# HDR Prostate
# Guildford Experience

Mark Long

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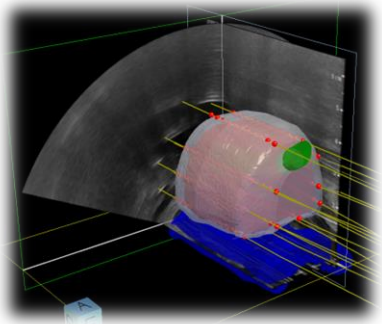
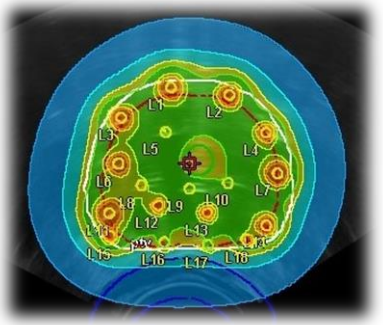
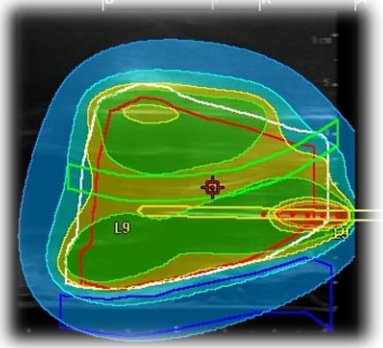
Elekta Brachytherapy Users Meeting

10th October 2019







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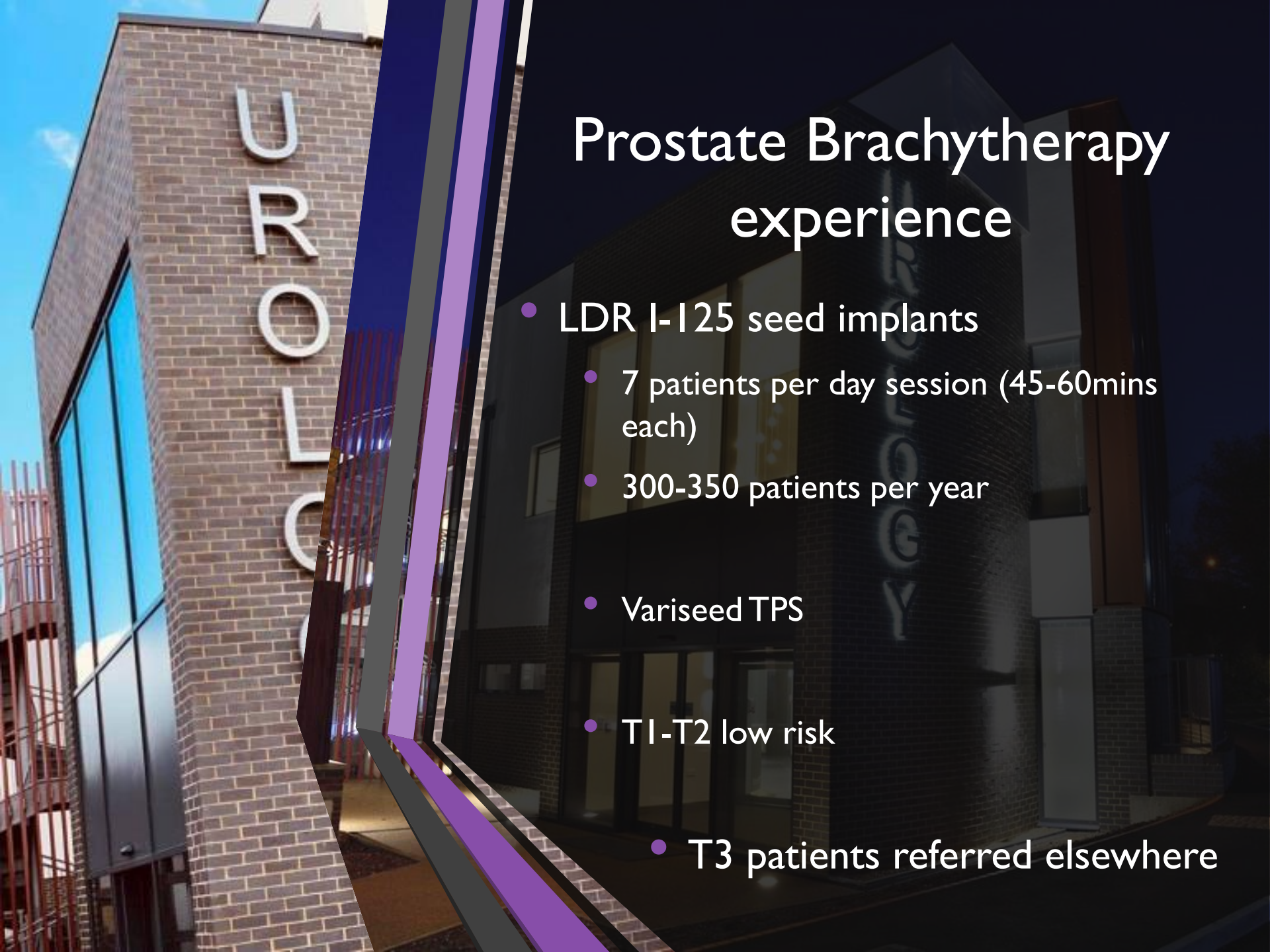
# Contents

- Our Brachytherapy Experience
- Equipment decisions
- Timeline of implementation
- Planning technique
- Two Example cases
- Future work
- Recommendations

# Brachytherapy experience

- HDR
  - Gynae (Brachy theatre)
    - IGBT (with interstitial needles) 2-3 treatments per week
    - Cylinders (6 treatments per week)
  - Oesophageal (~6 patients/year)
  - Rectum (~6 patients/year)
- Electronic Brachytherapy
  - Papillon 50
    - Rectum (40 patients/year)

# Prostate Brachytherapy experience

- LDR I-125 seed implants
  - 7 patients per day session (45-60mins each)
  - 300-350 patients per year
  - Variseed TPS
  - T1-T2 low risk
    - T3 patients referred elsewhere

# Journey begins:
# Site visits and pleas for help!

2017

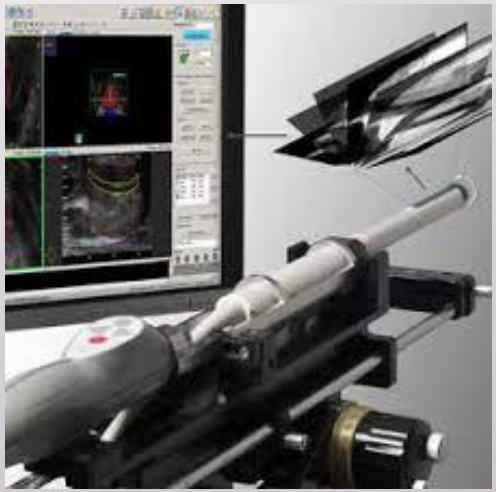
| | |
|---|---|
| Aug | Visit to Leeds to see treatments |
| Dec | Visit to Poole to see ECRM |

# Equipment decisions

- Oncentra Prostate 4
- Software options
  - Advanced Optimisation (DVHO)
  - Advanced imaging (sector analysis)
- Number of Template/holder/faceplate sets?
- Dedicated (OncoSelect) Stepper?
- ECRM?
- Type of Interstitial needles?

