Treatment planning based on CBCT images acquired for on-line positioning verification
- Report for Work Group of Treatment Planning

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Main use of on-board CBCT

- 3D positioning verification or target localization
  - 2D projection images (KV/MV) are not enough.
  - 3D positioning information.
  - Soft tissue information
    - Targets, critical organs and patient anatomy.
    - Organ deformation/dislocation, target volume change,
    - Patient weight (overall size) change
- Verification plan (or evaluation plan) to confirm the dose for
  - Target coverage
  - Critical organ sparing
- Re-plan?
  - Modify the original plan or re-plan based on CBCT?
  - Re-acquire the planning CT and re-plan?

Needs for dose-calculation based on CBCT

- Organ deformation and dislocation
- Target volume change and/or patient weight loss

CBCT-based dose calculation
Procedures

1) CBCT images in HU values (HU calibration)
   - HU linearity/ HU uniformity
   - Image quality: scatter/artifacts

1) Transfer CBCT images to treatment planning system
2) HU-to-ED conversion
3) Dose calculation

Feasibility of CBCT-based dose calculations

Siemens MVCBCT

Varian kV CBCT

Elekta kV CBCT

Tx verification/evaluation using ...

Siemens MVCBCT

Varian kV CBCT

Elekta kV CBCT

Adaptive re-planning and correction methods

Siemens MVCBCT

Varian kV CBCT
Purpose of this session

- The next three speakers will present
  - Current status of CBCT system for CBCT-based dose calculation
  - Limitations and concerns in clinical practices
    - FOV limitation to include the entire patient body.
    - HU calibration/ HU linearity/ HU uniformity
    - Scatter and artifacts
    - HU-to-ED conversion
  - Siemens MV CBCT, Elekta KV CBCT and Varian KV CBCT.