

MULTI-CENTRE INTENSITY MODULATED RADIOTHERAPY AUDIT IN MALAYSIA

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Abstract— It is widely known that there is a need to assess the accuracy levels of the current practices in radiotherapy centres, and identify issues which may exist for future improvement and development. There is yet a national audit programme in Malaysia that assess the accuracy of the IMRT delivery. This paper describes the first trial of audit activities that had been carried out between 2018 and 2019 in Malaysia. The IMRT technique in Malaysia, in general, is well implemented following the recommendations from international guidelines. This study provides an invaluable measure of the treatment quality that any necessary improvement can be planned and implemented.

Keywords— Dosimetry audit, IMRT, national survey, planning, QA.

I. INTRODUCTION

Dosimetry audit is one of the main components when it comes to managing the quality of the radiotherapy treatment [1]. It plays an important role to ensure the safe implementation of new technologies or techniques [2]. Besides, the external dosimetry audit can provide an independent check of the local approaches and allow the comparison among the participating centres. The sharing of experience among the participating centres allow benchmarking of centres with similar equipment and thus increases the knowledge of what is achievable with a particular combination of equipment. This activity will help the new or less-experienced centres in the implementation of new technologies or techniques.

Dosimetry audit may cover various levels from basic reference dosimetry to the treatment outcome [3]. In 2018, the University of Malaya in collaboration with Universiti Sains Malaysia has conducted the first external dosimetry audit activities in Malaysia. These activities focus on the Intensity Modulated Radiotherapy Technique (IMRT) where the majority of the centres had implemented the techniques after the year of 2010s. This activity is supported by Malaysia Oncological Society (MOS) and aims to assess the current practice and quality of IMRT delivery among radiotherapy centres in Malaysia. This article summarises the overall activity that had been conducted.

II. ACTIVITIES AND STATUS

There are in total 33 radiotherapy centres/department compromises of 9 public or university hospitals and 24

private centres from the list provided by Ministry of Health (MOH) Malaysia at the time of this audit was conducted. The first part of the audit programme conducted in Malaysia was carrying out a facility questionnaire followed by the IMRT planning activities and the on-site visit of verifying the deliverability of the IMRT plans. These activities were conducted in sequence as shown in Figure 1.

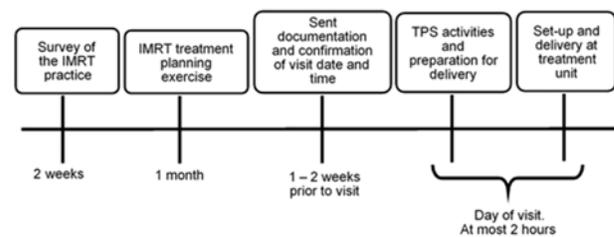


Fig. 1 The timeline of the audit activities

Facility questionnaire

The questionnaire was developed, and it contained several sections that covered the medical physics staffing information, treatment planning system, treatment units, IMRT QA tools and IMRT process. The questionnaire was then distributed to all radiotherapy centres/departments in Malaysia between December 2018 and September 2019.

There were 26 centres participated in this survey representing 79% of the response rate. From this survey, it was observed that the IMRT practice in Malaysia is homogenous with some variation in certain practice. All centres performed IMRT QA before starting the treatment [4]. About the IMRT process, the physicist in Malaysia spent a long time to produce a clinically acceptable head and neck treatment plan compared to those in the UK [4]. The survey provides a picture of medical physics of IMRT practice in Malaysia where the data can be used by radiotherapy centres to benchmark their local practice. The full results had been reported and can be found here (<https://doi.org/10.1016/j.ejmp.2019.10.023>).

IMRT treatment plan

In this second part of the audit activities, looking into the quality of the treatment plan produced by the physicist among

participating centres. The controlled dataset was given and the participating centres produced their treatment plan within the given time frame. The documentation was prepared and sent to the centres as guidance for the physicist to complete this part of the audit activity.

All plans were analysed against the planning goals provided using a commercialised software where the dose distribution can also be viewed as shown in Figure 2. Looking into details of the dose distribution, some variations were observed from the plan produced by the participating centres. Besides, some metrics were calculated to quantify the quality and complexity of the plans between participating centres. The full report of the results is set to be published soon.

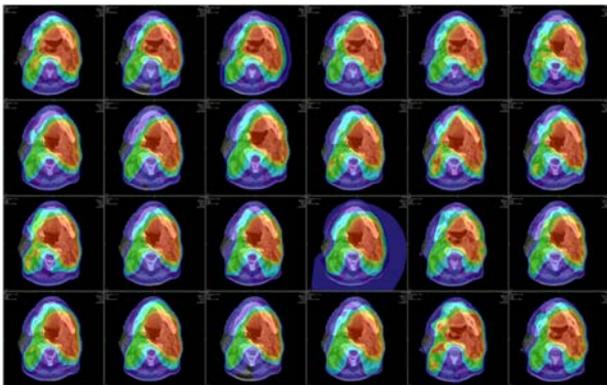


Fig. 2 Screenshot of the transverse view of the dose distribution from the plan produced by the participating centres

On-site visit

The last part of the audit activity was an on-site visit to the participating centres to assess the accuracy of the IMRT delivery. This part of the audit activity required more preparations as it involved visiting the centres where the flow of the activities was important due to the known busy clinics in radiotherapy centres/departments. Several documents were prepared and sent to the participating centres before visiting them. The measurements were done by using independent tools where the point dose and the planar dose were compared with the calculated dose distribution of the plan produced from the treatment planning system of the centres.

Due to the limited resources, 11 centres were visited in Klang valley area and Penang between April to September 2019. Figure 3 shows the photo taken during the visit from one of the participating centres. The dose difference of the point doses and the gamma analysis of the planar dose were analysed by using a recommended tolerance. The full results of the analysis will be available soon.

III. CONCLUSIONS AND SUGGESTIONS FOR FUTURE

A first multi-centre audit had been successfully conducted in Malaysia. This dosimetry audit should be continuously upgraded and conducted within radiotherapy centres. These activities will contribute towards advancement and harmonization of IMRT/VMAT treatment delivery in this country. Besides, the audit can be extended to more advanced techniques that have been introduced in radiotherapy.

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