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RESEARCH ARTICLE

REVISED **Impact of COVID-19 on international medical education and the future plans of medical students in Japan** [version 2; peer review: 2 approved]

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Abstract

Background: The aim of this study was to assess the impact of the coronavirus disease 2019 (COVID-19) pandemic on the current study methods and future plans of medical students compared to those in the pre-pandemic period.

Methods: Second-grade medical students reported their academic experiences, study methods, and future career plans before (between 2016 and 2019) and during the pandemic (2020) using a questionnaire-based survey at Hokkaido University, Japan (n = 534).

Results: From 2016 to 2019, we found an increasing trend for participation in short-term international exchange programs, taking the United States Medical Licensing Examination (USMLE), clinical training, and undertaking research abroad among the students. However, these percentages significantly declined (to 35.5%) during the COVID-19 pandemic in 2020 for all the assessed future plans, including short-term exchange programs (-27.9%), taking USMLE (-19.8%), clinical training (-24.5%), and undertaking research abroad (-13.2%) compared to 2019, wherein 67.9% of the students wished to have at least one of these four above-mentioned academic activities.

Conclusions: The COVID-19 pandemic adversely and significantly influenced our medical students' plans to go abroad for clinical and research training. Future studies are warranted to assess the long-term influence of this pandemic on the career planning of medical students.

Keywords
COVID-19 pandemic, medical education, medical students, future plans, outbound student mobility

Open Peer Review

Approval Status ✓ ✓

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version 1 03 Mar 2022	? view	✓ view

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Any reports and responses or comments on the article can be found at the end of the article.

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Introduction

The internationalization of higher education is a relatively new phenomenon; however, the concept of internationalization is broad and varied. Over the last 30 years, several research and education programs in different countries have been the motor for a broader and more strategic approach to internationalization in higher education, which is defined as "the intentional process of integrating an international, intercultural, or global dimension into the purpose, functions, and delivery of post-secondary education to enhance the quality of education and research for all students and staff and to make a meaningful contribution to society" (De Wit *et al*., 2015). In the 21st century, with extraordinary rapid changes, reforming professional education is inevitable. It is necessary to adapt education to strengthen health systems based on transnational, multi-professional, and long-term perspectives to respond needs of humans (Frenk *et al.*, 2010).

The most important benefits of international higher education are increased international awareness of the deeper engagement with global issues by students and improved quality of teaching and learning in Asia and the Pacific (De Wit *et al*., 2015; Stevens & Simmonds Goulbourne, 2012). A recent study examined the US clinical experience for Japanese international medical graduates and benefits of US training (Heist *et al*., 2020). Although medical education and the overall medical systems in the U.S. and Japan are different, international exposure of young physicians and direct learning in the two disparate systems will bring about the integration and the improvement of the medical systems in both countries. At a time of global interconnectedness, the internationalization of medical education has become an important part of medical education. Although several countries, including Japan, had implemented various strategies recently to enhance inbound and outbound student mobility, the coronavirus disease 2019 (COVID-19) pandemic halted international travel.

The World Health Organization (WHO) upgraded the COVID-19 outbreak to pandemic status on March 11, 2020. This has led to serious implications in almost all aspects of human life. The pandemic has also had a huge impact on the educational system, and in particular, medical education to a significant extent (Cleland *et al*., 2020). Medical schools have experienced dramatic disruptions in every aspect of medical education. Universities shifted the classes to online lessons and asked students to stay at home. In-person pre-clinical educational sessions were shifted to remote learning experiences, and student participation in all direct patient contact activities were paused or limited. Most education-related travels, including exchange student programs, electives, and international examinations, such as the United States Medical Licensing Examination (USMLE), have been canceled, suspended, or modified.

Although Japan has been promoting teaching medicine in English in recent decades by implementing medical English courses in the curriculum in pre-clerkship and during clerkship for medical students, medicine in Japan is mostly taught in Japanese. Medical students in Japan tend to study without ever opening English-written textbooks. Consequently, English proficiency has stagnated, and the national results of English proficiency tests, such as Test of English as a Foreign Language (TOEFL) and International English Language Testing System (IELTS), are generally lower than those of many other advanced countries (EF EPI, 2018; IELTS Test taker performance, 2019). In addition, national board exams for medical doctors have been performed in Japanese, although a few English questions have been introduced in recent years. Therefore, for some students, it is difficult to maintain their motivation to learn English for medical purposes and engage in international medical education and activities in Japan. The motivation to learn English significantly depends on their interest in global career development (Onozawa *et al*., 2020).

We conducted a medical English course for second-grade medical students, including a 15-session course starting in April every year. Our course is a bilingual (Japanese and English) inspiring course that focuses on the core competencies of English for medical purposes, including doctor–patient (taking history and physical examination) and doctor–doctor (evidence-based medicine, medical terminology, scientific presentation, etc.) communication. Since 2016, we have been conducting a questionnaire-based survey of our students before starting our course for a detailed characterization of second-grade medical students in the spring semester at Hokkaido University. To address the potential impact of the COVID-19 pandemic on academic achievements/plans of our students, in this study, we aimed to examine the potential impact of the COVID-19 pandemic on the academic-related

outcomes of our students, such as current study methods and future plans by comparing the pre-pandemic (2016–2019) and pandemic (2020) periods.

Methods

Study design

This study was a cross-sectional study between April 2016 and April 2020 at Hokkaido University, Sapporo, Japan. All second-grade medical students were eligible to complete participate in the current study. Using a questionnaire-based survey, the students at the first class in our course reported their academic experiences at the beginning of the course from 2016 to 2020. Of 541 eligible students, 7 students did not agree to participate in the current study. Ultimately, 534 took participation in our study (response rate: 98.7%) as follows: 108 in 2016, 108 in 2017, 108 in 2018, 106 in 2019, and 104 in 2020 (Table 1).

Questionnaire

A 15-item questionnaire was designed by one of the authors (M.O.) (Onozawa *et al.*, 2020) and discussed for content and construct validity (H.G., M.T.). No major changes were made to the preliminary version of the questionnaire. The questionnaire included closed- and open-ended questions, relating to the following themes:

(1) How have the students been exposed to and learned English (English experience), including participation in English conversation school, private lessons, volunteer activity, living in a foreign country, traveling abroad, short homestay abroad?

(2) How are the students studying English (current study methods) using radio, TV, podcasts, watching online movies, medical textbooks, journals, newspapers, conversation schools, private lessons, traveling abroad, international exchange student programs, and English skill examinations?

(3) What type of international academic activities do the students wish in their future (wish list), such as international exchange student programs, taking the USMLE, clinical training abroad, doing research abroad?

From 2016 to 2019, we distributed paper-based questionnaires and collected data on the above-mentioned questions. However, the survey was conducted on an online platform in 2020 due to the COVID-19 pandemic and online education. For all the three main categories of the above-mentioned questions, the students could select more than one option. The questionnaire can be found as *Extended data* (Goudarzi *et al.*, 2022b).

Ethical considerations

After explanation of the aim of the current study, we asked all second grade medical students in our school to participate in the present study at the first lesson of our medical English course. All participants gave written informed consent. No financial or other incentives were provided for participation. The questionnaire had an opt-out item for students who did not want to be included in the data analysis. Ethical approval for this study was obtained from the Institutional Review Board of the Faculty of Medicine and Graduate School of Medicine, Hokkaido University (20–040).

Statistical analysis

Descriptive data were reported as percentages or means with standard deviation. Statistical analyses were performed using the statistical software package JMP version 14 (SAS Institute Inc., Cary, NC).

Results

After excluding students who did not provide consent forms (n = 7), we collected data from 534 students over five years of the current study period from 2016 to 2020: 108 in 2016, 108 in 2017, 108 in 2018, 106 in 2019, and 104 in 2020 (Table 1) (Goudarzi *et al.*, 2022a). Of the students, 19.8% were female. Figure 1 shows the previous English experience (exposure) of students from 2016 to 2020. Traveling abroad was the most common experience, followed by a short homestay in a foreign country and participation in a conversation school. However, volunteer activities were uncommon among our students. We did not observe an evident trend for the assessed items, except for a declining trend for living abroad among students from 2016 to 2020.

Table 1. Characteristics of the study participants (n = 534).

Year	Number	Female, n (%)	National Center Test for University Admissions (English test score)*	Students passed standard English exams, n (%) [+]
2016	108	24 (22.2)	184.1 ± 10.2	52 (48.1)
2017	108	24 (22.2)	185.3 ±10.5	39 (36.1)
2018	108	21 (19.4)	191.2 ± 6.7	44 (40.7)
2019	106	19 (17.9)	183.7 ± 10.5	47 (44.3)
2020	104	18 (17.3)	183.3 ± 6.5	45 (43.2)

* Average ± standard deviation, out of 200

[+] IELTS (International English Language Testing System), TOEIC (Test of English for International Communication), TOFLE (Test of English as a Foreign Language), etc.
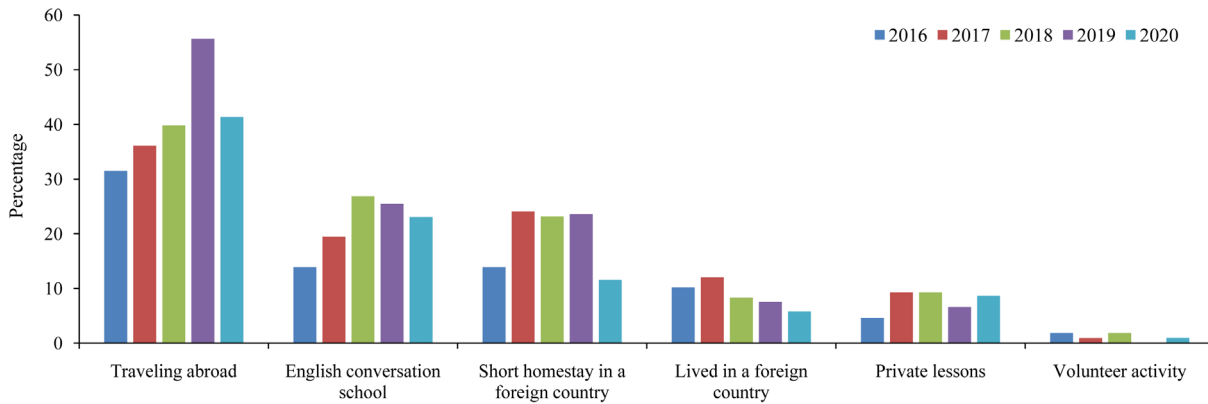
Figure 1. Previous English experience (exposure) in Japanese medical students between 2016 and 2020.

As shown in Figure 2, an evaluation of current study methods revealed that apart from traveling abroad and English skill examinations, watching online movies was the most popular study method among our students. Conversely, reading medical textbooks in English was the least popular method. Although we did not find a monotonous trend for the current English learning methods, watching online movies showed an increasing trend among students with the highest percentage during the COVID-19 pandemic. Notably, approximately 12% (ranging from 7.5% in 2019 to 16.3% in 2020) of the students did not study English at the time of conducting the survey.

From 2016 to 2019 (before the COVID-19 pandemic), we found an increasing trend for taking English skill examinations, such as IELTS, TOEFL, Test of English for International Communication (TOEIC) (Figure 3). In addition, participation in short-term international exchange programs, taking the USMLE, clinical training, and conducting research abroad showed an increasing trend in the pre-pandemic era. In 2019, the percentages of students who planned for academic-related programs were 50.9% for the short-term exchange program, 22.6% for taking the USMLE, 32.1% for clinical training, and 15.1% for doing research abroad. In 2019, 67.9% of the students wished to have at least one of the four above-mentioned academic activities, which indicated the willingness of our students to get involved in various international programs prior to the COVID-19 pandemic. However, these percentages significantly declined owing to the COVID-19 pandemic in 2020 for all assessed future plans, including short-term exchange programs (23.0%), taking the USMLE (2.9%), clinical training (7.7%), and undertaking research abroad (1.9%). In total, only 35.5% of our students wished to engage in such activities in 2020.

Discussion

To the best of our knowledge, this is the first report on the outbound mobility of medical students during the COVID-19 pandemic. We found promisingly increasing trends in international academic plans and activities from 2016 to 2019. About 68% of our students planned to engage in at least one of the academic-related activities; however, this number declined to 35% during the COVID-19 pandemic in 2020. Therefore, we observed a profound adverse effect of the COVID-19 pandemic on the trend of future academic planning among medical students in the pre-clerkship period, with a significant decline in studying or training abroad and intention to take international medical examinations. Notably, COVID-19 may affect the future career pathways of physicians, and such potential enduring transformation should be monitored in future longitudinal studies regarding the permanent change in medical education, academic achievements, and the careers of medical students and physicians.

We found an increasing trend regarding studying abroad, conducting research, or clinical training abroad among Japanese medical students between 2016 and 2019 before the COVID-19 pandemic. This could be a consequence of recent government and higher education institutions' attention turned toward outward student mobility in Japan (Bradford, 2015). Japan experienced a significant decline of Japanese students going abroad after its peak in the first half of the 2000s, and this was called "inward-looking," which implied that many young Japanese hesitated about going abroad for their studies. Therefore, in the recent decade, the Ministry of Education, Culture, Sports, Science, and Technology and other government bodies commenced the implementation of initiatives designed to internationalize the education system in Japan. In 2012, the Japanese government increased funding for outbound student mobility, and several programs, including collaborative mobility programs, joint degrees, credit transfer systems, and scholarships, were implemented. In addition, the Japanese government launched the Japan Revitalization Strategy in 2013 to double the number of students studying abroad by 2020 (Bradford, 2015; Kuroda et al., 2018). Furthermore, recent studies reported that the number of university exchange agreements increased significantly, especially for students who wished to study abroad for a short period of time (Horio, 2017; Kuroda et al., 2018). At least, partly, the increasing trend of outbound interest of the students between 2016 and 2019 in our study could be explained by government programs and university agreements, and the current pandemic represents a significant disruption in such established programs.
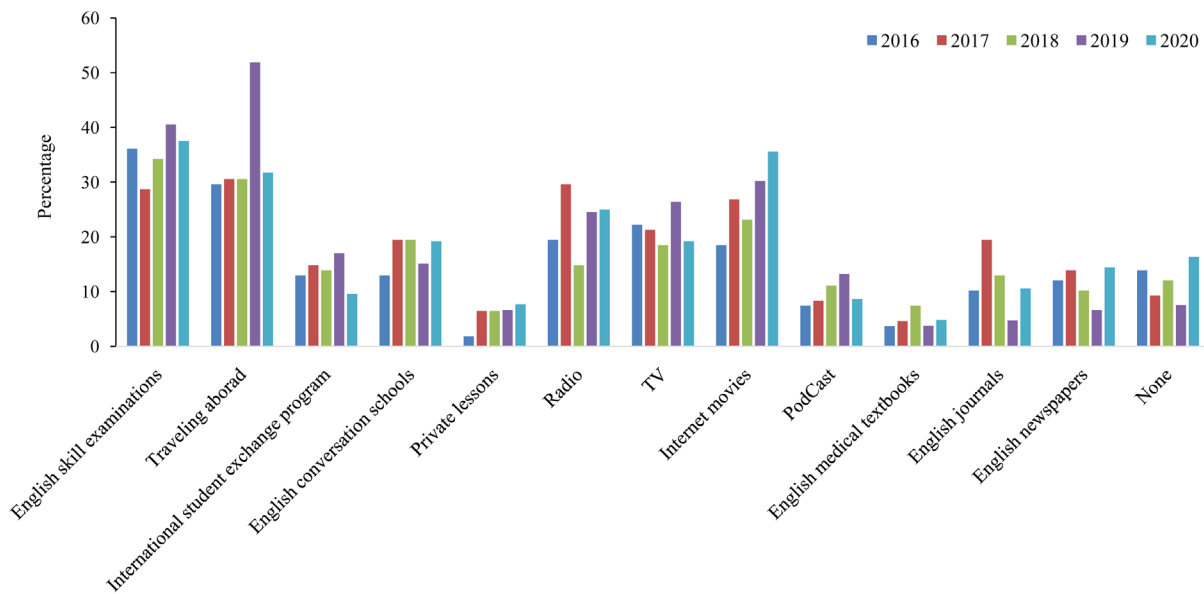
Figure 2. Current English study methods of Japanese medical students between 2016 and 2020.
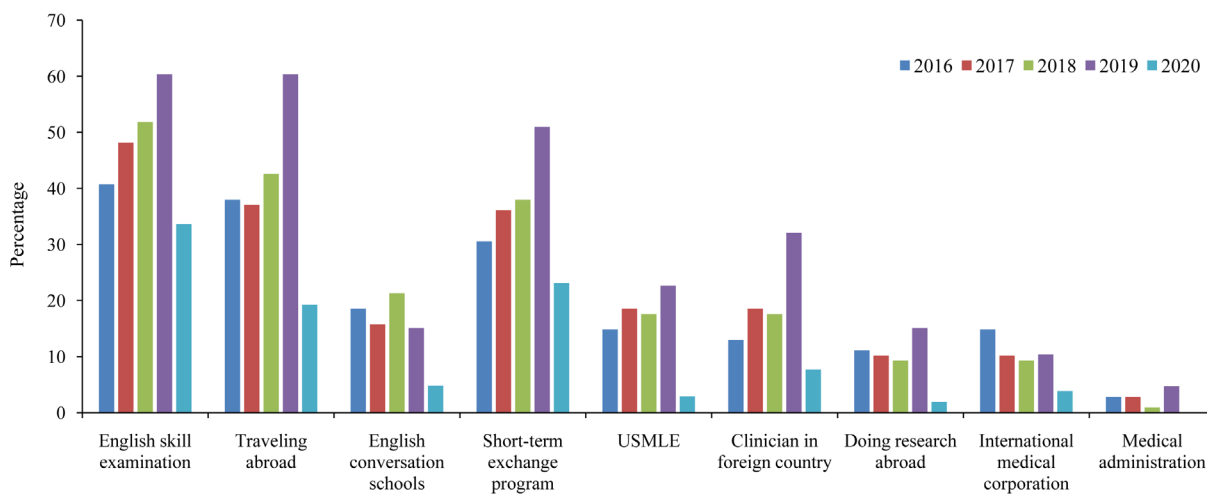
Figure 3. Wish list of Japanese medical students between 2016 and 2020. USMLE=United States Medical Licensing Examination.

Across the five years of the study, around 16% of students who participated in 2020, reported they did not study English, which was the highest compared to the other years (Figure 2, 16.3% vs. 7.5% in 2019). It is a very concerning result which could be, at least partially, because of the loss of motivation of the students during the COVID-19 era. Further studies are necessary to demonstrate underlying factors that result in the unwillingness of medical students to learn foreign languages, including demotivation (Riasati *et al.*, 2018). Such demotivation due to the pandemic may have consequent language learning failure for medical students (Vakilifard *et al.*, 2020). A recent German study reported that suitable digital learning formats and social support are important study resources for

engagement during the COVID-19 pandemic among health and social professions students (Koob *et al.*, 2021). In addition, universities and health institutions should provide beneficial teaching formats and innovative methods to support students during major life events.

On the other hand, watching online movies was the most popular English study method in 2020, almost double of that in 2016 (35.6% vs. 18.5%). This might reflect the recent expanding availability of subscription video-on-demand services, which are preferentially chosen in the stay-home policy during the COVID-19 era. It would be better to conduct more surveys and face-to-face interviews to clarify the content of popular online

learning programs among medical students and apply promising methods in future studies to enhance online learning strategies.

We found a remarkable influence of the COVID-19 pandemic on the future plans of our students, mainly regarding student mobility (Figure 3). A recent report in mainland China and Hong Kong, mainly from undergraduate schools (n=2,739), showed that 84% of students reported no interest in studying abroad even after the COVID-19 pandemic (Mok *et al*., 2021); although they examined under- and post-graduate students, rather than medical students, their data were in line with our results. They also found that the students who continue to pursue further study abroad think about Asian countries, such as Hong Kong, Japan, and Taiwan, in addition to the UK and the US, thereby suggesting a shifting mobility flow of international students. Another recent study reported that the most important concerns of international graduate students during the pandemic in the US were maintaining good health during their studies (67%) and understanding US medical insurance and obtaining health services (53%) (Chirikov & Soria, 2020). Therefore, medical students in Japan and Asian countries may think about countries having a better control of the pandemic as an ideal destination for international higher education in the future. In addition, we believe that the current pandemic has to influence different aspects of education in the world, not limited to medical education. Therefore, such results could be observed among medicine-related post-graduates and researchers.

Several international organizations, such as UNESCO, World Education Services, and the British Council, recently predicted a decline in student mobility to major destination countries, and our results confirmed this (Durnin, 2020; Goris, 2020; Schulmann, 2020). The experience of participating in international clinical rotations and residency provides a wide range of advantages from both practical and academic standpoints. In addition to broadening medical knowledge, such opportunities enable passionate candidates to explore the subject in-depth and gain real-world experience that they would not be able to obtain at their medical schools. It may also encourage the young generation of physicians to practice medicine among underserved and multicultural populations, which are always concerned with health systems, especially in developed countries. However, the US and European countries may have been influenced by the shortage of residents and medical doctors from foreign countries during the pandemic. Approximately 250,000 foreign-born doctors are practicing in the US, thus playing a key role in providing health care for millions of Americans (American Immigration Council, 2021). Moreover, the UK, compared to other European countries, has more foreign doctors who play a vital role in running Britain's publicly funded health service. Although most Japanese residents/doctors return to Japan after completing their training in a foreign country, the declining motivation during the COVID-19 pandemic and beyond to participate in international clerkship and residency in Asian countries will have serious consequences in the future for health care systems on a global scale.

Globalized medical education needs medical students to understand the global burden of diseases and epidemiology as well as disparities and inequities in global health systems. Consequently, all medical schools should incorporate programs for global health training and support inbound and outbound medical students' mobility. In the US, medical school graduates join residency programs with international health experiences (Drain *et al*., 2007). Although we did not find such a survey in Japan, this number seems to be significantly lower than that in the US. Additionally, our current study suggests that this number may decline during the COVID-19 pandemic and beyond. Therefore, placing more emphasis on global epidemiology courses and even the development of Master of Public Health programs in addition to other innovations in medical education would be beneficial toward training the next generation of physicians oriented to potential future pandemics and be able to contribute to the improvement of human health globally (Gibbs, 2020; Sangha & Hao, 2021).

The WHO declared the COVID-19 outbreak a global pandemic on March 11, 2020 (4). In late March, the Japanese Ministry of Health, Labor, and Welfare announced the daily increasing number of confirmed cases, and the Japan Medical Association asked the government to declare a state of emergency. A couple of days before our survey in mid-April, 2020, the Prime Minister declared the first nationwide state of emergency. Therefore, the timing of the survey could have significantly influenced students' minds and the results of the current study, while the world faced an unprecedented shock in addition to the unavailability of vaccines at that moment. However, because of the potential negative impact of declined outbound medical student mobility during the COVID-19 pandemic and beyond on the drive to nurture the next generation of physicians, it is necessary to follow up with medical students with longitudinal surveys and create supportive systems to develop a meaningful response, overcome barriers, and propose solutions to repair the damage caused by COVID-19's interruptions to learning trajectories.

Although the pandemic stressed the health care systems and medical education, it could also be a catalyst for the transformation of medical education (Lucey *et al*., 2020). The tremendous stress of the pandemic on education and healthcare systems may provide an opportunity to reassess the entire medical education, healthcare preparedness, and delivery. COVID-19 has been pushing universities to change their attitudes toward the curricula, methods of teaching, learning, and assessment. Hopefully, the COVID-19 pandemic will force education to a higher level and help the preparedness of universities for pandemics or a global health crisis in the future.

The current study has some limitations. We collected data from students between 2016 and 2019 via paper-based questionnaires. However, because of the prevalence of remote education in 2020, we collected such information using online questionnaires. This could influence the results; however, based on the adequate orientation of the students before completing the survey and monitoring of the students during the course, comparing

the results with the survey conducted at the end of the course suggested a minimal possibility of such bias. Additionally, we looked at the characteristics of the medical students each year between 2016 and 2020 to find any possible differences across the years that influence the results of the current study. However, we found a comparable sex ratio, university entrance exam scores, and percentage of students who passed standard English proficiency tests, such as IELTS, TOEFL, and TOEIC, each year. Furthermore, we assessed the English language proficiency of the students, including reading, writing, listening, and speaking skills, using a self-administered questionnaire and found rather similar proficiency levels among students each year, indicating a low possibility of the influence of students' English ability on the obtained results. We conducted this survey before clinical clerkship, and attitudes toward future career paths may change for the second-grade medical students over time. Therefore, it is necessary to follow up with the students to examine whether intent translates into action after graduation. Our survey is based on a single medical school in Japan. Therefore, medical students' attitudes in our university may not be extrapolated to all national and private schools in Japan. Further multi-institutional surveys are necessary to replicate our results. In addition, we did not specifically examine the underlying cause(s) for a significant decline in interest in studying or working abroad among the students' in 2020. Therefore further quantitative research is needed to underpin the underlying reasons in detail.

Some countries are planning to facilitate international travel with vaccination passports; however, much uncertainty persists for re-opening global medical communication, such as student and residency programs. For future research, more comprehensive studies on medical education, not merely a wish list of medical students, with longitudinal surveys are warranted to clarify the adverse effects of the COVID-19 pandemic on medical students and medical staff. Such studies will help to address the difficulties students face regarding their future goals and careers. In addition, close monitoring of education-related outcomes may facilitate the implementation of relevant education-oriented strategies, updating curricula, and supporting students to nurture the next generation of brilliant and motivated clinicians, physician-scientists, and researchers.

Conclusion
Although we observed an increasing trend for student outbound mobility among our medical students between 2016 and 2019, the COVID-19 pandemic adversely influenced this trend in 2020. Further longitudinal studies are necessary to determine the long-term effects of the pandemic on the trajectory of medical education and student mobility.

Take home messages
- Before the COVID-19 pandemic, we found an increasing trend for participation in short-term international exchange programs, taking the USMLE, clinical training, and undertaking research abroad among our medical students between 2016 and 2019.

- In 2020, we observed a significant decline in students' wish for outbound mobility, including short-term exchange programs (-27.9%), taking the USMLE (-19.8%), clinical training (-24.5%), and undergoing research abroad (-12.3%) compared to 2019.

- In 2019, 67.9% of the students wished to engage in at least one of these four above-mentioned academic activities; however, it declined to 35.5% in 2020 during the pandemic.

- The COVID-19 pandemic adversely and significantly influenced our medical students' plans to go abroad for clinical and research training.

- Further longitudinal studies are necessary to determine the long-term effects of the pandemic on the trajectory of medical education and student mobility.

Data availability
Underlying data
DRYAD: Impact of COVID-19 on international medical education. https://doi.org/10.5061/dryad.0vt4b8h1b (Goudarzi *et al.,* 2022a).

This project contains the following underlying data:
- Impact_of_COVID-19_on_international_medical_education.xlsx

- README_(Impact_of_COVID-19_on_international_medical__education).xlsx

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

Extended data
Zenodo: Impact of COVID-19 on international medical education. https://doi.org/10.5281/zenodo.6069426 Goudarzi *et al.,* 2022b.

This project contains the following extended data:
- Questionnaire_2022.02.09.docx

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

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Open Peer Review

Current Peer Review Status: ✓ ✓

Version 2

Reviewer Report 24 June 2022

https://doi.org/10.21956/mep.20563.r32148

✓ **Jay Yang, MD, PhD, MSEE**

Emeritus Professor, University of Wisconsin, Madison, WI, USA

The authors have addressed most of my previous concerns and I have no further comments.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Cellular and molecular medicine, clinical anesthesiology, medical education

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 28 April 2022

https://doi.org/10.21956/mep.20310.r31822

✓ **Forman Erwin Siagian**

Department of Parasitology, School of Medicine, Universitas Kristen Indonesia, Jakarta, Indonesia

Firstly, I would like to express my compliment to these authors due to their effort to examine the impact of covid on global medical education and combine it with the plans/futures of Japanese medical students.

This research positively reveals how higher education, especially medicine, has responded to the pandemic for its survival. In my opinion, the limitations of the research have been acknowledged partly, due to probably because of the qualitative approach to writing and this does not become an obstacle for the whole article in contributing positively to the field of medical science.

The reason for my statement "the limitations of the research have been acknowledged partly, due to probably due to the qualitative approach to writing" is as follows:

1. In the conclusion section, the author states that covid reduces the interest of medical students to go study abroad. The underlying reason for this is not stated clearly, I think this is probably because the possible answer is not covered in the questionnaires distributed. So this is a research limitation that has not been revealed in this study yet and further quantitative research is needed.

   I quote Queirós (2017)[1], who states " Qualitative research is therefore concerned with aspects of reality that cannot be quantified, focusing on the understanding and explanation of the dynamics of social relations. Qualitative research works with the universe of meanings, motives, aspirations, beliefs, values, and attitudes, which corresponds to a deeper space of relationships, processes, and phenomena that cannot be reduced to the operationalization of variables."

   Scientific research adopts qualitative and quantitative methodologies in the modeling and analysis of numerous phenomena. The qualitative methodology intends to understand a complex reality and the meaning of actions in a given context. On the other hand, the quantitative methodology seeks to obtain accurate and reliable measurements that allow statistical analysis. Both methodologies offer a set of methods, potentialities, and limitations that must be explored.

2. In the discussion section, the author states that "It is a very concerning result which could be, at least partially, because of the loss of motivation of the students during the COVID-19 era." It would be very interesting to carry out further research to find out whether it is the loss of motivation that underlies the unwillingness of medical students to learn foreign languages or perhaps any other reason.[2] Demotivation has negative effects on language learning processes and outcomes.[3] Actually, many factors influence the study engagement of health and social professions students during the COVID-19 pandemic. [4]

That's my opinion regarding the limitations of this research, but it should be understood that my personal opinion aims to make this article better.

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Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Have any limitations of the research been acknowledged?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Parasitology, Medical Education, questionnaire-based survey research, human behaviour

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 09 May 2022

Houman Goudarzi, Faculty of Medicine and Graduate School of Medicine, Hokkaido University,, Sapporo, Japan

Dear Dr. Forman Erwin Siagian

Thank you very much for reviewing our manuscript and providing very instructive and scientific comments. We are very thankful and greatly appreciate your comments. As you mentioned, our study has some limitations, and we believe that stating such limitations improves the clarity and quality of scientific papers. We will update the manuscript according to your valuable comments. In the Discussion section, we will state the limitation of the current study not to measure the underlying reasons for declined interest of our medical students in studying/working abroad during the pandemic. As kindly indicated, it is

necessary to conduct further quantitative research to clarify the underlying reasons. We are also very thankful for the provided references, which let us discuss these limitations more efficiently. Currently, we are waiting for comments from another reviewer. After receiving comments from all reviewers, we will be back to you with the updated manuscript.

Thank you very much again for your time, and valuable comments, and for providing new insight for future research projects.   Sincerely,   Houman Goudarzi, M.D., Ph.D. Assistant Professor Center for Medical Education and International Relations, Faculty of Medicine and Graduate School of Medicine, Hokkaido University

Competing Interests: No conflict of interest to declare.

Author Response 14 Jun 2022
Houman Goudarzi, Faculty of Medicine and Graduate School of Medicine, Hokkaido University,, Sapporo, Japan

Comments from Prof. Forman Erwin Siagian

Firstly, I would like to express my compliment to these authors due to their effort to examine the impact of covid on global medical education and combine it with the plans/futures of Japanese medical students.

Response: Thank you very much for accepting the invitation to do a peer review of our manuscript. Your instructive comments helped us improve the quality and clarity of the manuscript, especially in addressing the current study's limitations. We are very thankful to you. We have responded to your comments one by one as follows.

This research positively reveals how higher education, especially medicine, has responded to the pandemic for its survival. In my opinion, the limitations of the research have been acknowledged partly, due to probably because of the qualitative approach to writing and this does not become an obstacle for the whole article in contributing positively to the field of medical science. The reason for my statement "the limitations of the research have been acknowledged partly, due to probably due to the qualitative approach to writing" is as follows: In the conclusion section, the author states that covid reduces the interest of medical students to go study abroad. The underlying reason for this is not stated clearly, I think this is probably because the possible answer is not covered in the questionnaires distributed. So this is a research limitation that has not been revealed in this study yet and further quantitative research is needed.

Response: Thank you very much for indicating this point. As the reviewer stated, the underlying reason (s) for the decline in interest of our students studying abroad during the pandemic was not covered by our questionnaire. Accordingly, we acknowledged this limitation in the Discussion as follows (page 10, first paragraph):

The current study has some limitations. We collected data from students between 2016 and 2019

via paper-based questionnaires. However, because of the prevalence of remote education in 2020, we collected such information using online questionnaires. This could influence the results; however, based on the adequate orientation of the students before completing the survey and monitoring of the students during the course, comparing the results with the survey conducted at the end of the course suggested a minimal possibility of such bias. In addition, we did not specifically examine the underlying cause(s) for the significant decline in interest in studying or working abroad among the students' in 2020. Therefore further quantitative research is needed to underpin the underlying reasons in detail.

I quote Queirós (2017)1, who states "Qualitative research is therefore concerned with aspects of reality that cannot be quantified, focusing on the understanding and explanation of the dynamics of social relations. Qualitative research works with the universe of meanings, motives, aspirations, beliefs, values, and attitudes, which corresponds to a deeper space of relationships, processes, and phenomena that cannot be reduced to the operationalization of variables." Scientific research adopts qualitative and quantitative methodologies in the modeling and analysis of numerous phenomena. The qualitative methodology intends to understand a complex reality and the meaning of actions in a given context. On the other hand, the quantitative methodology seeks to obtain accurate and reliable measurements that allow statistical analysis. Both methodologies offer a set of methods, potentialities, and limitations that must be explored. In the discussion section, the author states that "It is a very concerning result which could be, at least partially, because of the loss of motivation of the students during the COVID-19 era." It would be very interesting to carry out further research to find out whether it is the loss of motivation that underlies the unwillingness of medical students to learn foreign languages or perhaps any other reason.2 Demotivation has negative effects on language learning processes and outcomes.3 Actually, many factors influence the study engagement of health and social professions students during the COVID-19 pandemic. 4 That's my opinion regarding the limitations of this research, but it should be understood that my personal opinion aims to make this article better.

Response: Thank you very much for your explanation and for introducing exciting references. I read the report of Queirós et al. (2017) regarding the strength and limitations of qualitative and quantitative research methods with great interest. Also, we appreciate your comments about further studies to explore underlying reasons for unwillingness to learn foreign languages among medical students in future studies. We included your comments on conducting further research on factors influencing demotivation of the students and its consequences in the Discussion, as follows (page 8, first paragraph):

Across the five years of the study, around 16% of students who participated in 2020, reported they did not study English, which was the highest compared to the other years (Figure 2, 16.3% vs. 7.5% in 2019). It is a very concerning result which could be, at least partially, because of the loss of motivation of the students during the COVID-19 era. Further studies are necessary to demonstrate underlying factors that result in the unwillingness of medical students to learn foreign languages, including demotivation (Riasati et al., 2018). Such demotivation due to the pandemic may have consequent language learning failure for medical students (Vakilifard et al., 2020). A recent German study reported that suitable digital learning formats and social support

are important study resources for engagement during the COVID-19 pandemic among health and social professions students (Koob et al., 2021). In addition, universities and health institutions should provide beneficial teaching formats and innovative methods to support students during major life events.

Competing Interests: No conflict of interest to declare.

Reviewer Report 28 March 2022

https://doi.org/10.21956/mep.20310.r31735

Jay Yang, MD, PhD, MSEE
Emeritus Professor, University of Wisconsin, Madison, WI, USA

Goudarzi *et al.* report on the longitudinal trend of medical students at the Hokkaido University School of Medicine surveyed by questionnaires conducted over 2016 to 2020. The survey focused on three areas of previous English language exposure, the current method of studying English, and plans for international academic experience. The responses captured an abrupt reversal of outward-bound trend in 2020, from that seen during 2016-2019 presumably from the impact of Covid-19. This abatement of interest in international exposure was broad, spanning all categories queried, including the desire to pass an English language skills examination presumably not directly limited by the Covid-related travel restrictions.

While many research papers have been published on the impact of Covid-19 on medical education, a report focusing on the outward-bound attitude of Japanese medical students is new and well-worth publishing and disseminating the findings.

Several points for consideration and revision are suggested:

1. As the authors acknowledge in the Discussion, the current result is based on a single questionnaire survey conducted with medical students at an early stage in their medical education. As in most parts of the world, medical education is a 6-year continuum upon graduation from high school. Therefore, the target cohort of "second-year students" is equivalent to a college sophomore in the United States, and attitudes towards future career paths may well change for students at this early stage of education. The current study should be followed up by the collection of data to see whether "intent" translates into "action" by following the post-graduate medical career choices of these cohorts.

2. The current survey is based on a single institution in Japan. While the Hokkaido University School of Medicine is a prominent national university and can be considered as a prototypical School of Medicine in Japan, the curriculum is mostly traditional in contrast to the highly innovative recently opened International University of Health and Welfare at

Narita where the first two-year curriculum is taught entirely in English and passing the USMLE is required for graduation. The potential limitation of the current study and whether the attitudes of medical students at Hokkaido University can be extrapolated to all of Japan should be discussed.

3. The drive towards internationalization of medical education and training in Japan is well-summarized in the Introduction. A key high-impact publication summarizing the need for a transformation of medical education in an interdependent world should be included (Frenk *et al*., Lancet 2010; 376: 1923-58)[1]. While both are wealthy and economically advanced industrial nations, medical education, training, and indeed the overall medical systems in the United States and Japan are very different, with both systems having advantages and disadvantages. International exposure of young physicians and direct learning in the two disparate systems will surely bring about the integration and the betterment of the medical systems in both countries. However, it is also well known that Japanese MDs face a huge hurdle in successfully matching with US clinical training programs because of cultural and linguistic differences (Heist, J Gen Fam Med, 2020; 21:102-108)[2]. The traditional Japanese medical establishments may marginalize the repatriated US trained Japanese physicians from implementing meaningful change based on their newly gained knowledge (Heist, Teaching Learning in Medicine 2019; 31:412-423)[3]. Such systemic limitations could be a more serious threat to the internationalization of Japanese medicine, far outlasting the impact of Covid-19.

4. The tremendous stress on the health care, education, and delivery created by the Covid-19 pandemic is not all bad because it provided an opportunity to reassess the entire healthcare preparedness, delivery, and even the medical education process itself (Lucey, JAMA 2020; 324:1033-1034;[4] www.youtube.com/watch?v=qDBtkq42fW8). As with many occasions, the crisis could be a trigger to reassess the status quo and for implementing the long-needed reforms. Such a glimmer of hope in the times of Covid-19 could be mentioned in the discussion.

5. The findings on previous and current English language exposure (Fig 1 and 2) are interesting. How does the result compare with the mode of English language exposure of the non-medical Japanese youths? Is the current finding something unique to the medical professionals?

6. Statistical analysis is properly mentioned in the Methods, but no statistics appear in the proportions data (i.e. All Figs).

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Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
No

Have any limitations of the research been acknowledged?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Cellular and molecular medicine, clinical anesthesiology, medical education

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 13 Apr 2022

Houman Goudarzi, Faculty of Medicine and Graduate School of Medicine, Hokkaido University,, Sapporo, Japan

Dear Professor Jay Yang, Thank you very much for your time and instructive comments. We greatly appreciate it. Currently, we are waiting for the comments from other reviewers. After receiving other comments, we will update the manuscript according to your valuable comments. Thank you very much again. Houman Goudarzi

Competing Interests: No conflict of interest to declare.

Author Response 14 Jun 2022

Houman Goudarzi, Faculty of Medicine and Graduate School of Medicine, Hokkaido University,, Sapporo, Japan

Comments from Prof. Jay Yang

Goudarzi et al. report on the longitudinal trend of medical students at the Hokkaido University School of Medicine surveyed by questionnaires conducted over 2016 to 2020. The survey focused on three areas of previous English language exposure, the current method of studying English, and plans for international academic experience. The responses captured an abrupt reversal of outward-bound trend in 2020, from that seen during 2016-2019 presumably from the impact of Covid-19. This abatement of interest in international exposure was broad, spanning all categories queried, including the desire to pass an English language skills examination presumably not directly limited by the Covid-related travel restrictions. While many research papers have been published on the impact of Covid-19 on medical education, a report focusing on the outward-bound attitude of Japanese medical students is new and well-worth publishing and disseminating the findings.

Response: Thank you very much for reviewing our manuscript. We greatly appreciate your instructive comments. We updated the manuscript according to your valuable comments, and we hope you will find it favorable.

Several points for consideration and revision are suggested: 1) As the authors acknowledge in the Discussion, the current result is based on a single questionnaire survey conducted with medical students at an early stage in their medical education. As in most parts of the world, medical education is a 6-year continuum upon graduation from high school. Therefore, the target cohort of "second-year students" is equivalent to a college sophomore in the United States, and attitudes towards future career paths may well change for students at this early stage of education. The current study should be followed up by the collection of data to see whether "intent" translates into "action" by following the post-graduate medical career choices of these cohorts.

Response. As the reviewer mentioned correctly, we also believe that only a single questionnaire survey during preclinical clerkship is not enough to assess the potential effect of the pandemic on future career planning. Therefore, it is necessary to do multi-center studies and follow up with the students longitudinally to observe whether this pandemic affects the "action" of the study participants in the future, not just intention. Therefore, we included this point in the manuscript as a future plan on page 10, first paragraph, as follows:

We conducted this survey before clinical clerkship, and attitudes toward future career paths may change for the second-grade medical students over time. Therefore, it is necessary to follow up with the students to examine whether intent translates into action after graduation.

2) The current survey is based on a single institution in Japan. While the Hokkaido

University School of Medicine is a prominent national university and can be considered as a prototypical School of Medicine in Japan, the curriculum is mostly traditional in contrast to the highly innovative recently opened International University of Health and Welfare at Narita where the first two-year curriculum is taught entirely in English and passing the USMLE is required for graduation. The potential limitation of the current study and whether the attitudes of medical students at Hokkaido University can be extrapolated to all of Japan should be discussed.

Response: Thank you very much for pointing out this important issue. Our survey in a national university may not be extrapolated to all medical schools in Japan, including the International University of Health and Welfare (Narita campus), with different curriculum and education systems. Therefore, we mentioned this point as a limitation of the manuscript (page 10, first paragraph), as follows:

Our survey is based on a single medical school in Japan. Therefore, medical students' attitudes in our university may not be extrapolated to all national and private medical schools in Japan. Further multi-institutional surveys are necessary to replicate our results.

3) The drive towards internationalization of medical education and training in Japan is well-summarized in the Introduction. A key high-impact publication summarizing the need for a transformation of medical education in an interdependent world should be included (Frenk et al., Lancet 2010; 376: 1923-58)1. While both are wealthy and economically advanced industrial nations, medical education, training, and indeed the overall medical systems in the United States and Japan are very different, with both systems having advantages and disadvantages. International exposure of young physicians and direct learning in the two disparate systems will surely bring about the integration and the betterment of the medical systems in both countries. However, it is also well known that Japanese M.D.s face a huge hurdle in successfully matching with U.S. clinical training programs because of cultural and linguistic differences (Heist, J Gen Fam Med, 2020; 21:102-108)2. The traditional Japanese medical establishments may marginalize the repatriated U.S.-trained Japanese physicians from implementing meaningful change based on their newly gained knowledge (Heist, Teaching Learning in Medicine 2019; 31:412-423)3. Such systemic limitations could be a more serious threat to the internationalization of Japanese medicine, far outlasting the impact of Covid-19.

Response: Thank you for introducing the report of Frenk et al. (2010). We included this critical report in the Introduction, as follows (page 3, first paragraph):

In the 21st century, with extraordinary rapid changes, reforming professional education is inevitable. It is necessary to adapt education to strengthen health systems based on transnational, multi-professional, and long-term perspectives to respond needs of humans (Frenck et al. 2010).

Also, thank you very much for indicating report of Heist *et al*. (*J Gen Fam Med,* 2020). We included this in the Introduction, as follows (page 3, second paragraph):

A recent study examined the U.S. clinical experience for Japanese international medical graduates and reported the benefits of U.S. training (Heist et al., 2020). Although medical education and the overall medical systems in the U.S. and Japan are different, international exposure of young physicians and learning in the two disparate systems will bring about the integration and the improvement of the medical systems in both countries.

Regarding the report of Heist et al. (*Teaching Learning in Medicine*, 2019), there would be several obstacles to the internationalization of Japanese medicine, such as system limitations. However, this is out of the scope of the current manuscript, and discussing this issue may not help this article. Hopefully, we will be able to focus on this issue in the following projects. Again, thank you very much for your precious comments.

4) The tremendous stress on the health care, education, and delivery created by the Covid-19 pandemic is not all bad because it provided an opportunity to reassess the entire healthcare preparedness, delivery, and even the medical education process itself (Lucey, JAMA 2020; 324:1033-1034;4 www.youtube.com/watch?v=qDBtkq42fW8). As with many occasions, the crisis could be a trigger to reassess the status quo and for implementing the long-needed reforms. Such a glimmer of hope in the times of Covid-19 could be mentioned in the Discussion.

Response: As the reviewers stated, this pandemic would be a great opportunity to transform medical education. To emphasize the importance of such an opportunity, we updated the Discussion as follows (page 9, fourth paragraph):

Although the pandemic stressed the health care systems and medical education, it could also be a catalyst for the transformation of medical education (Lucey et al. 2020). The tremendous stress of the pandemic on education and healthcare systems may provide an opportunity to reassess the entire medical education, healthcare preparedness, and delivery. Moreover, COVID-19 has been pushing universities to change their attitudes toward the curricula, methods of teaching, learning, and assessment. Hopefully, the lessons from the COVID-19 pandemic will force education to a higher level and help the preparedness of universities for pandemics or a global health crisis in the future.

5) The findings on previous and current English language exposure (Fig 1 and 2) are interesting. How does the result compare with the mode of English language exposure of the non-medical Japanese youths? Is the current finding something unique to the medical professionals?

Response: Regarding English language exposure, we did a literature review. However, we did not find any comprehensive study or report regarding English language exposure of Japanese students, including non-medical students. Schools in Japan offer a common (general education-oriented) curriculum for all students from elementary to high school under a single-track system. At the upper secondary education level, students have the option of academic (general), vocational, and specialized programs. Still, the content of the curricula does not vary widely with the type of program, including English education and exposure ways to the English language. However, there is a possibility that some medical

students planning to study/work/live abroad have tried more ways to learn English and be exposed to English. Also, medical students who have probably highly educated parents could have more chances to live or visit abroad and learn English more. Further studies would help address any possible difference between medical and non-medical students in Japan regarding previous and current English exposure mode.

6) Statistical analysis is properly mentioned in the Methods, but no statistics appear in the proportions data (i.e. All Figs).

Response: Thank you very much for the comments. We have shown data with percentages and means with standard deviation in Table 1, as indicated in the legend. Also, we showed the descriptive data in percentages for all figures (Fig. 1, 2, and 3).

Competing Interests: There is no conflict of interest to declare.