Catalan Clinical Audit Network for Quality Improvement in Radiotherapy

CAT·ClinART

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TOOLS FOR QUALITY AUDITS

D4.1

T4.2

WP4 members

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SUMMARY SHEET

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Summary	This deliverable encompasses clinical audit manuals, checklists and reporting templates as well as the list and definitions of Quality Indicators and standard to collect during the audit campaign.

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1. Executive Summary

1.1. Context

Radiotherapy is a highly complex medical discipline where safety, precision, and consistency are essential to ensure optimal treatment outcomes. In this context, clinical audits serve as a cornerstone of quality assurance, enabling departments to evaluate their practices against agreed standards and promote continuous improvement. Building upon established international methodologies—such as IAEA's QUATRO and Belgium's B-QUATRO—the Catalan Clinical Audit Network for Quality Improvement in Radiotherapy (Cat-ClinART) project aims to develop and implement a sustainable and harmonised audit framework across Catalonia.

1.2. Objectives

This deliverable (D4.1) outlines the tools developed under WP4 of Cat-ClinART to support comprehensive internal and external clinical audits in radiotherapy. The objectives are:

- To provide a standardised audit manual and checklist system adapted to the Catalan context.
- To define and structure Quality Indicators (QIs) relevant to prostate cancer.
- To establish a secure and interoperable digital infrastructure using REDCap.
- To facilitate peer-to-peer, multidisciplinary auditing through trained professionals.
- To align auditing activities with national and European regulatory requirements.

1.3. Outline

Chapter 2

Provides the historical and regulatory background of clinical audits in radiotherapy, framing Cat-ClinART within international developments and Spanish legislation.

Chapter 3

Details the audit manual, including methodology, team composition, logistics, tools, and ethical considerations.

Appendices A–C

Contain the practical audit instruments: checklists, QIs, and post-audit survey templates.

The tools and procedures defined in this document are the product of extensive interdisciplinary collaboration within WP4 and are designed to foster a culture of quality, transparency, and continuous improvement in radiotherapy services throughout Catalonia.

2. Introduction

Radiotherapy plays a crucial role in cancer treatment, offering high-precision interventions with potentially curative intent. However, due to the inherent complexity of radiotherapy and the high doses of ionising radiation involved, its practice must be underpinned by robust quality assurance mechanisms. Clinical audits, both internal and external, have emerged as a cornerstone of quality and safety management in radiotherapy. The present deliverable, “Tools for Quality Audits”, aims to describe the framework and infrastructure being developed within the Catalan Clinical Audit network for Quality Improvement in Radiotherapy (Cat-ClinART)

initiative to enable structured, sustainable, and effective clinical audits in Catalonia, drawing from international experience and tailored to the local context.

2.1. From PUB1990 to B-QUATRO: the evolution of comprehensive audits

The International Atomic Energy Agency (IAEA)'s Quality Assurance Team for Radiation Oncology (QUATRO) methodology, first established in 2007 and expanded in its 2022 second edition (IAEA PUB1990), has provided a benchmark for comprehensive clinical audits in radiotherapy. Unlike partial audits that focus on specific components of care, QUATRO adopts a systems-level perspective, evaluating infrastructure, staffing, workflows, equipment, patient management, and safety protocols. It also explicitly includes peer-to-peer assessments and multidisciplinary participation as best practices.

Building upon this international reference, Belgium developed B-QUATRO, an adaptation of the QUATRO methodology to meet national needs and organisational realities. B-QUATRO preserves the core principles of the IAEA model—such as emphasis on structure and process over outcome—and implements them within Belgium's regulatory and institutional context. Notably, it excludes outcome assessment (covered by other national institutions like Belgian Health Care Knowledge Centre (KCE)) but expands the focus on internal quality systems and operational efficiency. This model offers a concrete example of how a high-level framework can be effectively translated into local action.

2.2. The Cat-ClinART proposal: building a Catalan clinical audit network

Inspired by B-QUATRO, Cat-ClinART aims to develop and implement a permanent, systematic structure for clinical audits in radiotherapy across Catalonia, through a phased and participatory approach. To begin, a particular focus is placed on prostate cancer, which serves as the pilot disease site for adapting and testing the methodology, given its high prevalence in radiotherapy practice and the availability of established benchmarks. Funded under the European Union for Health (EU4Health) programme, the project aligns with European and national directives requiring clinical audits in medical radiation practices.

Work Package (WP) 4, coordinated by the Institut Català d'Oncologia (ICO), is responsible for developing the audit methodology and associated tools. This includes:

- Call and selection of auditors.
- Standardised clinical audit manuals and templates based on QUATRO/B-QUATRO.
- Definition of quality indicators (QI) and clinical standards for benchmarking.
- A model for dosimetric audits.
- An Information Technology (IT) infrastructure for data collection, sharing, and evaluation.
- And a strategic plan for long-term sustainability, coordinated with the Catalan health authority (Departament de Salut).

Importantly, Cat-ClinART does not limit itself to external reviews. It envisions a mixed model of internal and external audits, carried out by trained professionals across disciplines. This fosters peer learning, mutual trust, and shared responsibility among Catalan radiotherapy units. The training of auditors is addressed in WP5, and the pilot cycle is planned under WP6.

2.3. Legal and regulatory context

The implementation of clinical audits in radiotherapy is not optional. The Euratom Directive 2013/59/EURATOM, transposed into Spanish legislation via Real Decreto 601/2019, and further

clarified by Real Decreto 391/2025, makes clinical audits mandatory in radiological practices, including radiotherapy. Specifically, audits must be conducted in accordance with national procedures and standards and must examine both clinical processes and radiation protection measures.

The Directive defines clinical audit as "a systematic analysis of medical radiological procedures seeking to ameliorate the quality and outcome of patient care," with emphasis on comparing actual practice with agreed standards and modifying practice as needed.

Real Decreto 391/2025 introduces more detailed requirements for radiotherapy units. Each centre must develop a formal Programme of Quality and Safety, approved and supervised by a dedicated Commission for Quality and Safety in Radiotherapy composed of a radiation oncologist, a clinical medical physicist, and a radiotherapy technologist. This programme must cover the entire care pathway, from justification and optimisation to treatment delivery and follow-up, and must be available for review by the competent health authorities.

The decree also mandates that institutions conduct internal audits on a regular basis to monitor the effectiveness of their programmes and, in addition, submit to external audits at least once every five years, carried out by an independent body. Both types of audits must be documented, with the corresponding reports archived and accessible to the authorities.

Cat-ClinART responds directly to these legal requirements by providing the methodology, tools, and infrastructure needed to implement both internal and external clinical audits in a consistent and standardised way. The project's focus on auditor training, self-assessment instruments, external peer review, and data management platforms ensures that Catalan centres are equipped to comply fully with the regulatory framework, while also fostering a sustainable culture of quality improvement in radiotherapy.

2.4. A shared vision for quality improvement

In line with the "Esperanto" guidelines of the European Society of Radiology (ESR), Cat-ClinART adopts the ALPINE principles for clinical audits: Achievable, Local, Practical, Inexpensive, Non-threatening and Easy. The tools being developed within this deliverable are designed to embody these values. They support self-reflection and continuous improvement at each institution, rather than external control or punitive oversight.

Ultimately, the goal is to establish a robust and sustainable audit ecosystem—not just a one-off evaluation exercise, but an embedded practice of quality assurance that improves care, supports professional development, and contributes to patient safety and treatment efficacy.

The tools outlined in this deliverable reflect a collective Catalan effort, leveraging international expertise while anchoring itself in the local clinical, organisational and legal reality. At the same time, the project is fully aligned with the national framework defined by Spanish legislation, ensuring coherence with state-level requirements for quality and safety in radiotherapy. With this foundation, Cat-ClinART seeks to position Catalonia as a reference region for clinical audit implementation in radiotherapy at both the Spanish and European levels.

3. Clinical Audit Manual

This section outlines the methodology and procedures for conducting clinical audits within the Cat-ClinART initiative. It provides auditors—both national and international—with clear, practical, and complete guidance to carry out the audits of radiotherapy services across Catalonia, following the adapted B-QUATRO framework.

3.1. Overview and Scope

Cat-ClinART, coordinated by Fundació de Gestió Sanitària de l'Hospital de la Santa Creu i Sant Pau (FGSHSCSP) aims to implement comprehensive clinical audits in all public radiotherapy departments in Catalonia, ensuring alignment with international best practices and compliance with European and national regulations. The audits will be conducted as part of a broader strategy to promote continuous quality improvement, multidisciplinary collaboration, and transparency in radiotherapy services.

Each participating hospital will undergo one full clinical audit during the project's implementation phase. The audits will include an initial self-assessment, followed by an external on-site peer review, supported by a unified digital infrastructure based on Research Electronic Data Capture (REDCap).

3.2. Participating Hospitals

All public hospitals in Catalonia will be audited:

- Hospital de la Santa Creu i Sant Pau
- Institut Català d'Oncologia – Hospitalet
- Institut Català d'Oncologia – Badalona
- Institut Català d'Oncologia – Girona
- Hospital Universitari Vall d'Hebron
- Hospital Clínic de Barcelona
- Consorci Sanitari de Terrassa
- Hospital Universitari Sant Joan de Reus
- Hospital Arnau de Vilanova de Lleida
- Hospital del Mar

The use of Varian/ARIA as the common Oncology Information System (OIS) across all participating centres provides a uniform digital environment that enables the development of standardized audit tools. This shared framework ensures consistency in methodology and comparability of results, and its impact will be reflected throughout the remainder of this document.

3.3. Composition of the Audit Teams

In Cat-ClinART, the composition of the audit teams has been defined under WP4 (T4.1 – Call and selection of auditors). A call was launched, and a training course was organised to prepare auditors and auditees. The selection process has been completed, resulting in a group of eleven auditors equally distributed amongst the three professional profiles in radiotherapy (Radiation Oncologists (RO), Medical Physics Experts (MPE) and Radiation Therapy Technologists (RTTs)).

Each clinical audit team in CAT-ClinART is composed of three auditors, one from each of the core radiotherapy disciplines: RO, MPE and RTT. To ensure neutrality and avoid institutional bias, auditors must come from three different institutions and may not participate in audits of their own centres.

As part of the initial phase of the project, the first institutions and audits were used as training opportunities. During these audits, selected auditors participated as observers, while the audits themselves were led by international experts, providing high methodological quality and real-time exposure to best practices.

