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## ORIGINAL CLINICAL RESEARCH

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### EFFECTIVE MODIFICATIONS TO ANAESTHESIOLOGY AND CRITICAL CARE UNDERGRADUATE TEACHING MODULES AT A SAUDI ACADEMIC CENTRE DURING AND AFTER THE COVID-19 PANDEMIC PEAK

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#### Abstract

**Background:** The new COVID-19 has affected healthcare worldwide. Due to the pandemic, medical classrooms have been replaced by e-learning. This study evaluates pandemic-related undergraduate teaching module modifications.

**Methods:** This 2021 cross-sectional study comprised all 5th-year medical students and anaesthetic academic staff at King Abdulaziz University (KAU). Academic anaesthetic modules covered knowledge, psychomotor skills, affective attitudes, and practicals and to complete a 360-degree review for each student group, students were surveyed pre- and post-anaesthesia module and academic staff post-module.

**Results:** 350 students participated. The pre-course survey indicated that most participants (91.4%) were Basic Life Support (BLS) certified and the fewest (6%), were critical care (5C). Most (28.9%) taught 1%-20% online before the pandemic. 63.7% taught 81%-100% online during COVID-19. Before the COVID-19 epidemic, most (31.1%) were neither indifferent nor unsatisfied with online teaching, but during pandemic, most (37.1%) were satisfied. One hundred thirty-one participants expected to learn basic anaesthesia and critical care knowledge through the online Advanced Principles of Nurse Anaesthesia Practice (ANES 501), and 35 expected to learn about appropriate communication and interaction. In addition, 193 participants reported no obstacles in accessing online teaching, while 117 had internet connection problems at home. Similarly, 94.5% of participants were satisfied with the module design. Meanwhile, after taking the COVID-19 5C course, 81.5% felt more prepared to handle COVID-19, and 79.8% said they would recommend the COVID-19 5C course to younger students. Online instruction was also popular. 319 participants improved their airway bag-mask breathing and nasal airway insertion skills (311), while 276 preferred online lectures (311). 45 (70.3%) faculty members liked online instruction. Most liked video lectures and online classes suited students and teachers. Most students (74) want to discontinue practical sessions.

**Conclusion:** The COVID-19 epidemic suggests institutionalizing distance education and switching to hybrid digital pedagogy to increase student learning and engagement.

**Keywords:** Anaesthesia Curriculum; Medical Student; E-learning; Medical Education; Coronavirus.

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## Introduction

The novel coronavirus (COVID-19) has had a significant effect on healthcare systems around the world.<sup>1</sup> The unexpected surge in the number of critically ill patients has overwhelmed local hospitals,<sup>2</sup> and those on the front lines of combating COVID-19, such as anesthesiologists and critical care physicians, are at the greatest danger of contracting the virus themselves.<sup>3</sup> Anaesthesiologists oversee critical care units because of their knowledge of physiology, pharmacology, and resuscitation.<sup>4</sup> The COVID-19 epidemic has had profound personal and formative effects on Anesthesia and Critical Care residents.<sup>5</sup> Meanwhile, less theatre activity, displacement of trainees to critical care units, and shifts in conventional anaesthetic techniques have all posed problems for anaesthesia education.<sup>6</sup> Major efforts have focused on containing and minimizing the spread of COVID-19 and ensuring the safety of healthcare workers.<sup>7</sup> During the pandemic, the Association of American Medical Colleges suspended clinical rotations and advised medical students to avoid direct patient contact. Many other countries followed the same practices.<sup>8</sup> Since then, the COVID-19 epidemic and social distancing measures have disrupted the routines of medical students and medical educational systems worldwide.<sup>9</sup> Medical education is, however, required to learn about the novel COVID-19 infection.<sup>10</sup> Postgraduate and undergraduate medical trainees are needed to satisfy existing and predicted needs.<sup>11</sup> The global COVID-19 epidemic has changed medical education by transferring to online education.<sup>9</sup>

Establishing an online platform, or transitioning to an all-online curriculum, may present difficulties that should be carefully considered. The Industrial Revolution saw the first widespread application of the 360-degree feedback paradigm for assessing employees' recruiting, training, and performance on the job.<sup>12</sup> This model has been adopted in healthcare academic organizations for continuous assessment and development of medical curricula.<sup>13</sup> Medical program development, analysis, and enhancement have all benefited from the application of quantitative and qualitative evaluation.<sup>14</sup> Healthcare provider education and problem-solving are two essential components of infection prevention and control.<sup>7</sup> However, clinical services, like anesthesiology and critical care, were highly involved in preparing and responding to the rising demand for their skills during the pandemic<sup>15</sup> alongside direct patient care for operational, critical, and other medical needs.<sup>15</sup> Anesthesiology and critical care services have suffered since many hospitals have suspended elective procedures, reallocated staff and scarce hospital resources to COVID-19 patients and established some makeshift COVID-19 units.<sup>16</sup>

Most schools use online learning, although systems and results vary by country.<sup>17</sup> In 2011, researchers compared online and on-site training research methods. They showed satisfactory knowledge acquisition three months following course completion and predicted that online medical education would be valuable due to cost-effectiveness and logistics.<sup>18</sup> In 2016, a study examined

medical statistics blended learning vs. on-site learning for undergraduate medical students and found equal knowledge acquisition between the two strategies.<sup>19</sup> Similarly, another study shifted the focus from "will this approach work?" to "how can we help strengthen it?" by outlining the difficulties and teaching skills needed to accomplish the desired learning outcomes through online instruction.<sup>20</sup> Additionally, online undergraduate medical education expanded after the COVID-19 outbreak, and a scoping study on social distancing protected medical education. The authors evaluated innovative medical tele-education books that taught most clinical abilities. However, more research is needed to determine the educational efficacy of these strategies.<sup>21</sup>

The unforeseen ways in which the recent worldwide pandemic has changed the landscape of anaesthesiology education are numerous, and time should be set aside to fully reflect on what we can take away from this experience.<sup>22</sup> Online education effectively addresses many issues, because in a short time period, more people are able to benefit from online training than can attend a single classroom setting. The training itself is beneficial, as are the follow-up discussion periods, and the pre- and post-tests.<sup>23</sup> For these reasons, this study has chosen to assess the Anaesthesiology and critical care undergraduate module structure and modifications made during and after the Covid-19 pandemic. This study also presents an ongoing 360-degree evaluation method to inform the process of development of the module as part of the undergraduate curriculum at the Faculty of Medicine at King Abdulaziz University

(FOM-KAU). The aim of this is to assess the development of the online-based undergraduate anaesthesia curriculum and to assess the academic teaching requirements for online to onsite medical students.

