

1. Introduction

1.1 Purpose

Continuation of heavy ion radiotherapy is the top priority.

We need to prevent the spread of infection among accelerator operators.

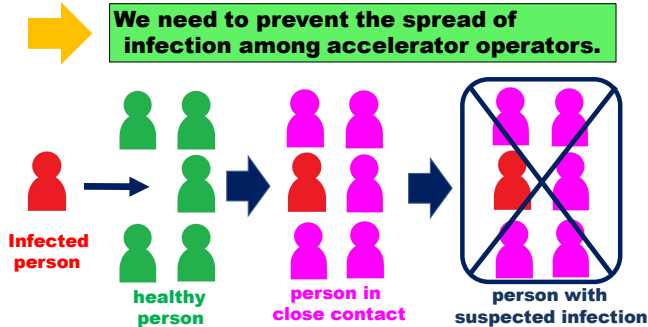
1.2 Background

HIMAC has been running 24 hours a day for 1-2 weeks, treating by day and experimenting by night.

Person with suspected infection will not be able to enter the control room.

Lack of operators needed for operation.

Risk of HIMAC shutdown!!



Execution of measures to prevent the spread of infection

2.2 Staffing during breaks

Breaks that involve eating and drinking greatly increase the risk of infection.

The number of operators using the break room has been limited so that the break room will not be crowded by using a timetable (Fig.3).

By sharing information about breaks in advance, we can prevent operators from becoming crowded.

Break Time	Break Room [capacity]				
	1 [6]	2 [4]	3 [2]	4 [2]	5 [1]
11:00~11:30		●			
11:30~12:00	● ●	●	●	●	
12:00~12:30	● ● ●	●	●		●
12:30~13:00	● ● ●	● ●	●	●	
13:00~13:30	●	●		●	●
13:30~14:00					

● Break room users

Fig.3 : Break room reservation table (Example of reservation status)

2. Measures

2.1 Devising operator shift organization

Shift organization was changed to prevent the spread of infection among operators.

	Operator												
	1	2	3	4	5	6	7	8	9	10	11	12	
Mon	D	D	M	M	M	M	M	M			M	M	
Tue	N	N		D	D	M	M	M	M	N	N	M	M
Wed			N	N		D	D	M	M	M	M	M	M
Thu	M	M			N	N		D	D	M	M	M	M
Fri	M	M	M	M					D	D	M	M	M
Sat	D	D	H	H	H	H		N	N	H	H	H	H

M : Maintenance(8:30~17:30) Day : Operation(8:30~20:30) Night : Operation(20:00~33:00)

Fig.1 : Operator shift (Before the COVID-19 Pandemic)

	Operator A Team						Operator B Team					
	1	2	3	4	5	6	1	2	3	4	5	6
Mon	M	M	B	B	C	C	M					
Tue	A	A	B	B	C	C	Telework and Backup					
Wed	A	A	B	B	C	C	Telework and Backup					
Thu	A	A	B	B	C	C	Telework and Backup					
Fri	A	A	B	B	C	C	Telework and Backup					
Sat	Holiday						Holiday					

A : Operation(6:00~15:00) B : Operation(14:00~23:00) C : Operation(22:00~31:00)

Fig.2 : Operator shift (During the first wave of COVID-19 Pandemic)

Change 1

Divide into two teams and isolated them from each other.

One team can be a backup in case of an infected person in the operator team.

Change 2

One team engages in operation and the other engages in telework.

The number of operator staying in the control room can be reduced.

Change 3

Changed from 12-hour shifts to 8-hour shifts to focus on operation.

Reduced contact time between operators.

3. Results

Devising operator shift organization

The number of operators staying in the control room could be reduced to **less than half**. The operator contact time could be reduced from a maximum of **8 hours to 1 hour**.

Staffing during breaks

Reduced the possibility of unexpected infection outside of operation.

However, we did not experience the effects of infection prevention measures.

No case of infection with COVID-19 appeared among the accelerator operators.

This is a result of the effective implementation of infection control measures by individuals.

Alcohol disinfection when entering and leaving the control room, wearing mask, daily temperature check, etc.

4. Summary

The following two points are important for infection prevention measures.

- Prevent secondary infection as much as possible in the event of an infection.
- Provide backup so as not to affect the accelerator operation.

Fortunately, there have been no cases of COVID-19 infection among the accelerator operators, and the accelerator operation have not been interfered. We will continue making our efforts to prevent infection so that we can lower the risk of HIMAC shutdown.