responded to the survey were in agreement that the questions asked during the webinar were answered appropriately by the speaker (84.7% strongly agree, 13.3% agree, 1.0% neither agree nor disagree, 0.4% disagree and 0.6% strongly disagree). There was significant differences in the proportion of each response between webinars, but again this reflected a change in the predominance of either agree or strongly agree ($P < 0.0001$, Fig. 3).

Overall enjoyment and was the webinar educational?

The participants were asked "did you enjoy the webinar overall and was it educational?". This question had the strongest agreement of all, with 94.7% saying they strongly agree, 5.1% agree, 0.1% neither agree nor disagree, 0.0% disagree and 0.1% strongly disagree. No χ^2 test could be performed due to the lack of positive responses in the "disagree" column.

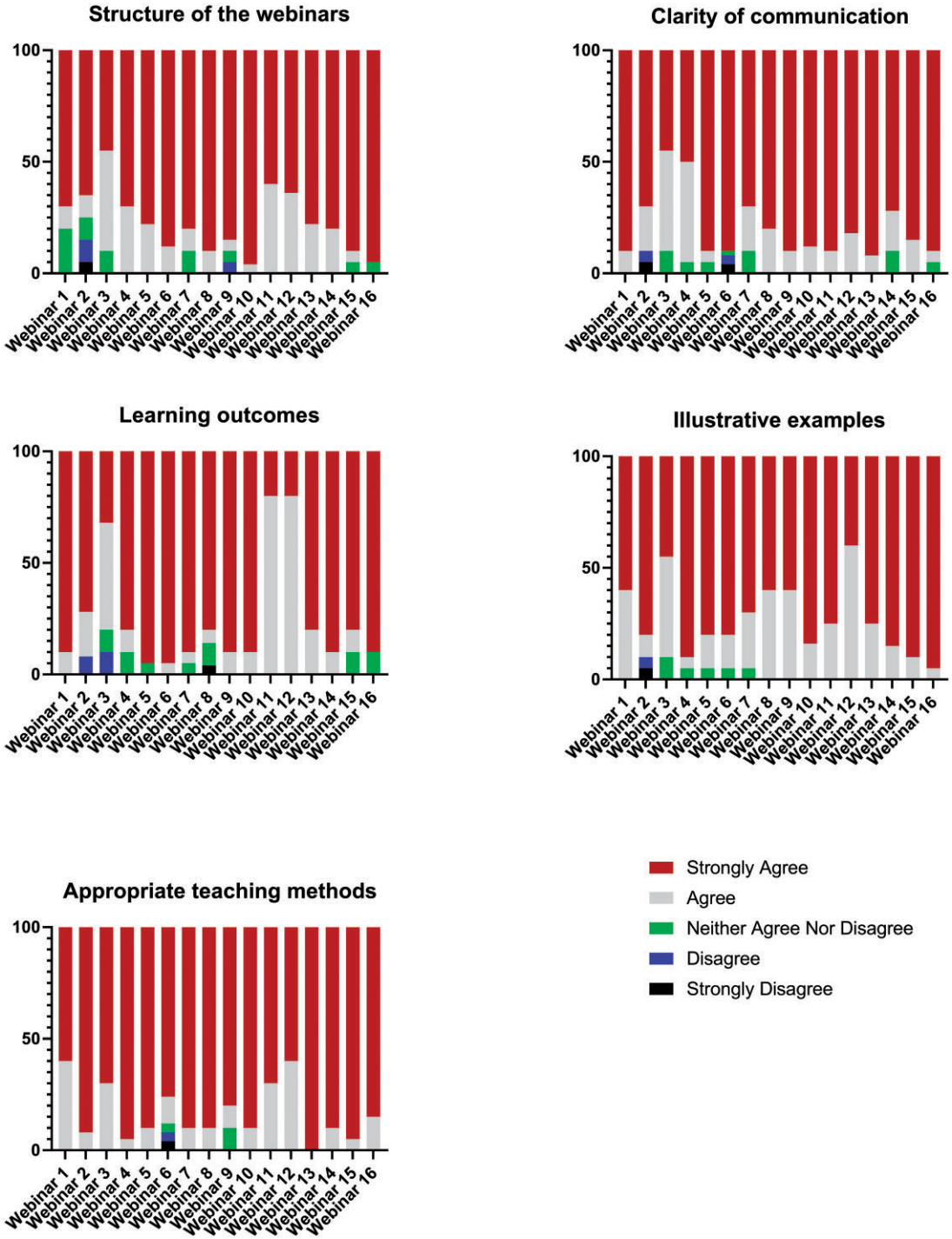

Figure 2. An overview of the comparison of ten webinars on the structure, learning outcomes, teaching methods, communication and illustrative examples of the subject.