## **Methodology**

### *Study design*

This was a cross-sectional study conducted at King Abdulaziz University (KAU) on 5th-year medical students and anaesthesia department academic staff for the 2021 academic year. The surveys were electronic based through Google Forms and were distributed via WhatsApp. Two student surveys (pre- and post-anaesthesia module) and one academic staff survey (post-anaesthesia module) were performed.

### *Participants*

All 5th-year medical students and the anaesthesia department's academic staff for the academic year 2021.

### *Inclusion criteria*

All 5th-year medical students and anaesthesia academic staff for the academic year 2021.

### *Exclusion criteria*

Refusal to participate.

### *Study settings*

The Faculty of Medicine (FOM) at KAU, Jeddah, Saudi Arabia, was established in 1975. Currently, the FOM has 8 Basic Sciences departments (anatomy, physiology, microbiology, parasitology, clinical biochemistry, pharmacology, pathology, and genetics),

and 13 clinical departments (medicine, surgery, obstetrics and gynaecology, pediatrics, hematology, otorhinolaryngology, anesthesia, ophthalmology, radiology, urology, orthopedic surgery, family and community medicine, and emergency medicine, as well as a recently established Department of Medical Education.) The curriculum lasts 6 years followed by one year of internship. The anesthesia and critical care module is offered during the 5th year of medical study over 2 weeks. Per year, the anesthesia and critical care department teach 6 groups of medical students.

#### *Module Design and Development*

This module briefly introduces the duties, tasks and responsibilities required when caring for a patient inside the OR and the critical care areas. The students were orientated to different types of anaesthesia, preoperative management and critical care management. By the end of the rotation, the following abilities are achieved: cognitive (knowledge), psychomotor (skills) and affective (attitudes). Details of lectures, practicals, and implications are presented in Appendix A.

#### *Pre-course survey*

In the pre-course survey had three parts. The first covered general online teaching. Second; the anaesthesia module, and third; courses related to COVID-19. In the first part, the satisfaction level of the participants in online teaching in the previous academic year and this year were assessed, namely if the online teaching met the objectives of each subject, if they had concerns about online teaching in the previous academic year including online

anaesthesia and the critical care module, if there were obstacles they faced in online teaching, if they had any expectations about online teaching in the anaesthesia module and, finally, if they had had any training in Black Board before. The second part of the survey was about the anaesthesia module and if they had any basic knowledge and skills about topics taught in the anaesthesia module. The third part of the survey was about COVID-19 training and included training courses for personal protective equipment (PPE) and Covid-19 Critical Care Crash Course (5C).

#### *Post-course survey*

In the post-course survey, the online teaching in anaesthesia module was focused on if it met the objectives of all the theoretical and practical sessions in the module, satisfaction with different modalities in online teaching in anaesthesia, ways to improve online teaching in anaesthesia, knowledge about anaesthesia topics after online teaching, skills competency in anaesthesia after online teaching and, finally, topics and skills that need to be added or removed in the anaesthesia module.

#### *Academic staff survey*

The academic staff survey was sent after the end of each two-week module, and its focus is on how to improve online teaching. During the academic year, after each group of medical students finished their module, we gathered the surveys, and the results were presented in the departmental meeting to discuss improving the academic teaching plan.

#### *Module Evaluation*

A 360-degree evaluation method was achieved for the academic year 2021 by applying two surveys to the 5th year medical students (pre- and post-anaesthesia module) and one survey to anaesthesia academic staff post-module for each student group. The results of the questionnaires were used in the process of developing an anaesthesia undergraduate curriculum.

### *Statistical analysis*

For the data analysis, descriptive statistics were performed using SPSS-26.0, and categorical data were analyzed using frequency, and percentage distributions, as well as five Likert scale.

## **Results**

### *Pre-course survey*

The mean age of the 350 students was  $22.50 \pm 1.02$  years (minimum age 20 years and maximum age 30 years). In the study, there were 166 (47.4%) male students and 184 (52.6%) female students. The male-to-female ratio was 83:92. Participants were asked about certification courses such as Basic Life Support (BLS), Advanced Cardiovascular Life Support (ACLS), Advanced Trauma Life Support (ATLS), PPE, 5C, or any other short training course. Most participants were BLS certified (91.4%), and the fewest number had completed 5 C courses (6%), as stated in **Table 1**.

**Table 1.** Courses attended by the study participants.

Q #	Statement	Pre-course survey	
		Yes	No
		N (%)	N (%)
1	Are you BLS certified?	320(91.4)	30(8.6)
2	Are you ACLS certified?	78(22.3)	272(77.7)
3	Are you ATLS certified?	26(7.4)	324(92.6)
4	Did you attend PPE training course before?	158(45.1)	192(54.9)
5	Did you take the COVID-19 Critical Care Course (5 C) before?	21(6.0)	329(94.0)
16	Did you have a previous training on online teaching (e.g., blackboard)	193 (55.1)	157 (44.9)

According to **Table 2**, participants were asked about the online teaching percentage before and after the COVID-19 pandemic. The majority, 28.9%, responded that before the pandemic, there was 1%-20% online teaching. In contrast, during the COVID-19 pandemic, 63.7% of participants responded that during the pandemic, there was 81%-100% online teaching, as indicated in Table 2.

When participants were asked about their satisfaction with online teaching before and during COVID-19, there was a mixed response, ranging from extremely dissatisfied to extremely satisfied. The majority (31.1%) were found to be neutral, or neither satisfied nor dissatisfied, before the COVID-19 pandemic, while during the pandemic, the majority (37.1%) of participants were satisfied with online teaching (**Table 3**).

Additionally, 37.1% of the participants agreed that the online teaching covered the rotation objectives during the pandemic and again, when participants were asked about their excitement about online teaching this year, the majority (31.1%) were excited, and even 18.6% were found to be extremely excited, as shown in **Table 3**. Similarly, when participants were asked about their satisfaction level with the teaching method used during online teaching, the majority were found to be satisfied with the lectures (35.1%), group discussion (32.3%), self-directed learning (30.3%), and interactive sessions (30.3%). In contrast, other methods, such as problem-based learning, continued assessment, and exams, had a mostly neutral response. In the practical session, the majority (28.9%) of participants were dissatisfied, and 27.4% were extremely dissatisfied (**Table 3**). Participants were also asked about their knowledge of different subjects. The majority had bad and very bad knowledge in all subjects except acute and chronic pain management, acid-base disturbance, and shock where participants were undecided whether they had good or bad knowledge, as indicated in **Table 3**.