# ECRM
# (EndoCavity Rotational Mover)

- Software-driven attachment to stepper
  - Rotates US probe within stepper cradle
  - Can create "fanned" data sets from longitudinal array automatically.
  - Improved workflow by allowing reconstruction in live sagittal plane.
    - Would allow us to mirror our LDR process



# Interstitial Needles

## Metal

Stainless steel bevelled

- 2-year lifetime
- \+ Allows (some) steering

- – 1.1cm source-tip distance
- \+ Requires one fixation plate

## Plastic

Proguide

- Single use
- – Not bevelled

- \+ 0.6cm source-tip distance
- – Requires two fixation plate

# Implementation timeline

2017

| | |
|---|---|
| Aug | Visit to Leeds to see treatments |
| Dec | Visit to Poole to see ECRM |
| Xmas | Equipment ordered |

# Implementation timeline

| | | |
|---|---|---|
| 2017 | Aug | Visit to Leeds to see implants |
| | Dec | Visit to Poole to see ECRM |
| | Xmas | Equipment ordered |
| 2018 | Mid Feb | Equipment delivered |
| | End of Feb | Elekta installation & implementation training |
| | End of March | Elekta Prostate HDR Workshop |
| | End of April | Full treatment run-through |
| | 10th May | First two patients treated! |

# Other implementation considerations

- Source stick (emergency) procedures with staff not familiar with HDR (Urology team)
  - Everyone trained to know what to do
- Sterilisation procedures
- IT infrastructure
  - Facilitate Paperless process

# Plan the planning procedure

| Oncologist | Urologist | Physics (planner) | Physics (checker) | Radiographers |
|---|---|---|---|---|

# Plan the planning procedure

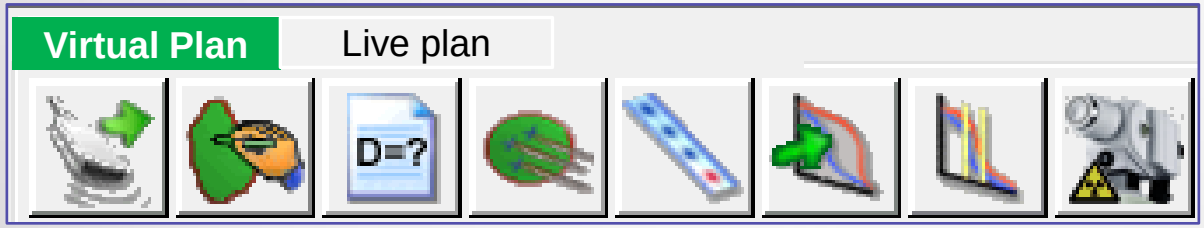
| Oncologist | Urologist | Physics (planner) | Physics (checker) | Radiographers |
|---|---|---|---|---|
| Ensure patient consented | | Afterloader QC | | |
| | | Connections and Pre-treatment system checks<br><br>Create Patient and study in OncP database | Check Aria Carepath and draft Prescription<br><br>Check Patient and study ID in OncP database | Set up sterile equipment |
| **Team briefing & WHO** | | | | |
| | | Attach stepper to the bed<br>(once patient in lithotomy position) | | |
| Patient/US position setup | | | | |
| | Transverse probe to base of prostate | | | |
| | | Set origin in OncP | | |
| | Sagittal probe (image 2cm beyond base/SVs) | | | |
| | | Acquire 'Virtual' images | | |
| Contour Prostate,PTV, Urethra and Rectum in OncP. | | Assist with clinician OncP contouring if necessary | Set 'O' markers on US | |
| | Insert group 1 needles with transverse probe at mid gland | | | |

//

| | | | |
|---|---|---|---|
| | | Disconnect systems and move carts to side of theatre (in case of source stick) | Check plan transfer to Flexitron TCC |
| **TREATMENT** (15-30minutes) | | | |
| | | Post-treatment scan (if necessary) | |
| Remove needles | | | |
| Fiducial marker insertion (if applicable) | | | |
| | | Detach stepper from bed | |
| | | Clear away and secure equipment | Patient moved to recovery |

# Planning Technique

- Oncentra Prostate design
  - Firstly, “Virtual” (without needles) process:



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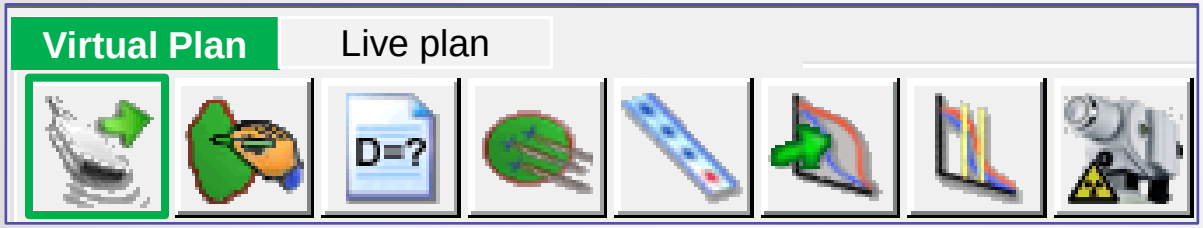


Image acquisition

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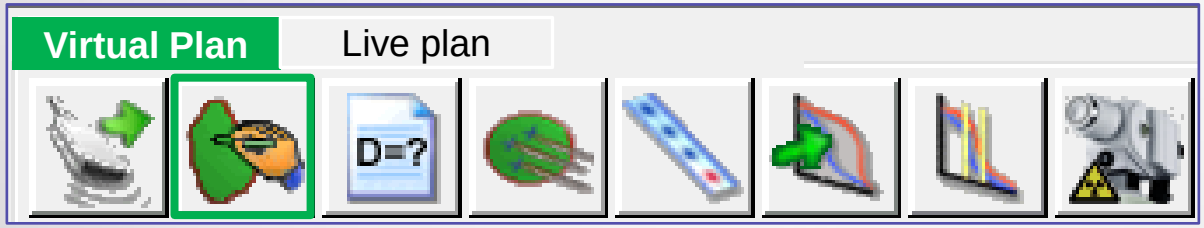


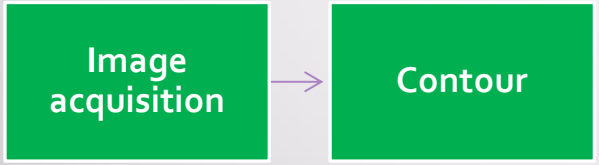

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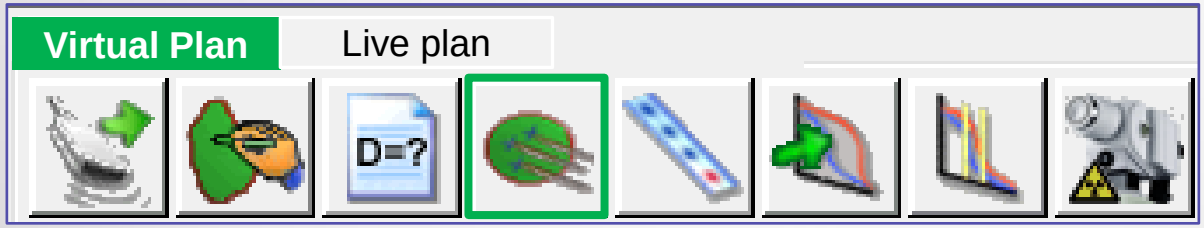


