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Factors Influencing on Clinical Practice Medical Students during the COVID-19 Pandemics in a Medical School in Korea

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Abstract

This study was designed to identify factors affecting polyclinic (clinical practice) during COVID-19. Fourth-year medical students at K Medical University in Daejeon, South Korea were recruited, and 64 medical students ultimately agreed to participate in a survey about polyclinics in a regional emergency center over 4 weeks. Satisfy answers for 5th grade and 6th grade was 15 (53.6%) and 13 (46.4%) respectively. Dissatisfy answers of observation of the ICU for 5th grade and 6th grade was 10 (27.8%) and 26 (72.2%) respectively. Thus, there were more satisfy answers in 5th grade and less satisfy answers in 6th grade ($p < 0.05$). Based on the results of confirming significance for regression coefficient, several factors influencing the polyclinic were identified, and the following categories showed statistical significance ($p < 0.05$): for 6th grade, satisfy answers of the clinic hours showed 3.656 times more than dissatisfy answers, exempt from the operation room showed 21.596 times more than dissatisfy answers, observation of the intensive unit care (ICU) showed 0.054 times less than dissatisfy answers, and cares of the COVID-19 patients showed 6.962 times more than dissatisfy answers. We suggest that hybrid or virtual medical education such as the polyclinic utilizing standardized patients (SP) or augmented reality (AR) technologies at the virtual hospital or the real hospital. More medical students would be encouraged to participate the problem-based learning (PBL) or team-based learning (TBL) in so-called 'hybrid or virtual' polyclinic.

Keywords: Medical Students, COVID-19, Polyclinic, Hybrid or Virtual Education

1. INTRODUCTION

The polyclinic is one of the most fundamental medical school programs. It covers the real-time experience with any clinical processes treating patients, 'real' patients, and the general aspects of any hospital environment

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before any medical students acquire medical licenses. Various clinical processes or procedures involving patients provide medical students invaluable time to integrate all their knowledge, and their experiences transform into the fundamental and crucial foundations of their future medical careers. Furthermore, throughout their interactions with patients, the medical students learn basic communication skills and the essential attitudes and ethics toward patients. Therefore, the polyclinic is the key process of the medical education. It is rather apprenticeship education that tends to be less efficient nor effective through the entire group of medical students [1].

Moreover, it is oriented toward ‘hands-on’ education less than ‘put-in’ knowledge solely by experiencing any clinical procedures or processes. This ‘hands-on’ education emphasizes opportunities to acquire the necessary techniques or skills for more evolving primary care physicians [2]. Most of Korean medical schools have a polyclinic program which consists of the necessary subjects and optional subjects. The necessary subjects are the internal medicine, the general surgery, the obstetrics and gynecology, the pediatrics, the psychology, and the emergency medicine. The optional subjects are the rest of the medical subjects that the medical students may choose to participate. The duration of the necessary subjects is various, such as 12 weeks for the internal medicine, 6 weeks for the general surgery, the obstetrics and gynecology, the pediatrics, the psychology, and 4 weeks for the emergency medicine.

After the completion of the polyclinic, the student internship program also offers the intensive polyclinic lasts for approximately 7 to 8 weeks. This program provides an opportunity to become a ‘true’ member of the department who can participate in all the activities in the wards or the clinic hours as if the medical students would be almost in the internship program [3]. Therefore, this program would be so-called ‘field-oriented’ education which may be able to bring out more active, effective, participative, and autonomous activities and experiences for the medical students [1, 4]. At this medical school, this student internship program has been offered to the students as a more ‘in-depth’ polyclinic before the COVID-19 pandemic. Moreover, there is an outside student program so-called ‘Vision Experience’ program which medical students can choose their specialties. The medical student would undergo this special program for approximately 7 to 8 weeks before or after the polyclinic, and it has been successful and received great responses from the medical students according to the internal polls.

Since 2019, the COVID pandemic has word widely, and there are numerous risks increased for medical students who should be in the polyclinic. Under very strict quarantine mandates, there are various restrictions or limitations in the polyclinic, and the percentages of participation in any clinical activities among medical students have decreased compared to the pre-COVID situations. Despite of following the government quarantine mandates strictly, numerous medical students tested as positive and had to be quarantined during the period of the polyclinic. These results would cause major obstacles for both professors and medical students in terms of the clinical lectures and activities. Naturally, both the participation rates and quality of the polyclinic decreased, because the risks of infection increased.

In 2020, with most medical schools in Korea offering online courses, there are increasing reports that basic courses and clinical programs that require hands-on training have also transitioned to online programs for a limited time. For example, some medical schools transitioned anatomy, one of the basic subjects that require hands-on training, turned to online lectures or *e-learning* programs as part of their learning management system (LMS). However, other medical schools offered some hands-on training by holding smaller anatomy lectures or shortening the lecture time. In 2021, anatomy lectures were offered as hands-on training due to strict government quarantine guidelines. Of course, there was an unspoken fear among medical students, so we designed a study to measure "fear" through anatomy lectures and a questionnaire asking for feedback. Perhaps, in a pandemic situation, integrating hands-on training with online training would be a more effective

education and a powerful tool [5].

2. METHODOLOGY

This study surveyed 70 senior (5th and 6th grade) medical students at the K Regional Emergency Medical Center (KUREC) polyclinic in Daejeon, Korea. The survey was administered to students who had completed or nearly completed all courses at the polyclinic. A total of 60 (85.7%) students responded to the survey. The survey consisted of feedback and satisfaction with the 4-week clinical program at KUREC. The questionnaire was adapted from the 2022 Association of American Medical Colleges (AAMC) Medical School Graduate Questionnaire on clinical training and medical education experiences. The questionnaire consisted of 1) 5-point Likert scale questions on satisfaction with the general and specific clinical program, 2) simple yes/no questions on COVID-19 exposure or diagnosis, 3) simple yes/no questions on polyclinic during COVID-19, and 4) short-answer questions on improvements to the clinical program. The questionnaire was anonymous but asked for age and gender. All medical students participated in the study voluntarily; the purpose of the study was outlined at the top of the questionnaire. The survey was open for one week, and SPSS 18 was used for statistical analysis. The characteristic distribution of the results related to polyclinics was assessed using the chi-square test (χ^2). Characteristics of the study subjects affecting polyclinics were assessed by backward elimination logistic regression analysis. Based on these results, we identified improvements or gaps related to the polyclinics.

3. RESULTS

3.1 General characteristics of the medical students in the polyclinic and the overall satisfaction and feasibility of the polyclinic.

This study surveyed 70 medical students attending the polyclinic of the K Region Emergency Center (KUREC) in Daejeon, Korea, and 60 (85.7%) of them completed the survey. The gender distribution of the participants was 72% male (18) and 28% female (7) in the 5th year, and 48.7% male (19) and 51.2% female (20) in the 6th year. The age distribution of the participants was 96% (24) in their 20s and 4% (1) in their 30s in Grade 5, compared to 92.3% (36) in their 20s and 7% (3) in their 30s in Grade 6. COVID-19 infection status was 40% (10) "confirmed" and 60% (15) "undetermined" in 5th grade and 41% (16) "confirmed" and 58.9% (23) "undetermined" in 6th grade. Fifth graders had an overall satisfaction rate of 72%, 24% were satisfied, and 4% (1) were dissatisfied. Sixth graders had an overall satisfaction rate of 64.1%, 17.9% were satisfied, and 0% were dissatisfied. Overall satisfaction was higher for 5th graders compared to 6th graders. However, when asked about the need for the polyclinics during the pandemic, all fifth graders said yes, while 89.7% of sixth graders said yes, and 10.2% said no. When asked about in-person instruction, 60% of fifth graders answered: "virtual," compared to 48.7% of sixth graders who answered "virtual" and 51.2% who answered "in-person" (Table 1).

Table 1. General characteristics of the medical students in the polyclinic and the overall satisfaction and feasibility of the polyclinic

Variables		5 th grade (n)	6 th grade (n)
Gender	Male	72% (18)	48.7% (19)
	Female	28% (7)	51.2% (20)
Age	20s	96% (24)	92.3% (36)

	30s	4% (1)	7% (3)
Confirmation of COVID-19	Confirm	40% (10)	41% (16)
	Not-confirmed	60% (15)	58.9% (23)
Overall satisfaction	Satisfied	70% (18)	64.1% (25)
	Moderate	24% (6)	17.9% (7)
Feasibility	Agree	100% (25)	89.7% (35)
	Disagree	0% (0)	10.2% (4)
In-person education	Agree	60% (15)	48.7% (19)
	Disagree	40% (10)	51.2% (20)

3.2 Questionnaire for a clinical program of the polyclinic of the ‘subclinical’ and ‘non-symptomatic’, ‘confirmed’ COVID-19 patients, and overall satisfaction of detailed questions.

Clinical program of the polyclinic of the COVID-19 patients showed 25.6% of the 6th grade and 32% of the 5th grade answered ‘negative’ feedback about the ‘in-person’ education. In a similar analog, a question for the clinical program of the polyclinic of the ‘subclinical’ and ‘non-symptomatic’ COVID-19 patients showed 30.7% of the 6th grade and 24% of the 5th grade answered ‘negative’ feedback about the ‘in-person’ education. In other words, under the COVID pandemic, more than half of the 5th and 6th-grade medical students would agree to participate in any clinical program of the polyclinic for all types of COVID-19 patients if the governmental mandates for COVID-19 were strictly followed. The overall satisfaction of detailed questions for 5th grade listed primary care (90%), cardiopulmonary resuscitation (CPR) (87.5%), and trauma patient care (85.7%) in high order. The overall satisfaction of detailed questions for 6th grade was listed as primary care (91.8%), trauma patient care (75%), and cardiopulmonary resuscitation (CPR) (72.7%) in high order (Table 2).

Table 2. Questionnaire for the clinical program of the polyclinic of the ‘subclinical’ and ‘non-symptomatic’, ‘confirmed’ COVID-19 patients, and overall satisfaction of detailed questions

Variables		5 th grade(n)	6 th grade (n)
Confirmed patients	Agree	68% (17)	74.3% (29)
	Disagree	32% (8)	25.6% (10)
Subclinical & Non-Symptomatic	Agree	76% (19)	69.2% (27)
	Disagree	24% (6)	30.7% (12)
Overall satisfaction	Primary care	90% (18)	91.8% (34)
	Critical patients care	78% (11)	63.6% (21)
	Toxins/hyperbaric oxygen therapy	85% (12)	50% (16)
	Suture	77.7% (14)	71.9% (23)
	CPR	87.5% (14)	72.7% (24)
	Trauma patients care	28.7% (12)	75% (24)

3.3 Characteristic distribution of the 5th and 6th grade medical students in the polyclinic.

The Chi-squared verification was done to investigate the characteristic distribution of the 5th and 6th grade medical students in the polyclinic. The results for the denial of the patient interviews showed that the overall satisfaction was 58.3% (14 persons) for the 5th grade and 41.7% (10 persons) for the 6th grade, and the overall dissatisfaction was 27.5% (11 persons) for the 5th grade and 72.5% (29 persons). The overall satisfaction was higher in the 5th grade, but the overall dissatisfaction was higher in the 6th grade ($p<0.05$). The results for the clinical program at the intensive care unit (ICU) showed that the overall satisfaction was 58.6% (15 persons) for the 5th grade and 46.4% (13 persons) for the 6th grade, and the overall dissatisfaction was 27.8% (10 persons) for the 5th grade and 72.2% (26 persons). The overall satisfaction was higher in the 5th grade, but the overall dissatisfaction was higher in the 6th grade ($p<0.05$). These two characteristics showed the statistical significance (Table 3).

Table 3. Characteristic distribution of the 5th and 6th grade medical students in the polyclinic