Social media attention

The webinars garnered significant attention with regard to the total number of people watching on release for wider viewing. Overall, there have been 42,576 views to date (28 February 2022).

Discussion

The global COVID-19 pandemic imposed numerous challenges on[6] our association and members. We are navigating through these unprecedented times with careful planning and preparation of teaching/learning opportunities for our

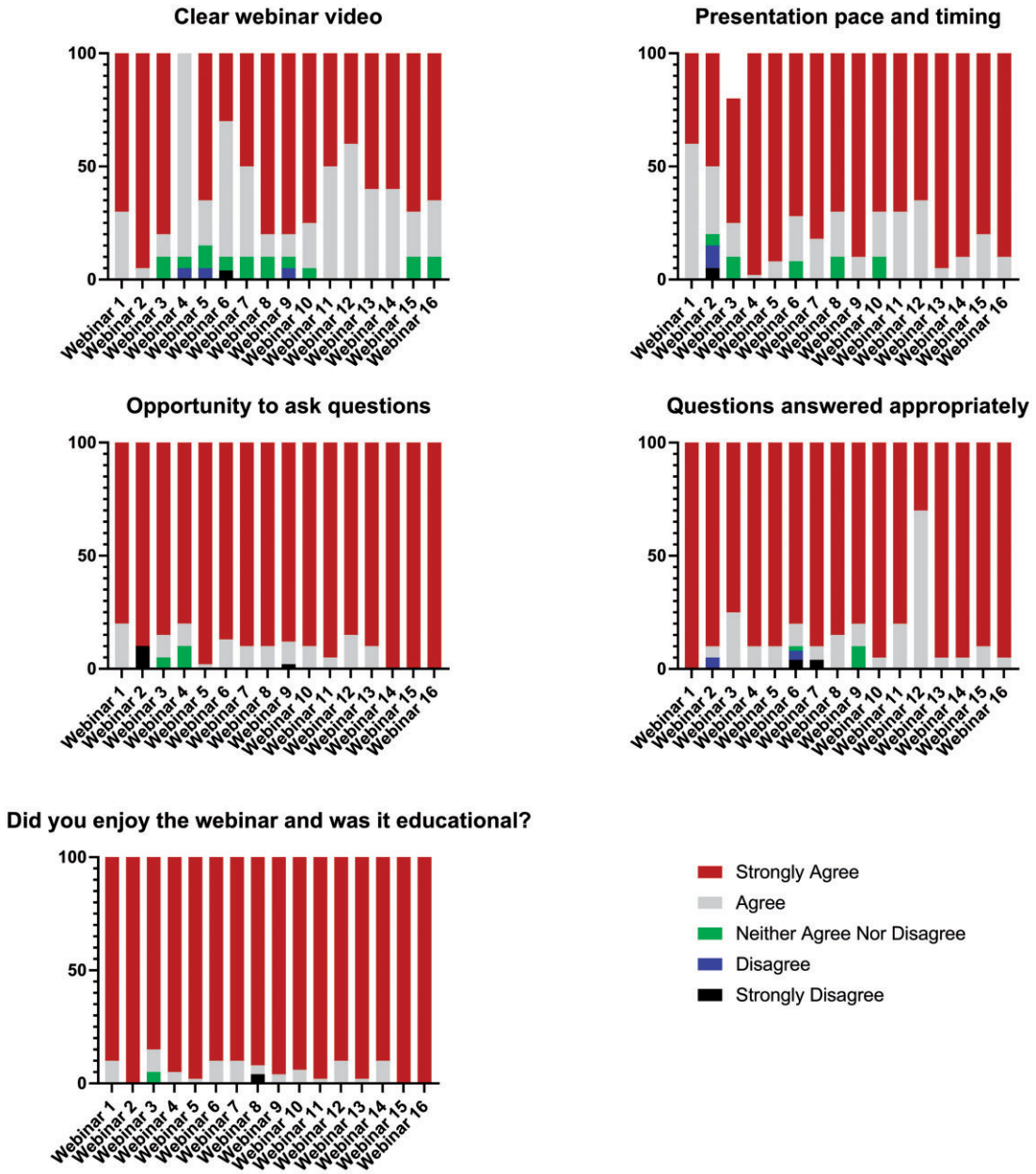

Figure 3. An overview of the comparison of ten webinars on the presentation, clarity, quality of the video and opportunity to ask questions and answers.

cardiothoracic community. We have observed from our results that a decrease in clinical duties and the ease of use of virtual platform meetings have allowed the participants to regularly attend the webinars even at weekends.