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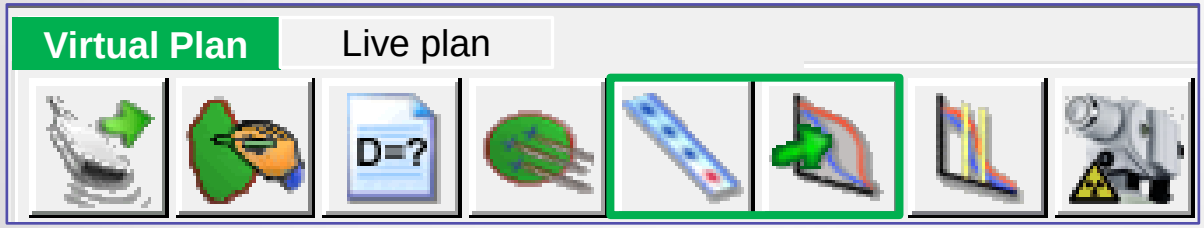


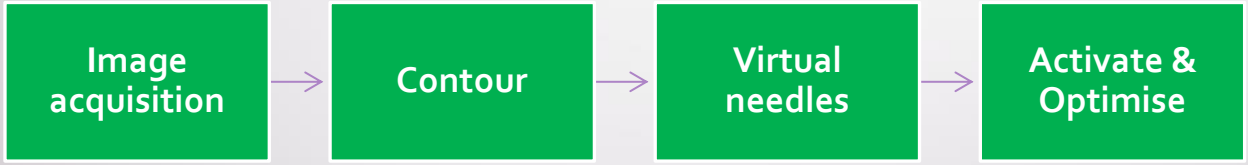

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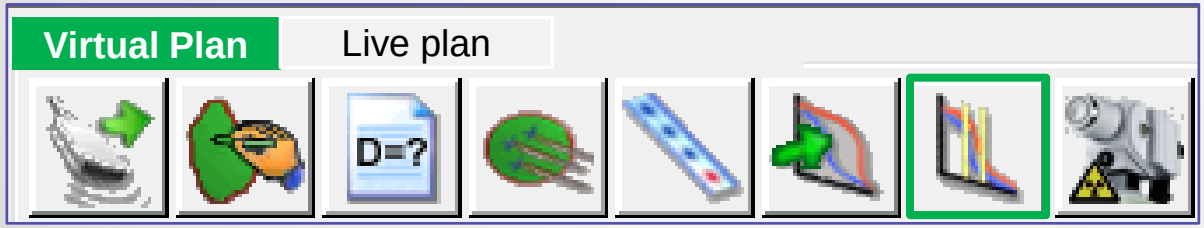


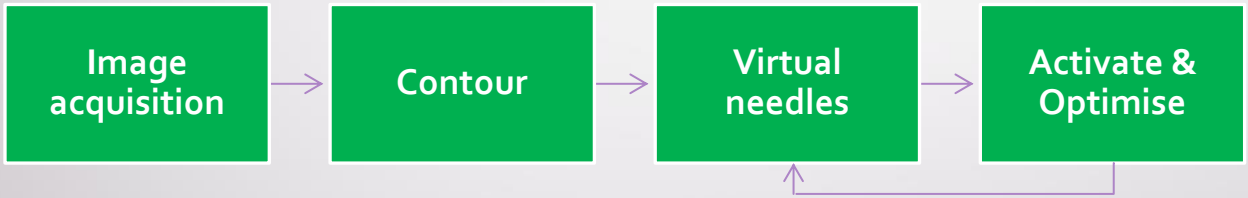

# Planning Technique

- Oncentra Prostate design
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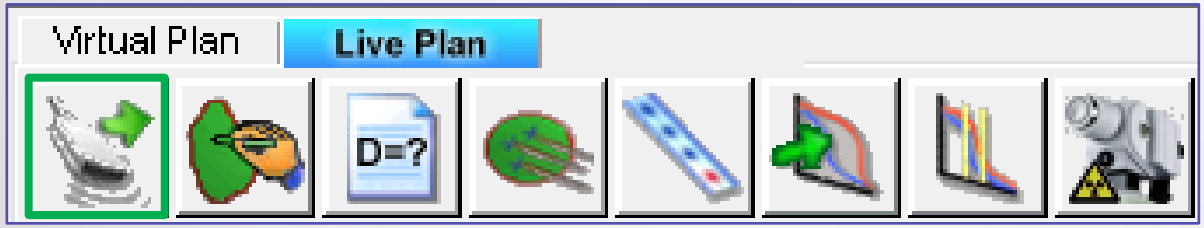


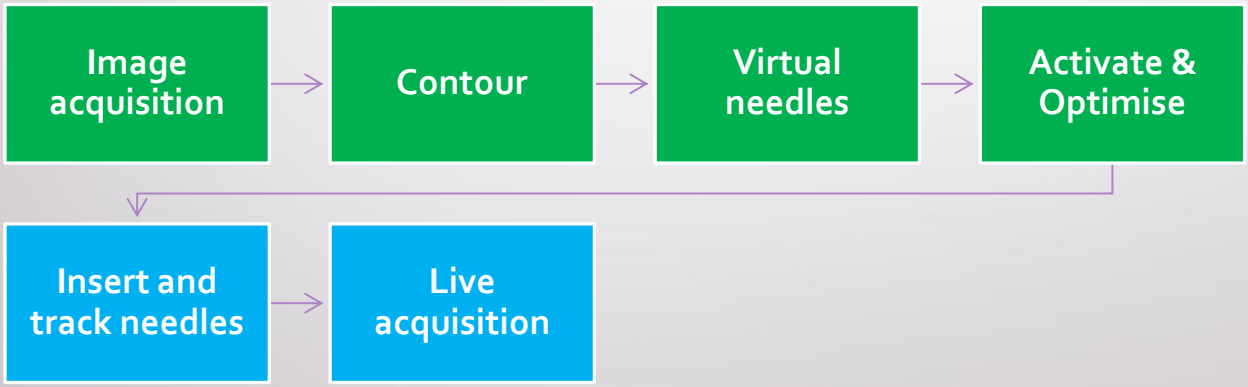

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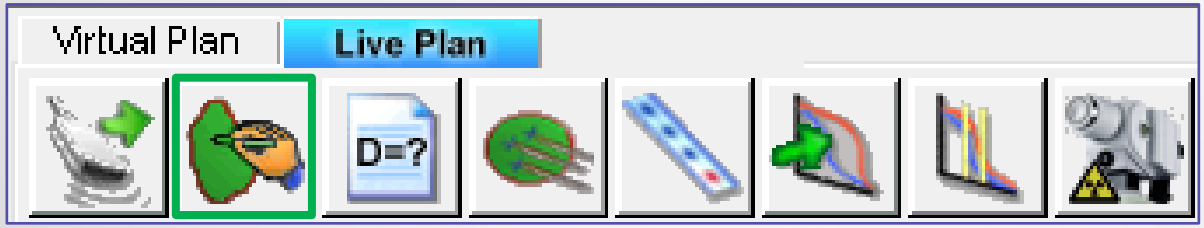