In line with this model, all future auditors must:

- Successfully complete the official CAT-ClinART training course (Work Package 5), which includes instruction on the QUATRO and B-QUATRO methodologies, use of standardized checklists and reporting tools, and application of audit-specific data collection systems such as REDCap.
- Observe at least one audit conducted by experienced auditors before participating actively and independently in the audit process.

This phased training pathway—theoretical training, supervised observation, and progressive involvement—ensures consistency and quality in audit execution while fostering peer-to-peer learning.

The multidisciplinary and cross-institutional composition of the audit teams is a cornerstone of the CAT-ClinART methodology, supporting a collaborative, non-threatening, and improvement-oriented environment that promotes harmonised practices and quality enhancement across all participating radiotherapy departments.

3.4. Audit Structure

3.4.1. Preparation of the audit

A clinical audit can only be effective if it is preceded by careful preparation from all parties involved. Each institution participating in the CAT-ClinART project must take responsibility for compiling and providing the audit team with the necessary information and documentation, including the use of the adapted B-QUATRO checklist as a preliminary self-assessment tool. While each audited institution must designate contact persons (one per discipline) to facilitate the audit process, these individuals are not required to accompany the audit team throughout the visit. In fact, auditors are expected to work independently, integrating with the clinical and technical teams, asking questions freely and directly observing practices.

The role of the designated contact persons is primarily to support logistics and access, not to supervise or mediate interactions. It is essential, however, that key professionals involved in the audited processes are identified in advance and made available during the visit. At the same time, the audit team must retain full autonomy to interview any staff member they consider relevant, to ensure a comprehensive and unbiased assessment of the radiotherapy service.

It is crucial to inform the entire department and the institution's management in advance about the audit and its schedule. For follow-up audits, it is advisable that the audited institution prepares a concise presentation highlighting the most relevant changes or improvements introduced since the last audit

Auditors are expected to be thoroughly familiar with audit procedures and to agree among themselves on the approach and distribution of responsibilities within the team. They must review the documentation provided by the institution, agree on a feasible schedule for the visit, and, if necessary, request additional information. This schedule will be proposed by the auditors and agreed by the audited institution. Once the audit has been completed, the audit team must produce a comprehensive report reflecting their observations, conclusions, and recommendations.

The audit will assess the overall functioning of the radiotherapy department, considering both internal processes and the department's interaction with other clinical services involved in cancer care (such as surgery, medical oncology, and medical imaging), as well as with hospital management and external stakeholders, including vendors and technical support services. Auditors must have free access to staff and the resources necessary to evaluate the flow of information and multidisciplinary collaboration. Although CAT-ClinART audits follow the QUATRO and B-QUATRO guidelines, the evaluation of brachytherapy will be limited to a high-level review of the available equipment and its impact on staffing and resources. Auditors should look for clear signs of a patient-centred institutional culture, openness to technological innovation, and a strong collective commitment to continuous improvement. This requires the presence of an active quality assurance system that enables the identification of areas for improvement and the regular and structured implementation of corrective actions.

Auditors are expected to follow established principles of professional conduct throughout the audit process. This includes ensuring the strict confidentiality of all patients, institutional, and staff-related information; approaching all observations and interactions with respect and objectivity; and fostering a collaborative and non-threatening environment. The audit should be seen as a quality improvement tool, not an inspection, and auditors must act with integrity, impartiality, and sensitivity to the context of each department.

3.4.2. Self-Assessment (Pre-Audit Phase)

Each participating centre will be contacted at least two months prior to the proposed audit date to coordinate scheduling and ensure sufficient time for internal preparation. At least three weeks before the audit, the institution must complete a structured self-assessment using REDCap. This self-assessment is based on the B-QUATRO checklist, adapted to the Catalan context by the WP4 T4.2 team, and is designed to guide the institution through a comprehensive reflection of its practices.

The REDCap platform allows each centre to securely complete the evaluation using dynamic online forms with conditional logic, upload supporting documentation, and engage multiple users with full traceability. The self-assessment includes key areas such as:

- Organizational and structural characteristics of the radiotherapy department
- Clinical processes and care workflows
- Description of the patient pathway, from referral to follow-up
- Existing quality management systems and continuous improvement strategies

Additional preparatory requirements include: ensuring availability of relevant staff during the audit period; compiling background materials (e.g., policies, protocols, treatment planning procedures); and informing both departmental teams and hospital leadership of the audit scope and timeline. Centres are also expected to prepare a brief presentation highlighting major developments since the last audit, if applicable.

Auditors will validate the information gathered, identify any areas requiring clarification, and request further documentation as needed.

It is expected that the institution will also identify contact persons to coordinate communication, assist with documentation requests, and facilitate access to personnel and resources as needed. These preparatory measures are essential to enable an informed, structured, and constructive assessment in line with established international standards.

3.4.3. External Audit (On-Site Visit)

The external audit visit within CAT-ClinART spans four full working days, during which the team of auditors carries out a structured review of the radiotherapy service. The visit follows a pre-established timetable agreed with the centre during the planning phase and is organized to allow a comprehensive yet non-disruptive evaluation of clinical operations.

Entrance Briefing

The first activity of the visit is the entrance briefing, attended by the full audit team and key representatives from the audited institution. At a minimum, the meeting should be attended by a representative of the board of directors, the heads of Radiation Oncology and Medical Physics, the head of RTTs, the Radiation Protection Officer, and a representative from the quality management team, if applicable. This meeting sets the tone for the entire process. The auditors introduce themselves, outline the structure and practicalities of the visit, and confirm the audit's scope in line with the information submitted during the self-assessment phase. The institution is invited to present a short overview of recent developments, organizational changes, or contextual information that may be relevant to the audit. The schedule for interviews, document access, and site tours is reviewed, and a liaison person from the centre is designated (if not already assigned). The briefing ensures mutual understanding of objectives, methods, and expectations, fostering a constructive and collaborative environment from the outset.

Workflow During the Visit

Over the four days, the auditors work through the structured tools prepared by the CAT-ClinART WP4 team, based on the B-QUATRO framework. The core data collection is conducted using the REDCap platform, which hosts customized checklists, forms, and upload fields. Auditors may complete these forms online during interviews or review sessions using laptops or tablets. If preferred, paper-based versions of the templates may be used temporarily; however, final data must be entered into REDCap to ensure standardization across the network and enable aggregation for project-level analysis.

While auditors may divide into smaller sub-teams to cover specific areas of the service depending on its complexity, teamwork remains essential throughout the audit. A dedicated room must be allocated to the audit team to allow regular regrouping, discussion of preliminary findings, and joint preparation of the final report. Dedicated time is allocated for reviewing documentation (e.g. protocols, quality assurance (QA) records, patient files), conducting interviews with staff from different professional profiles, and—when possible—observing aspects of clinical workflow, specifically for prostate. The audit team holds short internal coordination meetings throughout the visit to align findings, adjust interview plans if needed, and ensure full coverage of the checklist items.

Each audit is documented using:

- Checklists
- Data input forms
- Observation sheets
- Redacted interview summaries

Coordination and Institutional Support

Designated contact persons from the centre facilitate access to the agreed documents, assist in coordinating the interview schedule, and ensure availability of relevant staff. If additional clarification or documentation is required, it may be requested during the visit. The approach remains flexible and non-intrusive, with sensitivity to the clinical workload and patient care priorities.

Pre-Reporting and Consolidation

At the conclusion of the fourth day, the audit team holds a private internal debriefing to synthesize the observations and align on key points. Each auditor reviews the data entered in REDCap to ensure completeness and internal consistency. Responsibilities for drafting sections of the final report are assigned at this stage, and potential recommendations are discussed. Although observations and recommendations are discussed during the exit meeting with the institution, no formal conclusions are communicated until the written report is finalized and validated internally by the audit team. The full report will be sent to the department four to six weeks after the audit.

Exit meeting

The exit meeting marks the conclusion of the on-site clinical audit visit and is a key component of the QUATRO and B-QUATRO methodologies. Its primary aim is to provide the audited institution with a clear and constructive summary of the audit team's preliminary findings, including strengths, areas for improvement, and notable good practices observed during the visit. The meeting should be attended by the core multidisciplinary team of the radiotherapy service (including RO, MPE, and RTTs), the department's leadership, the designated contact persons, and, where appropriate, representatives from hospital management.

The tone of the exit meeting must remain collegial, respectful, and forward-looking. Auditors should frame feedback in a positive and supportive manner, avoiding judgmental language and focusing on opportunities for improvement rather than shortcomings. Strengths should be highlighted first to reinforce good practices, followed by clearly articulated suggestions for enhancement. The session is not the moment for detailed debate or justification, but rather to ensure clarity of the observations and to thank the host institution for its openness and collaboration. Final conclusions will be presented in the written audit report after internal team consensus and review.

3.5. Checklists and Templates

The core audit tool is a modular checklist and form system, adapted from B-QUATRO with prostate-specific sections, reviewed and validated by T4.2. It covers:

- Part I: Infrastructure

  Covers the physical, organizational, and human resources of the radiotherapy department. This includes staffing levels (radiation oncologists, medical physicists, RTTs), facility layout, and availability of essential spaces and resources required for safe and effective treatment delivery.

- Part II: Patient related procedures

  Focuses on the clinical workflow from diagnosis to follow-up. It assesses the appropriateness and consistency of clinical decision-making, including indications for treatment, contouring, planning, delivery, documentation, and multidisciplinary involvement—with specific attention to prostate cancer-specific pathways.

- Part III: Equipment related procedures

  Evaluates the functionality, commissioning, calibration, and maintenance of radiotherapy equipment. This includes treatment units (e.g., linacs), imaging systems, and IT systems, as well as procedures for dosimetric verification and fault management.

- Part IV: Quality management system

Assesses whether the department has a formal, documented quality management framework. Topics include internal audits, continuous improvement practices, Standard Operating Procedures (SOPs), risk management, incident learning, and quality indicators.

- Part V: Communication management

  Examines how information is shared within the team and with patients. It includes communication protocols, multidisciplinary meetings, documentation practices, informed consent processes, and how audit findings or quality improvements are communicated.

- Part VI: Radiation protection of staff and population

  Verifies compliance with national and European radiation protection standards. Includes shielding, staff training, dosimetry monitoring, and procedures to minimize unnecessary exposure to both personnel and the general public.