According to the Royal College of Psychiatrists, the mental health of the general public has deteriorated such that 43% of its members were reporting seeing an increase in urgent and emergency cases, including patients who had suicidal thoughts or were self-harming in May 2020 during the first UK national lockdown.[7] It is integral to ensure communication with other people via digital options and health solutions during the pandemic to reduce the incidence of mental illness.[8] One of the priorities of our joint association (Table 1) is the mental health and wellbeing within our cardiothoracic community. We therefore also offered a webinar focusing on mental health and wellbeing, which included a session on yoga, mindfulness and tai chi as part of the live teaching and practical session. This was well received by participants who actively engaged with instructors.

Our posters and session recordings were viewed on social media 42,576 times, which shows the potential reach of our

online webinar teaching platform. We have observed that problems occasionally arose with Wi-Fi networks, video quality and sound, but this was often dependent on the individual's Wi-Fi connection. It was a problem that was beyond our control, and this needs to be taken into consideration when planning any online education event. On a positive side, the reach of these webinars has benefitted delegates far from the British shores, raising awareness about our organizations as well as our educational offering.

Although the benefits of providing online education during the COVID-19 pandemic are clear, there are also significant future potential advantages to the development of an online platform for teaching delivery. First, many practitioners are unable to attend face-to-face sessions due to work commitments and geographic restrictions. By having sessions available online, there can be greater participation because attendees do not necessarily have to schedule leave to attend but have the possibility of attending virtually from their own home once their work commitments are completed. Furthermore, as these sessions can be recorded and made available at a later date, there can be additional ad hoc access for those unable to make it at a specific time. In addition, the provision of an online digital education platform negates any geographic restrictions and opens up global access. This allows us to foster greater communication between practitioners from different countries who may wish to take part and learn from our curriculum.

Limitations

One of the main limitations with these online educational webinars is that there can be no hands-on simulation or wet lab activities,[9] which are vital to enhance these practitioners' learning away from the operating theatres. However, we argue that safety of these practitioners is paramount during the present threat of COVID-19 infection. The use of a virtual platform can bring communication alive between our cardiothoracic community practitioners but the lack of physical and social interactions among participants alters the overall experience. Despite these limitations, the virtual platform offered a social interaction bubble for multidisciplinary practitioners, a means to support each other emotionally and mentally in challenging times, as well as maintaining CPD.

Conclusion

The results of our study have demonstrated that there are benefits to virtual learning including digital communication. However, there is a lack of physical/social interactions, which are vital for our wellbeing. The virtual platform offered a social interaction bubble of multidisciplinary practitioners, to support each other in challenging times as well as benefit from each other in maintaining CPD but mainly an emotional and mental support mechanism network.

We need to adopt and evolve our strategies and execution of educational platforms to offer CPD as well as offer emotional support bubbles in the challenging changes occurring during this global COVID-19 pandemic.

Conflict of interest

The authors declare that there is no conflict of interests or any financial benefits from surgical device companies or any participants. There was no commercial or financial support for the study from our commercial partners.