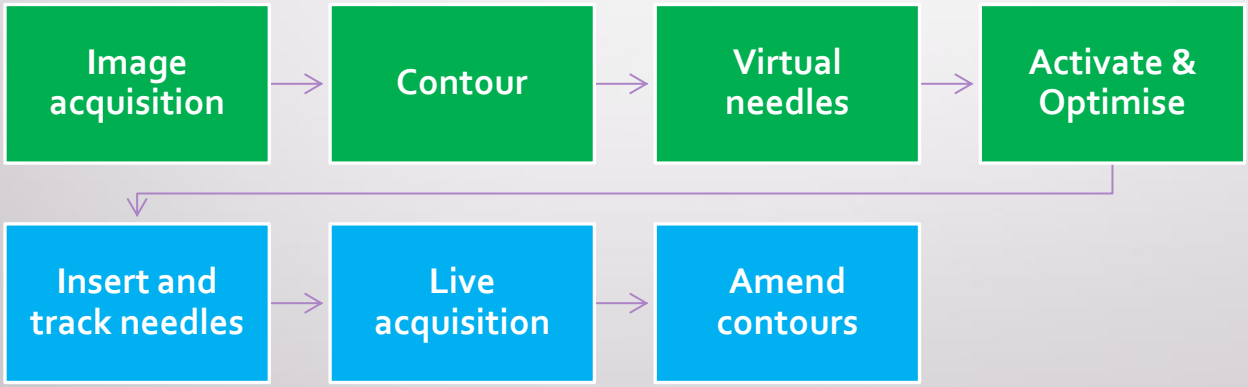

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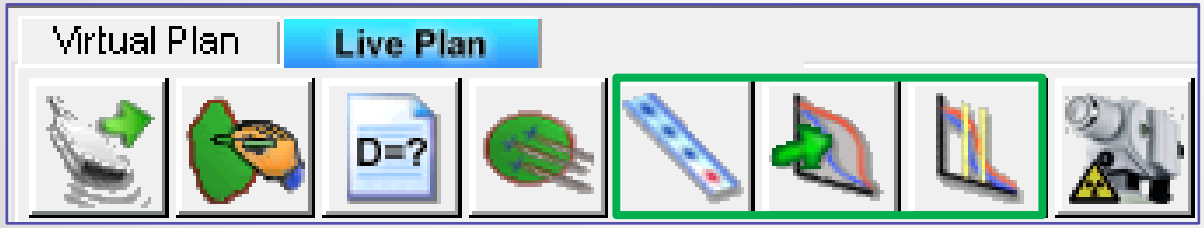


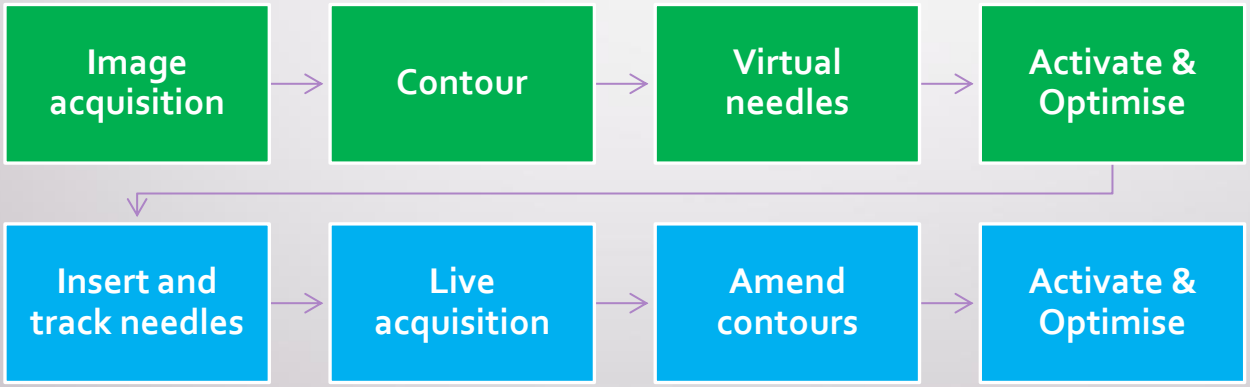

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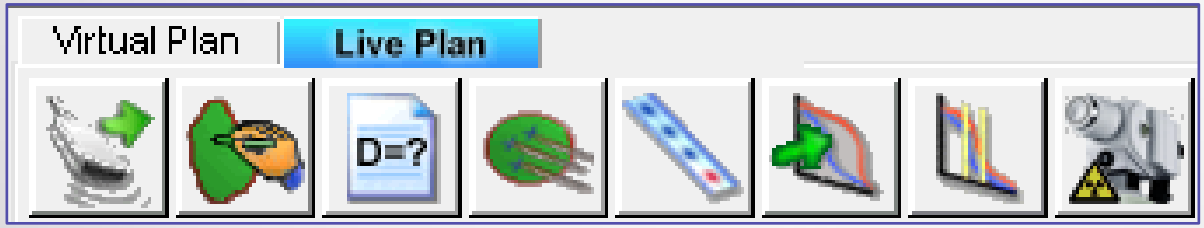


