

Radionuclide therapy services in an era of COVID-19: the radiation protection challenges, opportunities and considerations

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There have been a number of consequences for radionuclide therapy services arising from the coronavirus disease 2019 (COVID-19) pandemic. As well as changing the ability of patients to comply with radiation protection restrictions advice, the pandemic has also provided increased motivation to transfer services to a day-case or out-patient basis. This is driven by the need to reduce COVID-19 exposure risk to patients by minimising the amount of time spent in hospital. Additionally, measures to reduce the risk of radioactive therapy patients being readmitted to hospital with COVID-19 are now required and contingency procedures must be reviewed to ensure they are fit for purpose in this scenario. All these consequences of the pandemic give rise to a number of challenges, opportunities and considerations for the management of radiation protection associated with continuing and resuming radionuclide therapies in this new and rapidly evolving setting.

Changes in social behavior

The changes in social behaviour arising from the COVID-19 pandemic could give rise to increased complexity of challenging scenarios when performing a risk assessment of patient circumstances and coaching for compliance with radiation protection restrictions advice. Some patients could easily adhere to restrictions advice due to living alone as part of self-isolating measures. By contrast, others may be unable to follow even the most minimal of time and distance restrictions advice due to self-isolating with family members or friends. The widespread disruption to and limited options for childcare arrangements may also significantly impact some patients' ability to follow the longer restrictions advice associated with the radiation protection of young children. These various scenarios will lead to a wide range of doses being received by cohabiting family and friends [1]. Choice of travel arrangements home after administration may either prove advantageous or pose a challenge. A combination of official advice to minimise use of public transport, a risk-based reluctance of patients to use it and the reduction in service provision may result in an increased reliance on private vehicles. In many circumstances, this could prove to be beneficial in helping reduce public radiation

exposure. However, there will be patients who intend to be accompanied by a cohabiting family member or friend in a private vehicle and this may be a necessary arrangement rather than that of choice. In these cases, the overall radiation exposure to the accompanying person due to the length of journey and home circumstances combined may result in an unacceptable radiation dose. Solutions to this could include exploring alternative transport arrangements, extending the length or extent of precautions to follow once at home or extending the time spent in hospital before discharge. The latter must be considered carefully regarding its associated increased risk of hospital-acquired severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection with in-patient therapies ideally being confined to non-COVID wards.

Day case considerations

The magnitude of the radiation exposure and resultant radiation risk in all these scenarios will be higher from day-case patients compared to that from in-patients due to the higher external dose rates associated with patient contact earlier after administration [2,3]. Additionally, minimising transfer of radioactive contamination from urine, faeces, sweat or saliva in the home will be more challenging to achieve as the earlier discharge also results in higher levels of excretion occurring in the home [4]. Both of these factors result in the need for longer and more stringent time and distance restrictions and may require the exclusive use of separate bathroom facilities for the first few days post administration. The decision to transfer to and establish a day-case service or not should therefore be considered carefully with particular attention being paid to the number of patients who would be unable to comply with the increased radiation protection precautions. Furthermore, not all therapies are suitable to be performed on a day-case basis, including Y90 SIRT, I131 mIBG and 3.7GBq and 5.5GBq I131 for carcinoma of the thyroid. However, Lu177 PRRT, Y90 PRRT and 1.1GBq I131 for carcinoma of the thyroid are all viable for consideration with appropriate risk assessments. To fully account for all these complex and interrelated factors in a thorough radiation risk assessment of the patient's lifestyle circumstances, an experienced physicist should be

present at prior patient clinic consultations or available for remote consultation as a minimum. The use of the latter can be considered advantageous in helping minimise the patient's hospital visits and consequent COVID-19 exposure risk. Whilst the historical choice of lexicon to communicate time and distance restrictions may have varied between different healthcare professionals and centres, adoption of 'social distancing' as the new phraseology will now make the concepts more familiar to patients and may result in a more consistent understanding and improved compliance.

The day-case setting may facilitate a reduction in COVID-19 exposure risk to patients by minimising the amount of time spent in hospital but the ability to perform these therapies as an in-patient should still remain available. Irrespective of the patient's ability to comply with day-case radiation protection restrictions, the clinical decision to proceed with treatment as in-patient or out-patient should be taken jointly with the patient on an individual basis. This should take into consideration the risk vs. benefit of postponing therapy, any other underlying health conditions and the possible impact of therapy on immunity. This blended approach could have the potential benefits of improving the patient experience, providing greater choice and flexibility, reducing costs and staff time and increasing capacity.

Resources, facilities and other considerations required for day-case radionuclide therapies include, identifying a suitable noncarpeted clinical room with en-suite or immediate access to a designated radioactive patient toilet, satisfactory risk assessment of doses and dose rates in surrounding areas with approval from a Radiation Protection Advisor, designation as a controlled area with access controls and signage, availability of PPE and appropriately trained staff.

The COVID-19 patient

Risk assessments and contingency plans should already be in place for the readmission of a radioactive patient. However, the COVID-19 pandemic provides a heightened need to review these measures. In this new setting, the risk of radioactive COVID-19 positive patient readmission must be minimised and the radiation protection implications managed appropriately if this occurs. Measures to minimise the risk of readmission could include patient self-isolation for 14 days prior to and after treatment, patient household isolating prior to treatment and SARS-CoV-2 swab test prior to treatment. Measures

to manage the radiation protection implications in the event of a radioactive COVID-19 positive patient being readmitted include detailed contingency plans supported by thorough prior risk assessments, engagement with relevant staff groups, training and rehearsal. These must be accompanied by clear and tested methods of identifying such patients, for example, via wristbands; and robust channels of communication to ensure the timely enactment of contingency plans. These contingency plans should, as a minimum, cover staffing numbers and rotation, exclusion of pregnant staff, provision for personal radiation monitoring, temporary radiation controlled area designation and restriction of access, contamination monitoring and segregation and management of radioactive waste [5]. For these measures to be effective, it is crucial that they are developed with the full involvement of experienced infection control and intensive treatment unit staff with a focus on cooperation, flexibility and the balance of risks in order to maintain the quality and efficiency of patient care. This may in turn improve the reciprocal understanding of infection control and radiation protection methods by the different specialist staff groups and improve the synergy of the two requirements.

In exploring and agreeing upon solutions to all these challenges, a collaborative, creative and compassionate, patient-centred approach must be adopted by all healthcare professionals and managers involved. As well as overcoming these challenges, overall the situation presents multiple opportunities to drive changes that can improve patient experiences and clinical outcomes, rationalise services, increase efficiency and capacity, and deliver financial savings whilst maintaining high standards of radiation protection.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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