(様式4) (Form4)

学 位 論 文 の 内 容 の 要 旨
Dissertation Abstract

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(学位論文のタイトル) Title
Efficiency of an RFID Positioning System for Cancer Patients in a Heavy Ion Center
(重粒子線医学センターにおけるがん患者のためのRFIDポジショニングシステムの有効性)

(学位論文の要旨)

1) Background and Objective of Research

Heavy Ion therapy is relatively newer and more effective treatment modality of radiation therapy in cancer. Due to its high infrastructural cost, this facility is sparsely available (12 centers as of April 2020) across the globe. Most effective utilization of these centers is a must to provide maximum benefit to the society as well as generating more revenue. Long waiting time of patients due to various reasons reduces the efficiency of a treatment center and overall satisfaction of patients. By using Radio Frequency Identification Device (RFID) technology, we performed tracking of medical staff and patients treated at Gunma University Heavy Ion Medical Center (GHMC) and analyzed their stay time in various units of the center. The objective of our study is to prepare an appropriate treatment scheduling algorithm for patients in GHMC by using the recorded stay time data.

2) Method of Research

All patients, doctors and radiotherapy technicians of GHMC were being issued a specific semi-active IC tag routinely since September 2010. When they pass by a tag reader (RFID reader) placed near a door the time stamp was recorded at that point of time in the server, which was later used to calculate their stay time inside a particular room or unit inside GHMC. For this study we retrieved and sorted out the time stamp records of various cancer patients, doctors, and radiotherapy technicians from September 2010 to November 2013. The raw data was sorted out depending on data of patients and radiotherapy technicians.

The stay time of patients and their facing time with radiotherapy technicians were divided into a few specified periods depending on the treatment duration and availability of data in prostatic cancer, liver cancer, and lung cancer. Comparison was then made between days of a particular period and also between respective days of different periods

using the two tailed t-test.

3) Outcome and Consideration

It was found that in each period, the stay time in treatment unit is considerably reduced in the last several days as compared to the 1st day of treatment of prostatic cancer. In the inter-period comparison analysis, it was noticed that stay time of patients as well as the facing time with radiotherapy technicians in treatment unit was significantly lesser in the later period. There was a tendency that the stay time in treatment unit was decreased in liver and lung cancer. However, no significant difference was noticed in patient's stay time data in examination room with doctors.

4) Conclusion

Our data suggest that the patient compliance and set up time by radiotherapy technicians is gradually improved as patient's treatment progresses. Also, with time after installation of the center, skill of the technicians has improved leading to reduced stay time in later periods. This implies that RFID technology is a feasible method to assess the resource utilization efficiency & also for generating scheduling algorithms based on the plateauing stay time values.