Questions related to online teaching concerns before the pandemic were divided

into 6 main categories and further sub-categorized. In the teaching category, the main concern was the lack of skill identified by 85 participants. In comparison, 73 participants identified internet connection as a primary concern in the technical domain, and the remaining concerns were described in Table 4. When participants were asked to highlight their concerns, particularly the ANES501 module, 97 participants highlighted the lack of skill as a teaching concern, and 31 highlighted the internet connection as a concern in the technical category (**Table 4**).

Regarding expectations from ANES501 online teaching, there were 6 different categories highlighted in table 4. In terms of knowledge, 131 participants were expected to achieve a basic level of knowledge about anesthesia and critical care, and 35 participants were expected to update their knowledge regarding good communication and interaction. Other expectations are described in Table 4. During the pandemic's last rotation, 311 participants had surgery rotation, while at least 5 had a pediatrics, obstetrics, and gynaecology rotation (Table 4).

When participants were asked if they had any obstacles to online teaching, the majority (193) responded that they had no obstacles in accessing online teaching, whereas 117 participants reported internet connection problems at home. In contrast, the least number of participants (11) had no internet access at home at all (Table 5). Additionally, participants were asked to highlight the skills in which they felt competent, and the majority (186 participants) were competent in PPE. In comparison, at least 24 participants were competent in Laryngeal Mask Airway (LMA) insertion (Table 5).

**Table 2.** Questions related to online teaching regarding COVID-19.

Q #	Statement	0%	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
6	Before COVID pandemic; what was the percentage of Online teaching?	202 (57.7)	94 (28.9)	21 (6.0)	14 (4.0)	12 (3.4)	7 (2.0)
7	During the time of COVID pandemic (Last academic year); what was the percentage of Online teaching?	8 (2.3)	5 (1.4)	16 (4.6)	27 7.7)	71 (20.3)	223 (63.7)

**Table 3.** Questions related to satisfaction with online teaching.

	<b>Question</b>	<b>Extremely dissatisfied N (%)</b>	<b>Dissatisfied N (%)</b>	<b>Neutral N (%)</b>	<b>Satisfied N (%)</b>	<b>Extremely satisfied N (%)</b>	<b>I didn't use online teaching N (%)</b>
8	How Satisfied were you about Online teaching before COVID-19 pandemic?	31 (8.9)	54 (15.4)	109 (31.1)	70 (20.0)	26 (7.4)	60 (17.1)
10	How Satisfied were you about Online teaching given last academic year at the time of COVID-19 pandemic?	25 (7.1)	69 (19.7)	98 (28)	130 (37.1)	28 (8.0)	-
		<b>Strongly disagree</b>	<b>Disagree</b>	<b>Undecided</b>	<b>Agree</b>	<b>Strongly agree</b>	
14	Last year during the time of COVID-19 pandemic; the online teaching covered the rotation's objectives.	27 (7.7)	80 (22.9)	96 (27.4)	130 (37.1)	17 (4.9)	-
		<b>Extremely Unexcited</b>	<b>Unexcited</b>	<b>Neutral</b>	<b>Excited</b>	<b>Extremely Excited</b>	
15	On scale from 1-5; how Excited are you about this year online teaching?	31 (8.9)	46 (13.1)	99 (28.3)	109 (31.1)	65 (18.6)	-
18	<b>How satisfied are you using the Online methods of teaching for the following?</b>						
		<b>Extremely dissatisfied</b>	<b>Dissatisfied</b>	<b>Neutral</b>	<b>Satisfied</b>	<b>Extremely satisfied</b>	<b>Never used it</b>
	Lecture	16 (4.6)	25 (7.1)	75 (21.4)	123 (35.1)	108 (30.9)	3 (0.9)
	Group discussion	30 (8.6)	46 (13.1)	88 (25.1)	113 (32.3)	60 (17.1)	13 (3.7)
	Practical sessions	96 (27.4)	101 (28.9)	70 (20.0)	43 (12.3)	18 (5.1)	22 (6.3)
	Problem based learning	30 (8.8)	41 (11.7)	112 (32.0)	90 (25.7)	42 (12.0)	35 (10.0)
	Self-directed learning	27 (7.7)	26 (7.4)	76 (21.7)	106 (30.3)	92 (26.3)	23 (6.6)
	Interactive sessions	44 (12.6)	49 (14.0)	90 (25.7)	106 (30.3)	51 (14.6)	10 (2.9)
	Continue assessment	32 (9.1)	46 (13.1)	99 (28.3)	88 (25.1)	69 (19.7)	16 (4.6)
	Exams	71 (20.3)	54 (15.4)	90 (25.7)	80 (22.9)	51 (14.6)	4 (1.1)
19	<b>Now at the time being, how you classify your knowledge at the following subjects</b>						
	<b>Subjects</b>	<b>Very bad</b>	<b>Bad</b>	<b>Undecided</b>	<b>Good</b>	<b>Very good</b>	
	General anesthesia	111 (31.7)	144 (41.1)	81 (23.1)	13 (3.7)	1 (0.3)	
	Pre-operative assessment	75 (21.4)	123 (35.1)	115 (32.9)	34 (9.7)	3 (0.9)	
	Acute and chronic pain management	64 (18.3)	90 (25.7)	152 (43.4)	45 (12.3)	1 (0.3)	
	Regional anesthesia	104 (29.7)	152 (43.4)	79 (22.6)	12 (3.4)	3 (0.9)	
	Obstetric anesthesia	83 (23.7)	122 (34.9)	97 (27.7)	41 (11.7)	7 (2.0)	
	Crises resources management	123 (35.1)	149 (42.6)	65 (18.6)	11 (3.1)	2 (0.6)	
	Mechanical ventilation	121 (34.6)	145 (41.4)	65 (18.6)	18 (5.1)	1 (0.3)	
	Acid-based disturbance	53 (15.1)	90 (25.7)	134 (38.3)	60 (17.1)	13 (3.7)	
	Shock	60 (17.1)	76 (21.7)	133 (38.0)	71 (20.7)	10 (2.9)	
	Impact of COVID-19 on anesthesia	155 (44.3)	132 (37.7)	52 (14.9)	10 (2.9)	1 (0.3)	
	Critical care management of COVID-19 patient	156 (44.6)	125 (35.7)	51 (14.6)	16 (4.6)	2 (0.6)	



