Rationalise Radium: Reducing delays between treatment cycles of 223Radium Dichloride

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Background

223radium dichloride is a radiochemical preparation which irreversibly affects tumour cell DNA to cause necrosis, specifically targeting bone lesions.1 It is therefore used in patients with bone disease without other metastatic disease, after hormone treatment has failed, otherwise referred to as metastatic castration-resistant Prostate Cancer (mCPCA).

New Cross Hospital provides a regional quaternary service and is primarily Consultant led. Patients both locally and from neighbouring areas such as Shrewsbury and Telford are referred for consideration by their Responsible Oncologist. Following this, they are seen in clinic by the Consultant for consideration. If deemed appropriate, they are consented for and commence treatment. They attend separately for blood tests, clinic reviews and 223radium dichloride treatment. Clinic reviews are always carried out by the Consultant. Following completion or cessation of 223radium dichloride therapy, patients are referred back to their Responsible Consultant Oncologist.

The mechanism of action of 223radium dichloride is such that alpha-particle emission directly acts on bone-only metastases to improve pain, reduce skeletal events and ultimately increase overall survival time.1 A complete treatment consists of up to 6 doses of 223radium dichloride preferably 4 weeks apart.1 Side effects include nausea, diarrhoea and bone marrow toxicities. Given that its aim is to improve quality and quantity of life, ensuring an efficient delivery of the service is essential.

Problem

After retrospective data collection, an opportunity for improvement was clearly identified with the 223radium service at the Royal Wolverhampton NHS Trust; it was discovered that 45 patients (41 administrations of 223radium dichloride) 50% of who underwent more than one cycle experienced at least one delay of more than 6 weeks between cycles of therapy. At this point the decision was made to undertake a project to improve this aspect of the service.

New Cross Hospital is a provider of Oncology services in Wolverhampton, West Midlands. With regards to the 223radium Dichloride Therapy Service, it is a regional centre for delivery of this therapy, and as such it is important to ensure an efficient and effective service. The service is delivered by two Consultant Clinical Oncologists and the Consultant Radiographer for Nuclear Medicine. They are supported by staff providing health care assistance and phlebotomy. Considering all members of staff and points of patient contact was helpful to begin identification of possible barriers to an efficient service.

This led to a project aim of reducing inter-cycle delays in therapy (defined as more than 6 weeks) by 20%, by the end of June 2019. The process of identifying barriers, areas for change and a suitable aim are summarised in the following diagram.

Measurement

Baseline data collection took place retrospectively from the beginning of the 223radium service at New Cross Hospital. This covered a time period between 2015 and 2018. For the purpose of this project the primary measure for evaluation was the number of days between cycles of treatment (n). This gave the initial realisation that 50% of patients experienced at least one delay between cycles of more than 6 weeks, and is summarised in the following diagram:

<table>
<thead>
<tr>
<th>Time between cycles of 223radium dichloride therapy</th>
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<td>&lt; 6 weeks</td>
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<td>10%</td>
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Figure 1: Project Driver Diagram

Figure 2: Baseline data collection chart

The SMART aim of this project was to reduce total delays between cycles of 223radium dichloride by 20%, by the end of June 2019. A delay was defined as more than 6 weeks (42 days) between administrations. Three PDCA cycles were planned to be completed during the project cycle as it was not implemented. It remains a useful change to consider when appropriate.

PODA cycle 1:

The initial change was the introduction of consultant radiographer clinics. This took different forms; sometimes joint with the Consultant Oncologist and occasionally alone for review appointments. The perceived benefits of this intervention were better organisation and planning of 223radium dichloride administration, to increase total number administrations and reduce unnecessary delays. After implementation this did indeed lead to an increase in the total number of administrations and 94% of administrations were not associated with a delay within the first 6 months; this greatly exceeded the aim. Feedback from the 223radium team confirmed that the change improved the service but was not consistently sustainable. This was due rotating nature of the specialty trainees and lack of experience in the field. Given the reduced number in reduction of delays the change was felt to be a success, and as a result, Consultant Radiographer clinics were included in the service diary to achieve sustainability.

PODA cycle 2:

The second intervention attempted to increase both education and interactions between the patient and their community teams during their 223radium treatment. It was anticipated that increased education would reduce delays by increasing education on side effects of treatment and toxicities requiring treatment cessation; specifically, the difference between them. To do this a patient information leaflet was designed to be sent to the patient to carry. It contained all the information necessary for the patient to be awarded a discount for return visits to both GP and phlebotomy to consider dose on 223radium dichloride treatment. The information on the leaflet could be used by patients to self-assess any side effects and inform necessary action. It resulted in a significant decrease in the number of treatment delays unfortunately. Furthermore, feedback from patients indicated that extra information to be given and carried around did not aid in improving understanding and by extension reduce delays. Consequently, the information sheet was deemed an unsuccessful intervention.

PODA cycle 3:

The reduction in treatment delays coincided with an increase in the overall number of administrations. This is also visible when analysing data from 2018/19 onwards, where there were clearly fewer administrations and subsequently an increase in treatment delays. It therefore appears that the introduction of greater clinic availability resulted in a reduction of treatment delays.

It must also be mentioned that there were two data points not included in the SP chart to avoid massing data. These were delays of administration of 273 days and over 5000 days respectively. The chart was initially plotted with these data points and they were subsequently investigated. After investigation it appeared that these delays were due to treatment toxicity. Given that these delays would never have been altered by any proposed intervention, it was felt that inclusion in the SP chart would detract from useful interpretation, and therefore not included.

Conclusion

The aim at the outset of this project was to reduce delays in treatment of 223radium dichloride. This decision was made after it was found that half of patients in the service experienced delays. The results yielded over the course of data collection show that this was achieved. The measures used were quantitative and appropriate for the project. It was extremely useful in highlighting barriers to efficient treatment within the service, the knowledge of which can only benefit the staff and patients involved for the future.

The changes implemented are sustainable; Consultant Radiographer clinics are now an intrinsic part of the service and had the patient booklet shown success in reducing inter-cycle delays, they too could have become ingrained in the 223radium service. The position of the team members within the service and their accessibility during the project is key to improvements sustaining.

It is accepted that certain barriers are inevitable, namely treatment toxicity and reduction in supply of 223radium dichloride. Addressing the remaining barriers is therefore the most effective way to create a more efficient service. There remains another possible intervention of achieving a “one-day” clinic service which is a future target to aim for in more appropriate times.

References