- Part VII: RTT Roles and responsibilities

  Focuses on the definition, training, and deployment of Radiation Therapy Technologists (RTTs). It assesses whether their roles are clearly defined, whether they receive adequate continuing education, and how they contribute to safety, quality, and workflow—especially in areas like treatment setup and verification.

After completing each checklist, the auditors will also assign a global compliance score that reflects the extent to which the department meets the criteria established in the checklist. This score will follow a three-level system:

- Compliant: the department meets all checklist criteria, and no recommendations are issued.
- Partially compliant: the department meets most criteria but requires improvements in certain areas; minor recommendations are provided to enhance practice.
- Non-compliant: the department fails to meet key criteria; major recommendations are issued to address critical issues and improve practice.
- Non applicable: The checklist item does not apply to the audited department due to the absence of the relevant activity, technology, or clinical service. This may include procedures not performed, equipment not available, or organisational structures that are not relevant to the department's current scope of practice. No evaluation or recommendation is issued for these items.

In addition, a commendations/recommendations field is available just below each score, allowing auditors to record specific strengths, suggestions for improvement, or corrective actions directly linked to the rating.

The checklists and templates used for data collection and reporting are provided in Appendix A.

3.6. Dosimetric Audits

Dosimetric audits are also conducted independently under T4.4, with a dedicated protocol (D4.4). These audits include:

- A virtual dosimetry audit covering prescription, contouring and planning
- An end-to-end treatment delivery audit

The Survey on contouring and planning of two prostate clinical cases for the virtual audit is developed in REDCap and implemented as an online form with a dedicated link for participants to complete.

3.7. Quality Indicator Collection

In CAT-ClinART, QIs are designed to provide an objective measurement framework for assessing the quality, safety, and outcomes of radiotherapy services. They are collected separately from the clinical audit, ensuring a complementary but independent evaluation pathway.

All QIs are focused on prostate cancer, chosen as the reference disease for the first cycle of the project. The indicators have been selected from the literature to ensure international relevance, comparability, and evidence-based robustness. Data collection is performed at the patient level within REDCap, enabling robust analyses and statistical comparisons across centres. To ensure consistency, each centre must provide data from a randomised sample of 30 prostate cancer patients who received curative-intent radiotherapy and have a minimum follow-up of 3 years at the time of data collection, which will take place in 2026.

Inclusion criteria for patient selection:

- No history of previous tumours, except non-melanoma skin cancer.
- Radiotherapy initiated between 01/01/2022 and 31/12/2022.
- Treatment delivered with curative intent.
- No prior surgery before radiotherapy.

To complement the retrospective sample of 30 patients with ≥3 years of follow-up, each centre may optionally include an additional set of 30 patients who received radiotherapy between 6 and 12 months prior to data collection. The aim of this complementary cohort is to provide an opportunity to analyse whether clinical quality parameters have improved over the past three years, in light of:

- Implementation of updated clinical protocols.
- Optimisation of care pathways and workflows.
- Adoption of technological or organisational improvements.

Only indicators that do not require long-term follow-up will be analysed in this cohort. These may include acute toxicity, adherence to treatment planning protocols, time intervals between diagnosis and treatment, and other process-based indicators.

Participation in this complementary data collection is optional but encouraged, as it provides useful insight into the evolution of quality and allows comparison with the retrospective cohort.

The QIs are developed under Task 4.3 and integrated into REDCap using structured forms. Each indicator follows a standardized framework to ensure comparability across centres:

- Definition: clear description of the indicator and its clinical relevance.
- Formula: the method of calculation, specifying numerator and denominator.
- Standard: the benchmark value or target considered acceptable.
- Action level: the threshold at which corrective action is required.
- Frequency: how often the indicator is to be measured and reported.

This approach ensures that participating centres report consistently on quality, safety, and quality of life measures. The results feed into benchmarking analyses, and visual dashboards (e.g., via Power BI) allow for dynamic monitoring of performance and identification of areas for improvement.

The full set of QIs is presented in Appendix B.

3.8. Cat-ClinART IT Infrastructure

3.8.1. REDCap platform

All audit activity is centralized on a dedicated, secure REDCap instance hosted at ICO's Data Center (NUS Sanitari).

REDCap was selected as the IT platform for CAT-ClinART due to its strong alignment with the project's technical, clinical, and regulatory requirements. It addresses key priorities such as interoperability, security, compliance, and sustainability, while offering practical functionalities to support the clinical audit process across all participating centres.

The platform provides the following combined advantages:

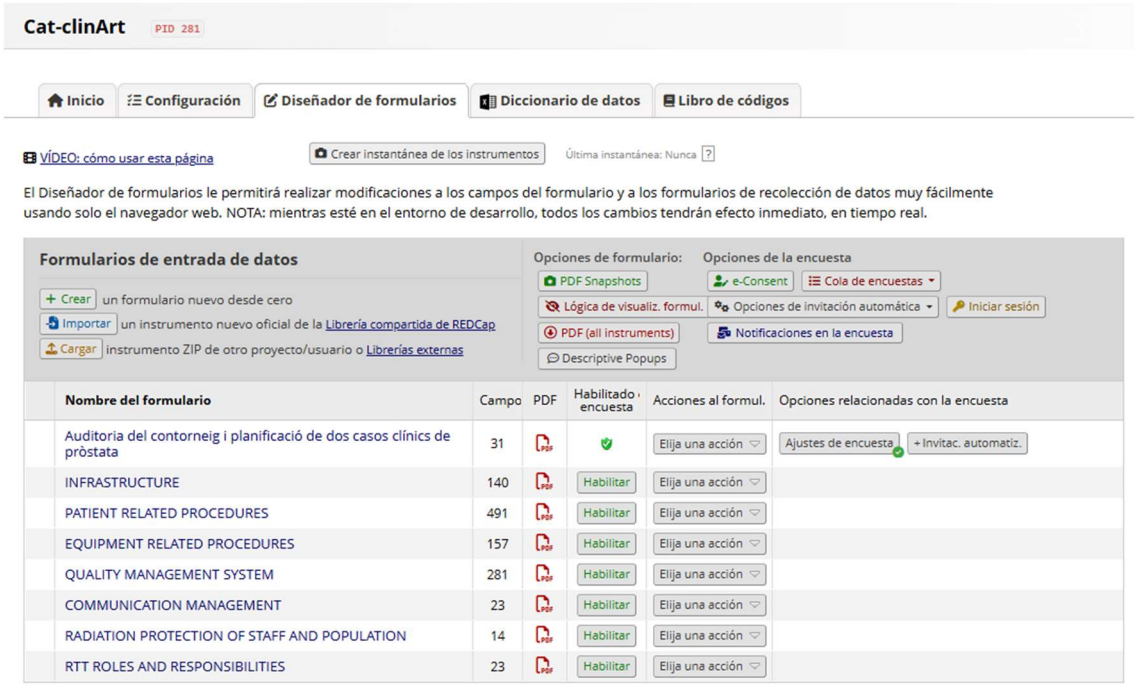
- Interoperability and Data Integration: Direct links with ARIA, Hospital Information Systems (HIS), and local databases, ensuring seamless data exchange.
- Security & General Data Protection Regulation (GDPR) Compliance: Encrypted data storage, role-based access control, and adherence to the GDPR for secure handling of sensitive health information.
- Centralized Data Platform with Real-Time Access: A secure, multi-user environment that allows institutions to store, manage, and access audit data in real time.
- Data Standardization and Validation: Structured input with automatic validation to ensure consistency and quality across centres.
- Flexible Data Input and Efficiency: Supports both automated extraction and manual entry, complemented by Extract, Transform, Load (ETL) processes to reduce manual work.
- Analytics & Dashboards: Built-in indicators, live reporting tools, and visual dashboards for monitoring quality indicators and audit findings.
- Scalability: The system adapts to project growth and evolving complexity.
- Sustainability and Maintenance: Designed as a long-term, reusable infrastructure, with dedicated IT staff to provide updates, hosting, and user support.

By combining these features, REDCap ensures a robust, efficient, and sustainable infrastructure for clinical audit data management, establishing a foundation for continuous quality improvement in radiotherapy services.

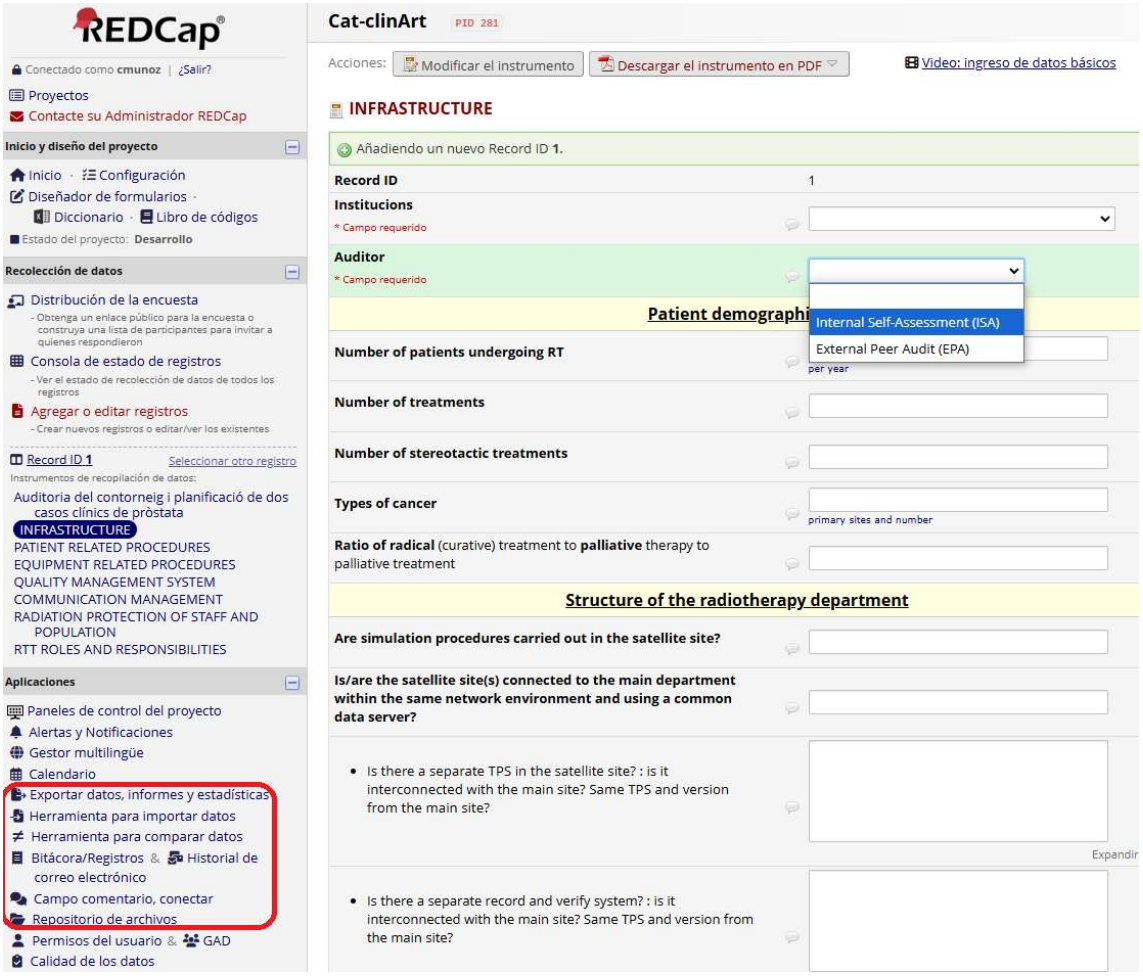
The official REDCap platform for CAT-ClinART is hosted at:

https://redcap.iconcologia.net/redcap/

The audit checklists and forms within the REDCap platform have been specifically designed for structured data entry. For documentation and review purposes, all forms can also be downloaded in PDF format directly from the platform:



When entering data into the REDCap platform, users can specify whether the audit corresponds to an Internal Self-Assessment (ISA) or an External Peer Audit (EPA), ensuring clear differentiation in reporting and analysis. The system supports multiple methods for data import and export, including structured file uploads and API connections, to facilitate integration with local systems and streamline workflows. Built-in benchmarking tools allow comparison of quality indicators across institutions or time periods. Additionally, a centralized file repository is available within the platform to organize and store supporting documents (e.g., protocols, QA reports, audit findings), ensuring secure and coordinated data management across the CAT-ClinART network:



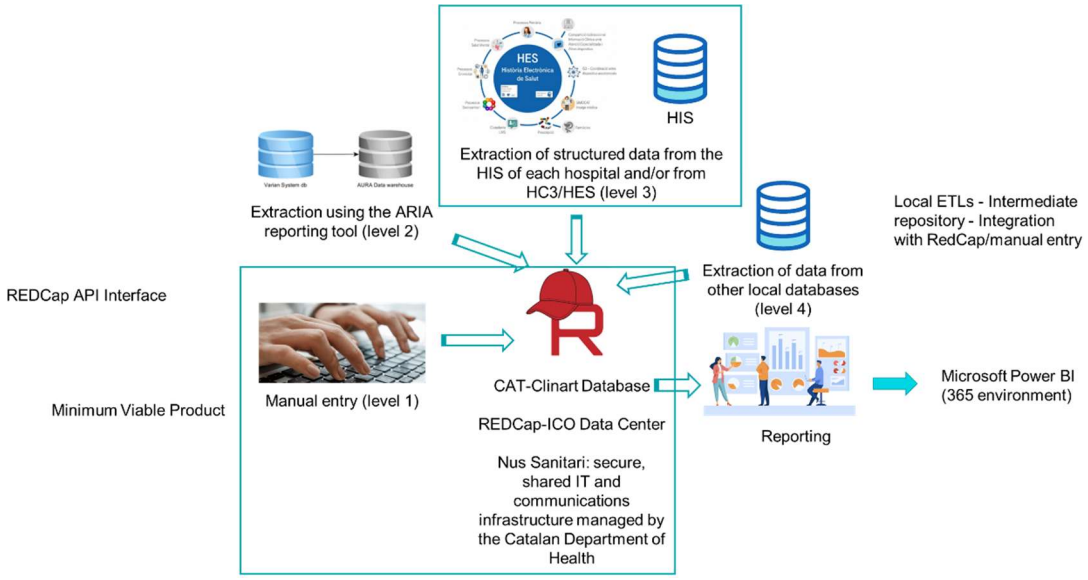
3.8.2. CAT-ClinART Digital Architecture: Interoperability and Data Integration

The CAT-ClinART IT infrastructure is built around REDCap as the central platform for data collection, management, and reporting. Data can enter the system through two main routes:

- Automated extraction from hospital systems (e.g., ARIA, HIS, the shared Medical Record of Catalonia HC3, local databases), ensuring interoperability and minimizing manual effort.
- Manual entry by auditors or staff, using standardized forms and checklists directly in REDCap.

Reporting within CAT-ClinART will be supported through Power Business Intelligence (BI), which integrates seamlessly with the consortium's collaborative environment based on Microsoft 365, the same platform used across the Catalan public health system. This setup enables secure sharing of interactive dashboards and visual reports, ensuring that audit results, quality indicators, and benchmarking data are accessible to authorized users in real time. Power BI's compatibility with REDCap exports and other hospital data sources allows efficient transformation of raw data into clear, actionable insights, while maintaining consistency with the project's overall IT and governance framework.

At present, a Minimum Viable Product (MVP) of this infrastructure is already operational, enabling immediate use for audit activities. The remaining developments—including advanced automation, data integration, and customized reporting—will be progressively explored during the project. These activities will be supported by a dedicated IT technician contracted for one year, as specified in the Description of the Action (DoA).



3.9. Audit Reports

The results of each audit carried out under CAT-ClinART are documented through three written reports, each addressing a distinct dimension of the evaluation:

- Clinical Audit Report – prepared by the clinical audit team and covering organisational, procedural, and clinical aspects based on the QUATRO/B-QUATRO methodology.
- Dosimetry Audit Report – summarising the outcomes of the dosimetric verification carried out during the audit cycle.
- CAT-ClinART Consolidated Clinical Audit Report – issued once the full audit cycle has been completed across all participating centres. This confidential, centre-specific report integrates the findings of the clinical and dosimetry audits with the results of the quality indicator (QI) collection. It includes an anonymised benchmarking analysis that allows each centre to understand its performance in relation to others, while preserving institutional confidentiality.

The clinical audit report will be prepared by the audit teams and delivered to the audited department within four to six weeks following the site visit. Each centre will have three weeks to review the draft report and provide comments or corrections in the event of factual inaccuracies. The Dosimetry audit report will be prepared by the dosimetry audit team and delivered to the department four to six weeks following the dosimetry audit.

3.9.1. Structure of the Clinical Audit Report

Each Clinical Audit Report is composed of two parts:

- Summary Report: A concise overview of the audit visit, its scope, key objectives, and main conclusions.
- Detailed Report: A full account of the audit activities, findings, and recommendations, including checklists and any benchmarking insights where applicable.

The suggested structure includes:

- Objectives and scope of the audit
- General description of the hospital and radiotherapy department
- Staffing structure, roles, and work organisation
- Infrastructure, treatment activities, and workload
- Audit methods (documentation review, interviews, observations)
- Findings (aligned with checklist domains)
- Benchmarking results (if applicable)
- Conclusions and overall assessment
- Commendations, suggestions, and recommendations
- Annexes (e.g. completed checklists, supplementary data)

3.9.2. Structure of the Dosimetry Audit Report

The Dosimetry Audit Report focuses on verifying the accuracy and consistency of dose delivery within the audited radiotherapy department. It complements the clinical audit by providing objective measurements of technical performance. The report is prepared by the dosimetry audit team in collaboration with the designated institutional contact for medical physics.

The suggested structure includes:

- Objectives and scope of the dosimetry audit
- Description of the dosimetry audit methodology
    - Type of tests performed (e.g. reference dosimetry, end-to-end tests)
    - Phantom and equipment used
    - Acceptance criteria
- Summary of results by modality or technique (e.g. IMRT, VMAT)
- Deviations identified and analysis of potential causes
- Comparison with expected tolerances or national/international standards
- Recommendations for correction or follow-up actions (if applicable)
- Conclusions and overall dosimetric assessment
- Annexes (e.g. raw data, measurement protocols, reference documentation)

The dosimetry audit contributes to verifying compliance with best practices in treatment delivery and supports safe and effective implementation of complex radiotherapy techniques.

3.9.3. CAT-ClinART Consolidated Clinical Audit Report and Final Workshop

The CAT-ClinART Consolidated Clinical Audit Report is provided to each institution only after all audits within the cycle have been completed. It offers a comprehensive, integrated view of the institution's performance, bringing together:

- Key findings from the clinical and dosimetry audits
- Results from the QI data collection

- An anonymised benchmarking analysis comparing quality indicators across centres (with only the audited institution identified)
- The Executive Summary of the audit report is designed to communicate key findings and recommendations at different levels of responsibility. It is structured into three distinct sections, each tailored to its intended audience:
    - Department-Level Summary: addressed to the clinical and technical teams (radiation oncologists, medical physicists, RTTs, and quality managers), this section focuses on operational findings, strengths, and specific recommendations for improving clinical practice and workflows within the radiotherapy department.
    - Hospital Management Summary: intended for hospital leadership, this section highlights strategic and resource-related aspects, such as staffing, infrastructure, equipment needs, and broader organisational issues impacting the quality and safety of radiotherapy services.
    - Summary for the Ministry of Health: designed for public health authorities, this high-level summary outlines systemic or recurrent issues, key benchmarking results (in anonymised format), and broader recommendations that may inform policy, planning, or regional harmonisation efforts.

This tiered structure ensures that each stakeholder receives targeted, relevant, and actionable information based on their role in the radiotherapy ecosystem

To conclude the audit cycle, a final workshop will be organised for all participating centres. During this event, aggregated and anonymised benchmarking results will be presented, and examples of good practices will be shared. The goal of the workshop is to encourage open dialogue, promote shared learning, and support the harmonisation of radiotherapy practice across Catalonia.

3.10. Ethics and Confidentiality

All audits follow strict confidentiality agreements. Audit data is stored in compliance with GDPR and Catalan regulations. Centre-specific audit reports are only shared with the audited institution, project coordinators, and—if applicable—health authorities with consent.

3.11. Post-Audit Satisfaction Survey

To support continuous improvement of the clinical audit programme, a short satisfaction survey will be sent to each audited institution following the delivery of the final audit report. The survey will collect anonymous feedback on key aspects of the audit process, including organisation, communication, usefulness of the tools, and perceived impact.

The results will help refine the methodology, enhance future auditor training, and ensure the process remains relevant, collaborative, and improvement-oriented. Aggregated results will be reviewed periodically by WP4 and shared with the Executive Board.

The survey will be completed online (via REDCap), and its structure is detailed in Appendix C.

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GLOSSARY

ALPINE – Achievable, Local, Practical, Inexpensive, Non-threatening, Easy

BI – Business Intelligence

CAT-ClinART – Catalan Clinical Audit Network for Quality Improvement in Radiotherapy

DoA – Description of the Action

EPA – External Peer Audit

ESR – European Society of Radiology

ETL – Extract, Transform, Load

EU4Health – European Union for Health Programme

FGSHSCSP – Fundació de Gestió Sanitària de l'Hospital de la Santa Creu i Sant Pau

GDPR – General Data Protection Regulation

HIS – Hospital Information System

IAEA – International Atomic Energy Agency

ICO – Institut Català d'Oncologia

ISA – Internal Self-Assessment

IT – Information Technology

KCE – Belgian Health Care Knowledge Centre

MPE – Medical Physics Expert

MVP – Minimum Viable Product

OIS – Oncology Information System

QA – Quality Assurance

QI – Quality Indicator

QUATRO – Quality Assurance Team for Radiation Oncology (IAEA audit methodology)

RO – Radiation Oncologist

RTT – Radiation Therapy Technologist

SOP – Standard Operating Procedure

WP – Work Package

APPENDIX A: CHECKLISTS AND TEMPLATES

INFRASTRUCTURE

Record ID

_____

Institucions

- ◯ HOSPITAL DE LA SANTA CREU I SANT PAU (HSCSP)
- ◯ INSTITUT CATALÀ D'ONCOLOGIA-HOSPITALET (ICO-HOSPITALET)
- ◯ INSTITUT CATALÀ D'ONCOLOGIA-BADALONA (ICO-BADALONA)
- ◯ INSTITUT CATALÀ D'ONCOLOGIA-GIRONA (ICO-GIRONA)
- ◯ CONSORCI SANITARI DE TERRASSA (CST)
- ◯ HOSPITAL SANT JOAN DE REUS (HSJR)
- ◯ HOSPITALVALL HEBRON (HVH)
- ◯ HOSPITAL CLINIC BARCELONA (HCB)
- ◯ HOSPITAL ARNAU DE VILANOVA (HAV)
- ◯ HOSPITAL DEL MAR (HMRIB)

Auditor

- ◯ Internal Self-Assessment (ISA)
- ◯ External Peer Audit (EPA)

Patient demographics

Number of patients undergoing RT

_____
(per year)

Number of treatments

_____

Number of stereotactic treatments

_____

Types of cancer

_____
(primary sites and number)

Ratio of radical (curative) treatment to palliative therapy to palliative treatment

_____

Structure of the radiotherapy department

Are simulation procedures carried out in the satellite site?

_____

Is/are the satellite site(s) connected to the main department within the same network environment and using a common data server?

_____

Is there a separate TPS in the satellite site? : is it interconnected with the main site? Same TPS and version from the main site?

_____

- Is there a separate record and verify system? : is it interconnected with the main site? Same TPS and version from the main site?

_____

Does the personnel working in the satellite site(s) have the same working conditions as those working in the primary site? _____

Is there systematic rotation of staff for ROs? _____

Is there systematic rotation of staff for the MPEs? _____

Is there systematic rotation of staff for the MPAs? _____

Is there systematic rotation of staff for the RTTs? _____

Are common staff meetings organized on a daily basis (new patients, TP review)? _____

Are the used treatment techniques harmonized between the different departments? _____

Are the clinical procedures identical between the satellite department(s) and the main department? _____

Is there a single quality management system covering all sites? _____

Personnel (human resources)

Number of and Ful Time equivalent (FTE) radiation oncologists (should specify board certified RO + RO in training) _____

Number of and FTE clinically qualified medical physicists (MPEs) in radiotherapy _____
(Specify the MPE, training MPE, MPA, MPE's extra roles, and MPA/MPE ratio)

Number of and FTE radiation therapists (RTT) _____
(A1 (HBO5) and A2 (HBO6) nurses and/or medical imagery technologists and specify the percentage of personnel in possession of certification in oncology and/or radiotherapy)

Presence of supportive staff _____
(Specialized nurses, social workers, psychologist, access to re-education and well-being centers etc)

Staff for maintenance, repair and IT

_____
(Engineers, technicians...)

Presence and FTE (a) Quality manager(s)

_____

Is teaching part of routine activity?

_____

Is research (basic, clinical) part of routine clinical activity?

_____

Staff allocated to clinical research

_____

Departmental operation

Contractual working hours (within the department) of the radiation oncologists, medical physicists and RTTs _____

Treatment hours of the department

_____

Days per week of operation

_____

Are emergency radiation services provided after hours?

_____

Minimum number of RTTs for each major item of equipment

_____

Minimum number of radiation oncologists during treatment hours

_____

Minimum number of physicists during treatment hours

_____

Item Observations
Location of the radiotherapy department relative to the main hospital Off-site _____

On-site _____

Integrated into the main building _____

Other: _____

Structural organisation and ayout of the department
Treatment rooms _____
Control rooms _____
Changing rooms/toilets _____
Consultation rooms _____
Waiting area _____
Dosimetry and physics room _____
Storage facilities _____
Administrative area _____

Other (ex "additional room" for items such as preparing patient immobilisation device, training for DIBH, or small technical tasks such as repairs, 3D-printing, individualised electron inserts) _____
Department's proximity to other facilities (including teaching facilities) _____
Additional source of medical science _____
Associated ward room

_____
Further comments/observations _____

Overall Score

Are the department's premises adequate in the context of the department's objectives and operations? _____
Commendations/Recommendations _____

Equipment/system Type Commissioning date Detail and comment on function and location
EBRT equipment
Equipment 1 _____ _____ _____
Equipment 2 _____ _____ _____
Equipment 3 _____ _____ _____
Equipment 4 _____ _____ _____
Equipment 5 _____ _____ _____
Equipment 6 _____ _____ _____
BT equipment
Equipment 1 _____ _____ _____
Equipment 2 _____ _____ _____
Equipment 3

_____ _____ _____
Equipment 4 _____ _____ _____
Imaging equipment
Equipment 1 _____ _____ _____
Equipment 2 _____ _____ _____
Equipment 3 _____ _____ _____
Treatment planning equipment
TPS 1 _____ _____ _____
TPS 2 _____ _____ _____
TPS 3

_____ _____ _____
Other equipment/facilities
Material Observations (Detail and comment on function and location)
Dosimetry equipment _____
Radiotherapy management system (OIS/R&V system) _____
Computerized networked imaging _____
Patient alignment equipment (IGRT equipment, lasers, SGRT systems...) _____
Immobilisation equipment _____
Does the institution have an equipment replacement program _____
Does the department have a calendar of preventative maintenance? _____
Further comments/observations _____

Overall Score

Is the department's equipment adequate in the context of the department's objectives and operations? _____
Commendations/Recommendations _____

Workload

Patient throughput on radiotherapy equipment	
Number of new cancer cases or consultations of patients entering the department	_____
Number of new radiation therapy patients treated per annum in the department	_____
Number of treatments/Teletherapy machine	_____
Number of sessions/fractions given over a one-year period by each teletherapy machine (T)	_____
Number of patient treated annually through brachytherapy	_____
Number of brachytherapy applications given annually by each brachytherapy machine	_____
Annual total of CT and/or MR only scans performed for planning purposes	_____
Annual total of simulations performed. If CT sim available, then annual CT number is identical to number of simulations	_____
Relative proportion of used treatment techniques	_____ (3D conformal radiotherapy, static IMRT, rotational IMRT, stereotactic treatments, other... each machine delivers)
Number of approved treatment plans/year (taking into account re-plan or re-simulations)	_____
Average treatment time on each machine	_____
Statistics	
Number of treatments per radiation oncologist annually	_____
Number of treatments per physicist (MPE only and MPE + MPA (dosimetrists)) annually	_____
Number of approved plans per MPE+MPA	_____
Number of treatments per RTT annually	_____
Number of treatments per teletherapy machine annually	_____

Number of sessions (fractions) per year

_____

Number of treatment sessions or fractions per RTT annually

_____

Number of RTTs per equipment item

_____

Overall Score

Is the department's workload in accordance with current reccomendations?

_____

Commendations/Recommendations _____

PATIENT RELATED PROCEDURES

Record ID

_____

Auditor

◯ Internal Self-Assessment (ISA)
◯ External Peer Audit (EPA)

Diagnosis and staging

CHECKLIST 1. Patient Assessment

	YES	In progress	No	N/A
Is patient specific and relevant radiotherapy information easily accessible by the rest of the institution?	◯	◯	◯	◯
Does the radiotherapy department have access to all relevant patient clinical data/records?	◯	◯	◯	◯

Please comment

_____

	YES	In progress	No	N/A
Is there an ease of access to patient diagnostic imaging data?	◯	◯	◯	◯
Is the pathology report included in all patients' files?	◯	◯	◯	◯
Are patients staged?	◯	◯	◯	◯
Is an international staging system used (TNM, AJCC, FIGO...)?	◯	◯	◯	◯
Is the pTNM available when indicated?	◯	◯	◯	◯
Is the patient's performance status assessed (WHO, Karnofsky or ECOG)?	◯	◯	◯	◯
Is systematic geriatric assessment carried out in patients >75 years old?	◯	◯	◯	◯

If oher age is determined to include in geriatric assessment, indicate

_____

	YES	In progress	No	N/A

Is there a systematic inquiry for previous radiation treatment made?	○	○	○	○
--- Is this formally recorded in order to allow for data analysis?	○	○	○	○
--- Is this formally communicated amongst the different disciplines?	○	○	○	○
Are patients with radiation-sensitive implanted material identified (ex: pacemaker)?	○	○	○	○

Comments

_____

Overall Score

Is patient assessment properly carried out by the radiotherapy department?