**Table 4.** Questions related to concerns and expectations about online teaching.

Q 9	<b>What was the biggest concerns with Online teaching before COVID-19 pandemic? (List top 3)</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	Teaching	No skill	85
		No knowledge	52
		Experience	58
		Lack of teaching material	12
		Time of lectures and sessions	23
b	Technical	Internet connection	73
		BB	11
		Expensive	04
c	Communication	<b>Communication</b>	47
d	Assessment	Examination	31
		Home work	04
e	Environment	<b>Environment</b>	06
f	Others	Irrelevant	51
		Nothing	32
		Waste of time	04
Q 11	<b>What is your biggest concern with the ANES501 module Online teaching at time of COVID-19 pandemic for this academic year? (List top 3)</b>		
a	Teaching	No skill	97
		No knowledge	49
		Lack of teaching material	11
b	Technical	Internet connection	31
		BB	07
		Experience	03
c	Communication	Communication	21
d	Module structure	Short time of module	19
		Lecture time schedule	21
		Organization	13
e	Assessment	Examination	29
		Home work	03
f	Environment	Environment to study	05
g	Others	Irrelevant answers	53
		Nothing	49
Q 12	<b>What is your expectation from the ANES501 module online teaching? (List top 3)</b>		
a	Knowledge	Basic knowledge about anesthesia and critical care	131
		Managing complicated, emergency and crises	12
b	skill	Skills	39
c	Teaching	Pre-posting the lectures and educational material in the platform?	05
		Good communication and interaction	35
d	Module structure	Light and easy module	17
		Organized	21
e	Assessment	Assessment	14
f	Others	Irrelevant answers	56
		Nothing	23
		Good and useful module	47

		Interesting and fun module	15
		Hard and default module	03
Q 13	<b>During last year (4th year medical school) what rotation you had at a time of COVID-19 pandemic?</b>		
a	Surgery	Surgery	311
b	Radiology	Radiology	303
c	Ethics	Ethics	299
d	Forensic / toxicology	Forensic / toxicology	301
e	ENT	ENT	20
f	Community medicine	Community medicine	29
g	Ophthalmology	Ophthalmology	11
h	Others	Pediatrics, obstetrics and gynecology	05

**Table 5.** Obstacles and skills development related questions.

Q 17	<b>Do you have obstacles to online teaching? (check all that apply)</b>	
	<b>Category</b>	<b>Frequency</b>
a	I don't have Obstacles	193
b	Don't have device to use for online teaching (laptop, desktop, iPad, mobile, etc...)	10
c	Don't have internet online access at home to use it	11
d	I have poor internet connection at home	117
e	Don't have a quiet place at home	47
f	<b>Others</b>	12
Q 20	<b>Which skills do you feel competent in: (check all that is apply)</b>	
1	Airway Bag mask ventilation	168
2	Nasal Airway insertion	53
3	Oral Airway insertion	49
4	LMA insertion	24
5	Direct Laryngoscope intubation	38
6	Lumber puncture	33
7	Ultrasound for vascular access	33
8	Personal Protective Equipment (PPE)	186
9	Crisis resource management	25
10	Others	30

### *Post-course survey*

The mean age of 352 students was  $22.53 \pm 0.833$  years (minimum age of 21 years and maximum age of 25 years). In the study, there were 177 (50.3%) male students, and 175 (49.7%) female students. The male-to-female ratio was 177:175.

After completion of the course, a survey was conducted, and again participants were asked if they completed courses related to BLS, ACLS, ATLS, PPE, and 5C. The majority, 86.9%, were BLS certified, while only 13.9% were ATLS certified. When participants were asked about the ANES501 module design meeting the objectives of rotation, 94.5% of participants responded yes, and 72.2% participants also responded positively that the online practical sessions in the first week helped them become competent in the skills required during the course, as shown in Table 6. Additionally, when participants were asked if their knowledge about the management of COVID-19 had improved after taking the 5C course, 81.5% responded 'yes', and 79.8% of participants were willing to advise younger students to attend the COVID-19 Critical Care Crash Course (5C).

After completion of the course, when participants were asked about their satisfaction level using the 5 points Likert scale, most were satisfied and extremely satisfied with the methods used during online teaching. The majority of participants, 40.1%, were satisfied with lectures, while 35.8% were extremely satisfied with continued assessment, as

indicated in Table 7. When participants were asked about their expectation level regarding the ANES501 online teaching methods, the majority agreed (42.9%) that online teaching methods met their expectations. After completing the course, participants were asked about the impact of the course on their knowledge of different subjects taught in the course. The majority of the participants reported a good (50%) and very good (24.7%) impact on their knowledge regarding acute and chronic pain management, as well as other subjects described in Table 7.

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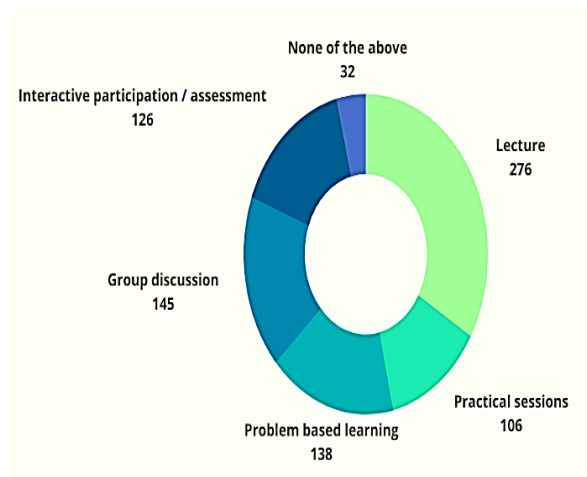
**Table 6.** Courses attended by the study participants.

Q #	Statement	Post course survey	
		Yes	No
		N (%)	N (%)
1	Are you BLS certified?	306 (86.9)	46(13.1)
2	Are you ACLS certified?	88(25.0)	264(75.0)
3	Are you ATLS certified?	49(13.9)	303(86.1)
4	Did you attend PPE training course before?	239(67.9)	113(32.1)
5	Did you take the COVID-19 Critical Care Course (5C) before?	296(84.1)	56(15.9)
6	Did the ANES501 module design met the objectives of the rotation?	333(94.6)	19(5.4)
8	Did the online practical sessions in the 1st week helped you to become competent in the skills required during the course?	254 (72.2)	98 (27.8)

**Table 7.** Questions related to satisfaction and impact on the knowledge of the participants.

<b>How satisfied are you using the Online methods of teaching after ANES501 rotation for the following?</b>						
7		<b>Extremely dissatisfied</b>	<b>Dissatisfied</b>	<b>Neutral</b>	<b>Satisfied</b>	<b>Extremely satisfied</b>
		<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>	<b>N (%)</b>
a	Lecture	19 (5.4)	27 (7.7)	54 (15.3)	141 (40.1)	111 (31.5)
b	Group discussion	34 (9.7)	28 (8.0)	48 (13.6)	132 (37.5)	110 (31.3)
c	Practical sessions	19 (5.4)	20 (5.7)	74 (21.0)	134 (38.1)	105 (29.8)
d	5C Problem based learning	21 (6.0)	13 (3.7)	68 (19.3)	135 (38.4)	115 (32.7)
e	Self-directed learning	20 (5.7)	17 (4.8)	79 (22.4)	114 (32.4)	122 (34.7)
f	Interactive sessions	20 (5.7)	25 (7.1)	52 (14.8)	138 (38.2)	117 (33.2)
g	Continue assessment	19 (5.4)	17 (4.8)	56 (15.9)	134(38.1)	126 (35.8)
9		<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly agree</b>
		<b>The online teaching methods for ANES501 module met your expectation.</b>	24 (6.8)	25 (7.1)	83 (23.6)	151 (42.9)
12	<b>After ANES501 course, how do you classify your knowledge at the following subjects:</b>					
	<b>Subjects</b>	<b>Very bad</b>	<b>Bad</b>	<b>Neutral</b>	<b>Good</b>	<b>Very good</b>
	<b>General anesthesia</b>	8 (2.3)	17 (4.8)	90 (25.6)	160 (45.5)	77 (21.8)
	<b>Pre-operative assessment</b>	7 (2.0)	7 (2.0)	49 (13.9)	160 (45.5)	129 (36.6)
	<b>Acute and chronic pain management</b>	5 (1.4)	13 (3.7)	71 (20.2)	176 (50)	87 (24.7)
	<b>Regional anesthesia</b>	5 (1.4)	10 (2.8)	58 (16.5)	145 (41.2)	134 (38.1)
	<b>Obstetric anesthesia</b>	9 (2.6)	8 (2.3)	61 (17.3)	153 (43.5)	121 (37.2)
	<b>Crises resources management</b>	8 (2.3)	6 (1.7)	43 (12.2)	131 (37.2)	164 (46.6)
	<b>Mechanical ventilation</b>	22 (6.3)	40 (11.4)	83 (23.5)	133 (37.8)	74 (21.0)
	<b>Acid-based disturbance</b>	6 (1.7)	3 (0.9)	49 (13.9)	106 (30.1)	188 (53.4)
	<b>Management of septic Shock</b>	13 (3.7)	12 (3.4)	77 (21.8)	143 (40.6)	107 (30.4)
	<b>Impact of COVID-19 on anesthesia</b>	12 (3.4)	11 (3.1)	68 (19.3)	157 (44.6)	104 (29.5)
	<b>Critical care management of COVID-19 patient</b>	9 (2.6)	17 (4.8)	70 (19.9)	156 (44.3)	100 (28.4)

According to Figure 1, participants were asked which methods of online teaching they would like to continue in the future, and the majority (276) preferred lectures as a method of online teaching. In contrast, 32 participants did not like any of the options.



**Figure 1.** Preference of online teaching method in future by participants.

After completing the ANES501 online rotation, 319 participants had increased competency in airway bag-mask ventilation followed by nasal airway insertion (311), and the remaining subjects were described in Table 8.

Questions related to the improvement of online teaching were divided into 6 main categories and then further subcategorized. In the teaching category, 67 participants proposed decreasing the duration of lectures. In the technical improvement category, 15 participants agreed on Black Board (BB), while the least number of participants (5)

proposed quizzes and homework to improve online teaching (Table 9).

When participants were asked which part of online teaching they would like to continue, most participants (18) wished to continue the practical sessions. At the same time, only 1 participant wished to continue the Anesthesia practicum and minute ventilation (MV). In addition, 23 participants wanted to continue online lectures. Responses for other categories and subcategories are presented in Table 9.

When participants were asked about which part they wanted to discontinue, most participants (39) wanted to discontinue online practical sessions in the category of practical sessions. In the category of lectures, the majority (19) wanted to reduce the duration of lectures. In the category of 'other', 51 participants wanted to discontinue 'everything' (Table 9).

Questions related to suggestions of things to be incorporated into the curriculum were also divided into three categories and further subcategorized. In the practical category, the majority (33 participants) suggested that more in-hospital practical sessions (including clinical skills and Simulation Center, Operating Room OR, and Intensive Care Unit ICU) must be added to the curriculum. In the category of lectures, 5 participants suggested incorporating skills related to Anaesthesia drugs and pain management, as indicated in Table 9.

**Table 8.** Impact on skills after completion of ANES501 online rotation.

Q #	Which skills after finishing ANES501 rotation you feel competent in: (check all that apply)	Frequency
13	Airway bag mask ventilation	319
	Nasal airway insertion	311
	Oral airway insertion	305
	LMA insertion	292
	Direct Laryngoscope intubation	203
	Lumber puncture	167
	Ultrasound for vascular access	121
	Personal protective equipment (PPE)	287
	Crises resource management	254
	others	89



**Table 9.** Questions related to improvement, continuation and discontinuation in the online teaching.

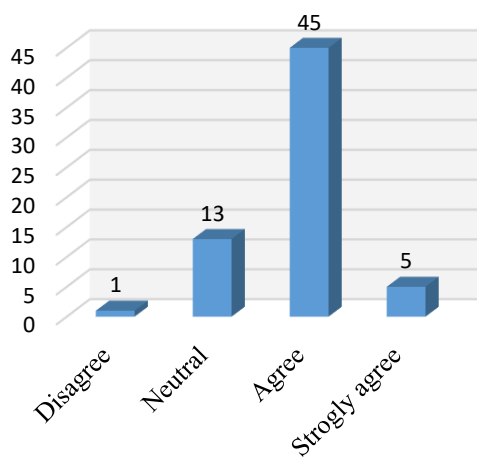
Q 11	<b>How can we improve the online teaching?</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	Teaching	More interaction	30
		Decreased duration of lecture	67
		Pre-recording sessions and lectures	19
		More teaching materials	15
		Small groups	12
		Less interaction in lectures	7
b	Technical improvement	BB	15
		Internet connection	9
c	Communication	Voice	7
		camera	5
d	Organization	More breaks	2
		Time of sessions and lectures	3
e	Assessment	Quizzes and home work	5
f	Others	Irrelevant answers	113
		Everything is good/Nothing	63
Q16	<b>What part of the course you would like to continue?</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	Practical session	Practical sessions	185
		In hospital practical sessions (Skill lab, OR, ICU)	50
		Anesthesia Practicum	1
		MV	1
		Stimulation	9
		LP	3
		Airway	8
		CRM	4
		Breaking bad news	3
		Approach to critically ill patients	5
		Pre-operative assessment	6
b	Lecture	Online lectures	23
		Lectures	21
		Pain management	6
		Pre-operative assessment	3
		GA	8
		Regional anesthesia	5
		MV	7
		Acid based disturbance	5
		CRM	9
c	Assessment/assignment	Continuous assessment	7
		Grade distribution	3
		Quizzes	3
d	Others	Everything	51
		5C course	15
		Interactive sessions	5
		Case discussions	5
		COVID-19 management	3

