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(IAEA TECDOC-1588)

APPENDIX A: SELF ASSESSMENT QUESTIONNAIRE
Extracted from TECDOC-1588

Transition from 2-D Radiotherapy to 3-D Conformal and Intensity Modulated Radiotherapy

Available on webpage: http://www-pub.iaea.org/MTCD/publications/PDF/TE_1588_web.pdf

This questionnaire is designed to assist centres that plan to embark on a programme of 3-D conformal radiotherapy to check that they have all the necessary requirements. By the time the first patient is to be treated the answers to all the questions should be "**Yes**". Where gaps are identified they will need to be corrected. The questionnaire begins with the staffing and equipment requirements and then looks at the process of conformal radiotherapy planning and treatment to identify the issues that need to be addressed. Items indicated with an asterisk (*****) are optional for 3-D CRT. Questions 4.26 – 4.39 cover additional issues required for IMRT, for which the items marked with an asterisk should be regarded as essential.

CONTACT INFORMATION		
Name of the Hospital		
Hospital web page		
Address	Street	
	PO Box	
	City	
	ZIP	
	County/State	
	Country	...
Main contact	Name	
	Position	
	E-mail	
	Phone	
Form completed by		
Form completed on		*(dd/mm/yyyy)* Today

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1. STAFFING	
1.01 Do you have a radiation oncologist who is trained and experienced in the practice of conventional radiotherapy?	○ Yes ○ No
1.02 Does the radiation oncologist have the academic knowledge necessary for 3-D CRT:	
a. Cross sectional anatomy, surface and radiological anatomy	○ Yes ○ No
b. Target volumes and critical structures	○ Yes ○ No
c. Dose response data	○ Yes ○ No
d. Understanding of beam shaping methodologies – leaf fitting	○ Yes ○ No
e. Linear accelerators, basic understanding especially choice of energy, choice of modality	○ Yes ○ No
f. Immobilisation methods for CRT	○ Yes ○ No
1.03 Has the radiation oncologist had practical training in contouring of target volumes and critical structures?	○ Yes ○ No
1.04 Is the radiation oncologist (or a radiologist who has time available) familiar with CT scanning procedures?	○ Yes ○ No
1.05 Has the radiation oncologist had practical training in the operation of the RTPS for contouring, image registration*, treatment planning, BEV planning for MLCs (or customised blocks)?	○ Yes ○ No
1.06 Do you have a medical physicist who is trained and experienced in the practice of conventional radiotherapy?	○ Yes ○ No
1.07 Has the medical physicist the academic knowledge necessary for 3-D CRT:	
a. Basic understanding of cross sectional anatomy, surface and radiological anatomy as it relates to radiotherapy planning and understanding of treatment plans;	○ Yes ○ No
b. Target volumes and critical structures	○ Yes ○ No
c. Dose response data	○ Yes ○ No
d. Understanding of beam shaping methodologies – MLC and customized blocks	○ Yes ○ No
e. Understanding of Linear accelerator concepts, commissioning and acceptance of linacs	○ Yes ○ No
f. Portal imaging systems	○ Yes ○ No
g. Random and systematic errors in radiotherapy treatment	○ Yes ○ No
h. In-vivo dosimetry	○ Yes ○ No
i. QC for MLCs, portal imaging, in-vivo dosimetry	○ Yes ○ No
j. Commissioning and acceptance of a image-based 3-D RTPS	○ Yes ○ No
k. Immobilization methods for CRT	○ Yes ○ No
l. QC of CT (and MR*) scanners especially in relation to geometry and Hounsfield units	○ Yes ○ No
1.08 Has the medical physicist had practical training in contouring of critical structures?	○ Yes ○ No
1.09 Has the Medical Physicist had practical training in the operation of the RTPS for beam data modelling, contouring, image registration*, treatment planning, BEV planning for MLCs (or customised blocks)?	○ Yes ○ No
1.10 Has the medical physicist had practical training in QC for CRT?	○ Yes ○ No

