

SAFETY IN THE MR LINEAR ACCELERATOR DEPARTMENT

An MR Linac (MRL) combines an MR scanner with a linear accelerator (Linac) and presents exciting opportunities for personalised radiotherapy. Currently available MRL systems incorporate magnets with field strength ranging from 0.35–1.5T.

The MRL department requires both therapeutic and diagnostic radiographers, radiotherapy and MRI clinical scientists and engineering staff. Ensuring adequate competency across both modalities requires training that may be difficult to deliver in the MRL department alone.

There is a range of testing equipment and tools for servicing the Linac in the Machine Room which, because of the necessity of a bunker for radiation protection, may only be accessible through the Treatment Room (figure 1)

Addressing the challenges

Therapeutic radiographers and radiotherapy clinical scientists and engineers require extensive MR safety training to gain the knowledge and competence required to become MR Authorised Persons. The standard MR safety framework documentation based on MHRA guidance requires the following to be adapted:

- *Training of radiotherapy clinical scientists to an appropriate level so they can work without supervision while performing QA*
- *Systems of work to allow ferromagnetic tools to be safely taken through the Treatment Room and into the Machine Room by engineers (see Fig. 1). QA may also require detailed work instructions as 4D phantoms may contain ferromagnetic parts. Clear MR safety labelling is essential.*
- *MR training for therapeutic radiographers may require collaborative working with a diagnostic MR department.*
- *Adapting MHRA terminology and adding additional staff designations may be necessary (e.g. clinical and non-clinical MR Operators to allow radiotherapy clinical scientists to perform QA).*
- *Additional considerations for patients with active medical implants where both MR conditions and dose limits must be followed.*
- *Emergency procedures may require particular attention to planning and training. The hazards of the magnetic field and ionising radiation, specific patient requirements (e.g. mask) as well as the access maze must be considered when developing these plans.*
- *Development of a comprehensive MRL training programme to ensure appropriate knowledge and competency can be evidenced. This includes ionising radiation and radiotherapy training for MR staff groups. An example framework is shown in figure 2.*

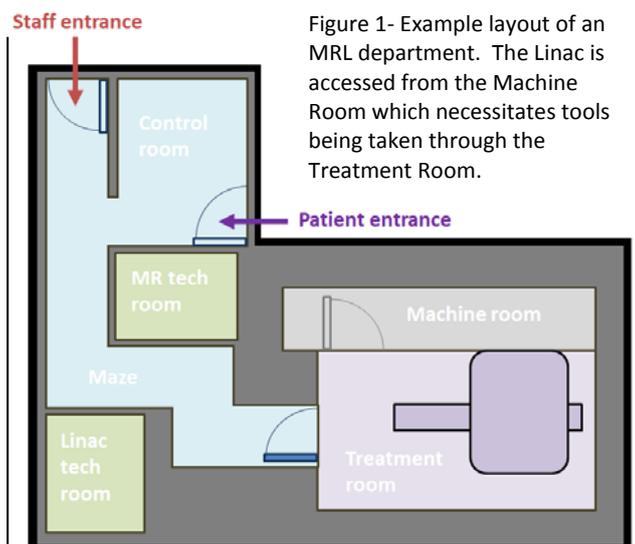


Figure 1- Example layout of an MRL department. The Linac is accessed from the Machine Room which necessitates tools being taken through the Treatment Room.



Figure 2 - Example hub-and-spoke education framework for the MRL department .