

## Introduction

This survey intends to scope current practice of on-line adaptive radiotherapy (ART) delivered using Magnetic Resonance Image (MRI) guidance (on-line MRI guided ART). This will help identify training needs for future and develop training programmes.

For the purposes of this survey ART is defined as where tumour and/or organs at risk are contoured and re-planning is performed on-line. For Unity users consider this as Adapt to Shape.

All data will be anonymised.

The questions will consist of four Sections.

**Section 1: Current practice and future requirements**

**Section 2: Professional Responsibilities**

**Section 3: Benefits and Barriers**

**Section 4a: Decision making and criteria - Physicist/Radiographer/RTT perspective**

**Section 4b: Decision making and criteria - Medical Doctor perspective**

Please contact [Helen.McNair@rmh.nhs.uk](mailto:Helen.McNair@rmh.nhs.uk) if you need more surveys

\* 1. What is the name of your institution?

\* 2. In which country are you situated?

\* 3. Which profession best represents yours?

- Therapeutic Radiographer/RTT
- Medical doctor
- Physicist
- Dosimetrist

Section 1: Current practice and future direction

Unless specified, all questions relate to on-line adaptive radiotherapy delivered using MRI guidance.

ART is defined as where tumour and/or organs at risk are contoured and re-planning is performed on-line.

4. Which system are you currently using in your institution?

- Elekta Unity
- ViewRay MRIdian Cobalt
- ViewRay MRIdian Linac

\* 5. When did your department start treating patients with on line MRI guided ART

- |                                   |                            |
|-----------------------------------|----------------------------|
| <input type="radio"/> Not started | <input type="radio"/> 2016 |
| <input type="radio"/> 2019        | <input type="radio"/> 2015 |
| <input type="radio"/> 2018        | <input type="radio"/> 2014 |
| <input type="radio"/> 2017        |                            |

6. In what circumstances is a table shift or dose shift (ATP) used

- As the treatment option
- Prior to on-line MRI guided ART
- Subsequent to on-line MRI guided ART
- Never

Other (please specify)

7. Which tumour site was the **first** to be treated with on line MRI guided radiotherapy in your department?

Please Indicate if a table or dose shift (Adapt to position (ATP))**only** was used

	Table or dose shift (ATP) only	ART (re contouring and re planning)
Prostate	<input type="radio"/>	<input type="radio"/>
Bladder	<input type="radio"/>	<input type="radio"/>
Rectum	<input type="radio"/>	<input type="radio"/>
Cervix	<input type="radio"/>	<input type="radio"/>
Oligometastases	<input type="radio"/>	<input type="radio"/>
Pancreas	<input type="radio"/>	<input type="radio"/>
Liver	<input type="radio"/>	<input type="radio"/>
Breast	<input type="radio"/>	<input type="radio"/>
Oesophagus	<input type="radio"/>	<input type="radio"/>
Lung	<input type="radio"/>	<input type="radio"/>
Head and neck	<input type="radio"/>	<input type="radio"/>
Brain	<input type="radio"/>	<input type="radio"/>
Palliative - Bony metastases	<input type="radio"/>	<input type="radio"/>
Palliative - other	<input type="radio"/>	<input type="radio"/>

8. Please select the tumour site's currently being treated with on line MRI guided radiotherapy in your department and indicate if on line ART **OR** a table or dose shift (ATP) is **initial treatment intent**.

Tick all that apply

	Table or dose shift only	ART ( re contouring and replanning )
Prostate	<input type="checkbox"/>	<input type="checkbox"/>
Bladder	<input type="checkbox"/>	<input type="checkbox"/>
Rectum	<input type="checkbox"/>	<input type="checkbox"/>
Cervix	<input type="checkbox"/>	<input type="checkbox"/>
Oligometastases	<input type="checkbox"/>	<input type="checkbox"/>
Pancreas	<input type="checkbox"/>	<input type="checkbox"/>
Liver	<input type="checkbox"/>	<input type="checkbox"/>
Breast	<input type="checkbox"/>	<input type="checkbox"/>
Oesophagus	<input type="checkbox"/>	<input type="checkbox"/>
Lung	<input type="checkbox"/>	<input type="checkbox"/>
Head and neck	<input type="checkbox"/>	<input type="checkbox"/>
Brain	<input type="checkbox"/>	<input type="checkbox"/>
Palliative - Bony metastases	<input type="checkbox"/>	<input type="checkbox"/>
Palliative - other	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

9. In which circumstances and for which tumour sites is recontouring of the **tumour volume** used for replanning?

	Prostate	Bladder	Rectum	Cervix	Oligometatstases	Pancreas	Liver	Breast	Oesophagus	Lung	Head and neck	Brain	Palliative eg bony metastases	Palliative other
Every fraction, Tick all that apply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Particular fractions when required, Tick all that apply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scheduled fractions, Tick all that apply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

10. In which circumstances and for which tumour sites is recontouring of the **organs at risk** used for replanning?

	Prostate	Bladder	Rectum	Cervix	Oligometatstases	Pancreas	Liver	Breast	Oesophagus	Lung	Head and neck	Brain	Palliative eg bony metastases	Palliative other
Every fraction, Tick all that apply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Particular fractions when required, Tick all that apply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scheduled fractions, Tick all that apply	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

Section 2 :Professional responsibilities

All questions relate to on-line adaptive radiotherapy delivered using MRI guidance.

ART is defined as where tumour and/or organs at risk are contoured and re-planning is performed on-line.

11. How many professionals are **currently** required to treat with On-line MR guided ART?

Number of professional (FTE)

Physicists

Dosimetrists

Radiographers/RTT's

Medical doctor

Other (please specify)

12. Has this changed since starting treating with on line MRI guided ART?

Yes

No



**All questions relate to on-line adaptive radiotherapy delivered using MRI guidance.  
ART is defined as where tumour and/or organs at risk are contoured and re-planning is performed on-line.**

13. How many professionals **were previously** required to treat with on line MRI guided ART?

Number of professional (FTE)

Physicists	<input type="text"/>
Dosimetrists	<input type="text"/>
Radiographers/RTT's	<input type="text"/>
Medical doctor	<input type="text"/>
Other (please specify)	<input type="text"/>

14. In your department, **in total**, how many professionals of each discipline have been trained to treat patients with on-line MRI guided ART?

Number of professional (FTE)

Physicists	<input type="text"/>
Dosimetrists	<input type="text"/>
Radiographers/RTT's	<input type="text"/>
Medical doctor	<input type="text"/>
Other (please specify)	<input type="text"/>

15. Which profession is taking the lead responsibility for each step **on-line**?

Professional

Patient set up	<input type="text"/>
Image acquisitions	<input type="text"/>
Image registrations	<input type="text"/>
Contouring tumour	<input type="text"/>
Contouring organs at risk	<input type="text"/>
Decision to replan/recontour	<input type="text"/>
Plan creation	<input type="text"/>
Plan checking	<input type="text"/>
Decision to treat with adapted plan	<input type="text"/>

16. Has this changed since starting treatments?

Yes

No

17. Please indicate where changes have been made i.e who previously took responsibility for each step?

Professional

Patient set up	<input type="text"/>
Image acquisitions	<input type="text"/>
Image registrations	<input type="text"/>
Contouring tumour	<input type="text"/>
Contouring organs at risk	<input type="text"/>
Decision to replan/recontour	<input type="text"/>
Plan creation	<input type="text"/>
Plan checking	<input type="text"/>
Decision to treat with adapted plan	<input type="text"/>

18. Are you aiming to change this for the future?

Yes

No





19. Please indicate where changes will be made i.e who will take responsibility in the future

Professional

Patient set up	<input type="text"/>
Image acquisitions	<input type="text"/>
Image registrations	<input type="text"/>
Decision to replan/recontour	<input type="text"/>
Contouring tumour	<input type="text"/>
Contouring Organs at Risk	<input type="text"/>
Plan creation	<input type="text"/>
Plan checking	<input type="text"/>
Decision to treat with adapted plan	<input type="text"/>

### Section 3: Benefits and Barriers

All questions relate to on-line adaptive radiotherapy delivered using MRI guidance.

ART is defined as where tumour and/or organs at risk are contoured and re-planning is performed on-line.

20. Rate the importance, in your department, of the following aspects in implementing on line MRI guided ART

	not at all important	slightly important	important	fairly important	very important	Don't know	NA
Improvement in patient outcome	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase in job satisfaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Closer team working	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. Rate the importance in your department of any barriers to implementing or increasing the use of on line MRI guided ART?

	not at all important	Slightly important	important	fairly important	very important	don't know	NA
Lack of training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of medical doctors or medical doctors time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of physicists or physicists time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of radiographers/RTT or radiographers/RTT time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of capacity on MR Linac	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of precise fast/performant software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of reimbursement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

Section 4a: Decision making and criteria - PHYSICIST/RADIOGRAPHER/RTT Perspective

All questions relate to on-line adaptive radiotherapy delivered using MRI guidance.

ART is defined as where tumour and/or organs at risk are contoured and re-planning is performed on-line.

You will be asked to choose a tumour site that you have the most experience planning and/or treating to answer the following questions

22. Chose a **tumour site** with which you are most you have the most experience planning and/or treating to answer the following questions about decisions for MRI guided ART ?

- |  |  |
|--|--|
| <input type="checkbox"/> Prostate        | <input type="checkbox"/> Breast                        |
| <input type="checkbox"/> Bladder         | <input type="checkbox"/> Oesophagus                    |
| <input type="checkbox"/> Rectum          | <input type="checkbox"/> Lung                          |
| <input type="checkbox"/> Cervix          | <input type="checkbox"/> Head and neck                 |
| <input type="checkbox"/> Oligometastases | <input type="checkbox"/> Palliative eg Bony metastases |
| <input type="checkbox"/> Pancreas        | <input type="checkbox"/> Palliative other              |
| <input type="checkbox"/> Liver           |  |

Other (please specify)

23. For the chosen tumour site, would you prefer to use on line MRI guided ART, regardless of anatomy changes?

- Yes
- No
- Other (please specify)

24. Rate the importance of the criteria that you consider when making the decision to use on-line MRI guided ART i.e recontouring.

Rate 1 as most important to 9 as least important. If not applicable leave as blank

- Overall gross anatomy changes of target and organs at risk
- Target not covered by PTV
- Target too close to edge of PTV
- Target dose at that fraction
- Organs at risk close to high dose area
- Organs at risk dose at that fraction
- Dose delivered to target previous fractions
- Dose delivered to organs at risk previous fractions
- Co-morbidities of patient which may increase toxicity

25. What is the minimum improvement in dose to the tumour volume you believe would justify treating with on line MRI guided ART?

- <2%
- 3-5%
- 6-10%
- 11-20%
- 21-30%
- >30%

26. Which organs do you consider the dose limiting for your chosen tumour site ?

Tumour site

Organ at Risk One

Organs at Risk Two

Organ at risk Three

27. What is the minimum reduction in absolute volume of 'dose limiting organs at risk' receiving the maximum dose constraint that would justify treating with on line MRI guided ART

	0	0.5cc	1cc	1.5cc-5cc	5.5cc-10cc	10cc-15cc	>20cc	N/A
Organ at risk one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organ at risk two	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organ at risk three	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

Section 4b: Decision making and criteria - MEDICAL DOCTORS perspective

Medical doctors to complete.

All questions relate to on-line adaptive radiotherapy delivered using MRI guidance.

ART is defined as where tumour and/or organs at risk are contoured and re-planning is performed on-line.

Please answer this section for your specialist tumour site

28. Which tumour site(s) is/are your specialist region ? Tick all that apply

- |  |  |
|--|--|
| <input type="checkbox"/> Prostate        | <input type="checkbox"/> Breast                        |
| <input type="checkbox"/> Bladder         | <input type="checkbox"/> Oesophagus                    |
| <input type="checkbox"/> Rectum          | <input type="checkbox"/> Lung                          |
| <input type="checkbox"/> Cervix          | <input type="checkbox"/> Head and neck                 |
| <input type="checkbox"/> Oligometastases | <input type="checkbox"/> Palliative eg Bony metastases |
| <input type="checkbox"/> Pancreas        | <input type="checkbox"/> Palliative other              |
| <input type="checkbox"/> Liver           |  |

Other (please specify)

29. In current clinical practice, on a conventional Linac, when do you see and approve the treatment plan ?

- Always see and approve the treatment plan
- Only see the treatment plan when constraints haven't been met
- Other (please specify)

30. When would you want to review the MRI guided ART treatment plan ?

- |   |   |
|---|---|
| <input type="checkbox"/> Every day              | <input type="checkbox"/> Only when constraints aren't met               |
| <input type="checkbox"/> When present treating  | <input type="checkbox"/> When I request , after review of treated plans |
| <input type="checkbox"/> About once a week      |   |
| <input type="checkbox"/> Other (please specify) |   |

31. If you weren't present when treatment was delivered - When would you want to review the MR Linac treatment plan after on line MRI guided ART?

- Every day
- About once a week
- Only when constraints aren't met
- When I request , after review of treated plans
- Other (please specify)

32. Would you prefer to treat with ART, regardless of anatomy changes

- Yes
- No

33. Rate the importance of the criteria that you consider when making the decision to use on-line ART i.e recontouring.

Rate 1 as most important to 9 as least important. If not applicable leave as blank

- Overall gross anatomy changes of target and organs at risk
- Target not covered by PTV
- Target too close to edge of PTV
- Target dose at that fraction
- Organs at risk close to high dose area
- Organs at risk dose at that fraction
- Dose delivered to target previous fractions
- Dose delivered to organs at risk previous fractions
- Co-morbidities of patient which may increase toxicity

34. What is the minimum improvement in dose to the target you believe would justify treating with ART?

- |                                |                                 |
|--------------------------------|---------------------------------|
| <input type="checkbox"/> <2%   | <input type="checkbox"/> 11-20% |
| <input type="checkbox"/> 3-5%  | <input type="checkbox"/> 21-30% |
| <input type="checkbox"/> 6-10% | <input type="checkbox"/> >30%   |

35. Which organs do you consider the dose limiting for your primary specialist tumour site ?

Tumour site

Organ at Risk One

Organs at Risk Two

Organ at risk Three

36. What is the minimum reduction in volume of 'dose limiting organs at risk' receiving the maximum dose permitted that would justify treating with on line MRI guided ART

	0.1cc	0.5cc	1cc	1.5cc-5cc	5.5cc-10cc	10cc-15cc	>20cc
Organ at risk one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organ at risk two	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organ at risk three	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

37. If Applicable - Which organs do you consider the dose limiting for another specialist tumour site ?

Tumour site

Organ at Risk One

Organs at Risk Two

Organ at risk Three

NA

38. What is the minimum reduction in volume of 'dose limiting organs at risk' receiving the maximum dose permitted that would justify treating with on line MRI guided ART

	0	0.5cc	1cc	1.5cc-5cc	5.5cc-10cc	10cc-15cc	>20cc	N/A
Organ at risk one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organ at risk two	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organ at risk three	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)