Acknowledgement

The authors would like to thank all invited faculty (Mr Joel Dunning, Miss Nisha Nair, Mr Richard Thompson, Miss Jeni Palima, Mr Terry O'Connor, Dr Amrita Bajaj, Dr Sameer Hanna-Jumna, Mr Sridhar Rathinam, Mrs Joanne Jones, Mrs Hayley Pike, Miss Letty Mitchell, Mr Robin Sunley, Mr Joseph Zacharias, Miss Mandy Gunn, Mr Aziz Momin, Dr Bhuvaneswari Krishnamoorthy, Dr Iqbal Toor, Mr Anthony Walker, Mr Simon Kendall, Mrs Helen Munday, Mr Stephen Billing, Prof Donna Eaton, Dr Syed Ashan, Mr Chris Theaker, Dr Carol Kelly, Dr Julie Sanders, Mr Ashley Thomas, Mr Marcus Taylor, Dr Timothy Hayes, Mr Sendhil K Balasubramanian, Miss Elena Desouto Ares, Mrs Laura Head, Mr Sagal Haval, Mr James Bedford, Mrs Tracey Mutt, Mr Vipin Mehta, Miss Angela Davies, Mr Amal Bose, Mr Faisal Hashmi, Mrs Udo Abah, Mr Felice Granato, Mr Hasan Dejnan, Mr Vipin Mehta, Prof Jonathan Ghosh, Miss Una Ahearn, Mr Tom Routledge, Mr Mindaugas Balcuinas, Mr Joel Dunning, Miss Liza Mills, Mr Vivek Srivastava, Miss Carolina Britton, Miss Katherine Atkin, Miss Zoe Brown-Barrett, Mr Chris Duff, Dr Sajith Kumar, Miss Cristina Rui-Segria, Dr Karthik Balasubramanian, Dr E Eladway, Miss Lucy Addison, Mr Michael Rothera, Mr Maninder Kalkat, Dr Shruti Khurana, Miss Sophie Lazeli) who took time to present these webinars on weekends during this crisis. Special thanks to Getinge International Ltd, Atricure Ltd and Smith-Nephew Ltd for allowing their clinical trainers to speak in our webinars.

References

1. Newman NA, Lattouf OM. Coalition for medical education-A call to action: a proposition to adapt clinical medical

education to meet the needs of students and other healthcare learners during COVID-19. J Card Surg 2020; 35(6): 1174–1175. https://doi.org/10.1111/jocs.14590.

2. Dineen EH, Hsu JJ, Saeed A. Reinforcing cardiology training during a pandemic: an open letter to our leaders. Circulation 2020; 142(2): 95–97. https://doi.org/10.1161/CIRCULATIONAHA.120.047593.
3. Coyan GN, Aranda-Michel E, Kilic A, Luketich JD, Okusanya O, Chu D, et al. The impact of COVID-19 on thoracic surgery residency programs in the US: a program director survey. J Card Surg 2020; 35(12): 3443–3448. https://doi.org/10.1111/jocs.14954.
4. Alvin MD, George E, Deng F, Warhadpande S, Lee SI. The impact of COVID-19 on radiology trainees. Radiology 2020; 296(2): 246–248. https://doi.org/10.1148/radiol.2020201222.
5. Mandler AG. Touch surgery: a twenty-first century platform for surgical training. J Digit Imaging 2018; 31(5): 585–590. https://doi.org/10.1007/s10278-018-0102-y.
6. Kogan M, Klein SE, Hannon CP, Nolte MT. Orthopaedic education during the COVID-19 pandemic. J Am Acad Orthop Surg 2020; 28(11): e456–e64. https://doi.org/10.5435/JAAOS-D-20-00292.
7. Torjesen I. Covid-19: Mental health services must be boosted to deal with "tsunami" of cases after lockdown. BMJ 2020; 369: m1994. https://doi.org/10.1136/bmj.m1994.
8. Chew AMK, Ong R, Lei HH, Rajendram M, Grisan KV, Verma SK, et al. Digital health solutions for mental health disorders during COVID-19. Front Psychiatry 2020; 11: 582007. https://doi.org/10.3389/fpsyt.2020.582007.
9. Kenny L, Booth K, Freystaetter K, Wood G, Reynolds G, Rathinam S, et al. Training cardiothoracic surgeons of the future: the UK experience. J Thorac Cardiovasc Surg 2018; 155(6): 2526–2538 e2. https://doi.org/10.1016/j.jtcvs.2018.01.088.

Appendix 1. Webinar survey questionnaire

1. Was the webinar session clearly structured?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
2. Was the information about the crucial aspects of the topic communicated clearly in the webinar?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
3. Was there any clear learning points in the webinar presentations?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
4. Was there good use of illustrative examples in the webinar presentations?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
5. Were the teaching/presentation methods appropriate?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
6. Was the webinar video clear?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree

7. Was the presentation pace, timing and speakers clear and concise?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
8. Were all delegates given adequate opportunity to ask questions?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
9. Were the questions answered appropriately?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree
10. Did you enjoy the webinar overall and was it educational?
    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree