Influence of COVID-19 on operations in the medical setting of a particle therapy facility

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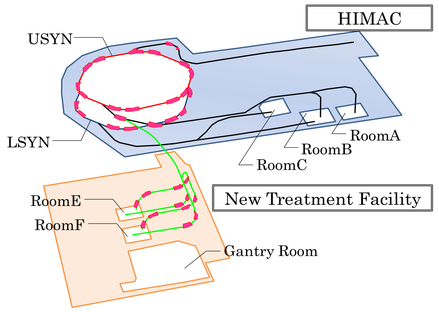
WAO 2021 Workshop on Accelerator Operations 5th - 8th October 2021, Barcelona, Spain

Introduction

Outline of HIMAC

At National Institutes for Quantum and Radiological Science and Technology (QST), carbon-ion therapy has been conducted since 1994, and a total of more than 13,000 patients have been treated to date. Our facility has **"HIMAC Building"**, which houses from the ion source to the synchrotron, and **"New Particle Therapy Research Facilities"**, which houses from the transport line to the treatment room, each operated by different teams. (Hereafter, the former is referred to as the **INJ/SYN** team and the latter as the **IRRD** team.)

Overall view of HIMAC beamlines



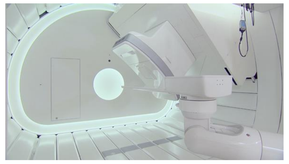
Pandemic of COVID-19

The COVID-19 pandemic in 2020 prompted the need for robust infection control measures for all medical facilities. Our facility, which specializes in cancer treatment, was no exception. Doctors, nurses, and radiologists, as medical staffs, took the same infection control measures as in a normal hospital.

Although IRRD team operators do not have direct contact with patients, indirect contact such as passing by patients or touching places that patients have touched occurs frequently. Therefore, IRRD operators need to take the measures equivalent to those taken by medical staffs.

However, in the midst of the pandemic, combined with the chaos of the explosive spread of the disease, the supply of disinfectants and masks was in a severe shortage in Japan. Thus, the question of how to allocate limited resources for measures also was critical problem. Masks were distributed to medical staffs and IRRD operators by the QST hospital, but they were not distributed to INJ/SYN operators since the hospital also did not have a large stock of masks. Even the medical staffs sometimes spent a week with only one mask.

Superconducting rotating-gantry at QST



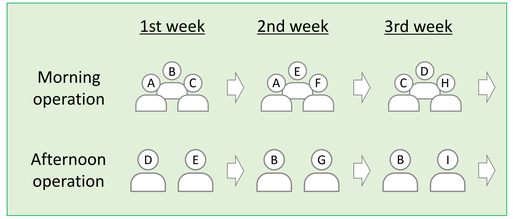
Policy for measures against infection -two policies as medical facility-

Two policies for measures

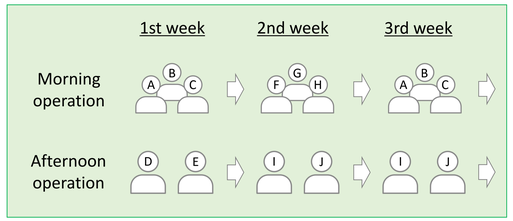
In addition to the above, our measures focused on two points: "not to infect patients" and "to ensure that treatment can be continued in the event of an infected person".

Shift of fixed operation team

Before COVID-19



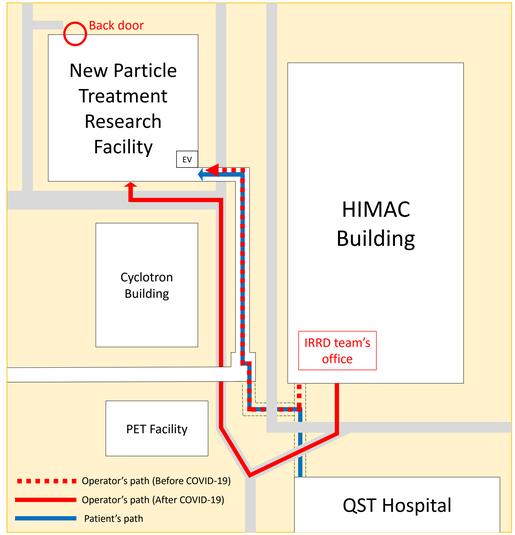
After COVID-19



Measures to continue treatment

Originally the combination of operation teams was different from week to week, but to prevent the spread of infection, the combination became to be fixed. This minimizes the number of other operators suspected of infection, even if someone is infected.

Path of operator and patient to New Treatment Facility

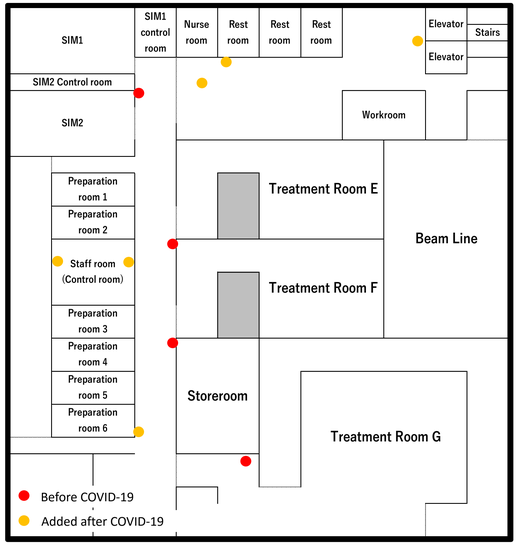


Measures to avoid contact between operator and patient

A passageway and elevators connecting the QST hospital and the New Particle Therapy Research Facilities, which were previously shared by staffs and patients, are forbidden to be used by operators. As a result, IRRD operators must now pass through the open air to go back and forth between their office and the field. Late at night or early in the morning when the building is locked, they have to take a detour and enter through the back door.

Basic measures against infection

Where to put rubbing alcohols



Basic measures

In the New Particle Therapy Research Facilities, rubbing alcohols have been installed in each treatment room and staff room. Before COVID-19, medical staff disinfected only when they touched the patient's body, but now they disinfect the area where the patient came in contact every time they finish treatment one patient. At the end of the day, IRRD operators disinfect the computers and equipment control panels in the treatment rooms and the staff room.

Response after discovery of infection

Case of an infected operator

In January 2021, one IRRD operator reported a sore throat and fever. He had been working in the New Particle Therapy Research Facilities as a team of two people for 3 days prior to the fever, but had no contact with the patient. The following week, his PCR test results turned positive.

Behavioral history of the four people who had close contact with the infected operator

	1/18	1/19	1/20	1/21	1/22-2/5
Infected IRRD operator	Work in N.T.R.F.	→	→	Have a fever in home	Down or work from home until 2/11
IRRD operator A	Work with the infected operator all day	→	→	→	Work from home
IRRD operator B	Work outside of N.T.R.F.	→	Work with the infected operator for 30 minutes	Work outside of N.T.R.F.	Work from home
INJ/SYN operator who is A's spouse	Work in HIMAC	→	→	→	Work from home
QST staff	Work outside of N.T.R.F.	In a same room with the infected operator for 1 hour	Work outside of N.T.R.F.	→	Work from home

Measures to prevent the spread of infection & Result

On the day he reported the fever, all areas that he might have touched were disinfected. In addition, he reported his entire behavioral history within 3 days on an hourly basis. From the next day, four people who had close contact with him were ordered to work from home for two weeks. Thanks to minimizing the number of operators suspected of infection, it was easy to secure replacing.

They were able to go to work after their PCR test results turned negative. The infected operator returned after two weeks from the fever subsided. As a result, the infection did not spread any further.

Summary

Our facility had taken extra stringent measures against COVID-19. Even with these measures in place, an infected person occurred, but the infection did not spread to patients or staffs. This result may have been due to the thoroughness that comes with being in the medical setting. Measures against infection will continue to be taken from now on, sometimes with optimization.