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# Medical and nursing students' perceptions of online learning and pandemic preparedness during COVID-19 in Singapore

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## Abstract

**Introduction:** During the first wave of the COVID-19 pandemic in Singapore, clinical attachments for medical and nursing students were temporarily suspended and replaced with online learning. It is unclear how the lack of clinical exposure and the switch to online learning has affected them. This study aims to explore their perceptions of online learning and their preparedness to COVID-19 as clinical postings resumed.

**Methods:** A cross-sectional study was conducted among undergraduate and graduate medical and nursing students from three local universities, using an online self-administered survey evaluating the following: (1) demographics; (2) attitudes towards online learning; (3) anxieties; (4) coping strategies; (5) perceived pandemic preparedness; and (6) knowledge about COVID-19.

**Results:** A total of 316 responses were analysed. 81% agreed with the transition to online learning, most citing the need to finish academic requirements and the perceived safety of studying at home. More nursing students than medical students (75.2% vs 67.5%  $p=0.019$ ) perceived they had received sufficient infection control training. Both groups had good knowledge and coping mechanisms towards COVID-19.

**Conclusions:** This study demonstrated that medical and nursing students were generally receptive to this unprecedented shift to online learning. They appear pandemic ready and can be trained to play an active part in future outbreaks.

**Keywords:** Medical Students, Nursing Students, COVID-19, Pandemic, Online Learning, Survey

## I. INTRODUCTION

During the first wave of the COVID-19 pandemic in Singapore, the government implemented safe distancing and movement restriction orders in a bid to flatten the epidemiological curve. These measures from 7<sup>th</sup> April to 1<sup>st</sup> June 2020 were coined the “circuit breaker” period. Clinical attachments for medical and nursing students were suspended to lower the risk of COVID-19 transmission and to focus the hospitals’ efforts towards dealing with the outbreak.

Before the pandemic, students were embedded within clinical teams where they received bedside teachings,

practised communications with patients and acquired practical skills. Students perceive online learning during the pandemic to be less effective for acquiring clinical skills due to the absence of patient interaction and real-world practice (Wilcha, 2020). As the pandemic situation stabilised in Singapore, healthcare students gradually returned to the hospitals from May 2020. In one study, students were concerned about returning to the clinical settings as they perceived themselves as untrained and worried about the risks they might introduce to patients (Hernández-Martínez et al., 2021). This may arise from a lack of pandemic preparedness, which is not commonly incorporated into the medical and nursing school curriculum.

To date, there are no studies evaluating the perceptions of both local medical and nursing students towards the disruption of their studies by the pandemic, and whether these perceptions would be similar to those cited in the aforementioned study. Specifically, we aim to describe the perceptions of online learning and pandemic preparedness of medical and nursing students in Singapore during the “circuit breaker” period. Understanding this will help us create more effective learning strategies and reinforce their preparation for future pandemics.

## II. METHODS

### A. Study Design and Setting

This was a cross-sectional survey involving medical and nursing students from Yong Loo Lin School of Medicine (YLLSOM) and Alice Lee Centre for Nursing Studies (ALCNS), National University of Singapore (NUS); Duke-NUS Medical School (Duke-NUS); and Lee Kong Chian School of Medicine (LKCSOM), Nanyang Technological University (NTU). Students doing clinical attachments in healthcare institutions during the “circuit breaker” period were sent a link to a self-administered, anonymous online questionnaire. Participation was voluntary. Ethics approval for waiver of written informed consent was obtained from NUS Institutional Review Board (Reference number: NUS-IRB-2020-129).

### B. Study Instrument

The questionnaire comprised six parts with a total of 74 questions: (1) socio-demographic characteristics; (2) attitudes towards halting clinical attachments and shift to online learning; (3) anxieties towards the pandemic; (4) coping strategies; (5) perceived pandemic preparedness; and (6) specific knowledge about COVID-19. Responses were collected on Likert scales and the questionnaire was adapted from previous studies with permission. Minor modifications were made to standardise the terms used to refer to COVID-19 and online learning and to ensure understandability in Singapore's context, while preserving the original intent of the source studies. Content validity of the questionnaire was examined by three board-certified emergency physicians involved in undergraduate and postgraduate medical education.