		Videos	3
		I don't know/nothing	19
Q 17	<b>What part of the course you would like to discontinue?</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	Practical session	Online practical sessions	39
		Practical sessions	13
		CRM	7
		OR sessions	5
		PACU session	3
		Videos in practical sessions	1
		Online stimulation	3
		US	3
b	Lectures	Lectures	5
		Online lectures	13
		Drugs in detail	3
		Pain management	5
		MV	15
		Long duration of lectures	19
		OB anesthesia	5
		Shock	3
		Acid base disturbance	4
		Regional anesthesia	3
		Anesthesia overview/GA	3
		Critical care	1
		Dividing the lecture into 3 parts	3
		CRM	5
		Participation in lectures	1
	Online teaching	1	
c	Assessment/assignment	No free time before the exam	3
		Interactive assessment	5
		Assessment	5
		Short exam time	3
d	Others	Self-directed learning	1
		Long day hours	5
		Online part	3
		Non-interactive sessions	1
		Using microphones	1
		Short module duration	1
		PBL	3
e	COVID-19	5C course	9
		COVID-19 topics	3
f	Others	I don't know/nothing	121
		Everything	5
Q18	<b>What knowledge/skills do you suggest to be added to the curriculum?</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	Practical	Airway	7
		More practical sessions	15
		More in hospital practical sessions (including skill lab, OR, ICU)	33
		IV cannula insertion	7
		ABG/regional anesthesia	5
		MV	7
		Others practical works	15

b	Lectures	Anesthesia drugs/pain management	5
		Case discussion/clear overview at the end of lecture	3
		GA/MV/anesthesia complications	3
		Anesthesia consultation	5
		5C course lecture	3
d	Others	5C course	3
		Management of life threatening and emergency cases	9
		BLS, ACLS, ATLS	7
		Others more interactive discussion sessions	5
		I don't know/nothing	95

### Faculty survey

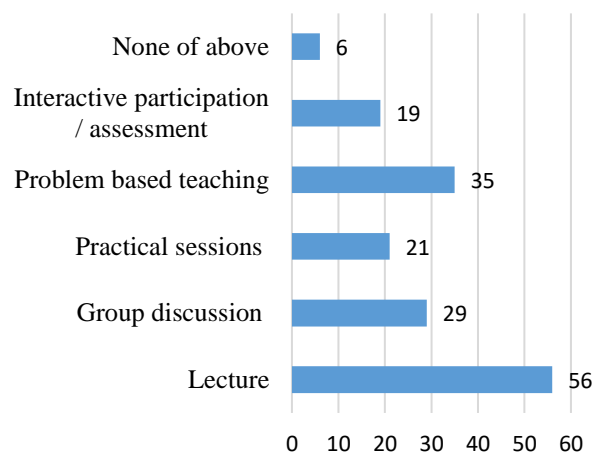
There were 6 sessions of the ANES501 course in the academic year, and in each session, there were 12 faculty members. In total, faculty members responded to the questionnaire 64 times using the four-point Likert scale. Only 45(70.3%) responded that online teaching met their expectations, as indicated in Figure 2.



**Figure 2.** Response of faculty members using four-point Likert scale for the level of expectations.

According to Figure 3, when faculty members were asked about the online teaching methods, they said they would like them to be continued in the future. The highest response (56) was the wish to continue with online lectures, while at least 6 responses stated they did not like the options given.

When the faculty members were asked if they would recommend the 5C course to the students, the majority (58; 90.6%) agreed they would recommend the 5C course to the students.



**Figure 3.** Response of faculty members towards the question related to the methods of online teaching they would like to be continued in the future.

When faculty members were asked about their preference for developing professional videos for the teaching segments, a maximum of 41 responses preferred professional videos for lectures, while 6 responses indicated no preference for the given options, as stated in Table 10.

The questions related to the improvement of online teaching were divided into six categories, and each category was sub-categorized. Most (15) faculty members suggested improving the quality of online teaching, and responses to other categories are presented in Table 11.

When faculty members were asked which module they wanted to continue, there were 33 responses that they wished to continue all the modules, while 2 responses stated they did not want to continue anything (Table 11). In contrast, when asked which module they wanted to discontinue, most (44) did not want to discontinue anything (Table 11). The skills that faculty members want to add to the curriculum are also listed in Table 11.

**Table 10.** Preference for the development of professional videos for online teaching

Q3	Do you prefer to develop professional educational videos for your teaching segments?	
	Items	Frequency
a	Lecture	41
b	Group discussion	29
c	Practical sessions	20
d	Problem based learning	35
e	Interactive participation / assessment	19
f	None of above	06

**Table 11.** Questions related to the improvement and skills for online teaching

5	<b>How can we improve the online teaching?</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	<b>Improving BB</b>	Improving quality	15
b	<b>Reducing number of students</b>	Smaller group	23
		PBL	02
c	<b>Improving educational material and methods</b>	Opening camera	03
		Video illustrated	05
		Flipped teaching	03
		More interactive sessions	05
		Better video	02
		Sharing video on BB	03
d	<b>Internet connections</b>	Better internet connection	09
e	<b>OR and ICU round</b>	Attending OR and ICU	01
f	<b>No reply</b>	No reply	06
Q6	<b>What part of the module you would like to continue?</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	<b>All</b>	All of the modules	33
b	<b>Teaching/Lectures</b>	Lectures in class room	02
		Lectures on line	06
		Practical	03
		Clinical	02
c	<b>Skill</b>	Hands on	02
		Skill training	04
d	<b>Nothing</b>	None	02
Q7	<b>What part of the module you would like to discontinue?</b>		
	<b>Main Category</b>		<b>Frequency</b>
a	<b>All</b>	All of the modules	02
b	<b>Teaching/Lectures</b>	5C	04
		Lectures on line	01
		Practical/online practical	07
		CRM	01
		PAC	01
c	<b>Skill</b>	Hands on	01
		US utilization	01
d	<b>Nothing</b>	None	44
Q8	<b>What knowledge/skills do you suggest to be added to the curriculum?</b>		
	<b>Main Category</b>	<b>Sub-category</b>	<b>Frequency</b>
a	<b>Lecture</b>	Simulation sessions	04
		PBL	03
b	<b>Preoperative sessions</b>	5C	04
		Lectures on line	01
		Practical/online practical	07
		CRM	01
		Journey	04
c	<b>CRM</b>	ICU	01
d	<b>Vascular access</b>	IV access	02
		IV insertion/Cannulation	10
e	<b>Nothing</b>	None	29

## Discussion

One of the most effective programs to stop the spread of COVID-19 has been online education, which is not geographically constrained in the same way that face-to-face instruction is, allowing instructors and students to complete assignments from home. By severing transmission chains, the online teaching method is a valuable strategy for limiting the spread of infectious diseases among students.<sup>24</sup> Online resources for medical students' educational materials, including lectures, tutorials, and textbooks, have increased, and mobile technology and online learning tools are becoming more widely available.<sup>25</sup> The COVID-19 epidemic has hastened the adoption of e-learning, and most medical schools have used it, regardless of their preparation. In our study, we sought to determine the most effective approach to apply online teaching, whether it can be applied after a pandemic, and the perception of students and faculty members towards online teaching.