Variables	Category	Total (n=64)	5 th grade (n=25)	6 th grade (n=39)	χ^2	<i>p</i> -value
Gender	Male	37	18(48.6)	19(51.4)	3.386	0.066
	Female	27	7(25.9)	20(74.1)		
Age	20s	60	24(40.0)	36(60.0)	0.354	0.552
	30s	4	1(25.0)	3(75.0)		
History of COVID-19 infection	Yes	26	10(38.5)	16(61.5)	0.007	0.935
	No	38	15(39.5)	23(60.5)		
Overall satisfaction	Satisfied	15	8(53.3)	7(46.7)	1.676	0.195
	Dissatisfied	49	17(34.7)	32(65.3)		
Primary care	Satisfied	52	18(34.6)	34(65.4)	2.304	0.129
	Dissatisfied	12	7(58.3)	5(41.7)		
ICU Program	Satisfied	32	11(34.4)	21(65.6)	0.591	0.442
	Dissatisfied	32	14(43.8)	18(56.3)		
Hyperbaric therapy	Satisfied	28	12(42.9)	16(57.1)	0.301	0.583
	Dissatisfied	36	13(36.1)	23(63.9)		
Suture	Satisfied	37	14(37.8)	23(62.2)	0.055	0.814
	Dissatisfied	27	11(40.7)	16(59.3)		
CPR	Satisfied	38	14(36.8)	24(63.2)	0.194	0.660
	Dissatisfied	26	11(42.3)	15(57.7)		
Trauma care	Satisfied	36	12(33.3)	24(66.7)	1.135	0.287
	Dissatisfied	28	13(46.4)	15(53.6)		
Denial of patient interview	Satisfied	24	14(58.3)	10(41.7)	5.991 [*]	0.014
	Dissatisfied	40	11(27.5)	29(72.5)		
Denial of operation room program	Satisfied	33	14(42.4)	19(57.6)	0.323	0.570
	Dissatisfied	31	11(35.5)	20(64.5)		
ICU clinical program	Satisfied	28	15(53.6)	13(46.4)	4.402 [*]	0.036
	Dissatisfied	36	10(27.8)	26(72.2)		
Contactless	Yes	34	15(44.1)	19(55.9)	0.779	0.378
	No	30	10(33.3)	20(66.7)		

COVID-19 patient	Yes	46	17(37.0)	29(63.0)	0.305	0.581
	No	18	8(44.4)	10(55.6)		
Subclinical/non-symptomatic COVID-19 patient	Yes	46	19(41.3)	27(58.7)	0.345	0.557
	No	18	6(33.3)	12(66.7)		

3.4. Logistic regression analysis for the effects of the characteristics of the study subjects toward the polyclinic.

The Backward Elimination Logistic regression analysis was done to verify the effects of the characteristics of the study subjects toward the polyclinic. The results showed the statistically significant in the Logistic regression (Hosmer & Lemeshow test $\chi^2=13.650$, $p=0.091$), the explanatory power of the Logistic regression was 48.1% (Nagelkerke $R^2=0.481$).

Based on the results for the significance of regression coefficients, the factors effecting the polyclinic were the following categories: the primary care showed the overall satisfaction 3.656 times higher than the dissatisfaction ($p<0.05$) in the 6th grade. The denial of the operation room program showed the overall satisfaction 21.596 times higher than the dissatisfaction ($p<0.05$) in the 6th grade. The ICU clinical program showed the overall satisfaction 0.054 times lower than the dissatisfaction ($p<0.05$) in the 6th grade. The clinical program for the COVID patient answered ‘Yes’ 6.962 times more than ‘No’ ($p<0.05$) in the 6th grade (Table 4).

Table 4. Logistic regression analysis for the effects of the characteristics of the study subjects toward the polyclinic

Variable		B	S.E.	ρ	Exp (B)	Low	High
Gender	Female(Ref)						
	Male	-1.425	0.743	0.055	0.241	0.056	1.033
Primary care	Dissatisfied(Ref)						
	Satisfied	2.158	0.959	0.024	8.656	1.321	56.731
Denial of patient interview	Dissatisfied(Ref)						
	Satisfied	-1.753	0.933	0.060	0.173	0.028	1.079
Denial of operation room program	Dissatisfied(Ref)						
	Satisfied	3.072	1.391	0.027	21.596	1.413	330.09
ICU clinical program	Dissatisfied(Ref)						
	Satisfied	-2.926	1.435	0.042	0.054	0.003	0.894
Contactless	No(Ref)						
	Yes	-1.293	0.717	0.071	0.274	0.067	1.118
COVID-19 patient	No(Ref)						
	Yes	1.940	0.898	0.031	6.962	1.198	40.445

Nagelkerke $R^2= 0.481$, Hosmer & Lemeshow test $\chi^2=13.650$ ($p=0.091$)

4. DISCUSSION

The polyclinic is one of the most important educational program in any medical schools, and throughout

this practical clinical program, the medical students are able to experience all possible clinical situations and to prepare for any similar circumstances ahead. Mostly, it provides opportunities for the medical students to encounter all diseases and patients which they learned throughout the lectures and textbooks. Based on this educational program, they are able to acquire various clinical skills and procedures and to manage the basic steps from diagnosis to treatments for patients by integrating their knowledge scientifically. Although the fundamentals of the polyclinic are to offer various similar clinical experiences for the medical students in order to obtain the necessary knowledge, attitude, clinical skills and procedures, most programs of the polyclinic are ‘apprenticeship’ which are very passive. Thus, its methods have always been an eye of the typhoon [6].

The inherent characteristics of the polyclinic are unstructured and nonsystematic naturally generating some unnecessary educational activities which cannot be totally excluded, and other studies published these issues. Numerous feedbacks from the medical students reported that they spend their times on low educational valued activities, such as ‘waiting’ for other students to finish the clinical procedures or ‘watching’ on other’s procedures [7]. The quality of the clinical programs in the polyclinic depends upon severely difference of various exposures to the individual situations at that time and unstructured coincident process. In addition to the ancillary factors, the cores of the polyclinic, which are the educational feedbacks and supervisions, were often limited because of the ‘apprenticeship’. Thus, more efficient and practical clinical programs would provide the medical students more effective the polyclinic [6].

The clinical skill program including CPX (Clinical Performance Examination) would be more effective and efficient if the residents and fellows would participate in those clinical programs on the polyclinic actively, and the student to teacher ratio would reduce comparing to the current ratio. According to the researchers from national and international studies, the medical students have chosen the residents and fellows as their mentors who provide lots of assistances and advices on the polyclinic. Also, most of monitors and feedbacks for the medical students are performed by the residents during the polyclinic [7, 8]

Generally, the residents tend to be more responsible and attentive toward the medical students on the polyclinic, because they believe that the act of teaching would be beneficial to their own medical careers as well. There are several facts to support these statements. First, they could spend most of their time with the medical students. Second, they could stay with patients long enough to evaluate and to teach the medical students directly. Third, they would be closer to the age of most medical students in order to form the relationship easier. Additionally, they could be not only teachers but also role-models to the medical students which later they would select the field of the medicine for their careers in the future. The medical students would mimic or imitate the residents to obtain the clinical skills or attitudes toward patients. Therefore, the residents are one of the crucial roles in the polyclinic. However, a lack of skills or expertise of the medical education and inadequate amount of time to prepare any lectures or to teach the medical students would be an obstacle to participate in any clinical programs or the polyclinic [6].

Recently, most of the national or the international medical schools would adopt the OSCE (Objective Structured Clinical Examination) and CPX (Clinical Performance Examination) using the Standardized Patients (SPs) to evaluate the clinical skills or attitudes for the primary care physicians. These examinations are more advanced forms of evaluations and have currently become the essential educational programs, because these examinations would evaluate the aptitude of the medical students and provide the specific feedbacks effectively [9].

Based on the results of this study, 90 % of the medical students would satisfy with the interview of patients on the primary care. The OSCE would be one of great tools for the medical students to evaluate the aptitude of the interviews and history taking skills on the primary care. Additionally, the SPs would become valuable resources to reduce any unnecessary time or energy in the polyclinic under the pandemic. And they would also

make the polyclinic more effectively and systematically efficient by following the government mandates for the COVID-19 effectively and strictly. Therefore, the utilization of the SPs would be one of good alternatives during the pandemic period.

Since the COVID-19 situations escalated into the pandemics, almost every educational programs including the medical school educational curriculums switched to the online education. The methodology of the medical school educations have not evolved as much as other fields of education, and there were some lacks of understanding of completely new breeds of lecturing approach and student oriented educational environments. It stirred various discussion and critics, because the current medical school curriculums have been held either in the lecture halls or in the hospitals where all the educational programs were performed for the medical students by physically participating and reviewing all knowledge and patients. Thus, the online educational programs were totally new concepts for the medical schools and students. Additionally, the needs of college level online educational programs for various adult students were modest. Of course, these online programs were temporary methods due to the pandemics. However, the medical school curriculums and educational programs would evolve from the current systems despite of termination of the pandemics [10].

During the COVID-19 pandemics, Nepalese study suggested 'distant virtual medical education' which was alternative educational program for students who physically could not participate in any of the medical educational programs including the lectures because of the geographic hindrances. Nepal has numerous mountainous terrain, and many of schools including the medical schools were temporarily closed down when the pandemics grew serious and severe. The medical education usually required lots of time, and online educational programs become suitable alternatives during the lock-down situation. However, this option was not apt for those students who could not afford the internet equipment, live in geographically remoted place where the internet service was not available, and have no private place due to quarantine with entire family. Nonetheless, they described 'distant virtual medical education' as acceptable alternatives, because it produced the effective results of more than expected until now [11].

Swiss study suggested 'Teamwork' which is the modular educational programs. Teamwork focused on 'team play' among medical staffs and personnel. It is similar to the multi-disciplinary conference or relationship at many medical schools and hospitals. In this way, they were able to keep the ongoing relationship with peers, and proper mixtures of 'contact' and 'contactless' for the medical educational programs could be suitable means to overcome the COVID-19 pandemics [12].

This 'hybrid' educational programs were also suggested by British researchers. They described this combination of 'hybrid' educational programs were the most efficient and effective to their medical students [13]. Other Swiss study suggested 'digital teaching' which switched all 'contact' lectures to 'contactless', totally online, educational programs since a small portion of contact lectures was done during the pandemics. They described that all lectures for the basic medicines and clinical programs could be arranged with this 'digital teaching'. All the digitalized lectures and the polyclinic using virtual patient (VP) could turn into the augmented reality (AR) [14].

Most Korean and international researchers would expect that this newly developed virtual medical educations or digital educational programs which were previously mentioned could become more efficient and better effective educational programs in the future as long as the medical schools maintain the proper numbers of the medical students and control the government mandates for the COVID-19. This new type of educational programs would improve previous problems in the polyclinic such as unnecessary waiting, unstructured clinical systems, and busy schedules of lecturers. It also would response to the government mandates for the COVID-19 easily [15].

All the medical students and other medical related personnel who completed their educations through

'Corona semester' can adopt earlier to those new systems such as 'telemedicine' or 'digital or virtual healthcare service' [16]. According to the previous researchers, all the knowledge and skills to diagnose and to manage any diseases are important, but the attitude toward any patients to disclose their hearts is also crucial for the medical education. All these aspects can be obtained with real patients and experiences [17]. Therefore, the standardized patient (SP) can be proper substitutes for the real patients in the polyclinic. First, the medical students or educators would not be pressured or ashamed by any improper languages or physical examinations. Second, the medical students could be less worrisome about the primary cares due to their lack of experiences. Third, it is impossible to select patients with adequate diseases in the real clinical situations and to provide the same conditions for the medical students. Fourth, it is unnecessary to obtain the consent from patients each time. Fifth, the medical students could see patients with proper levels at any given time and place. Sixth, well-trained SPs could simulate various physical reactions and emotional gestures toward all different questions and attitudes of the medical students. And then the medical students could receive their feedbacks immediately and objectively which enhance the effect of the medical educations. However, SPs would take numerous trainings, efforts, and times, and they would cause quite financial burdens [9].

5. CONCLUSION

The proper and efficient management of the polyclinic under the COVID-19 pandemic is the most important resolution for all the medical schools including this institute. Abiding by the government and WHO guidelines for the COVID-19, all the medical schools might need to scrutinize their facilities and faculties as well as all the enrollees. As previously stated, 'hybrid or virtual medical education' would be the essential medical education with the pandemic. It should contain the PBL (Problem-based learning) or TBL (Team-based learning) in the subgroups of the medical students. In restrict situations, the medical students could interact with the SPs to complete the polyclinic. The essential clinical skills or procedures could be learned through the Augmented Reality (AR) technology or online media or lectures. All these new medical education systems are not fully established yet under the pandemics, but they would become the standard medical educational methods in the foreseeable future.