### C. Survey Dissemination

The survey was disseminated to eligible students via email by each school's administrative staff, who were

not part of the study team. Four reminder emails were sent from September to October 2020.

### D. Statistical Analysis

Results were analysed using Stata 14 (StataCorp LP, College Station, TX). Categorical variables were reported as proportions in percentages and analysed using  $\chi^2$  test or Fisher's exact test, as indicated. A p-value of  $< 0.05$  was considered statistically significant.

## III. RESULTS

A total of 316 students were recruited between September and December 2020. 64.2% (203/316) were medical students, most of whom were from YLLSOM (147/203, 72.4%). The majority were between 21 and 29 years of age (250/316, 79.1%).

Table 1 details the respondents' attitudes towards clinical attachment and their perceived pandemic preparedness. Overall, 57% (180/316) of respondents agreed or strongly agreed with stopping clinical attachments. 81% (256/316) agreed with the shift to online learning. The two main reasons for preferring online learning were the need to finish academic requirements and the perceived safety of studying at home. Of those who disagreed, most preferred learning in the clinical areas and felt there was a lack of personal interaction with tutors and classmates via online learning.

With regards to pandemic preparedness, more nursing students agreed or strongly agreed they had received sufficient infection control training in school or the hospitals they were posted to (75.2% vs 67.5%  $p=0.019$ ) and had someone to turn to for advice on the use of personal protective equipment if uncertain ( $p<0.001$ ), compared to the medical students. They were also more likely to have received influenza vaccination ( $p<0.001$ ) or were recommended to do so ( $p=0.020$ ).

More than 70% of students used healthy coping strategies such as participating in relaxation activities and interacting with family and friends for support. More than 90% were aware of the basic facts about COVID-19, such as its origin, symptoms, transmission, and prevention methods. Supplementary tables of the complete survey results have been made openly available online at <https://doi.org/10.6084/m9.figshare.19646340>.