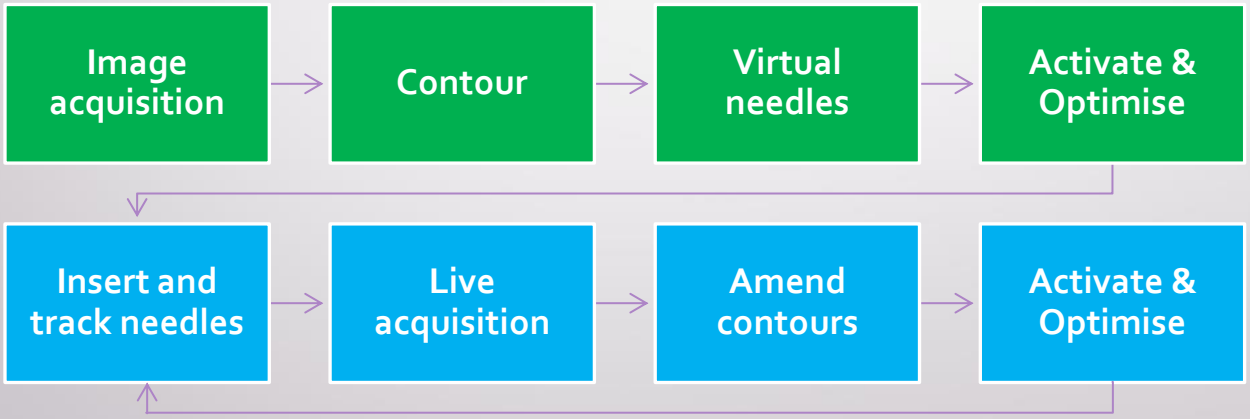

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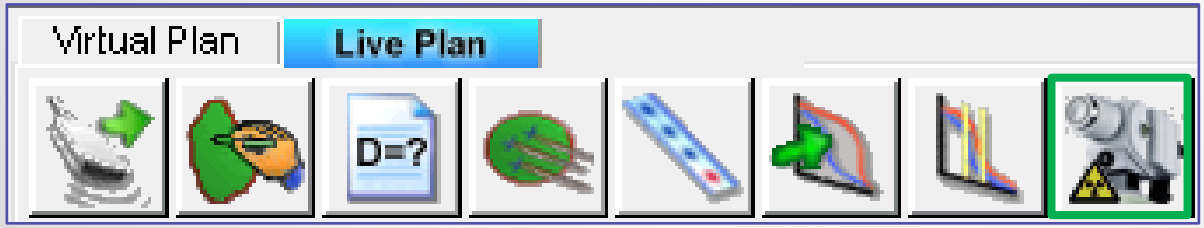
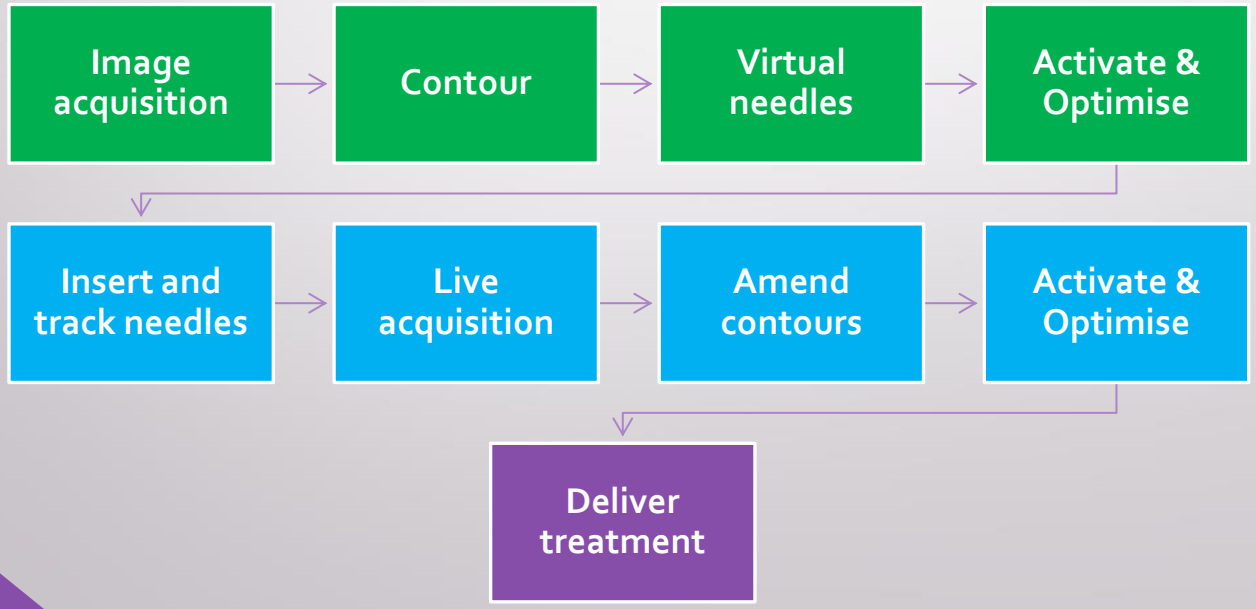
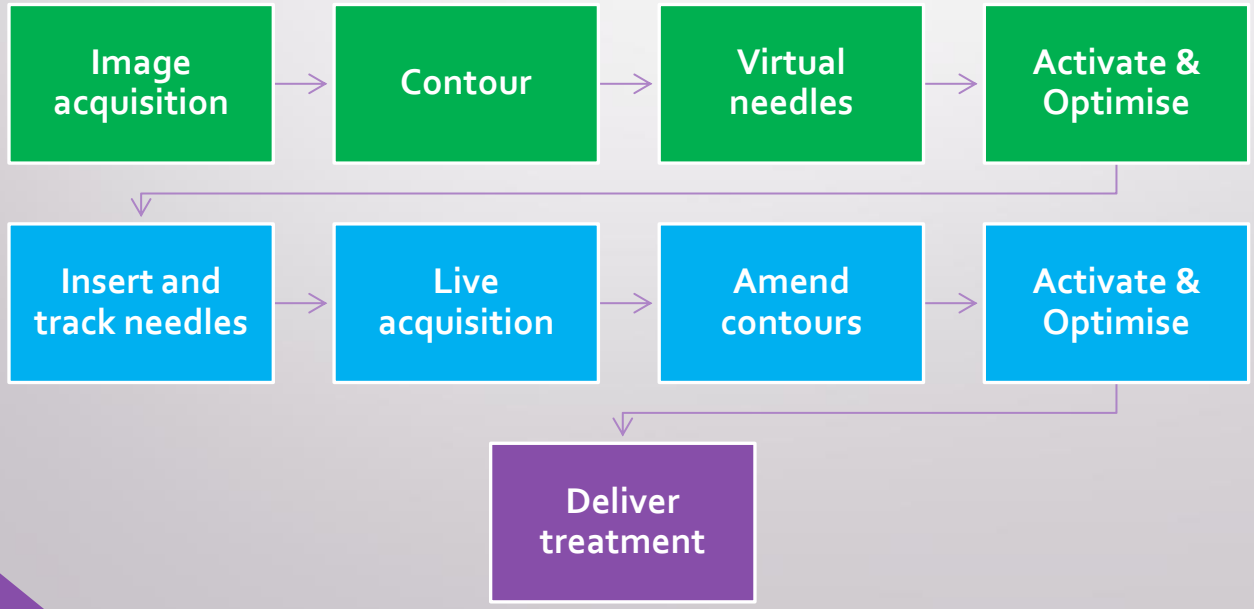


# Our Technique

- Virtual needle position on US scanner
  - Blend LDR process of needle placement
- Remove Virtual plan phase



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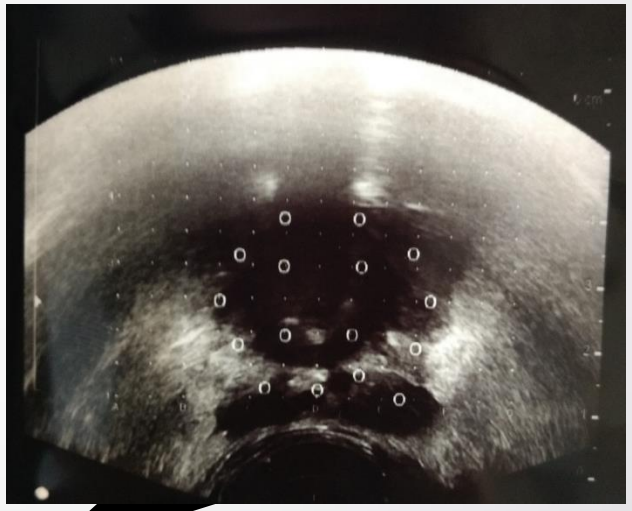