In the present study, before and during COVID-19, students were polled on their opinion of online teaching. A majority of participants (31.1%) were neutral about online teaching before the COVID-19 pandemic, but most participants (37.1%) were satisfied with online teaching during the pandemic. Our findings agreed with a study that stated that most students and teachers favour online teaching, had positive views of online education, and were satisfied with online teaching.<sup>26</sup> A study by Kaur et al (2020)<sup>27</sup> concluded that online teaching could enrich the current education process. Still, it cannot replace the established education system. Online classes have been shown to be equally effective but not superior to conventional

classroom teachings, and students were not greatly satisfied with this teaching style. In the present study, the percentage of online teaching increased during the COVID-19 pandemic. A possible explanation can be the easiness and usefulness of technology; especially during the COVID-19 pandemic: everybody wants to stay at home and prefers online education. In the current study, before the pandemic, the percentage of online teaching was almost 1%-20%, as 57.7% of respondents (students) indicated. During the COVID-19 pandemic, 63.7% of respondents showed that the percentage of online teaching increased to 81%-100%, and it may be due to the strict government policies put in place to keep a social distance, which is why almost all educational institutes, including medical schools, converted their system to online teaching.

In the current study, 31.1% were excited, and 18.6% were extremely excited, about online teaching this year. This excitement may be because online teaching is flexible regarding when or where students want to study. With this in mind, a survey of 27 UK medical schools found that flexibility was one of the distant learning's primary benefits in the post-COVID-19 period.<sup>28</sup> In addition, during the pandemic, medical schools needed help with the practical and clinical aspects of their curriculum being taught via online teaching. Our students were generally in favor of continuing online teaching after the pandemic was over. Still, it has also been found that student concerns can be increased over time, especially during the latter years of college, when students are most involved in the practical aspects of their studies. This is because, at this

point in their education, students need to interact with and examine real patients so that they may learn to distinguish different symptoms by in-person examination. Students' performance in these areas is essential for producing competent physicians in the future.<sup>29</sup> A similar conclusion was reached in a recent study conducted at one of the medical institutions in Saudi Arabia, which also advocated for the implementation of blended learning in the form of face-to-face instruction of practical components.<sup>30</sup>

In the present study, after completing the 5C course, knowledge about the management of COVID-19 had improved according to the response (81.5%), and 79.8% of participants were willing to advise younger students to attend the COVID-19 Critical Care Crash Course (5C). Because of the course, all the essential aspects related to the management of COVID-19 were highlighted, which is why most of the participants were satisfied with the course. Well-structured and organized e-courses have a more substantial influence on information acquisition and student performance than traditional learning and are associated with high satisfaction levels.<sup>31</sup>

One of the most common worries expressed by students in this research was related to too much time spent in front of a device. Another study had the same problem, too.<sup>32</sup> It also caused students to pay less attention in class. Students' ability to focus and learn from a lecture or other session should be maximized by keeping it to no more than 30 minutes.<sup>33</sup> Teachers sometimes use poll questions or quick quizzes to keep pupils "engaged" and paying attention during class. Lessons that would otherwise be too dry could be

enhanced with engaging case studies and videos.<sup>34</sup>

Additionally, access to fast and reliable internet significantly correlated with students' favorable impressions. Strong internet connections are necessary to use applications essential to effective online learning. Overall, faculty members were satisfied with online teaching and preferred online lectures with the help of professional educational videos. In the present study, faculty members highlighted that online teaching is an extra burden for them only six times. This minor concern needs to be addressed, as do other challenges or barriers. In the meantime, a possibly helpful approach can be to maximize uploads of online education courses in the form of videos to reduce the unnecessary duplication of recorded content, improving and enhancing the interaction between teachers and students. This is done through group discussions, and optimizing and integrating learning software to enhance the online learning experience.

## Conclusions

The medical education system was given a wake-up call during COVID-19 when a more robust system to face future and current difficulties was needed. After the pandemic, online education has become the new norm. In the present study, the perception of students and faculty members towards online teaching before and after the pandemic was assessed. Before the pandemic, there was almost 1%-20% of online teaching, while during the pandemic the percentage of online teaching increased to 81%-100%. Overall, students and faculty members were satisfied with online teaching. Still, the primary concern



was the practical sessions, as most students highlighted concerns over this and wanted more from the practical sessions. This means that, even after the pandemic, it will be acceptable to use online instructions for the theoretical components of medical curricula. However, for students to acquire practical skills, they must participate in face-to-face practical and clinical components. Quality assurance and standard guidelines or recommendations are needed for both students and medical schools to ensure efficient operation and maximize the potential of this modality. These findings suggest that to successfully shift to digital pedagogy in hybrid form and continue promoting learning and

interaction with our student's training after the pandemic, we should reflect on the institutionalization of distance education by learning from the experience gained during the COVID-19 pandemic. In this past year, students were more engaged with practical sessions. In the future, surveys should be conducted among students from different years to present a clearer picture regarding their theoretical and practical needs.

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#### ***Conflicts of Interest***

The authors declare no competing interests.

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## Appendix A

### 1) Cognitive (Knowledge)

The student were:

1. Able to perform preoperative assessment of patients presenting for various diagnostic and surgical procedures.
2. Have a working knowledge and be able to use tools and monitors that are routinely utilized during anesthesia and other situations to assess patients' vital signs.
3. Know the indications, contraindications, advantages and disadvantages for different options for anesthesia.
4. Have an understanding of different anesthesia and critical care services.

### 2) Psychomotor (Skills)

The participants acquired the following skills:

1. Vascular Sonography
2. Lumbar puncture
3. Basic Airway and Advanced Airway
4. Peri-operative Anesthesia skills management
5. Approach of Critical Care Ill Patient's Simulation Case
6. Basics of Mechanical Ventilation

### 3) Affective (Attitudes)

The participants were:

1. Punctual
2. Respectful of patients, medical, nursing, and support staff
3. Sympathetic with patients and their families
4. Supportive of patients wishes
5. Able communicate effectively with patients and their families

The module design consists of 24 Interactive Lectures, 5 Interactive practical sessions, and 14 self-directed learning sessions.