REFERENCE

- [1] G.H. Park, Y.D. Lee, J.H. Oh, I. S. Choi, Y. M. Lim, & Y. Y Kim "Program development of student internship in Gachon medical school," *Korean Journal of Medical Education*, Vol. 15, No. 2, pp. 113-125, August 2003. <http://dx.doi.org/10.3946/kjme.2003.15.2.113>
- [2] S. H. Chang, D. S Ahn, S. W. Yoo, H. K. Kim. " A survey about improvements of clinical training in medical students." *Korean Journal of Medical Education*, Vol. 5 No. 1 pp. 34-40, October 1993. <https://doi.org/10.3946/kjme.1993.5.1.34>
- [3] Y. I. Kim. Workshop on Clinical Practice Education Planning. *Gacheon Medical School*, 2001. doi: <https://doi.org/10.3946/kjme>.
- [4] M. S. Lee. "What is Subinternship?" *Korean Journal of Medical Education, Appendix* pp.13-23. 2002.qu
- [5] S. J. Jung, K. R Park, J.H. Lee, "Students' Response to Anatomy Practice in era of the COVID-19 Pandemic,". *Anatomy & Biological Anthropology*, Vol. 34 No. 2 pp.39-43, June 2021.
- [6] J. H. Park, S. Kim. "evaluating clinical clerkship in medical school". *Korean Journal of medical education*, Vol. 16 No. 2 pp. 157-167, August 2004.
- [7] H. H. Van Der Hem-Stokroos, A. J.J.A. Scherpbier, C. P.M. Van Der Vleuten, H. De Vries, H. J.Th.M.

- Haarman. "How effective is a clerkship as a learning environment?" *Med Teach.*, Vol. 23 No. 6, pp. 599-604, October 2001. doi: 10.1080/01421590120091000.
- [8] Busari JO, Weggelaar NM, Knottnerus AC, Greidanus PM, Scherpbier AJ. "How medical residents perceive the quality of supervision provided by attending doctors in the clinical setting," *Med Educ*, Vol. 39 No. 7, pp 696-703, July 2005. doi 10.1111/j.1365-2929.2005.02190.x.
- [9] Yoon Ho Choi JJS, Joon Hyoek Lee, Chin Sang Chung, Kyung Pyo Hong, Byung Heon Ahn, Soo Eung Chai, Jung Don Seo. "The use of standardized patients in medical education," *Korean Journal of medical education*, Vol. 12, No. 2 pp. 353-361, 2000. doi: <https://doi.org/10.3946/kjme.2000.12.2.353>
- [10] H. Han. "Medical Education in the Era of Online Learning_ Challenges and Opportunities,". *Korean Medical Education Review*, Vol. 23, No. 3 pp. 145-146, October 2021.
- [11] Atreya A, Acharya J. " Distant virtual medical education during COVID-19: Half a loaf of bread, ". *Clin Teach*, Vol. 17, No. pp. 418-419, August 2020.
- [12] Weissmann Y, Useini M, Goldhahn J. "COVID-19 as a chance for hybrid teaching concepts," *GMS J Med Educ*, Vol. 38. No. 1, pp.1-5, January 2021. doi: 10.3205/zma001408
- [13] Dost S, Hossain A, Shehab M, Abdelwahed A, Al-Nusair L. "Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross-sectional survey of 2721 UK medical students," *BMJ Open*, Vol. 10. No. 11, pp.1-10, November 2020. doi :10.1136/bmjopen-2020-042378.
- [14] Tolks D, Kuhn S, Kaap-Fröhlich S. "Teaching in times of COVID-19. Challenges and opportunities for digital teaching," *GMS J Med Educ*, Vol. 37. No. 7, pp.1-6, December 2020. doi: 10.3205/zma001396
- [15] Cairney-Hill J, Edwards AE, Jaafar N, Gunganah K, Macavei VM, Khanji MY. "Challenges and opportunities for undergraduate clinical teaching during and beyond the COVID-19 pandemic," *J R Soc Med.*, Vol. 114. No. 3, pp.113-116, January 2021. <https://doi.org/10.1177/0141076820980714>
- [16] Thakur A, Soklaridis S, Crawford A, Mulsant B, Sockalingam S. "Using Rapid Design Thinking to Overcome COVID-19 Challenges in Medical Education," *Acad Med*, Vol. 96. No. 1, pp.56-61, January 2021. doi: 10.1097/ACM.0000000000003718.
- [17] Y. J. Hong. "Clinical education by using standardized patients," *Korean Journal of Medical Education*, Vol. 4. No. 2, pp.12-17, December 1970. <http://dx.doi.org/10.3946/kjme.1992.4.2.12>