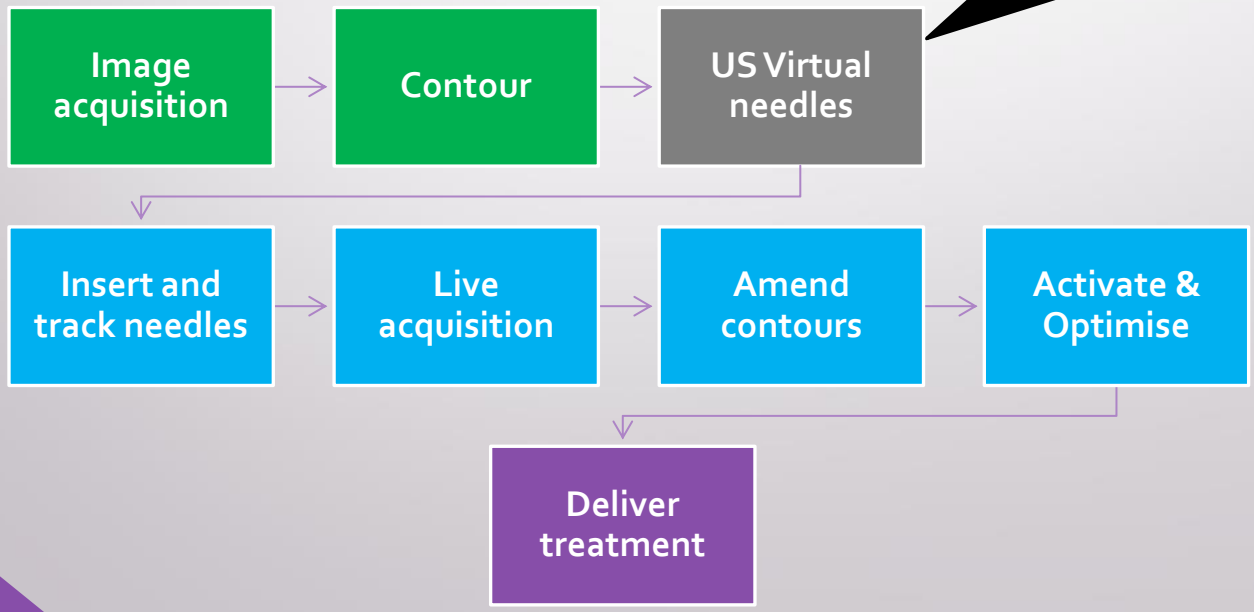

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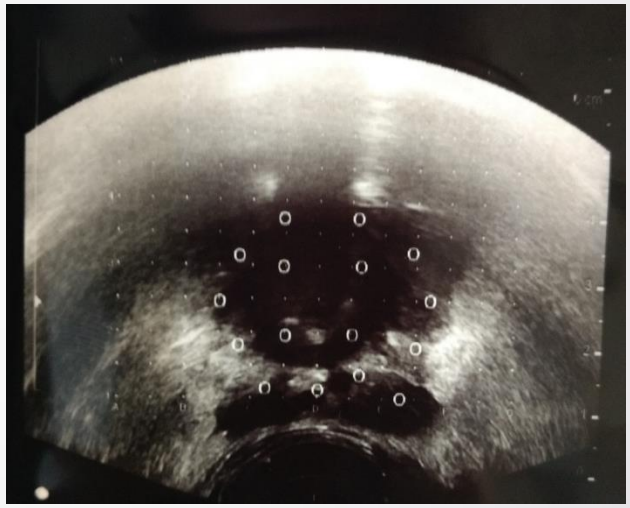

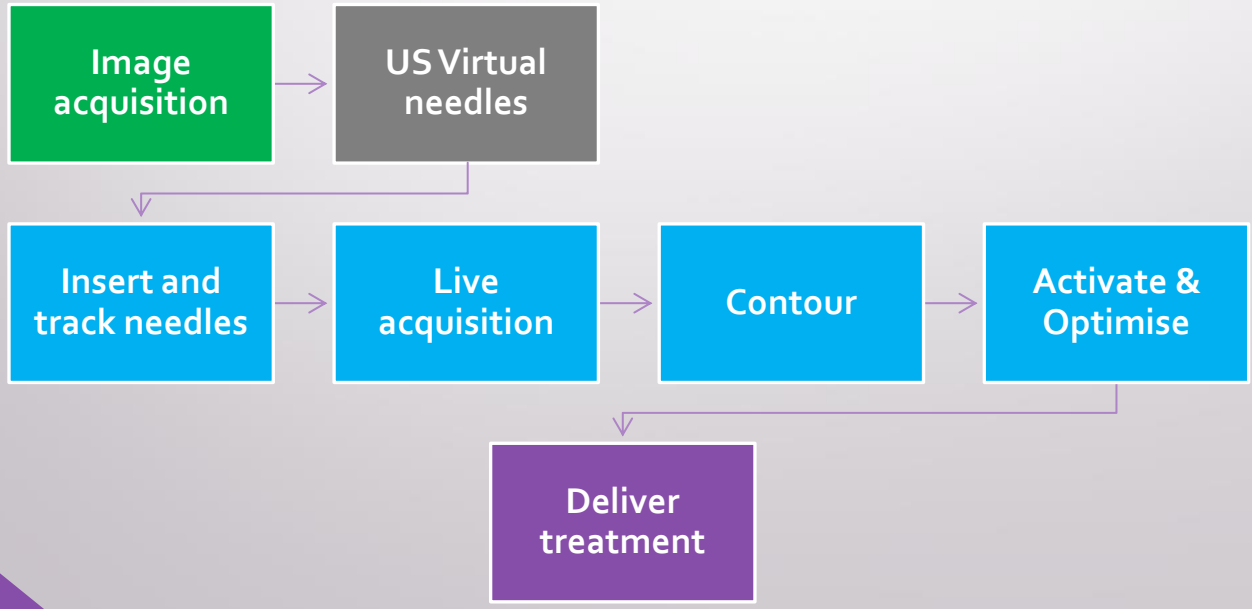

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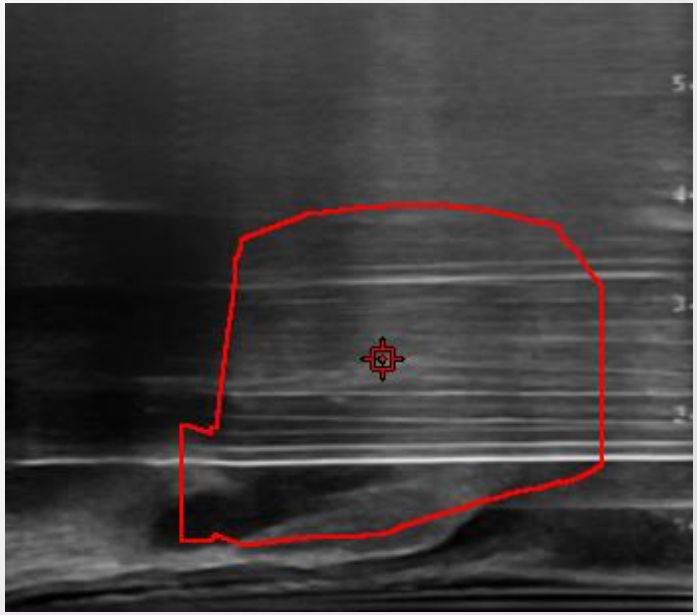

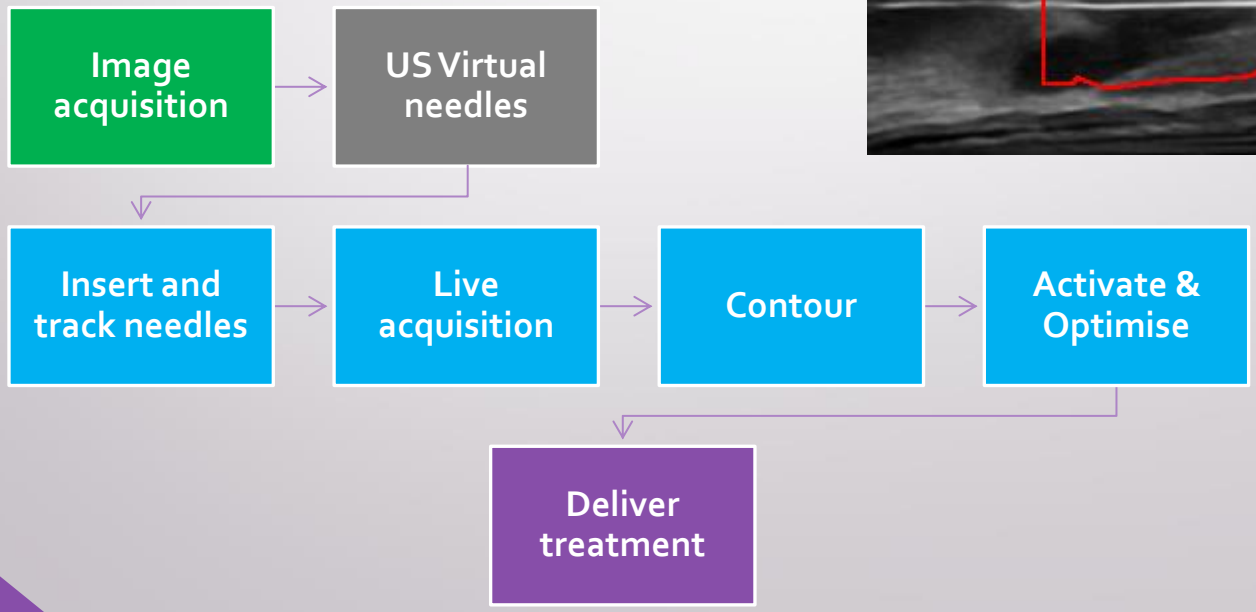

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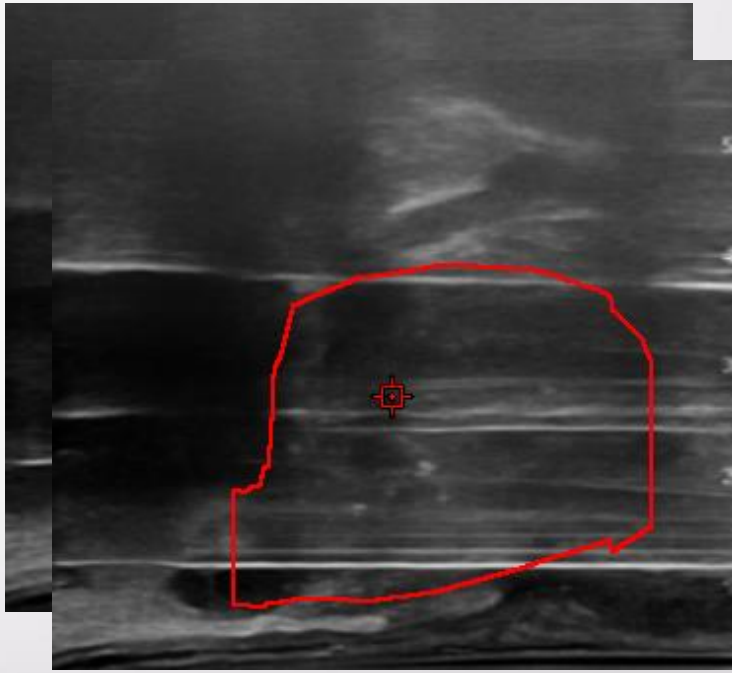

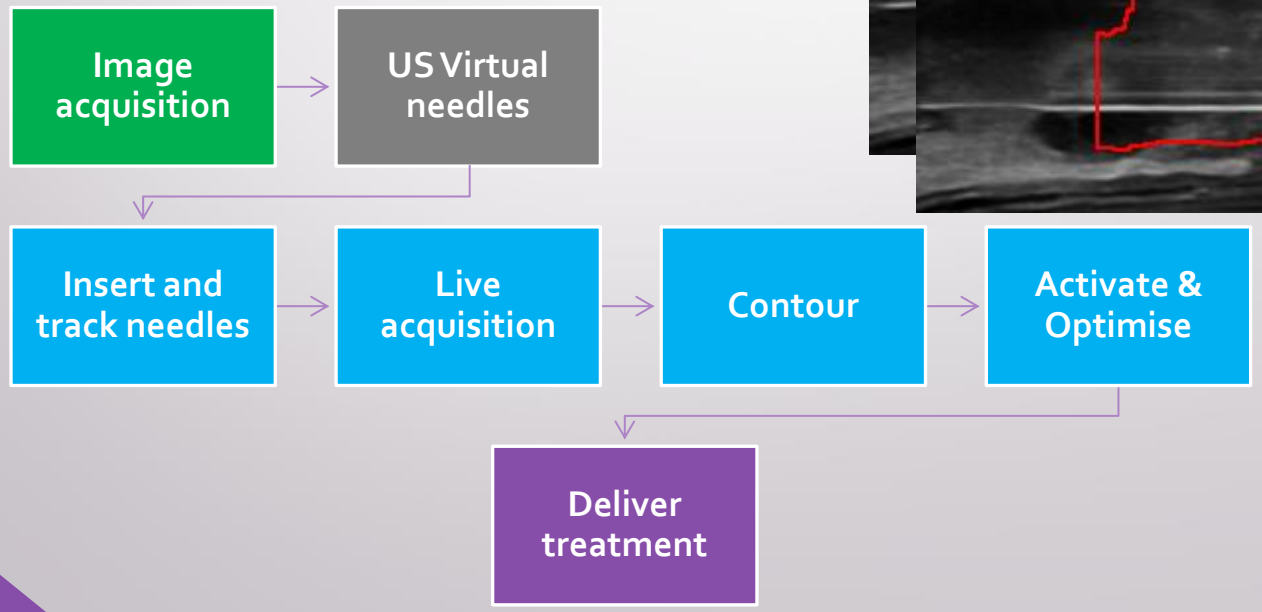

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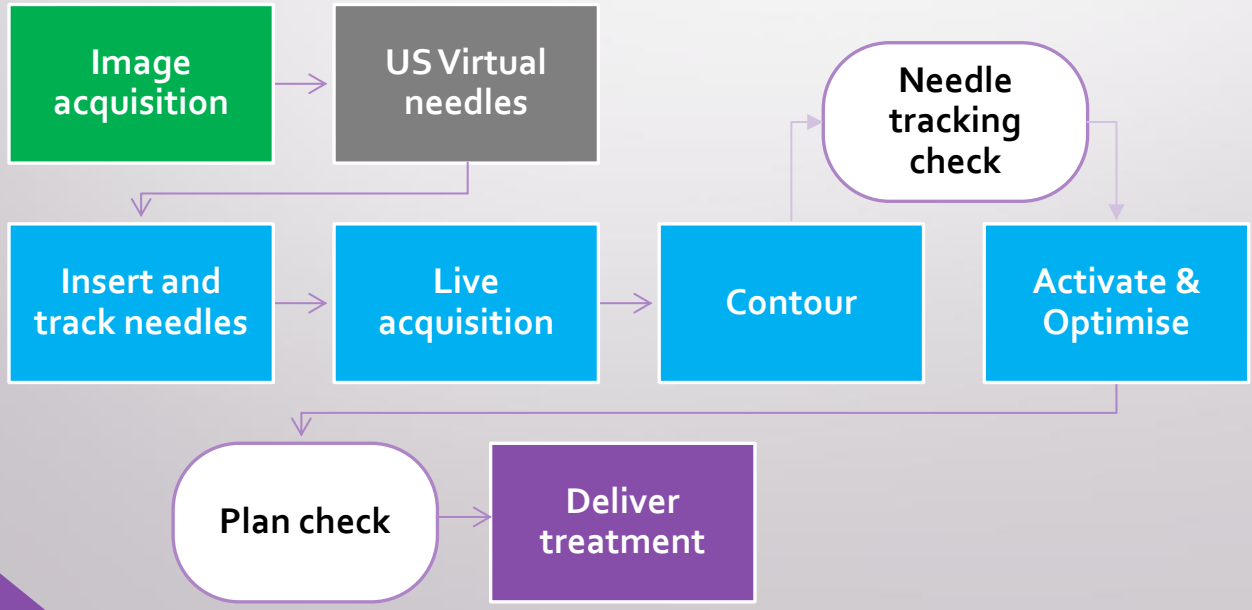


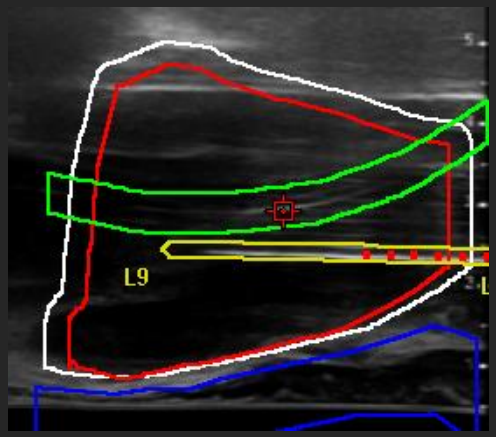
# Patients

- T3, base of SV involvement
  - HDR boost + EBRT (46Gy/23# VMAT, prostate & nodes)
  - Started with HDR prior to EBRT
  - Now EBRT prior to HDR
  - Post HDR: Three-way catheter to allow irrigation
    - Patients go home after one night
- Planning aim
  - Prostate D90 > 15Gy (100%)
  - Plan to PTV (Prostate + 3mm, 0mm posterior)