| Question  | Medical, n (%)<br>(n = 203) | Nursing, n (%)<br>(n = 113) | P value |
|---|-----------------------------|-----------------------------|---------|
| <b>Attitudes towards clinical attachments</b>   |                             |                             |         |
| 1. Do you agree with the stoppage of clinical attachments during the COVID-19 pandemic?   |                             |                             | 0.149   |
| • Strongly disagree   | 14 (6.9)                    | 5 (4.4)                     |         |
| • Disagree  | 29 (14.3)                   | 20 (17.7)                   |         |
| • Neutral   | 37 (18.2)                   | 31 (27.4)                   |         |
| • Agree   | 102 (50.3)                  | 43 (38.1)                   |         |
| • Strongly agree  | 21 (10.3)                   | 14 (12.4)                   |         |
| 2. Do you agree with the shift to online learning during this period? (n = 315)   |                             |                             | 0.016   |
| • Yes   | 173 (85.2)                  | 83 (74.1)                   |         |
| • No  | 30 (14.8)                   | 29 (25.9)                   |         |
| 2a. For respondents who answered "Yes" (n = 256):   | <b>N = 173</b>              | <b>N = 83</b>               |         |
| • I want to finish my academic requirements   | 132 (76.3)                  | 60 (72.3)                   | 0.488   |
| • I am bored at home and I miss doing academic tasks  | 42 (24.3)                   | 14 (16.9)                   | 0.179   |
| • Online classes are more convenient and practical than going for clinical attachments  | 63 (36.4)                   | 21 (25.3)                   | 0.076   |
| • It is about time to use online learning in medical school in lieu of clinical attachments, especially during a crisis like this | 97 (56.1)                   | 49 (59.0)                   | 0.654   |
| • It is safer to study at home than to go for clinical attachments  | 111 (64.2)                  | 47 (56.6)                   | 0.246   |
| 2b. For respondents who answered "No" (n = 59):   | <b>N = 30</b>               | <b>N = 29</b>               |         |
| • I do not have reliable broadband internet access or sufficient mobile data  | 4 (13.3)                    | 0                           | 0.112*  |
| • I do not have personal computers and smartphones  | 0                           | 0                           |         |
| • I find online learning challenging to complete  | 9 (30.0)                    | 10 (34.5)                   | 0.713   |
| • I prefer learning in the clinical areas   | 28 (93.3)                   | 27 (93.1)                   | 1.000*  |
| • I find online classes boring  | 14 (46.7)                   | 12 (41.4)                   | 0.683   |
| • I cannot learn through online classes   | 11 (36.7)                   | 16 (55.2)                   | 0.154   |
| • There is no personal interaction with my tutors and classmates  | 20 (66.7)                   | 19 (65.5)                   | 0.926   |
| <b>Pandemic preparedness</b>  |                             |                             |         |
| 1. I have received sufficient training for infection control in school or the hospital I am posted to.                            |                             |                             | 0.019*  |
| • Strongly disagree   | 1 (0.5)                     | 0                           |         |
| • Disagree  | 5 (2.5)                     | 1 (0.9)                     |         |
| • Not sure but probably disagree  | 4 (2.0)                     | 3 (2.7)                     |         |
| • Not sure but probably agree   | 56 (27.6)                   | 24 (21.2)                   |         |
| • Agree   | 101 (49.8)                  | 46 (40.7)                   |         |
| • Strongly agree  | 36 (17.7)                   | 39 (34.5)                   |         |
| 2. I have received adequate personal protective equipment training.   |                             |                             | 0.140*  |
| • Strongly disagree   | 1 (0.5)                     | 0                           |         |
| • Disagree  | 1 (0.5)                     | 1 (0.9)                     |         |
| • Not sure but probably disagree  | 7 (3.5)                     | 1 (0.9)                     |         |
| • Not sure but probably agree   | 37 (18.2)                   | 18 (15.9)                   |         |
| • Agree   | 107 (52.7)                  | 51 (45.1)                   |         |
| • Strongly agree  | 50 (24.6)                   | 42 (37.2)                   |         |
| 3. I have someone to turn to if unsure of use of personal protective equipment.   |                             |                             | <0.001* |
| • Strongly disagree   | 2 (1.0)                     | 0                           |         |
| • Disagree  | 4 (2.0)                     | 3 (2.7)                     |         |
| • Not sure but probably disagree  | 8 (3.9)                     | 3 (2.7)                     |         |
| • Not sure but probably agree   | 53 (26.1)                   | 10 (8.9)                    |         |
| • Agree   | 97 (47.8)                   | 52 (46.0)                   |         |
| • Strongly agree  | 39 (19.2)                   | 45 (39.8)                   |         |
| 4. My school has a preparedness plan for a COVID-19 pandemic.   |                             |                             | 0.359*  |
| • Strongly disagree   | 3 (1.5)                     | 2 (1.8)                     |         |
| • Disagree  | 11 (5.4)                    | 7 (6.2)                     |         |
| • Not sure but probably disagree  | 18 (8.9)                    | 9 (8.0)                     |         |
| • Not sure but probably agree   | 61 (30.1)                   | 46 (40.7)                   |         |

|  |            |           |          |
|--|------------|-----------|----------|
| • Agree  | 74 (36.5)  | 37 (32.7) |          |
| • Strongly agree   | 36 (17.7)  | 12 (10.6) |          |
| 5. I am personally prepared for the COVID-19 pandemic.                     |            |           | 0.272*   |
| • Strongly disagree  | 2 (1.0)    | 3 (2.7)   |          |
| • Disagree   | 9 (4.4)    | 11 (9.7)  |          |
| • Not sure but probably disagree   | 17 (8.4)   | 8 (7.1)   |          |
| • Not sure but probably agree  | 76 (37.4)  | 34 (30.1) |          |
| • Agree  | 87 (42.9)  | 48 (42.5) |          |
| • Strongly agree   | 12 (5.9)   | 9 (8.0)   |          |
| 6. I have been recommended to receive flu vaccination.                     |            |           | 0.020*   |
| • Strongly disagree  | 12 (5.9)   | 3 (2.7)   |          |
| • Disagree   | 26 (12.8)  | 11 (9.7)  |          |
| • Not sure but probably disagree   | 6 (3.0)    | 4 (3.5)   |          |
| • Not sure but probably agree  | 33 (16.3)  | 9 (8.0)   |          |
| • Agree  | 68 (33.5)  | 33 (29.2) |          |
| • Strongly agree   | 58 (28.6)  | 53 (46.9) |          |
| 7. I have received flu vaccination in the last 6 months.                   |            |           | < 0.001* |
| • Strongly disagree  | 69 (34.0)  | 11 (9.7)  |          |
| • Disagree   | 47 (23.2)  | 19 (16.8) |          |
| • Not sure but probably disagree   | 2 (1.0)    | 3 (2.7)   |          |
| • Not sure but probably agree  | 8 (4.0)    | 4 (3.5)   |          |
| • Agree  | 16 (7.9)   | 18 (15.9) |          |
| • Strongly agree   | 61 (30.1)  | 58 (51.3) |          |
| 8. I have bought anti-viral medications or hydroxychloroquine/chloroquine. |            |           | < 0.001* |
| • Strongly disagree  | 173 (85.2) | 74 (65.5) |          |
| • Disagree   | 29 (14.3)  | 35 (31.0) |          |
| • Not sure but probably disagree   | 0          | 3 (2.7)   |          |
| • Not sure but probably agree  | 0          | 1 (0.9)   |          |
| • Agree  | 0          | 0         |          |
| • Strongly agree   | 1 (0.5)    | 0         |          |
| 9. I have bought face masks.   |            |           | 0.710*   |
| • Strongly disagree  | 6 (3.0)    | 6 (5.3)   |          |
| • Disagree   | 13 (6.4)   | 7 (6.2)   |          |
| • Not sure but probably disagree   | 2 (1.0)    | 0         |          |
| • Not sure but probably agree  | 2 (1.0)    | 0         |          |
| • Agree  | 92 (45.3)  | 47 (41.6) |          |
| • Strongly agree   | 88 (43.4)  | 53 (46.9) |          |

Table 1. Attitudes towards clinical attachments during Singapore's circuit breaker period (7 April to 1 June 2020) and their perceived pandemic preparedness

\*Fisher's exact test

Cronbach's alpha for 9 items of pandemic preparedness = .60

#### IV. DISCUSSION

##### A. Paradigm Shift to Online Learning

Our study found that the majority were agreeable with transitioning to online learning during the pandemic. Unsurprisingly, given Singapore's digital connectivity, students in this study did not lack a reliable internet connection or access to technological devices – reasons why students in other countries found virtual teaching challenging (Wilcha, 2020). Among those who disagreed with the transition to online learning, more than 90% indicated they preferred learning in the clinical areas. They were also concerned about the lack of personal interaction with tutors and classmates. These were similar concerns reflected by medical and nursing students in other studies, who felt that online teaching could not adequately replace clinical teachings and learning of practical clinical skills, in the absence of direct patient contact. Lack of physical interaction with tutors and classmates can also result in reduced student engagement levels which may lead to less effective learning (Wilcha, 2020).

To address the perceived weaknesses of online learning, educators worldwide have increasingly adopted novel teaching methods. These include virtual simulations and ward rounds where students can interact with real patients, and simulated set-ups at home for clinical skills practice. In several studies, positive feedback was cited in terms of an increase in medical knowledge, clinical reasoning, and communication skills with these teaching methods (Wilcha, 2020). Our study focused on their perceptions of online learning in the initial phase of the pandemic. As the pandemic persists and with more experience in these innovative ways of online engagement, it is unclear whether the students may view online learning differently now.

It is also uncertain whether online learning is less effective in acquiring knowledge compared to clinical placements. Weston and Zauche (2021) found no difference in standardised assessment scores between nursing students who completed an in-person paediatric

clinical practice versus those who used high-fidelity virtual simulation software with pre-briefing and debriefing components. More research is needed to evaluate the effectiveness of technology-assisted education in imparting clinical competency compared with traditional bedside teaching.

### *B. Pandemic Preparedness*

In this study, we found most of the medical and nursing students felt they were prepared for the pandemic. However, a greater proportion of nursing students perceived they had received sufficient infection control training or had someone to seek advice on the use of personal protective equipment. More had also received the influenza vaccination or were recommended to do so. A previous study found that nursing students were superior to medical students in hand hygiene performance (Cambil-Martin et al., 2020). This was attributed to curriculum differences and less practical training in the healthcare setting for medical students. Our results may reflect similar curriculum disparities, suggesting a need to narrow this gap in pandemic preparation education.

A systematic review by Martin et al. (2020) found that medical students were keen to assist in responses to pandemics and other global health emergencies, in both clinical and non-clinical roles, citing social responsibility and an obligation to help. Having adequate training and knowledge were some factors encouraging their participation. In this study, we did not directly examine if students were willing to serve in the pandemic should the need arise. They however did demonstrate satisfactory basic knowledge about COVID-19 and had healthy coping strategies. This suggests they may be pandemic-ready and may be recruited to play a more active part in future outbreaks.

### *C. Limitations*

Our study has its limitations. First, the voluntary survey results are subjected to non-response bias. However, the demographics of responders were similar to the entire student body and should be representative of the cohort. Second, a cross-sectional survey does not allow the tracking of changes in responses over time. Third, the results may not be generalisable to other countries at varying stages of socio-economic development. Lastly, the results cannot capture responses outside the pre-set questionnaire. For this, qualitative studies would be required to further explore the impact of COVID-19 on the students' perceptions towards online learning and pandemic preparedness.

## V. CONCLUSION

The COVID-19 pandemic has disrupted the education of medical and nursing students in Singapore, causing an unprecedented shift from classroom teaching and bedside clinical attachments to online learning. Although this study demonstrated that medical and nursing students were generally receptive towards this paradigm shift, there is a need to continue implementing and refining online learning methods, especially in teaching clinical skills that are traditionally acquired at the bedside. Additionally, our study found that local medical and nursing students may be pandemic ready and can be trained to take an active part in future outbreaks.

### Notes on Contributors

Yiwen Koh reviewed the literature, designed the study, analysed the data and wrote the manuscript. Chengjie Lee performed data collection, analysed the data and critically revised the manuscript. Mui Teng Chua advised on statistical analysis methods, analysed the data and critically revised the manuscript. Beatrice Soke Mun Phoon performed data collection and critically revised the manuscript. Nicole Mun Teng Cheung designed the study instrument and critically revised the manuscript. Gene Wai Han Chan reviewed the literature, conceptualised the overall design of the study and critically revised the manuscript. All authors have read and approved the final manuscript.

### Ethical Approval

Ethics approval for waiver of written informed consent was obtained from the NUS Institutional Review Board (Reference number: NUS-IRB-2020-129).

### Data Availability

The ethical approval by NUS Institutional Review Board was based on the conditions that only study team members will have access to the raw data that will be stored in a password-protected file. A copy of the survey questions and the additional tables of survey results are openly available at

<https://doi.org/10.6084/m9.figshare.19646340>

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### Declaration of Interest

The authors have no conflicts of interest to declare.

### References

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Cambil-Martin, J., Fernandez-Prada, M., Gonzalez-Cabrera, J., Rodriguez-Lopez, C., Almaraz-Gomez, A., Lana-Perez, A., & Bueno-Cavanillas, A. (2020). Comparison of knowledge, attitudes and hand hygiene behavioral intention in medical and nursing students. *Journal of Preventive Medicine and Hygiene*, 61(1), E9–E14. <https://doi.org/10.15167/2421-4248/jpmh2020.61.1.741>

Hernández-Martínez, A., Rodríguez-Almagro, J., Martínez-Arce, A., Romero-Blanco, C., García-Iglesias, J. J., & Gómez-Salgado, J. (2021). Nursing students' experience and training in healthcare aid during the COVID-19 pandemic in Spain. *Journal of Clinical Nursing*. <https://doi.org/10.1111/jocn.15706>

Martin, A., Blom, I. M., Whyatt, G., Shaunak, R., Viva, M., & Banerjee, L. (2020). A rapid systematic review exploring the involvement of medical students in pandemics and other global health emergencies. *Disaster Medicine and Public Health Preparedness*, 1–13. <https://doi.org/10.1017/dmp.2020.315>

Weston, J., & Zauche, L. H. (2021). Comparison of virtual simulation to clinical practice for prelicensure nursing students in pediatrics. *Nurse Educator*, 46(5), E95–E98. <https://doi.org/10.1097/NNE.0000000000000946>

Wilcha, R. J. (2020). Effectiveness of virtual medical teaching during the COVID-19 crisis: systematic review. *JMIR Medical Education*, 6(2), e20963. <https://doi.org/10.2196/20963>

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