_____

Commendations/Recommendations _____

CHECKLIST 2. Access to Diagnostic Procedures

	YES	In progress	No	N/A
Is there an access to Computer Tomography (CT) without any delay (= 3 days)?	○	○	○	○
Access to Nuclear Imaging (scintigraphy) without any delay (= 2 weeks)?	○	○	○	○
Is there an access to PET/PET-CT procedures without any delay (= 2 weeks)?	○	○	○	○
Is there an access to MRI procedures without any delay (= 2 weeks)?	○	○	○	○
Are the reports of significant radiological findings in the patient chart?	○	○	○	○

Overall Score

Are diagnostic procedures easily accessible without significant delay?

_____

Commendations/Recommendations _____

Indications and decision to treat

CHECKLIST 3. Multidisciplinary Medical Approach (MOCs)

	YES	In progress	No	N/A
Are decisions to treat based upon meetings of multidisciplinary teams (MOCs)?	◯	◯	◯	◯
Are all frequent cancers covered by MOCs?	◯	◯	◯	◯

Point out Pathologies covered

_____

	YES	In progress	No	N/A
Do all patients with a frequent cancer benefit from a MOC?	◯	◯	◯	◯
If MOC advice is not followed, is this formally justified/recorded?	◯	◯	◯	◯
Do ROs systematically attend the MOCs?	◯	◯	◯	◯

Comments

_____

Overall Score

Are the majority of decisions to treat based on MOCs?

_____
Commendations/Recommendations _____

Frequency of MOCs In hospital Outside of hospital
Site 1 Name: _____ Site 2 Name: _____ Site 3 Name: _____ Other Site: _____
Breast _____ _____ _____ _____ ...
Lung _____ _____ _____ _____ ...
Prostate _____ _____ _____ _____ ...
Colorectal _____ _____ _____ _____ ...
H&N _____ _____ _____ _____ ...
CNS _____ _____ _____ _____ ...
Hematology _____ _____ _____ _____ ...
Other: (Sarcoma, ...) _____ _____ _____ _____ ...

Frequency of MOCs Outside of hospital
Site 4 Name: _____ Site 5 Name: _____ Site 6 Name: _____
Breast _____ _____ _____
Lung _____ _____ _____
Prostate _____ _____ _____
Colorectal _____ _____ _____
H&N _____ _____ _____
CNS _____ _____ _____
Hematology _____ _____ _____
Other: (Sarcoma, ...) _____ _____ _____

CHECKLIST 4. Practice Guidelines

	YES	In progress	No	N/A
Are written cancer handbooks available for the most common clinical treatment sites?	○	○	○	○
--- Are they updated every 1-3 years?	○	○	○	○
Have cancer handbook protocols been ratified by an oncology committee?	○	○	○	○
Is there protocol review committee that verifies that treatments conform to protocols/GUIDELINES) (at MOC level)?	○	○	○	○
Are treatments not corresponding to a protocol/guideline medically justified?	○	○	○	○
Are written radiotherapy specific protocols available for the most common clinical treatment sites?	○	○	○	○
Have written radiotherapy specific protocols been ratified by a departmental committee?	○	○	○	○
Are the written radiotherapy specific treatment protocols regularly reviewed?	○	○	○	○

Comments

_____

Overall Score

Are the guidelines and departmental policies adequate?

_____

Commendations/Recommendations _____

CHECKLIST 5. Research and Clinical Studies/trials

	YES	In progress	No	N/A
Is the department involved in clinical trials?	○	○	○	○

Number of active ongoing clinical trials

_____

	YES	In progress	No	N/A
Is there an impact of the clinical trials on the workload of the department?	○	○	○	○
Is the department involved in departmental research projects/ scientific research?	○	○	○	○
Are all disciplines (if involved) informed of the implementation of the research project?	○	○	○	○
Is there an impact of the research projects on the workload of the department?	○	○	○	○
Have all research protocols been ratified by an institutional ethics committee?	○	○	○	○

Comments

_____

Overall Score

Is research properly implemented in the department?

_____

Commendations/Recommendations _____

CHECKLIST 6. Patient Information and Consent

	YES	In progress	No	N/A
Are benefits and risks of radiation therapy explained to patients?	○	○	○	○
Do patients receive written support explaining all the risks and benefits of the RT treatment?	○	○	○	○

Is there a written or electronic evidence of Patient Consent (signed by patient and RO)

_____

	YES	In progress	No	N/A
Are patients of childbearing potential systematically informed of the risk for the unborn child?	○	○	○	○
Does the RTT have a systematic role in delivering information to the patient?	○	○	○	○

If yes, how is it organized?

_____

Comments

Overall Score

Is information given to the patient in an optimal manner?

_____
Commendations/Recommendations _____

Treatment preparation - instruction for planning

Simulation

CHECKLIST 7. Treatment Preparation and Image Acquisition Infrastructure

Specify major equipment used for localisation:

	YES	In progress	No	N/A
Fluoroscopic simulator	○	○	○	○
CT in radiology dedicated for planning	○	○	○	○
CT in radiology with 4D acquisition dedicated for planning	○	○	○	○
CT simulator in radiotherapy department	○	○	○	○
CT simulator in the radiotherapy department with 4D acquisition	○	○	○	○
MR-simulator within radiotherapy department	○	○	○	○

*IF CT located outside of RT department:

	YES	In progress	No	N/A
Is there a flat couch tabletop?	○	○	○	○
Is there the possibility of indexed fixation?	○	○	○	○
Are there fixed supplementary lasers?	○	○	○	○
Are these imaging modalities networked with the RT department?	○	○	○	○
Are there sufficient time slots for RT patients?	○	○	○	○

Are the indexing systems the same as those used on the treatment table?	○	○	○	○

If use of MRI in treatment preparation phase:

	YES	In progress	No	N/A
Is there a flat couch tabletop?	○	○	○	○
Is there the possibility of indexed fixation?	○	○	○	○
Are there fixed supplementary lasers?	○	○	○	○
Are these imaging modalities networked with the RT department?	○	○	○	○
Are there sufficient time slots for RT patients?	○	○	○	○
Are the indexing systems the same as those used on the treatment table?	○	○	○	○

If use of PET-(CT) in treatment preparation phase:

	YES	In progress	No	N/A
Is there a flat couch tabletop?	○	○	○	○
Is there the possibility of indexed fixation?	○	○	○	○
Are there fixed supplementary lasers?	○	○	○	○
Are these imaging modalities networked with the RT department?	○	○	○	○
Are there sufficient time slots for RT patients?	○	○	○	○
Are the indexing systems the same as those used on the treatment table?	○	○	○	○

Comments

_____

Overall Score

Is there consistency throughout the various imaging modalities used for treatment planning?

_____

Commendations/Recommendations _____

CHECKLIST 8. Simulation Procedures and protocols

	YES	In progress	No	N/A
Are there protocols describing the main types of simulation?	○	○	○	○
Are the roles of the various staff defined in the protocols?	○	○	○	○
Do the clinical tumour/site-specific protocols contain instructions for patient positioning?	○	○	○	○
Are CT protocols adopted to anatomical sites?	○	○	○	○
Are the available scanning protocols secured (by password, user rights, ...)?	○	○	○	○
Are there pediatric CT protocols?	○	○	○	○
Is there a formal protocol for 4D acquisition?	○	○	○	○
Are the immobilization systems used consistently for the same indications?	○	○	○	○
Are the immobilisation systems used in accordance with the treatment technique used?	○	○	○	○
Is a biometric identification system available?	○	○	○	○

Comments

_____

Overall Score

Are simulation procedures appropriately adapted to the anatomical sites?

_____

Commendations/Recommendations _____

CHECKLIST 9. Simulation Workflow

	YES	In progress	No	N/A
Is there a setup marking protocol (reference/isocentre marking/tatooless approach)?	○	○	○	○

How are the marks maintained?

_____

	YES	In progress	No	N/A
Is there appropriate patient setup documentation (immobilization system used, marking, photos...)?	○	○	○	○
Is IV contrast workup systematically checked prior to simulation (renal function, allergies)?	○	○	○	○
Does the department have a formal policy on managing IV contrast reactions?	○	○	○	○
Is relevant clinical information provided to and verified by the RTTs before simulation?	○	○	○	○

How is this done (through the Record and verify system, meetings, ...)?

_____

	YES	In progress	No	N/A
Is there adequate time for simulation procedures?	○	○	○	○
Is the delay between the patients' 1st consultation and simulation reasonable?	○	○	○	○
Is there a formal protocol to deal with potential waiting lists?	○	○	○	○

Comments

_____

Overall Score

Is simulation carried out in a patient centered and optimized manner?

_____

Commendations/Recommendations _____

Contouring

CHECKLIST 10 - Roles in contouring

Who contours the target volumes?

- ☐ Radiation oncologist
- ☐ MPE
- ☐ MPA
- ☐ RTT
- ☐ AI
- ☐ Other

(Multiple answers are allowed)

Other, specify

_____

Who contours the OARs?

- ☐ Radiation oncologist
- ☐ MPE
- ☐ MPA
- ☐ RTT
- ☐ AI
- ☐ Other

(Multiple answers are allowed)

Other, specify

_____

Comments

_____

CHECKLIST 11. Generation of target volume and OAR definition

2D

	YES	In progress	No	N/A
Are all contours based on volumetric acquisitions?	◯	◯	◯	◯
If NOT for all: For curative (radical) patients?	◯	◯	◯	◯
For palliative patients?	◯	◯	◯	◯

3D

Are the following target volumes used (ICRU 50 & 62, 83)?

	YES	In progress	No	N/A
Gross Tumour Volume (GTV)	◯	◯	◯	◯
Clinical Target Volume (CTV)	◯	◯	◯	◯
Planning Target Volume (PTV)	◯	◯	◯	◯
Irradiated Target Volume (ITV)	◯	◯	◯	◯
Planning Organ at Risk (PRV)	◯	◯	◯	◯
Other volume:	◯	◯	◯	◯

Specify the other volume

_____

Is there a normalized nomenclature for Targets ans OAR,s

_____

	YES	In progress	No	N/A
Are the used margins between CTV and PTV clearly defined?	◯	◯	◯	◯

How is the PTV generated?

	YES	In progress	No	N/A
Manually	◯	◯	◯	◯
Script/template based	◯	◯	◯	◯
Combination of above	◯	◯	◯	◯

What are these margins based on?

◯ In house measurements?
◯ Literature research?
◯ Both (depending on localization)
◯ Other

Other

_____

	YES	In progress	No	N/A
Does the department carry out robust treatment planning?	◯	◯	◯	◯

If yes, please comment on when this is carried out (site specific, as per treatment technique...) and shortly describe how this is carried out

_____

	YES	In progress	No	N/A
Is an automatic delineation tool used for OARs? (atlas-based segmentation, AI ...)	◯	◯	◯	◯
Is there an independent verification of the OAR contours?	◯	◯	◯	◯
Is there a peer review of generated target volume contours?	◯	◯	◯	◯

Is 4D information integrated within the contouring process?

	YES	In progress	No	N/A
DIBH	◯	◯	◯	◯
MidP	◯	◯	◯	◯
MidV	◯	◯	◯	◯
MIP	◯	◯	◯	◯
AIP (=average Intensity Projection)	◯	◯	◯	◯

Other item?

◯ Yes, 1 more ◯ Yes, 2 more
◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

Comments

_____

Overall Score

Is the delineation methodology appropriately adapted to the anatomical sites?

_____
Commendations/Recommendations _____

Treatment aim

CHECKLIST 12. RO treatment prescription

	YES	In progress	No	N/A
Does the radiation treatment aim clearly include sufficient information, including, at a minimum, dose and fractionation, treatment site, and confirmation of laterality to allow for the planning and delivery of the treatment as intended without ambiguity?	◯	◯	◯	◯
Is the treatment aim signed/approved by the radiation oncologist before treatment planning starts?	◯	◯	◯	◯

Are there based prescription templates ?

_____

How are changes in RT aim managed?

_____

Comments

_____

Overall Score

Is the treatment aim clearly defined and available?

_____
Commendations/Recommendations _____

Treatment planning

CHECKLIST 13. Treatment Planning

	YES	In progress	No	N/A
Are there formal protocols for treatment planning?	○	○	○	○
Are dose constraints on target volumes and OAR clearly defined in the treatment planning protocols?	○	○	○	○
Does the RO communicate patient specific planning goals?	○	○	○	○
Are site and side verified with a secondary source document (medical file, treatment prescription...) at the time of planning?	○	○	○	○
Is there a policy on maximum and minimum doses to PTV?	○	○	○	○
Is treatment planning endorsed (signed) by the medical physicist?	○	○	○	○
Is treatment planning endorsed (signed) by the radiation oncologist?	○	○	○	○
Is treatment planning endorsed (signed) by treatment modality RTT?	○	○	○	○
Can the treatment start in the absence of endorsement?	○	○	○	○
Is there a secondary check done by a MPE of the treatment plans (overall check)?	○	○	○	○
Is the result of the treatment plan (treatment prescription18) recorded in the patient file?	○	○	○	○
Are there planning peer review meetings?	○	○	○	○

If yes, what is their frequency, the extent of the meetings, use of defined parameters (checklist)?

_____

Re-irradiations/re-treatments

	YES	In progress	No	N/A

Is there a protocol that described how and by whom previous treatment plans are retrieved from other departments?	○	○	○	○

How are previous treatments from other centers retrieved?

_____

	YES	In progress	No	N/A
Is the impact of previous radiation treatments on the current treatment plan evaluated?	○	○	○	○

How?

_____

Comments

_____

Overall Score

Is treatment planning carried out using formal procedures and safety barriers?

_____

Commendations/Recommendations _____

From planning to delivery and pre-treatment checks

CHECKLIST 14. Pre-treatment Checks

	YES	In progress	No	N/A
Is data transfer from planning to delivery double-checked ?	○	○	○	○

By who?

_____

	YES	In progress	No	N/A
Is the pre-treatment physics plan review consistent with the appropriate guidelines?	○	○	○	○
Is there an independent secondary calculation of the treatment plan?	○	○	○	○
Are tolerances and action levels defined?	○	○	○	○

How is pre-treatment QA carried out?

_____

	YES	In progress	No	N/A
Is there a policy on frequency of patient specific QA? (class solution, all patients, other?)	○	○	○	○
--- Has this policy been internally validated?	○	○	○	○
--- Is this policy re-evaluated on a regular basis?	○	○	○	○

If yes, how is this policy re-evaluated? (based on what?)?

_____

	YES	In progress	No	N/A
Is there adequate time to carry out pre-treatment patient specific QA?	○	○	○	○

By whom is this carried out?

_____

	YES	In progress	No	N/A
Do the RTT review treatment charts prior to treatment start?	○	○	○	○
Do the RTT have adequate time to review treatment chart prior to treatment start?	○	○	○	○
Do the RTT have adequate time to prepare treatment chart prior to treatment start (IGRT, SGRT, ...)?	○	○	○	○

Comments

_____

Overall Score

Are pretreatment checks carried out in an optimal manner?

_____

Commendations/Recommendations _____

Treatment delivery

CHECKLIST 15. Patient Identification on a Daily Basis

	YES	In progress	No	N/A
Is there a formal policy on patient identification?	○	○	○	○

At what moment of the treatment process are patients identified?

	YES	In progress	No	N/A
At reception (when the patient checks in)	○	○	○	○
At the treatment modality (=console/treatment unit)	○	○	○	○
Inside the treatment room	○	○	○	○

	YES	In progress	No	N/A
Is patient identification realized in an unambiguous manner?	○	○	○	○
Is patient identification realized in an unambiguous manner for vulnerable patients (pediatric, patients presenting mental disabilities, language barriers, ...)?	○	○	○	○
Is patient confidentiality adequately ensured?	○	○	○	○

Comments

_____

Overall Score

Is patient identification properly carried out?

_____

Recommendations _____

CHECKLIST 16. Patient Setup and Setup Verification

	YES	In progress	No	N/A
Is there a formal preparation/information session organized for the patient?	○	○	○	○
Are patients properly informed in a language that they understand?	○	○	○	○
Is there a check (formal/informal) that the patient has properly understood all the given information?	○	○	○	○
Is there special attention given to anxious patients (including pediatric patients)?	○	○	○	○

What methods are used to ensure that the proper setup and immobilization devices are being used?

	YES	In progress	No	N/A
Written document	◯	◯	◯	◯
Text in R&V system	◯	◯	◯	◯
Photographs	◯	◯	◯	◯
Digitally (set up recognition system, RFID, bar codes...)	◯	◯	◯	◯

Other items? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name _____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name _____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

	YES	In progress	No	N/A
Is there a time out21 period performed before the first session of a treatment?	◯	◯	◯	◯
--- Is the patient involved in this?	◯	◯	◯	◯

	YES	In progress	No	N/A
Is there specific (additional) time allocated to the first treatment session?	◯	◯	◯	◯
Is the delay between simulation and the patient's first treatment session reasonable?	◯	◯	◯	◯

Is a RO present:

	YES	In progress	No	N/A
For all first treatments?	◯	◯	◯	◯
For particular treatment techniques only (stereotactic, on-line adaptive...)?	◯	◯	◯	◯
For difficult set-up problems only?	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name _____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

Comments on RO presence

_____

Is a MPE present:

	YES	In progress	No	N/A
For all first treatments?	◯	◯	◯	◯
For particular treatment techniques only (stereotactic, on-line adaptive...)?	◯	◯	◯	◯
For difficult set-up problems only?	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

Comments on MPE presence

_____

Patient set-up (positioning and immobilization)

	YES	In progress	No	N/A
Does the department have formal/written patient setup procedures?	◯	◯	◯	◯
Is patient setup performed in a logical manner?	◯	◯	◯	◯

Is patient setup performed with care and precision?	◯	◯	◯	◯
Is there a formal policy on double checking patient/ treatment setups (=secondary independent check of patient setup by RTT/secondary system)?	◯	◯	◯	◯
Are significant deviations in patient setup further explored?	◯	◯	◯	◯

If yes, how?

_____

If required, how are changes in the patient setup managed and communicated during treatment?

_____

	YES	In progress	No	N/A
Is there a formal protocol to override treatment setup?	◯	◯	◯	◯
Are treatments that need respiratory motion management strategies clearly indicated?	◯	◯	◯	◯

IGRT

	YES	In progress	No	N/A
Is IGRT carried out on daily basis?	◯	◯	◯	◯
--- For all sites?	◯	◯	◯	◯
Is patient setup verified through volumetric IGRT?	◯	◯	◯	◯
--- For all sites?	◯	◯	◯	◯
Are there IGRT protocols (=Traffic light protocol/take action protocol/how to handle deviations) available per treatment site?	◯	◯	◯	◯

What information do they contain?

	YES	In progress	No	N/A
Structures to match	◯	◯	◯	◯
Frequency of IGRT	◯	◯	◯	◯
Modality of IGRT to use	◯	◯	◯	◯
Management of inter-fraction deviations	◯	◯	◯	◯
Management of intra-fraction deviations	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

Please specify any other information that they contain

_____

	YES	In progress	No	N/A
Is there an offline image reviewing procedure?	◯	◯	◯	◯

Comments

_____

Roles in IGRT procedures

Who performs the co-registration of patient set up imaging?

	All the time	1st day of treatment only	Particular treatment only (SRS, SBRT)	Never
RTT (1)	◯	◯	◯	◯
RTT (>1^23)	◯	◯	◯	◯
RO	◯	◯	◯	◯
MPE	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A

Other item (2)	○	○	○	○

Comments

_____

In case of online ART, how is the workflow organised and what are the roles and responsibilities of the different RT team members?

_____

Overall Score

Is patient positioning and patient setup verification carried out in a optimal manner?

_____

Commendations/ Recommendations _____

CHECKLIST 17. Treatment Delivery

	YES	In progress	No	N/A
Is sufficient time allocated for all treatment sessions?	○	○	○	○
Are these durations regularly reviewed/adapted?	○	○	○	○
Is there a formal policy for handling planned interruptions in treatment?	○	○	○	○
Is there a formal policy for handling unplanned interruptions in treatment (ex: machine breakdown, ...)?	○	○	○	○
Is there a formal policy for handling no-shows?	○	○	○	○
Is there a clear clinical workflow for re-simulation/re-planification of patients?	○	○	○	○

How are plan changes communicated to all involved members of the RT team?

_____

	YES	In progress	No	N/A
If more than one work shift, is there a formal change-over protocol?	○	○	○	○
Does a change in RTT teams occur during the treatment delivery of one patient?	○	○	○	○

Are all patients clinically reviewed during treatment?	◯	◯	◯	◯

If so, how frequently?

