

Submitted: 21 August 2020  
Accepted: 12 November 2020  
Published online: 4 May, TAPS 2021, 6(2), 57-65  
<https://doi.org/10.29060/TAPS.2021-6-2/OA2378>

# The COVID-19 pandemic: Impact on interns in a paediatric rotation

Nicholas Beng Hui Ng<sup>1,2</sup>, Mae Yue Tan<sup>1,2</sup>, Shuh Shing Lee<sup>3</sup>, Nasyitah binti Abdul Aziz<sup>3</sup>, Marion M Aw<sup>1,2</sup> & Jeremy Bingyuan Lin<sup>1,2</sup>

<sup>1</sup>*Khoo Teck Puat-National University Children's Medical Institute, National University Health System Singapore;* <sup>2</sup>*Department of Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore, Singapore;* <sup>3</sup>*Centre for Medical Education (CenMED), Yong Loo Lin School of Medicine, National University of Singapore, Singapore*

## Abstract

**Introduction:** The coronavirus disease 2019 (COVID-19) pandemic has brought about additional challenges beyond the usual transitional stresses faced by a newly qualified doctor. We aimed to evaluate the impact of COVID-19 on interns' stress, burnout, emotions, and implications on their training, while exploring their coping mechanisms and resilience levels.

**Methods:** Newly graduated doctors interning in a Paediatric department in Singapore, who experienced escalation of the pandemic from January to April 2020, were invited to participate. Participants completed the Perceived Stress Scale (PSS), Maslach's Burnout Inventory (MBI), and Connor Davidson Resilience Scale 25-item (CD-RISC 25) pre-pandemic and 4 months into COVID-19. Group interviews were conducted to supplement the quantitative responses to achieve study aims.

**Results:** Response rate was 100% (n=10) for post-exposure questionnaires and group interviews. Despite working through the pandemic, interns' stress levels were not increased, burnout remained low, while resilience remained high. Four themes emerged from the group interviews – the impacts of the pandemic on their psychology, duties, training, as well as protective mechanisms. Their responses, particularly the institutional mechanisms and individual coping strategies, enabled us to understand their unexpected low burnout and high resilience despite the pandemic.

**Conclusion:** This study demonstrated that it is possible to mitigate stress, burnout and preserve resilience of vulnerable healthcare workers such as interns amidst a pandemic. The study also validated a multifaceted approach that targets institutional, faculty as well as individual levels, can ensure the continued wellbeing of healthcare workers even in challenging times.

**Keywords:** COVID-19, Stress, Burnout, Resilience, Junior Doctor, Intern

## Practice Highlights

- Intern doctors face additional and unique challenges in a pandemic, besides the usual stresses of their school-to-work transition.
- Our study shows that a multi-faceted approach that target institution, faculty and individual can lead to reduced burnout and preserved resilience in these doctors.

## I. INTRODUCTION

With the coronavirus disease 2019 (COVID-19) pandemic, there are new stressors contributing to burnout in healthcare workers. We were particularly interested in evaluating the impact of COVID-19 on newly qualified doctors doing their internship, also known as House Officers or post-graduate year 1 doctors in Singapore. This is a particularly vulnerable group of healthcare workers as the school-to-work transitional year is

traditionally a challenging period with high reports of burnout (Low et al., 2019; Sturman et al., 2017).

In Singapore, our first case of COVID-19 was on 23 January 2020. By February 2020, Singapore had one of the highest numbers of cases out of China (Chia & Moynihan, 2020). A global pandemic was declared on 12

March 2020. In early April 2020, the government tightened local measures with a ‘Circuit Breaker’, akin to the lockdowns in many countries (Ministry of Health Singapore, 2020).