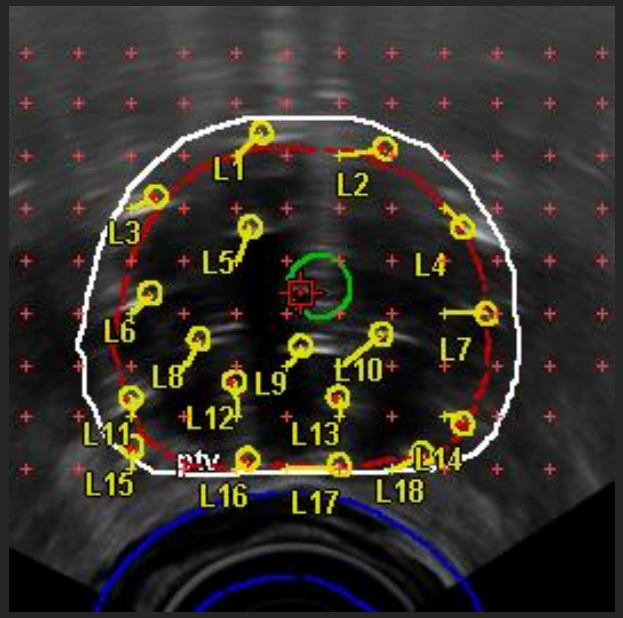
# Example Case 1

- Asymmetric plan with apical needle. Vol 39.3cc

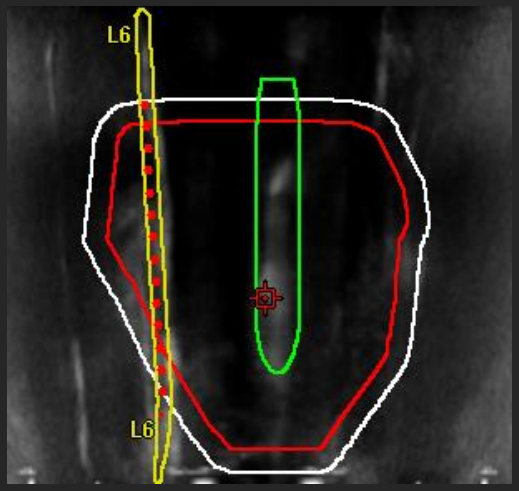
sagittal




transverse




coronal



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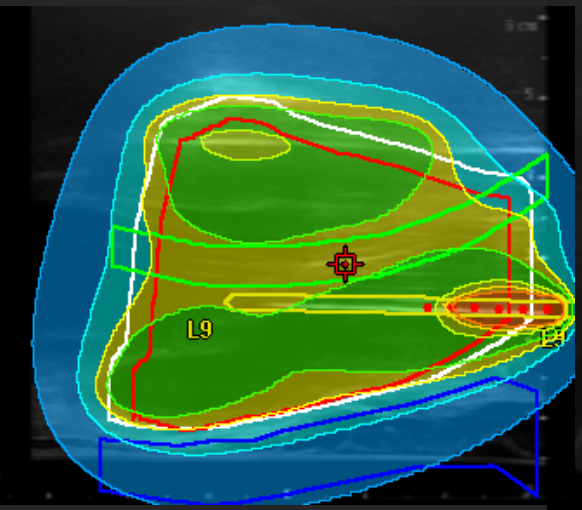


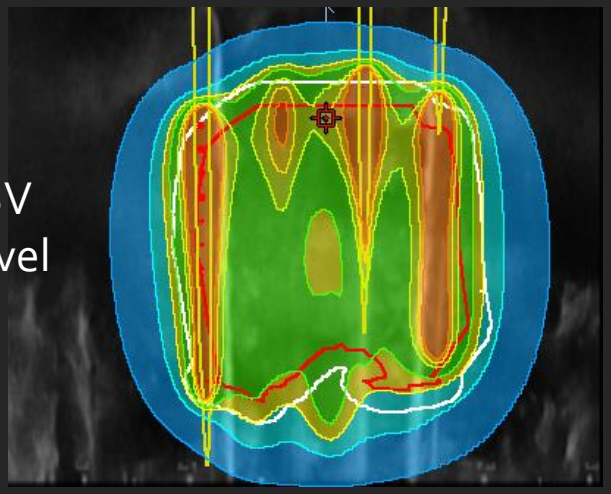

transverse


coronal

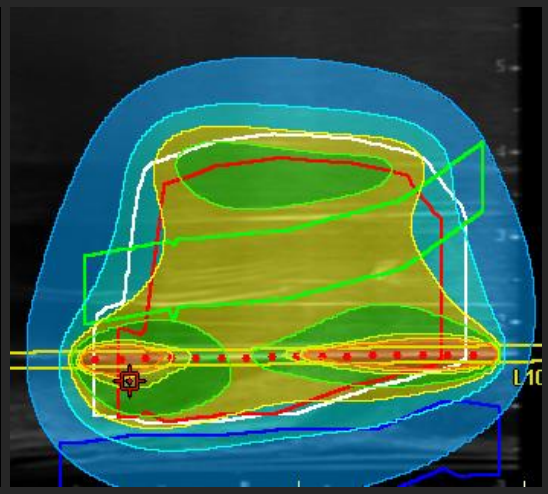

# Example Case 2

- T3b, TURP, Left base of SVs. Vol 26.8cc

SV level



coronal



sagittal


transverse

Mid gland


# Summary of patients thus far

- Average DVH data from 21 patients Prostate
  - Planning aim Prostate D90 > 15Gy = 100%

| Structure | DVH Stat | Tolerance | Av. From 21 pts (±1 std dev) |
|---|---|---|---|
| Prostate | D90% | ≥ 15Gy | 16.8Gy ± 0.5Gy |
| | V100% | ≥ 95% | 98.9% ± 1.2% |
| | V150% | < 45% | 31.9% ± 6.3% |
| | V200% | < 15% | 10.4% ± 3.2% |
| PTV | V100% | ≥ 95% | 94.3% ± 3.0% |
| Urethra | D10% | < 115% | 113.4% ± 1.5% |
| | D0.1cc | < 150% | 114.8% ± 2.2% |
| Rectum | D2cc | < 11.8Gy | 10.1Gy ± 0.6Gy |
| | V100% | = 0 | 0.0% ± 0.0% |

- First 5 patients total theatre time ~5hrs
  - More recently this is ~3hrs

# Future work

- Needle placement/plan quality improvements
  - Retrospective review of previous plans
- Focal treatments (participation in PIVOTAL Boost)
- MOSFET in vivo implementation
- Investigate other template solution (Martinez)

# Recommendations

- Seek advice from brachytherapy community!
- Frequent communication with all involved teams (fortnightly MDT)
- Use existing brachytherapy experience to adapt workflow
- Consistent apps specialist
- Request to Elekta:
  - Physicist support for first case please

# Recommendations

- Label the OncoSelect Stepper controls:



- Complex process, therefore good to have steady patient rate to maintain familiarity
  - At least 1 patient per month (ideally more than 2)
- Retrospective review of plans

# Thank you

mark.long@nhs.net

And a very big thank you to the following Brachytherapy Teams:

- Leeds Cancer Centre
- Poole Hospital
- Northern Ireland Cancer Centre, Belfast