### Lectures:

24 interactive lectures to deliver knowledge based on the following topics:

1. General Anesthesia overview
2. General Anesthesia complication
3. Pharmacology of General Anesthesia
4. Safety & Medical errors in Anesthesia & Critical Care setting
5. Crisis Resource Management
6. Clinical Simulation in Anesthesia & Critical Care
7. Basic of Acid-Base Disturbances
8. Clinical approach to metabolic acid-base disorders
9. Clinical approach to respiratory acid-base disorders
10. Basic Principles of Mechanical Ventilation

11. Non-invasive Mechanical Ventilation
12. Invasive Mechanical Ventilation
13. Management of Shock
14. Types of Shock
15. Approach to shock patient
16. Acute Pain
17. Chronic Pain
18. Cancer Pain
19. Pre-op assessment I (History & Physical)
20. Pre-op assessment II (Optimization)
21. Obstetric Anesthesia
22. Regional Anesthesia Overview
23. Spinal Anesthesia
24. Epidural Anesthesia

### **Practical Sessions:**

#### 1. Anesthesia Practicum

##### 1.1 Lumbar Puncture

By the end of this session, students were familiar with: 1. Spinal cord anatomy. 2. Indications of lumbar puncture. 3. Contraindication of lumbar puncture. 4. Complication of lumbar puncture. 5. Procedure of lumbar puncture.

##### 1.2 Vascular Sonography

By the end of this session, students were able to demonstrate knowledge of:

1. Introduction to Ultrasound use: A. Introduction to ultrasound machine, transducer types, basic scanning techniques, and planes of view. B. Ability to distinguish arteries from veins with ultrasound.
2. Vascular sonography: A. Indications of central line. B. Contraindication of central line insertion. C. Complications of central line insertion. D. Procedure of central line insertion. E. Ability to distinguish carotid artery, jugular vein

##### 1.3 Airway Management

The aim of this session is to guide students to be able to demonstrate their airway skills competencies. Which include: 1. Understanding anatomy of airway. 2. To identify patients with compromised airway. 3. To perform maneuvers to open obstructed airway in patients with/ without cervical spine injury in manikins. 4. To be able to insert oropharyngeal and nasopharyngeal airways. 5. To perform facemask and bag mask ventilation in manikins. 6. To insert supraglottic airway (LMA) in manikins. 7. To be able to perform direct laryngoscopy. 8. To be able to choose the correct size of the endotracheal tube according to age and gender. 9. Identify the complications of endotracheal intubation. 10. The differences between supraglottic and infraglottic devices.

#### 2. Crisis Resource Management (CRM) Simulation

By the end of this session, students [in a small group exercise] were able to; 1. Introduced to the practical setting of High-fidelity Simulation and some of its capabilities. 2. List some moral and basic Clinical Simulation session rules and recommendations as the confidentiality agreement and the fiction contract 3. Be introduced to Debriefing-in-action method of feedback. 4. Identify elements of CRM during a facilitated discussion using multiple standard video scenes prepared for this particular subject 5. Demonstrate a team approach to a crisis event in a virtual simulated environment 6. Critique the application of CRM elements including leadership, communication, etc. 7. Reflect on their own thoughts and analyze the team performance 8. Formulate a future improvement plan for the simulated video-recorded scenario in group debriefing exercise facilitated by an expert debriefer.

### **3. Critical Care Overview and Fundamentals of Mechanical Ventilation**

By the end of this session, students were able to demonstrate knowledge of:

1. Critical Care Overview: A. Discover the Intensive Care Unit (ICU) overall environment. B. Become familiar with ICU devices and equipment. C. Explore documentation in ICU and read few examples of ICU flow charts. D. Establish a general approach to a critically ill patient. E. Understand the importance of communication skills in breaking bad news in ICU. F. Go through real-life cases to understand the concept of critical care management.

2. Fundamentals of Mechanical Ventilation: A. Learn the concept of negative and positive pressure ventilation. B. Understanding the physiological effects and complications of positive pressure ventilation. C. Indications of Mechanical Ventilation D. Understanding the basics of ventilators waveforms. E. Understating the basics of ventilator weaning and criteria for extubation.

### **4. Approach to critically ill Patient: Simulation session**

By the end of this session, students were able to;

1. Recognizes critically ill patient. 2. Perform a rapid initial assessment and intervention. 3. The importance of gathering essential information from focused history, physical examination and medical records as fast as possible. 4. Ability to prioritize patient care plans. 2. To effectively be able to utilize all available resources of health care providers, monitors, laboratory and radiological services. 3. Ability to undertake concurrent management i.e. simultaneously diagnose and treat the critically ill patient. 4. Management of life-threatening problems based on the “ABC Approach” Airway, Breathing, and Circulation. 5. To be able to reassess and re- evaluate the patient and the management plan frequently

### **5. 5C [COVID-19 Critical Care Crash Course]**

COVID-19 Critical Care Crash Course is an online training course through the Saudi Commission for Health Specialties Online Platform. In this module, the objectives for 5th year medical students are to have an over scope understanding of the following: 1. Impact of COVID-19 on Anesthesia Practice. 2. Critical Care Management of COVID-19 patients the course is a combination of lectures, interactive practices and quizzes.

**Self Directed Learning:**

During the time of self-directed learning students are required to finish the Short Answer Questions sheet. Objectives: 1. Understanding of preoperative Fasting Guidelines. 2. Over scope of Standard Anaesthesia Monitoring. 3. Understand Aldrete's Score 4. To be aware of criteria for discharging patients post Anaesthesia from recovery room You will receive with the module package the references to read and will help you to finish the task of short answer questions sheet.

**Module Implementation:**

The mode of delivering this module consisted of 24 Interactive Lectures, 5 Interactive practical sessions, 1 Online practical session (E-learning course; COVID-19 Critical Care Crash Course (5Cs) developed by the Saudi Commission for Health Specialties), and 14 self-directed learning sessions. Prior to COVID-19 pandemic the Lectures were giving in a large lecture room but due to the Pandemic it changed to online Lectures via Blackboard platform. The Practical sessions used to be held at clinical skill center but due to the Social distancing regulation, the practical sessions were given online through recorded videos and short power point presentation followed by divided small groups of students presenting to clinical skills and simulationcenter to demonstrate their ability to perform the skills and to be assessed by a faculty member. The course was administered 6 times through the academic year (3 male + 3 Female groups) standardization of teaching was ensured through standardizing the learning outcome (LOS), contents, hand-outs, as well as exams.

Students Assessment: