

# The aspect of eye clinic at the Tokyo 2020 Olympic and Paralympic Games

原 著

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**Key words:** The Tokyo 2020 Olympic and Paralympic Games, Polyclinic, eye, ophthalmic care, COVID-19

**[Abstract]** The Tokyo 2020 Olympic and Paralympic Games had been postponed for a year due to the spread of the new coronavirus disease 2019 (COVID-19). Since the infection of athletes may spread COVID-19 all over the world, the medical care system focused on infection control in addition to regular medical care. This study reports on the implementation of ophthalmic medical services at the Athletes' Village General Clinic (hereinafter referred to as "Polyclinic") for the Tokyo 2020 Olympic and Paralympic Games.

There were 697 patients during the Olympic Games, and 556 patients during the Paralympic Games. Visual acuity of patients at the Olympic and Paralympic Games was as follows: At the Olympic Games, 1/620 (0.2%) had a visual acuity of log MAR 1.0 (Snellen equivalent, 20/200) or worse; at the Paralympic Games the respective number of patients was 31/516 (6.0%).

During the Olympic Games, there were seven patients who received treatment due to trauma. From the results of the questionnaire survey of volunteers who worked in Polyclinics, a handy slit and high/low power eye glass lenses were necessary.

At the Tokyo 2020 Olympic and Paralympic Games, the eye care team — consisting of ophthalmologists, certified orthoptists, and opticians — were able to provide ophthalmic care efficiently amidst the COVID-19 pandemic.

## Introduction

The Tokyo 2020 Olympic and Paralympic Games had been postponed for a year due to the spread of the new coronavirus disease 2019 (COVID-19). In the history of the modern Olympic

Games, it has been canceled only thrice (in 1916, 1940, and 1944), all related to World War I or II. It was the first time the event had been postponed due to the spread of an infectious disease. In the fifth wave of COVID-19 infections which emerged in July 2021, the entire country was hit by an outbreak of infection never seen before due to the extremely infectious delta strain that was dominant in those days. At that time, in Japan, vaccination had been made accessible for medical workers and the elderly; it was not yet given to the rest of the population.

Since the infection of athletes and Olympic officials may spread COVID-19 all over the world, the medical care system focused on infection con-

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trol in addition to regular medical care. As a strict rule of conduct for athletes<sup>1)</sup>, only those who tested negative were allowed to enter the Athletes' Village, and PCR tests were conducted regularly even later. The staff at the Athletes' Village General Clinic (hereinafter referred to as "Polyclinic") underwent laboratory-based saliva antigen screening every morning and avoided contact with athletes as much as possible<sup>2)</sup>. Although the ophthalmology practice had been in operation since 2009 at the Polyclinic, this was the first time it had been followed with infection control measures in place.

This study describes the characteristics of ophthalmological care at the Polyclinic during the Tokyo 2020 Olympic and Paralympic Games held during the COVID-19 pandemic.

## Materials and Methods

At the Tokyo 2020 Olympic and Paralympic Games, the Polyclinic was established in the Athletes' Village (Harumi, Tokyo). The Polyclinic was open from July 13 to August 11, 2021 (Olympic Games) and from August 17 to September 8 (Paralympic Games). The Polyclinic provided specialized sports medicine services for athletes and temporary emergency medical care for athletes and officials (non-athletes) residing in the Athletes' Village. There were no inpatient or surgical facilities; patients would be transferred to an external medical institution for hospitalization or advanced medical care. The Polyclinic facility had an area of 3,800mm<sup>2</sup>, and outpatient fever consultation center and testing center were installed in the temporary medical facility. At the entrance of the Polyclinic, triage was conducted utilizing temperature checks and questionnaires. To prevent overcrowding in the clinic, the Polyclinic also introduced an online appointment management system. Athletes were able to check availability and make reservations by themselves using smartphones or similar devices. Medical records were stored in a GE Healthcare electronic medical record.

All ophthalmological examinations were per-

formed by volunteers, 19 ophthalmologists, 14 certified orthoptists, and 11 opticians working in shifts from 7:00 am to 11:00 pm. The ophthalmology department was divided into three rooms: an examination room, a consultation room, and an eyeglass provision space. An autorefractometer/keratometer/non-contact tonometer TONOREF III (Nidek, Japan), a slit-lamp biomicroscope with Goldmann applanation tonometer SL-D701 (Topcon, Japan), a non-mydriatic digital Fundus Camera NIDEK AFC330 (Nidek, Japan) were used for ophthalmology examination. There were 400 frames on display in an eyeglass provision space, and after selecting one, the optician made the spectacles according to the patient's prescription, in approximately an hour. The spectacles were limited to single focus spectacles and were not compatible with bifocals/multifocals. The power of the lens spanned -10.0D to +6.0D, including astigmatism. Contact lens inventory was limited to 1day Acuvue Moist (Johnson & Johnson, USA) from -12.0D to +5.0D (BC9.0, SIZE 14.2), and did not support astigmatism or bifocals/multifocals. At the Tokyo 2020 Games, prescriptions for eyeglasses and contact lenses were provided only for athletes, and prescriptions were issued only to coaches and officials of the athletes' organization.

After the Tokyo Games, ophthalmology services provided at the polyclinics were ascertained using a questionnaire. The questionnaires were distributed via the Internet from September 9 until September 30 2021 and sent to 43 volunteers who worked at the polyclinic (18 ophthalmologists, 14 certified orthoptists, and 11 opticians) excluding one volunteer who is the first author. The questionnaire consisted of 5 questions regarding equipment needed for medical care, difficulties encountered in the practice, and infection control measurements.

Statistical analysis was conducted using Jump Pro software (version 16) and a significance level of 0.05.

Table 1 Demographics of patients attending the Polyclinic

	Olympic	Paralympic
Extended number of patients	697	556
Gender (male/female)	405/292	340/216
Age	36.2 ± 13.7 (min15 ~ max81)	40.1 ± 11.9 (min14 ~ max82)

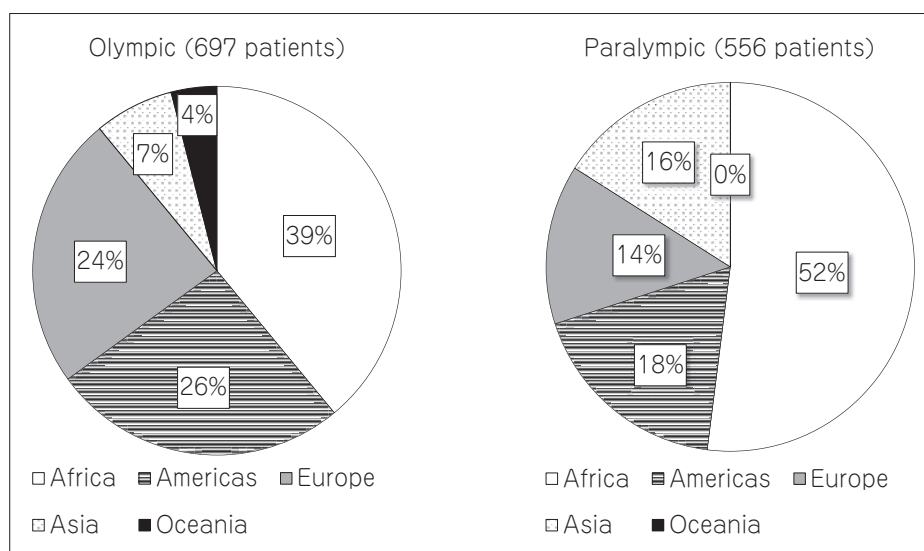


Figure 1 Continent of patient attending the Polyclinic

## Results

### 1) Demographics

There were 697 patients during the Olympic Games (405 males, 292 females), with an average age of  $36.2 \pm 13.7$  years (minimum 15 years, maximum 81 years). There were 556 patients during the Paralympic Games (340 males, 216 females), with an average age of  $40.1 \pm 11.9$  years (minimum 14 years, maximum 82 years) (Table 1). At the Olympic Games, 52% of patients were from Africa, 18% from the Americas, and 14% from Europe. At the Paralympic Games, 39% of patients were from Africa, 26% from the Americas, and 16% from Asia (Figure 1). In terms of the sport, at the Olympic Games, the Polyclinic saw 93 track and field athletes, followed by 46 swimmers, and 29 boxers. At the Paralympic Games, the Polyclinic saw 110 track and field athletes, followed by 50 weightlifters, and 39 wheelchair basketball athletes (Table 2). Figure 2 presents the daily visits for the Olympic and Paralympic

Games. At both the Olympic and Paralympic Games, the number of patients gradually increased during the tournament from the day after the village opened until the day before the village closed. The maximum number of patients examined per day was 46 and 42, respectively.

### 2) Clinical Findings

Visual acuity (hereinafter meaning the better visual acuity) of patients at the Olympic and Paralympic Games was as follows: The patients with poor eyesight were significantly more in Paralympic than in Olympic ( $p=0.0084$ ). At the Olympic Games, 1/620 (0.2%) had a visual acuity of log MAR 1.0 (Snellen equivalent, 20/200) or worse; at the Paralympic Games, the respective number of patients was 31/516 (6.0%) (Table 3). At the Olympic and Paralympic Games, 63% and 75% of patients wanted corrective eyeglasses, respectively. Refractive error was the most common at both the Olympic and Paralympic Games: 503/697 (72.2%) and 403/556 (72.5%), respectively (Table 4). At the Olympic Games, refractive er-

Table 2 Competition of patients attending the Polyclinics

Olympic		Paralympic	
competition	number of patients	competition	number of patients
Athletics	93	Athletics	110
Swimming	46	Powerlifting	50
Boxing	29	Wheelchair Basketball	39
Rugby	23	Swimming	25
Judo	21	Table Tennis	18
Fencing	19	Sitting Volleyball	13
Volleyball	18	Shooting	12
Shooting	17	Archery	8
Hockey	16	Goalball	7
Weightlifting	15	Judo	7
Wrestling	15	Athlete Competition Partner	5
Handball	14	Water Polo	2
Basketball	13	3x3 Basketball	1
Canoe Sprint	11	Baseball/Softball	1
Baseball	10	Equestrian	1
Rowing	8	Marathon Swimming	1
Beach Volley	7	Triathlon	1

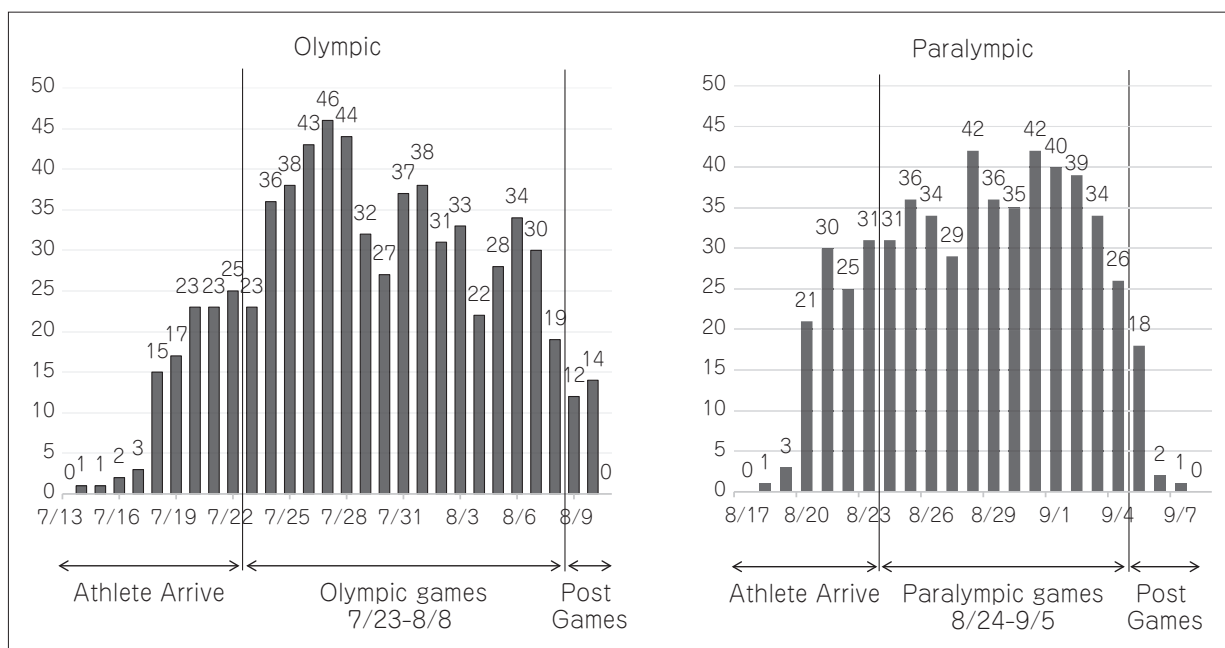


Figure 2 Number of patients attending the Polyclinic

ror, dry eye, and eye strain were common, and at the Paralympic Games, refractive error, dry eye, and conjunctivitis were the most common. A total of 598 glasses and 101 pairs of contact lenses (for 51 people) were provided. The disease characteristics of patients who visited the Polyclinic during the Paralympic Games were optic nerve atrophy, corneal opacification, aniridia, phthisis

bulbi, keratoconus, and macular dystrophy.

During the Olympic Games, there were seven people who received treatment due to trauma. A handball athlete and a rugby athlete had traumatic iritis, a rugby athlete had traumatic keratoconjunctivitis, a boxing athlete, a judo athlete, and a rugby athlete had corneal erosion, and a basketball athlete had cheekbone fracture. No

**Table 3** Visual acuity (meaning the better visual acuity) of patients at the Olympic and Paralympic Games

log MAR (Snellen equivalent)	Olympic	Paralympic
-0.3 (20/10)	17	13
-0.2 (20/12.5)	119	91
-0.1 (20/16)	437	288
0 (20/20)	29	44
0.05	7	15
0.1 (20/25)	2	7
0.15	4	6
0.2 (20/32)	3	7
0.3 (20/40)	0	3
0.4 (20/50)	1	1
0.5 (20/63)	0	4
0.7 (20/100)	0	4
0.8 (20/125)	0	2
1 (20/200)	1	6
1.05	0	1
1.15	0	1
1.2 (20/320)	0	4
1.3 (20/400)	0	2
1.4 (20/500)	0	3
1.5 (20/630)	0	2
1.7 (20/1000)	0	4
2 (NLP※)	0	3
2.4	0	1
3 (20/20000)	0	1
3.3	0	3
total	620	516

※NLP: non-light perception

**Table 4** Reason for visit

Olympic		Paralympic	
disease	number of patients	disease	number of patients
Refractive error	503 (72%)	Refractive error	403 (73%)
Dry eye	46 (7%)	Dry eye	50 (9%)
Eyestrain	29 (4%)	Conjunctivitis	39 (7%)

trauma-related illnesses were found among Paralympic Games athletes. A non-athlete who developed retrobulbar neuritis during the Olympic Games was transported from the Polyclinic to another hospital. An athlete who developed rhegmatogenous retinal detachment during the Paralympic Games was transported to another hospital for surgery.

### 3) Questionnaire survey

The survey was sent to 43 volunteer from which 34 (79%) completed the survey. All partici-

pants agree to the privacy policy statement. The characteristics of the participants are described in **Table 5**. The hand held slit lamp and refractometer were medical devices that many felt necessary. Moreover, 3 respondents thought high/low power eye glass lenses, 2 people thought flat/steep base curve contact lens (**Table 6**). The most difficult part was dealing with the lack of information about the free distribution of eyeglasses and contact lenses to players only. Three respondents indicated that they experienced difficulties

Table 5 Personal data of the participants

Age	30s and younger	4
	40s	18
	50s and older	12
Occupation	ophthalmologists	14
	certified orthoptist	10
	opticians	10
Number of activities	1-4	4
	5-9	18
	10-14	8
	15-19	2
	20 times and more	2

in using electronic medical records and communicating with patients respectively. More than 75% (26/34) of respondents scored themselves “satisfied” or “very satisfied” with the polyclinic’s medical services. No respondent felt that the medical care provided was “very dissatisfied”. On the other hand, only 44.1% (15/34) of respondents scored “good” or “very good”, 8.8% (3/34) of respondents scored “poor” with infection control measures.

## Discussion

This study reports on the implementation of ophthalmic medical services at the Polyclinic for the Tokyo 2020 Olympic and Paralympic Games. The Games, which were postponed for the first time in history due to the spread of COVID-19, were designed to keep athletes healthy while paying close attention to taking appropriate infection control measures.

Patients at the Polyclinic were asked to wear masks, disinfect their hands, and prevent overcrowding. However, several athletes were not wearing masks correctly or were not wearing non-woven masks. In ophthalmological examinations, the number of people who could place reservations was limited and the distance between chairs in the waiting room were increased to avoid the overcrowding of patients. As most Paralympic athletes relied on support from their team, and thus they were often surrounded by other individuals, overcrowding was a frequent result. In addition, some volunteers felt uneasy

because infection control measures varied from country to country. Excessive media coverage has made volunteers uneasy. It was important to share correct and well-founded information at the polyclinics during the pandemic. Because many volunteers were sensitive to information about infected and close contacts, the information of teams with members who contracted COVID-19 was shared with the Polyclinic staff every morning. During the Games, there were no cluster outbreaks in any medical department, and the tests for COVID-19 and the response to those who tested positive were reportedly useful<sup>3)</sup>.

The maximum daily number of patients was 46 patients a day at Olympic Games and 42 patients a day at Paralympic Games, respectively; these numbers were lower than those at the Sydney 2000 Olympic and Paralympics, London 2012<sup>4,5)</sup>, and Rio 2016<sup>6)</sup>. It might be due to the introduction of the first-ever online reservation management system to limit the number of patients to prevent the spread of infection. There was no reservation system in the past Games, so athletes and officials were free to visit the medical department at any time. The “Playbook” created by the Organizing Committee also instructed the athletes to restrict movement within the Athletes’ Village and promptly leave the village after the Games as a countermeasure against infectious diseases. Consequently, the length of stays at the Olympic Village was shortened, which led to fewer non-essential patients. In Tokyo 2020 Games, the largest number of patients came from the African

Table 6 Questionnaire survey

Q1, What equipment did you find you needed when you provided medical care in Polyclinic?	
hand held slit lamp	9
hand held refractometer	7
shielding lens	4
angular vision, preferential looking test	2
Optical Coherence Tomography (OCT)	1
lensmeter	1
eye glass frame (bigger size)	1
penlight	1
high/low power eye glass lens	3
flat/steep base curve CL	2
color CL (for aniridia)	1
Q2, What were some of the difficulties you encountered when you provided medical care in Polyclinic?	
response to lack of information regarding free distribution of eyeglasses and contact lenses only for athletes	11
communication with patients	3
difficulty using electronic medical records	3
arrangement for transportation for patient	1
difficulty measuring visual acuity for Paralympic athletes	1
need for a non-English medical questionnaire	1
lack of reception staff	1
wondering how much to explain about congenital diseases	1
difficulty placing their chin on the examination table in wheelchairs	1
Q3, How good were the medical services you provided in Polyclinic?	
Very dissatisfied	0
Dissatisfied	1
Neutral	7
Satisfied	17
Very satisfied	9
Q4, What were your concerns about infection control measures in Polyclinic?	
concerning about patient's infection control measures (not wearing mask correctly or wearing cloth mask)	6
overcrowding in examination room or waiting room	3
delayed information on close contact patients	3
lack of PPE (immediately after the opening of the village)	2
concerning about the overheated media coverage of the spread of COVID-19	1
No worries about infection control measures	3
I was relieved to get a saliva antigen test	1
I was relieved to get vaccination	1
Q5, What was the level of infection control measure in Polyclinic?	
Very poor	0
Poor	3
Average	15
Good	13
Very good	3

continent. It has also been reported that the countries with the highest number of consultations were low or low-middle income countries in the past competition<sup>7)</sup>. The athletes who underwent medical examinations had been unable to receive medical care due to economic shocks and the global spread of the disease. Some athletes had

been unable to receive medical care because they had fled their home countries following the pandemic.

Paralympians tend to have more eye pathology than Olympians. It took time to move a patient in a wheelchair to the examination table. It also took a significant amount of time to examine a per-

son's vision, making it necessary to adjust the appointment schedule accordingly. The most common disease was refractive error both in Olympic and Paralympic game, which was the same as in past competitions. Optimal health of athletes is necessary for the success of the Games, and the International Olympic Committee is responsible for providing medical care during the Games that assesses not only injuries but also comprehensive progress health<sup>8,9)</sup>. Accordingly, as many patients visited the hospital to check the health condition of their eyes rather than injuries during the competition, they had mild diseases such as eye strain and dry eye.