Newly graduated doctors in Singapore complete a 12-month training period (4-month rotations in 3 different disciplines) prior to full medical registration. The period of January to April 2020 was during their third block and coincided with the full evolution of the pandemic, which came with multiple unexpected changes in work within the hospital. These included new protocols for personal protection, team segregation and mechanisms to cope with the increase in COVID-19 cases. In our department, interns and residents were divided into active and passive teams rotating fortnightly, where the active team had to shoulder the responsibility of caring for at risk or COVID-19 paediatric patients, with an intense overnight call duty schedule, different from the weekly frequency in the non-pandemic setting. In addition to work changes, there were also cancellation of overseas leave as well as cessation of scheduled teaching sessions.

With these changes, we aimed to evaluate the impact of the COVID-19 pandemic on interns in our department, focusing on their psychological well-being in terms of stress and burnout, and impact on clinical training. Our secondary aim was to explore the interns’ resilience, coping mechanisms and identify systemic measures they perceived as helpful during this pandemic.

## II. METHODS

### A. Study Design and Sample

This was a mixed-methods quantitative and qualitative study involving interns who worked from January to April 2020, in a paediatric department at a tertiary academic hospital that actively admitted COVID-19 patients. Informed consent was obtained from all participants for both the quantitative and qualitative components of the study.

### B. Quantitative Data Methodology

Pre-pandemic data on perceived stress, burnout and resilience levels were collected a priori in early January 2020, when the interns first joined the department. This was part of a baseline evaluation of a separate study. We employed validated scales: the Perceived Stress Scale (PSS) (Cohen et al., 1983), the Maslach Burnout Inventory (MBI) for Health Services Survey (Maslach & Leiter, 2016), and the Connor-Davidson Resilience Scale 25-item (CD-RSIC 25) (Connor & Davidson, 2003) to measure stress, burnout and resilience respectively. The PSS measures the perception of stress, and is designed to tap how unpredictable, uncontrollable,

and overloaded respondents find their lives. Scores ranging from 0-13, 14-26, and 27-40 are mild, moderate, and high perceived stress, respectively. The MBI is a 22-item inventory with scores in 3 domains of burnout: emotional exhaustion (EE), depersonalization (DP), and low personal accomplishment (PA) based on multiple questions for each of these subscales. We used a strict definition of burnout as having fulfilled criteria in all 3 domains of the MBI (i.e. high EE  $\geq$  27, high DP  $\geq$  10, and low PA  $\leq$  33). A liberal definition (i.e. high EE  $\geq$  27 and high DP  $\geq$  10 with or without a low PA) was also measured as both definitions are widely adopted in literature (Rotenstein et al., 2018). The CD-RISC 25-item (English version) is a validated scale to measure resilience. It gives a score ranging from 0 to 100, with higher scores reflecting greater resilience. On completion of the posting in end April 2020, the interns repeated the same set of questionnaires.

### C. Qualitative Data Methodology: Group Discussions

We conducted group interviews to further evaluate the responses obtained from the questionnaires and to better understand the impact on the interns. Invitation emails were sent to all interns; participation was voluntary. The questions were developed to explore the challenges, emotions, psychological states and reflections of their coping mechanisms and supportive measures of the interns while working in the pandemic. The questions were developed and refined by the authors after discussion and consensus (Appendix 1). Two group interviews were conducted on separate days by the same interviewer, to maintain team segregation and physical distancing. Each group had 5 participants. The sessions were recorded and subsequently transcribed by an independent party.

### D. Data Analysis

Quantitative data on the validated scales were scored according to the corresponding manuals. Descriptive and comparative analysis was done with SPSS, Version 23. For the interviews, thematic analysis was conducted. Two of the authors (SS & NAA) read the transcripts to understand fully the data, generated the initial codes independently. Next, codes with consistently similar content were grouped into sub-categories, and similar sub-categories were then combined into categories to form themes. In the event there were differing views on the coding or theme, they re-examined the primary data and further discussed to achieve consensus.

## III. RESULTS

### A. Quantitative Results

We had a 90% response rate (n=9) for the pre-exposure and 100% (n=10) for the post-exposure questionnaires.

There was no change in PSS scores among the interns despite the pandemic, with both median scores in the moderate stress category at 17.5 post-exposure and 17 pre-exposure. There was no high perceived stress in all interns post-exposure. Using the strictest definition of burnout, burnout remained low at 20% post-exposure, compared to 11.1% pre-exposure (Table 1). When a

more liberal definition of burnout is used as discussed in the methodology section, only 20% of participants were burnout post-exposure, compared to 66.7% of participants pre-exposure. High resilience levels were maintained, with median score of 74 pre-exposure and 72.5 post-exposure.

Measures	Pre-exposure, (n=9)	Post-exposure, (n=10)	p value
<b>Perceived Stress Scale (PSS)</b>			
Median (SD)	17 (6.75)	17.50 (5.70)	N.A
Low stress, n (%)	4 (44.4%)	3 (30%)	0.65
Moderate stress, n (%)	4 (44.4%)	7 (70%)	0.37
High stress, n (%)	1 (11.1%)	0 (0%)	0.474
<b>Maslach Burnout Inventory (MBI)</b>			
No burnout, n (%)	3 (33.3%)	4 (40.0%)	0.999
Strict definition of burnout, n (%)	1 (11.1%)	2 (20.0%)	0.999
Liberal definition of burnout, n (%)	6 (66.7%)	2 (20%)	0.09

Table 1: Quantitative results showing scores on the Perceived Stress Scale and Maslach Burnout Inventory of the interns pre-pandemic, compared with scores post-exposure. (SD= Standard Deviation).

### B. Qualitative Results

We had 100% participation in the group interviews (n=10). Four themes emerged from the qualitative

analysis – psychological impact (feelings), impact on duties, impact on teaching and learning as well as preventive measures and support system. These are summarised in Table 2.

<b>Key Theme 1: Psychological Impact (Feelings)</b>	
<b>Sub-themes</b>	<b>Sample of quotations</b>
a) Loss of control coping with many changes	“...throughout the pandemic, there were a lot of unexpected changes and uncertainty among the junior doctors especially the PGY1s (referring to interns)...”
b) Emotional exhaustion (fear, burnout, uncertainty, loneliness)	“...COVID gives people much stress due to the uncertainty in a lot of things...” “the thought of COVID patients is scary” “...if I really contract this (COVID-19) I wouldn’t have too much concern (but) I was more scared I would pass it on to my family “...stress stemming from fear” “... cannot help but experienced feelings of isolation and loneliness... I avoided my mother, who is immunocompromised as I worry about passing the infection to her even when I am off active COVID-care duty...” “feeling of being protected alleviated stress and concerns related to contracting the virus”
c) Positive feelings	“...months during pandemic (in the posting) were enriching and enjoyable...” “working during pandemic is deemed as “a badge of honour” “felt the months during pandemic situation was a ‘good learning experience’”

<b>Key Theme 2: Impact on Duties</b>	
<b>Sub-themes</b>	<b>Sample of quotations</b>
a) Changes in clinical duties	“felt that manpower shortage coupled with more frequent on-call duties within two weeks causes early burnout”
b) Dealing with rapidly changing protocols	“...I think on the ground level the protocol is always bleak, for example who to swab and when...” “delayed updating of protocol online led to a bit of confusion” “not getting updated instantaneously and lack of accessible to the information”
<b>Key Theme 3: Impact on Teaching and Learning</b>	
<b>Sub-themes</b>	<b>Sample of quotations</b>
a) Clinical exposure	“...in terms of the variety of cases in posting, it is significantly affected due to pandemic that changed demographic of attendees”
b) Changes in teaching approaches	“...there wasn’t much teaching on-going until recently when we got the online platforms which I do feel is more helpful...” “due to having lesser patients, feels consultants have more time to teach” “while there is no group teaching, there is more teaching of cases on wards”
<b>Theme 4: Protective Measures and Support System</b>	
<b>Sub-themes</b>	<b>Sample of quotations</b>
a) Rotation system which ensured sufficient manpower and rest	“...we have enough manpower to actually toggle between the rotations for COVID-care and non-COVID services...”
b) Institutional measures for personal protection against COVID-19 infection	“...PGY1s (Interns) are protected as we don’t swab the patients and we don’t have to expose ourselves to the possible aerosolisation of the secretions, so I think that really protected us and relieved our stress...”
c) Seniors, Peers and Staff support	“... regular meetings (with) seniors that sat down to uncover our worries... seniors were open to taking feedback about rostering and manpower...” “...I really think it’s the support that has been given by the department and the institution, and the seniors especially have been very supportive...”
d) Self-adaptability and resilience	“...think of the hardships faced by other health professionals, one’s situation will not compare to theirs” “...stay strong, persevere, and that everyone will get through it together by supporting each other” “...remember that it was a choice and that it is also a privilege to be in medicine...”

Table 2: Summary of key themes and sub-themes as well as verbatim quotations from our interns, from the group interviews.

1) *Theme 1 – Psychological Impact (Feelings)*: Most interns perceived that the pandemic had caused drastic changes in their personal and work lives, with various psychological impacts. They expressed increased emotional exhaustion such as stress and burnout, that is mainly related to changes in their clinical duties (Theme 2). The interns also shared about risks of COVID-19 infection to self and especially to family and loved ones, increasing their worries and stress. Interns followed physical distancing measures and team segregation at work, but several interns avoided their loved ones at home, especially the elderly and immunocompromised. For these interns, they further shared feelings of isolation and loneliness. Positive emotions such as feeling secure,

valued and protected existed simultaneously and were mainly associated with the protective measures and support systems (Theme 4) in the workplace. Some also reported that the posting was still enjoyable and felt proud to be working in the pandemic.

2) *Theme 2 – Impact on Duties*: The interns highlighted there were many changes in institutional work processes and their duties due to the pandemic. Due to manpower changes, there were pervasive reports of physical fatigue. There were however those who felt the workload was still manageable. Interns also raised the issue of non-timely information and unclear protocols which often led to confusion and uncertainty in their work.

3) *Theme 3 – Impact on Teaching and Learning:* There were mixed comments on this. As a result of strict physical distancing and team segregation, initial planned teaching sessions on general paediatrics were cancelled and the interns felt they “missed out” on their clinical training. Sessions were subsequently conducted using web-based platforms, which many found helpful. All interns felt that learning was restricted in the pandemic. Although it was beneficial to learn about pandemic response and management of suspected or affected COVID-19 patients, they felt their exposure to general paediatrics was reduced due to the limited variety of ward cases. However, there were some who felt there was better quality of teaching on the ward rounds as consultants had more time to teach with fewer elective and non-urgent cases in the rotations of non-COVID care.

4) *Theme 4 – Preventive Measures and Support Systems:* Despite the impacts on the interns’ psychology, duties and learning, they also shared on the various protective measures and support systems they perceived helped them cope. This was also the main reason for reported positive feelings of protection and support. Departmental and institutional work processes were implemented to take care of the interns’ physical and psychological welfare such as a rotational system of team segregation, which they reported provided a strict work-rest cycle as well as respite from COVID-care. In addition, seniors and faculty also ensured interns were competent and comfortable dealing with COVID-19 patients prior to taking on high risk duties such as swabbing patients. Support from multiple levels (seniors, department, institution) helped them through. In particular, the seniors and faculty provided support to the interns through regular “check-in” meetings where they could share concerns and provide feedback. The interns also shared that as a result of the strong support received, they were able to develop adaptability, perseverance and resilience, and they were even grateful to be in healthcare at this time.

#### IV. DISCUSSION

According to the demand-control-support model (Thomas, 2004), occupational stress causes burnout when job demands are high, individual autonomy is low and when job stress interferes with home life (Campbell et al., 2001; Linzer et al., 2001). On that note, we hypothesised that with the COVID-19 pandemic, interns would have increased stress and burnout, in addition to their routine difficulties in the transition from student to doctor. The pandemic-related concerns our interns had were similar to many healthcare workers globally – including the fear of contracting COVID-19 and more so transmitting it to vulnerable loved ones (Chen et al.,

2020). Physical fatigue was also seen in our interns given the more intensive work schedule (Sasangohar et al., 2020). Although the total amount of admissions during the period was reduced to 40% of the usual load, the need for team segregation had led to a smaller pool of interns covering each clinical area. In addition, each intern had to do more in-house night calls while on active service. Segregation also meant that there would be less cross-coverage of duties where interns would receive less support from peers who would otherwise have been able to help with the workload on the ground. Another important aspect that had led to reported stress among many was the frequent changes in clinical workflows coupled with the lack of timely and reliable information (Wu et al., 2020). Many interns also highlighted concerns with regards to compromise and interference with their paediatric internship training (Liang et al., 2020). Despite all these, objectively the interns’ perceived stress was maintained without increase in burnout.

Burnout is known to be inversely related to resilience – this pattern is also reflected in our results. Resilience is the process of adapting well in the face of adversity, trauma, tragedy, threats or even significant sources of stress (Southwick et al., 2014). Our interns had high resilience scores, above what has previously been published among physicians (McKinley et al., 2020). One reason for this may be the development of resilience through a time of crisis, a phenomenon well encapsulated by the Crisis Theory: during a crisis or disequilibrium such as the current pandemic, people make attempts to adapt and seek solutions to restore stability. (Brooks et al., 2017; Caplan, 1964). The development of resilience is increasingly emphasised as an integral strategy to combat burnout. Potentially, the mitigating factors, coping mechanisms and support shared by our interns in the interviews, could explain their low burnout and high resilience.

Our interns perceived many systemic measures helped them cope with the pandemic – giving testament to the importance of institutional leadership in implementing safeguards for psychological health (Dewey et al., 2020; Wu et al., 2020). Protocols relating to staff protection, availability of personal protective equipment (Rasmussen et al., 2020) were some of the measures common to institutions worldwide. Furthermore, interns being the most junior member of the team, were spared from doing aerosolising procedures such as intubation, nebulisation administration and airway suctioning that were deferred to clinicians with prior experience and training. This allowed interns time to learn and improve in their competency and confidence prior to assuming these responsibilities. The interns were also thankful for the protected work-rest cycles (Wu et al., 2020), and that they were allowed to take paid leave – which is essential,

more so in the pandemic to reduce fatigue and allowed time for rejuvenation.

Other than institutional support, direct support from seniors and faculty were significant in our interns' responses in helping them, supporting the importance of mentorship (Ramanan et al., 2006). Despite feeling that they might not have reliable and timely access to important updates, they felt supported under the direct guidance of seniors who took the lead on the ground. Regular fortnightly 'check-in' sessions were conducted to elicit concerns, obtain feedback, and ensure continual wellbeing. This channel of communication was well received by interns: they appreciated the faculty's concerns, had the autonomy of being able to input and contribute to the care of patients, the opportunity to air grievances confidentially and importantly, had closure on concerns they have raised regarding their rotations and training (Fischer et al., 2019). The enhanced collegiality between interns, support from seniors and improved cooperation among healthcare workers during this time of crisis naturally also contributed to reduced burnout levels, a finding well established in literature. (Li et al., 2013)

In terms of the impact of training, teaching sessions were initially discontinued to maintain physical distancing. Moreover, the interns had a higher proportion of time spent in the provision of COVID-19 care, which meant traditional general paediatric exposure was compromised. However, within 4 weeks of the pandemic, departmental teaching activities were restored via web-based sessions which interns found useful. The role of faculty in persisting with academic continuity, is again important in mitigating the impact of the pandemic on learning – some interns felt they had more teaching on the wards as consultants had more time to teach for each patient.

We believe that the perceived continual institutional and senior support for our interns allowed them to maintain high personal resilience, that could have mitigated their stress and burnout. In this pandemic, interns demonstrated adaptability and perseverance to the many changes, ability to persevere as well as finding gratitude amidst the challenges and focusing on their goal to help patients and fight the pandemic, which are all known features of resilience (Bird & Pincavage, 2016; Zwack & Schweitzer, 2013).

To our knowledge, this is the first research study in the pandemic that objectively evaluated the impact of the COVID-19 on interns' psychological state, resilience and training. However, we recognise our study limitations. The small population would mean that it

would be difficult to derive statistical comparisons in the pre- and post-exposure results. However, we believe the temporal exposure of the pandemic for this group of interns during their posting, made the pre- and post-pandemic results valid. The results were further supported by qualitative findings from a good group interview participation (100%) and in-depth discussion, that provided substantial explanations to the trend of results. We recognise that 2-4 months might be a short duration for negative psychological effects such as stress, and burnout to set in. Nonetheless, the amount of unprecedented changes and intensity of work for the interns involved within this period, were undoubtedly high. Another study limitation is the inclusion of Paediatric interns only and the possible lower exposure to COVID-19 as compared to their adult counterparts due to decreased disease morbidity and mortality in children. Although this factor could potentially result in less impact on the psychological factors studied, we believe other interns are likely to face similar concerns and challenges in the pandemic, due to their similar backgrounds and job scopes across most departments and disciplines.

This study elucidated the impact of the pandemic on interns in terms of their stress, burnout, as well as clinical duties and training. Despite increasing concerns on the psychological well-being of healthcare workers in the pandemic, our study has demonstrated that it is possible to mitigate their stress, burnout and preserve resilience, even in vulnerable new medical graduates. Our findings objectively validated the importance and effectiveness of the multi-faceted approach that target institution, faculty as well as the individual level, to build resilience and combat burnout in healthcare providers in this pandemic and beyond.

#### Notes on Contributors

Nicholas BH Ng contributed to conception and design of study, interpretation of data, drafting and critical revising of the article. Mae Yue Tan contributed to analysis and interpretation of data, drafting and critical revising of the article. Shuh Shing Lee contributed to analysis and interpretation of data, drafting and critical revising of the article. Nasyidah bte Abdul Aziz contributed to analysis and interpretation of data, drafting of the article. Marion M Aw contributed to interpretation of data, drafting and critical revising of the article. Jeremy BY Lin contributed to conception and design, interpretation of data, drafting and critical revising of the article. All authors gave final approval of the version to be published.

## Data Availability

The data for this study can be found at <https://doi.org/10.6084/m9.figshare.12924029.v1>. The access to these datasets are available for use subject to approval of the authors of this article.

## Ethical Approval

Ethics approval was obtained from the NHG Domain Specific Review Board (DSRB), with NHG DSRB reference number of 2020/00392.

## Acknowledgement

The authors would like to thank the interns who participated in this study.

## Funding

Funding for this study was obtained from NUHS Fund Limited – Medical Affairs (Education) Fund.

## Declaration of Interest

All authors have no conflicts of interest to declare.

## References

- Bird, A., & Pincavage, A. (2016). A curriculum to foster resident resilience. *MedEdPORTAL*, 12, 10439. [https://doi.org/10.15766/mep\\_2374-8265.10439](https://doi.org/10.15766/mep_2374-8265.10439)
- Brooks, S. K., Dunn, R., Amlôt, R., Rubin, G. J., & Greenberg, N. (2017). Social and occupational factors associated with psychological wellbeing among occupational groups affected by disaster: A systematic review. *Journal of Mental Health*, 26(4), 373-384. <https://doi.org/10.1080/09638237.2017.1294732>
- Campbell, D. A., Jr., Sonnad, S. S., Eckhauser, F. E., Campbell, K. K., & Greenfield, L. J. (2001). Burnout among American surgeons. *Surgery*, 130(4), 696-702; discussion 702-695. <https://doi.org/10.1067/msy.2001.116676>
- Caplan, G. (1964). *Principles of preventive psychiatry*. Basic Books.
- Chen, Q., Liang, M., Li, Y., Guo, J., Fei, D., Wang, L., He, L., Sheng, C., Cai, Y., Li, X., Wang, J., & Zhang, Z. (2020). Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatry*, 7(4), e15-e16. [https://doi.org/10.1016/s2215-0366\(20\)30078-x](https://doi.org/10.1016/s2215-0366(20)30078-x)
- Chia, R., & Moynihan, Q. (2020, February 20). This alarming map shows where the coronavirus has spread in Singapore, one of the worst-hit areas outside of China Business Insider Singapore. *Business Insider*. <https://www.businessinsider.com/coronavirus-singapore-map-shows-spread-worst-hit-outside-china-2020-2?IR=T>.
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behaviour*, 24(4), 385-396.
- Connor, K. M., & Davidson, J. R. (2003). Development of a new resilience scale: The Connor-Davidson resilience scale (CD-RISC). *Depression and Anxiety*, 18(2), 76-82. <https://doi.org/10.1002/da.10113>
- Dewey, C., Hingle, S., Goelz, E., & Linzer, M. (2020). Supporting clinicians during the COVID-19 pandemic. *Annals of Internal Medicine*, 172(11), 752-753. <https://doi.org/10.7326/M20-1033>
- Fischer, J., Alpert, A., & Rao, P. (2019). Promoting intern resilience: Individual chief wellness check-ins. *MedEdPORTAL*, 15, 10848. [https://doi.org/10.15766/mep\\_2374-8265.10848](https://doi.org/10.15766/mep_2374-8265.10848)
- Li, B., Bruyneel, L., Sermeus, W., Van den Heede, K., Matawie, K., Aiken, L., & Lesaffre, E. (2013). Group-level impact of work environment dimensions on burnout experiences among nurses: A multivariate multilevel probit model. *International Journal of Nursing Studies*, 50(2), 281-291. <https://doi.org/10.1016/j.ijnurstu.2012.07.001>
- Liang, Z. C., Ooi, S. B. S., & Wang, W. (2020). Pandemics and their impact on medical training: Lessons From Singapore. *Academic Medicine*. <https://doi.org/10.1097/acm.0000000000003441>
- Linzer, M., Visser, M. R., Oort, F. J., Smets, E. M., McMurray, J. E., & de Haes, H. C. (2001). Predicting and preventing physician burnout: results from the United States and the Netherlands. *The American Journal of Medicine*, 111(2), 170-175. [https://doi.org/10.1016/s0002-9343\(01\)00814-2](https://doi.org/10.1016/s0002-9343(01)00814-2)
- Low, Z. X., Yeo, K. A., Sharma, V. K., Leung, G. K., McIntyre, R. S., Guerrero, A., Lu, B., Lam, C. C. S. F., Tran, B. X., Nguyen, L. H., Ho, C. S., Tam, W. W., & Ho, R. C. (2019). Prevalence of burnout in medical and surgical residents: A meta-analysis. *International Journal of Environmental Research and Public Health*, 16(9). <https://doi.org/10.3390/ijerph16091479>
- Maslach, C. J. S., & Leiter, M. P. (2016). *Maslach burnout inventory manual*. Mind Garden Inc.
- McKinley, N., McCain, R. S., Convie, L., Clarke, M., Dempster, M., Campbell, W. J., & Kirk, S. J. (2020). Resilience, burnout and coping mechanisms in UK doctors: A cross-sectional study. *British Medical Journal Open*, 10(1), e031765. <https://doi.org/10.1136/bmjopen-2019-031765>
- Ministry of Health (MOH), Singapore. (2020). Circuit breaker to minimise further spread of COVID-19. <https://www.moh.gov.sg/news-highlights/details/circuit-breaker-to-minimise-further-spread-of-covid-19>. (Retrieved April 3, 2020)
- Ng, N. B. H. (2020). *The COVID-19 Pandemic: Impact on Paediatric Postgraduate Year One Doctors [Data set]*. Figshare. <https://figshare.com/s/74c81ca193638a553ea2>
- Ramanan, R. A., Taylor, W. C., Davis, R. B., & Phillips, R. S. (2006). Mentoring matters. Mentoring and career preparation in internal medicine residency training. *Journal of General Internal Medicine*, 21(4), 340-345. <https://doi.org/10.1111/j.1525-1497.2006.00346.x>
- Rasmussen, S., Sperling, P., Poulsen, M. S., Emmersen, J., & Andersen, S. (2020). Medical students for health-care staff shortages during the COVID-19 pandemic. *The Lancet*, 395(10234), e79-e80. [https://doi.org/10.1016/s0140-6736\(20\)30923-5](https://doi.org/10.1016/s0140-6736(20)30923-5)
- Rotenstein, L. S., Torre, M., Ramos, M. A., Rosales, R. C., Guille, C., Sen, S., & Mata, D. A. (2018). Prevalence of burnout among physicians: A systematic review. *The Journal of the American Medical Association*, 320(11), 1131-1150. <https://doi.org/10.1001/jama.2018.12777>
- Sasangohar, F., Jones, S. L., Masud, F. N., Vahidy, F. S., & Kash, B. A. (2020). Provider burnout and fatigue during the COVID-19 pandemic: Lessons learned from a high-volume intensive care unit. *Anesthesia and Analgesia*, 131(1), 106-111. <https://doi.org/10.1213/ane.0000000000004866>

Southwick, S. M., Bonanno, G. A., Masten, A. S., Panter-Brick, C., & Yehuda, R. (2014). Resilience definitions, theory, and challenges: Interdisciplinary perspectives. *European Journal of Psychotraumatology*, 5,(1), 25338. <https://doi.org/10.3402/ejpt.v5.25338>

Sturman, N., Tan, Z., & Turner, J. (2017). "A steep learning curve": Junior doctor perspectives on the transition from medical student to the health-care workplace. *BMC Medical Education*, 17(1), 92. <https://doi.org/10.1186/s12909-017-0931-2>

Thomas, N. K. (2004). Resident burnout. *The Journal of the American Medical Association*, 292(23), 2880-2889. <https://doi.org/10.1001/jama.292.23.2880>

Wu, P. E., Styra, R., & Gold, W. L. (2020). Mitigating the psychological effects of COVID-19 on health care workers. *Canadian Medical Association Journal*, 192(17), E459-e460. <https://doi.org/10.1503/cmaj.200519>

Zwack, J., & Schweitzer, J. (2013). If every fifth physician is affected by burnout, what about the other four? Resilience strategies of experienced physicians. *Academic Medicine*, 88(3), 382-389. <https://doi.org/10.1097/ACM.0b013e318281696b>

---

\*Jeremy Bingyuan Lin  
1E Kent Ridge Road,  
NUHS Tower Block Level 12,  
Singapore 119228  
Tel: (65) 6772 4847  
Email: jeremy\_lin@nuhs.edu.sg



**Appendix 1: Group Interview Prompts**

1. Share with us your feelings and sentiments about how the past 4 months has been?
2. How do you think the COVID-19 pandemic changed your postgraduate year one training? This may be in a negative or positive way.
3. What were the specific changes relating to COVID-19 at work that you found most challenging?
4. What do you think are some of the aspects that could have contributed to possible burnout, if any?
5. Describe how did you and your peers cope with these changes?
6. Were there specific things done by faculty or department that helped you cope with these changes?
7. Were there positive aspects or outcomes, if any, that have occurred due to the COVID-19 pandemic?