1.11 Do other treatment planning personnel have the academic knowledge necessary for 3-D CRT:	
a. Basic understanding of cross sectional anatomy, surface and radiological anatomy as it relates to radiotherapy planning and understanding of treatment plans;	○ Yes ○ No
b. Target volumes and critical structures	○ Yes ○ No
c. Understanding of beam shaping methodologies – leaf fitting methodologies	○ Yes ○ No
d. Immobilization methods for CRT	○ Yes ○ No
e. Basic understanding of the physics of treatment planning dose calculation	○ Yes ○ No
1.12 Have other treatment planning personnel had practical training in planning 3-D-CRT?	○ Yes ○ No
1.13 Is there a medical physicist (or other IT expert) with knowledge of networking and DICOM protocols?	○ Yes ○ No
1.14 Are there sufficient RTTs trained and experienced in conventional radiotherapy treatment to cope with the workload?	○ Yes ○ No
1.15 Are the RTTs trained and experienced in the additional requirements for 3-D CRT:	
a. Basic understanding of cross sectional anatomy, surface and radiological anatomy as it relates to radiotherapy planning and understanding of treatment plans;	○ Yes ○ No
b. Immobilization techniques	○ Yes ○ No
c. Portal imaging and registration techniques	○ Yes ○ No
d. MLC operation	○ Yes ○ No
e. Daily QC for MLCs	○ Yes ○ No
f. R&V systems	○ Yes ○ No
g. CT operation for radiotherapy planning	○ Yes ○ No
1.16 Comment on staffing	

2. EQUIPMENT	
2.01 Is there a CT scanner with a flat top couch and alignment lasers suitable for radiotherapy planning with time available?	○ Yes ○ No
2.02 Is there a linear accelerator with an MLC (or block cutting facilities)?	○ Yes ○ No
2.03 Is there an electronic portal imaging system available on the linear accelerator (or facilities for portal films)?	○ Yes ○ No
2.04 Is there an image-based TPS with sufficient spare capacity, which is capable of the following:	
a. 3-D display	○ Yes ○ No
b. 3-D dose calculation	○ Yes ○ No
c. BEV display with facility for field shape design	○ Yes ○ No
d. Dealing with many CT slices	○ Yes ○ No
e. Image fusion*	○ Yes ○ No
f. DVH calculation and display;	○ Yes ○ No
g. Non-coplanar beams including display, inhomogeneity correction, DRRs, and DRR export	○ Yes ○ No
2.05 Is there a Record and Verification system with a networked connection to the RTPS and CT scanner?	○ Yes ○ No

2.06 Is there appropriate measurement equipment in addition to that required in TECDOC 1040	
a. Dose plotting tank with detectors	Yes No
b. Anthropomorphic phantom	Yes No
2.07 Is there an appropriate immobilisation system for all relevant disease sites?	Yes No
2.08 Comment on equipment	

3. COMMISSIONING PROCEDURES	
3.01 Have measurements of geometric accuracy been made on the linear accelerator to demonstrate that conformal treatment fields can be delivered accurately?	Yes No
3.02 Has a check of the CT scanner geometric and CT number accuracy been carried out?	Yes No
3.03 Have the appropriate parameters been entered into the RTPS physics database to ensure that the MLC (or blocking system) parameters (e.g. transmission factors and position in space) are taken into consideration?	Yes No
3.04 Has the dose calculation for MLC (or block) shaped fields been verified in terms of its geometric and dosimetric accuracy?	Yes No
3.05 Is there a system in place to ensure that an independent check calculation of the dose delivered by a treatment plan for the given monitor units is carried out before each patient treatment course? Has it been verified that this system is using an independent algorithm and can correctly calculate the dose for a simple shaped field on a phantom to better than 2% accuracy at a non standard SSD and field size?	Yes No
3.06 Have all the network connections been set up and have the transfer protocols been verified for accuracy using realistic data?	Yes No
3.07 Have dose volume histogram algorithms been tested?	Yes No
3.08 Comment on commissioning procedures	

4. 3-D CRT PLANNING AND TREATMENT PROCESS	
CT scanner	
4.01 Is a system for identifying skin marks (e.g., isocentre indication) on CT scans (and for the establishment and marking of the isocentre*) in place?	Yes No
4.02 Is there a system in place for geometric QC of the CT scanner in place and is the CT scanner geometry within 1 mm?	Yes No
4.03 Has the CT number to relative electron density conversion been measured and the results input to the TPS translation table?	Yes No
4.04 Has the CT scanner couch deflection under load as defined by the IEC been measured and is it <5 mm?	Yes No
4.05 Has electronic transfer from the CT scanner to the RTPS been established and the results of the data transfer been verified (for geometric and CT number accuracy).	Yes No