Many volunteers were satisfied with the medical care they provided. Several volunteers had difficulty communicating with non-English speaking patients because the interpreters could not translate correctly. The most difficulties with patients concerned the free distribution of eyeglasses and contact lenses. The "Playbook" created by the organizing committee also stated that prescriptions for eyeglasses and contact lenses were only for athletes. However, the eyeglasses, which had been distributed free of charge at previous games, were not distributed to anyone other than the athletes at the Games, thus causing confusion immediately after the Athletes' Village had opened. If optimal health of athletes is necessary, it may have been more appropriate to prepare light-shielding glasses that alleviate pathological glare, sports glasses that prevent glare (halo, glare), and magnifying glasses that allow people with visual impairment to see better. Several medical devices and instruments were needed to provide better medical care. Especially in the Paralympics, a hand held slit lamp and a handy refractometer would have reduced patient transfer and examination time. Paralympic athletes needed high/low power eye glass lenses and flat/steep base curve contact lens more than expected. This information would be helpful for future competition.

Eye injuries had occurred in handball, rugby, boxing, judo, and basketball players during the

Olympic Games. All these sports entail physical contact between players. All the patients needed the Polyclinic visits for several days with eye drops, but none required hospitalization or surgery.

At the Tokyo 2020 Olympic and Paralympic Games, the eye care team — consisting of ophthalmologists, certified orthoptists, and opticians — were able to provide ophthalmic care efficiently amidst the COVID-19 pandemic. Our team was able to meet the patient's needs quickly with limited equipment. Our infection control measures worked well to prevent COVID-19 clusters inside the village. We hope that the experience of ophthalmological care at the most recent Games will be considered when other countries host the event in future.

#### **Acknowledgement**

The authors would like to express their thanks to all the volunteers of ophthalmologist, certified orthoptists and opticians at the Tokyo 2020 Olympic and Paralympic Games. We would also like to thank Miss. Tamami Kaku.

#### **Conflicts of Interest**

All authors declare that they have no conflicts of interests.

#### **Ethics approval**

This study was approved by the Medical Ethics committee of Showa University School of Medicine (Approval No.21-099-B).

#### **Author contribution**

Takuya Tsuji and Tomomi Nishida-Shimizu substantially contributed to the study conceptualization. Kimi Endo and Tomoyo Kobayashi significantly contributed to data formal analysis and investigation. Yumi Kamijo substantially contributed to the manuscript original drafting. All authors critically reviewed and revised the manuscript draft and approved the final version for submission.

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(Received: January 6, 2023, Accepted: April 3, 2023)

## 東京 2020 オリンピック・パラリンピック競技大会における眼科診療

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キーワード：オリンピック・パラリンピック競技大会，ポリクリニック，眼，眼科診療，新型コロナウイルス

【要旨】 東京 2020 オリンピック・パラリンピック競技大会は，新型コロナ感染症拡大のために，2020 年に開催される予定であった大会を 1 年間延期した。今大会での医療提供体制は，通常選手村に必要な医療の他に感染対策が重視された。この研究の目的は，今大会における選手村診療所の眼科診療の特徴を記録し，将来に引き継ぐことである。

眼科診療は，すべてボランティアで，医師 19 名，視能訓練師 14 名，眼鏡士 11 名が 7:00～23:00 までシフトを組んで対応した。選手村診療所内の過密化を防ぐために，インターネット上で利用可能な予約管理システムを導入した。延患者数は，オリンピック期間は，697 人，パラリンピック期間は，556 人だった。視力 0.1 以下の人は，オリンピック競技大会では 1/620 (0.2%)，パラリンピック競技大会では 31/516 (6.0%) だった。視力 1.0 以上の人は，オリンピック競技大会では 602/620 (97.1%)，パラリンピック競技大会では 436/516 (84.5%) だった。オリンピック競技大会中に 7 人が外傷によって受診した。診療参加者からのアンケート調査結果より，診療器具として手持ちスリットランプやレフラクトメーターが必要で，眼鏡レンズとしては，事前に準備していたレンズより，さらに強い/弱い度数が必要だった。

眼科チームは，新型コロナ感染症の中で効率的に医療を提供することができた。