4.06 Comment on CT scanner	
MR scanner	
4.07 Has electronic transfer from the MR scanner to the RTPS been established and the results of the data transfer been verified (for geometric and CT number accuracy)? *	Yes No
4.08 Is a system for image registration of MR and CT scans in place? *	Yes No
4.09 Comment on MR scanner*	
Target and Normal Tissue Segmentation	
4.10 Has a protocol been written to cover the definition of the GTV, CTV and ITV?	Yes No
4.11 Has a protocol been written to cover the definition of normal tissue structures including the identification of staff authorised to carry this out?	Yes No
4.12 Has an audit been carried out to establish the magnitude of setup uncertainties (both random and systematic) and is it established that setup within 5 mm can be achieved?	Yes No
4.13 Has a protocol been written to cover the volume growing procedures from GTV/CTV to PTV and of OARs to PRVs and are the margins based on the audit of setup uncertainties?	Yes No
4.14 Comment on Target and Normal Tissue Segmentation	
Treatment Planning	
4.15 Has QA involving phantom measurements of planned shaped fields been carried out on the RTPS to verify that dose calculations for MLC (or blocked) fields are carried out accurately both geometrically and dosimetrically?	Yes No
4.16 Are appropriate treatment planning protocols in place giving details of appropriate techniques (including beam energies) and dose calculation algorithms, including specification of inhomogeneity correction policies, for particular sites?	Yes No
4.17 Has a policy been established regarding leaf fitting methodologies for MLCs including when and how to make manual adjustments of automated field shaping?	Yes No
4.18 Have dose prescription protocols for all the relevant sites been produced and do they include dose constraints for normal tissues?	Yes No
4.19 Is there a protocol in place for the evaluation of treatment plans, including 3-D visualisation of the target volumes compared to the calculated doses and DVH analysis?	Yes No
4.20 Comment on Treatment Planning	

Patient Treatment	
4.21 Is there a tested protocol for the transfer of patient data from the planning system to the treatment machine verification system and have appropriate responsibilities for the data accuracy and integrity been assigned to the relevant personnel?	○ Yes ○ No
4.22 Has a system been set up for the checking of the individual patient field shape against a printed template of the treatment fields to check that the correct patient and plan data are in place?	○ Yes ○ No
4.23 Is there a portal imaging verification protocol in place that takes appropriate account of the effects of random and systematic errors?	○ Yes ○ No
4.24 Is there a system in place for carrying out beam entry in-vivo dosimetry on one fraction for every patient and for evaluation of the results?	○ Yes ○ No
4.25 Comment on patient treatment	

IMRT specific issues	
4.26 Are items marked with an asterisk (*) available?	○ Yes ○ No
4.27 Have all groups of staff had at least one year experience in the planning and delivery of 3-D CRT?	○ Yes ○ No
4.28 Has an IMRT committee been established to oversee the introduction of IMRT?	○ Yes ○ No
4.29 Are there sufficient radiation oncology, medical physics and RTT staff to ensure that the introduction of IMRT does not compromise other radiotherapy treatment including 3-D CRT?	○ Yes ○ No
4.30 Are there satisfactory service support arrangements to ensure that the MLC can be maintained at the required level of accuracy?	○ Yes ○ No
4.31 Have all groups of staff had additional training in the planning and delivery of IMRT?	○ Yes ○ No
4.32 Is there a 3-D dosimetry system available (e.g., using film) and are anthropomorphic phantoms available for IMRT verification?	○ Yes ○ No
4.33 Have QC measurements been made on the linear accelerators to ensure that the MLC is set up to the required higher level of accuracy?	○ Yes ○ No
4.34 Has a system of dose constraints for different organs-at-risk been established?	○ Yes ○ No
4.35 Have class solutions been developed for the anatomical sites to be treated and have the dose distributions been compared to those obtained using 3-D CRT?	○ Yes ○ No
4.36 Have phantom measurements been made to verify the accuracy of IMRT including geometric accuracy in three dimensions?	○ Yes ○ No
4.37 Have tests been carried out to ensure that the R&V system is reliable when delivering IMRT beams?	○ Yes ○ No
4.38 Have tests been carried out to ensure that if an IMRT beam is interrupted, the treatment can be completed accurately?	○ Yes ○ No
4.39 Comment on IMRT specific issues	