_____

By whom:

◯ Radiation oncologist
◯ RTT
◯ Specialist nurse
◯ Other

Other (specify)

_____

	YES	In progress	No	N/A
Is patient condition and follow up well documented?	◯	◯	◯	◯
Is patient clinical information easily accessible to the RTTs (including lab results)?	◯	◯	◯	◯
Is this information consulted by the RTTs prior to treatment sessions?	◯	◯	◯	◯
Are there available patient care procedures?	◯	◯	◯	◯
Is there a regular check of treatment chart carried out (number of sessions, dose delivered, IGRT feedback, ...)?	◯	◯	◯	◯

How often? (ex: Weekly during dedicated time period, daily during treatment...)

_____

By whom?

_____

Comments

_____

In-vivo dosimetry

	YES	In progress	No	N/A
Is in-vivo dosimetry carried out?	◯	◯	◯	◯
--- For all treatments?	◯	◯	◯	◯

Types of in-vivo dosimetry:

◯ Point measurements (TLD/ MOSFET/Diodes/other)
◯ Transit dosimetry
◯ Other

Other (specify):

_____

Frequency of in-vivo dosimetry

_____

	YES	In progress	No	N/A
Is there a follow-up protocol when the in-vivo results are outside fixed tolerances?	○	○	○	○
Are the fixed tolerances based on in-house measurements?	○	○	○	○

Comments on in-vivo dosimetry (timing, frequency, ...)

_____

Overall Score

Is patient treatment delivery properly carried out in a safe and efficient manner?

_____

Commendations/ Recommendations _____

CHECKLIST 18. Professional Behaviour during Treatment Delivery

Hygiene procedures

	YES	In progress	No	N/A
Are there formal procedures on hygiene practice?	○	○	○	○
Are hygiene procedures properly carried out? (disinfection of hands, absence of jewellery, ...)	○	○	○	○
Is food allowed at the treatment units?	○	○	○	○

Are the simulation and treatment unit properly disinfected?

	YES	In progress	No	N/A
In between patients	○	○	○	○
At the end of the day	○	○	○	○

Comments on hygiene practice

_____

Professional behaviour

	YES	In progress	No	N/A
Are cell-phones allowed at the simulation unit?	○	○	○	○

Are cell-phones allowed at the treatment unit?	○	○	○	○
Are patients actively monitored through camera during treatment?	○	○	○	○
Is professional behaviour evaluated during personnel evaluation?	○	○	○	○

Comments on professional behaviour

_____

Overall Score

Are treatments provided in a patient centered and hygienic manner?

_____

Commendations/ Recommendations _____

Treatment summary (documentation)

CHECKLIST 19. Documentation of Treatment Summary

	YES	In progress	No	N/A
Is the completeness of the treatment checked?	○	○	○	○

By whom?

_____

	YES	In progress	No	N/A
Is there a radiotherapy treatment summary available in the EMR/EPD/DPI (=hospital electronic patient file)?	○	○	○	○
If yes, is there ease of access to the documents?	○	○	○	○
Is patient treatment information electronically archived using the DICOM format?	○	○	○	○
Are the files kept for 30 years?	○	○	○	○
Are archived treatments easily retrievable?	○	○	○	○
Is a copy of treatment details sent to the referring physician?	○	○	○	○

	YES	In progress	No	N/A
Is this information sent within 10 calendar days of the end of treatment?	○	○	○	○

Comments

_____

Overall Score

Is the treatment summary summarized and accessible to all involves parties?

_____

Commendations/ Recommendations _____

Follow-up during and after treatment

CHECKLIST 20. Patient Follow-up

	YES	In progress	No	N/A
Is follow-up done by physicians other than radiation oncologists?	○	○	○	○
Is patient follow up done by nurses or social workers?	○	○	○	○
Is radiation toxicity graded?	○	○	○	○
Is radiation toxicity documented?	○	○	○	○

Comments

_____

	YES	In progress	No	N/A
If performed outside the radiotherapy department, are the reports on the outcome of patients available to the radiotherapy department?	○	○	○	○
Is there a regular analysis of toxicity and tumour control data carried out?	○	○	○	○

By whom?

_____

	YES	In progress	No	N/A
Is systematic feedback given to the RT department if there is a toxicity grading >3	○	○	○	○

Is there a policy of systematic review of serious complications?	◯	◯	◯	◯

Comments

_____

Overall Score

Is patient follow-up formally organized with the department /cancer centre?

_____

Commendations/ Recommendations _____

Review of typical treatments

CHECKLIST 21. Chart Review: Elements to be reviewed during case analysis

% of patient charts in which the pathology report is included (n/10 random charts %)	_____
% of patients charts in which the staging is properly documented (n/10 charts %)	_____
% of patients charts in which the performance status is included (n/10 charts %)	_____
% of carts of patients >75 years old in which the geriatric assessment has been carried out (n/10 charts %)	_____
Are the tumour/site-specific protocols applied consistently within the department? (Are the tumours of a particular site and stage treated the same way?)	_____
% of Charts where Plan prescription coincides with therapeutic decision at Clinical Course (EMR)	_____
% of charts where the total dose stipulated?	_____
% of charts where the number of fractions stipulated	_____
% of charts in which the RT prescription is evidence-based	_____
% of charts with complete documentation of patient setup	_____
% of charts with complete documentation of setup	_____
% of charts where patient condition and follow up is well documented	_____

Presence of RTT relevant clinical information, patient specificities and characteristics _____

Presence of Physics elements (Patient QA documentation, in vivo dosimetry or equivalent, MPE sign off...) _____

Comments

_____

Overall Score

Overall, are the patients' charts accurate and comprehensive?

_____
Commendations/ Recommendations _____

EQUIPMENT RELATED PROCEDURES

Record ID

_____

Auditor

◯ Internal Self-Assessment (ISA)
◯ External Peer Audit (EPA)

Equipment quality assurance - medical physics aspects -QA checklists

CHECKLIST 22. Imaging Equipment (CT, CT-sim, MRI, PETCT, other)

	YES	In progress	No	N/A
Is a manual of operation available at the equipment?	◯	◯	◯	◯
Are MPE involved in preparation of imaging procedures?	◯	◯	◯	◯

Are the acceptance testing procedures available and signed by the MPE RX24 (as applicable)?

	YES	In progress	No	N/A
CT/CT-sim	◯	◯	◯	◯
MRI	◯	◯	◯	◯

Other item?

◯ Yes, 1 more ◯ Yes, 2 more
◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

Has the personnel received training for the following equipment (as applicable)?

	YES	In progress	No	N/A
CT/CT-sim	◯	◯	◯	◯
MRI	◯	◯	◯	◯

Other item?

◯ Yes, 1 more ◯ Yes, 2 more
◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A

Other item (1)	◯	◯	◯	◯

Other item (2) - name _____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

Are the commissioning procedures available for the following equipment (as applicable) and signed by the MPE RT?

	YES	In progress	No	N/A
CT/CT-sim	◯	◯	◯	◯
MRI	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name _____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name _____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Is an incident logbook available for the following equipment (as applicable)?

	YES	In progress	No	N/A
CT/CT-sim	◯	◯	◯	◯
MRI	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name _____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name _____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

CT/CT-sim

Is there a daily test carried out for:

	YES	In progress	No	N/A
the mobile lasers	○	○	○	○
SGRT	○	○	○	○
4D CT/DIBH	○	○	○	○

	YES	In progress	No	N/A
Are the QC procedures available and signed by the MPE RT?	○	○	○	○
Are the QC procedures available and signed by the MPE RX?	○	○	○	○
Are QC carried out after upgrade?	○	○	○	○

Comments on frequencies, action levels, performed by MPE RT/MPA, MPE RX:

_____

Which recommendations are followed? (i.e. AAPM, NCS, IAEA, ...)

_____

Comments:

_____

MRI

	YES	In progress	No	N/A
Are the QC procedures available and signed by the MPE?	○	○	○	○

Comments on frequencies, action levels, performed by MPE, MPA:

_____

Which recommendations are followed? (i.e. AAPM, NCS, IAEA,...)

_____

Comments:

_____

Other (specify) (ex: PET/PET-CT)

	YES	In progress	No	N/A
Are the QC procedures available and signed by the MPE NM/MPE RX?	○	○	○	○

Comments on frequencies, action levels, performed by MPE, MPA:

_____

Comments:

_____

Overall Score

Are the QA procedures correctly implemented at the imaging sites?

_____

Commendations/ Recommendations _____

CHECKLIST 23. Treatment equipment (conventional and SRS/SBRT)

	YES	In progress	No	N/A
Is a manual of operation available?	○	○	○	○
Has the personnel received training?	○	○	○	○
Has the equipment been officially accepted?	○	○	○	○
Is a report of the commissioning available and signed by the MPE RT?	○	○	○	○
Does the commissioning include small field dosimetry?	○	○	○	○

On which equipment?

_____

	YES	In progress	No	N/A
Is a dosimetric audit performed for all energies prior to clinical use?	○	○	○	○

If yes, which one?

_____

	YES	In progress	No	N/A
Is a dosimetric audit performed on a regular basis (at least 5 yearly)?	○	○	○	○

If yes, which one?

_____

Which recommendations are followed? (i.e. AAPM, NCS, IAEA, ...)

_____

QC program

	YES	In progress	No	N/A
Is the QC program clearly defined (tests with frequency)?	○	○	○	○
Are QC procedures carried out after technical interventions?	○	○	○	○
Are mechanical tests well implemented and results well documented?	○	○	○	○
Are dosimetry tests well implemented and results well documented?	○	○	○	○

Which recommendations are followed for QC? (i.e. AAPM, NCS, IAEA)

_____

Which dosimetric protocol is used for reference dosimetry (photons, electrons, other)?

_____

	YES	In progress	No	N/A
Are end-to-end tests performed on a yearly basis?	○	○	○	○

For which indications and techniques?

_____

Comments

_____

Overall Score

Are the QA/QC procedures correctly implemented for treatment equipment?

_____
Commendations/ Recommendations _____

CHECKLIST 24. Equipment for Patient setup and setup verification

Patient positioning and setup equipment

	YES	In progress	No	N/A
Have the immobilisation systems been checked and validated before clinical use?	○	○	○	○
Has the staff been trained in the use of the immobilisation devices?	○	○	○	○

Is the equipment appropriately stored?	○	○	○	○
Is the equipment easily accessible at each treatment modality?	○	○	○	○
Is there a regular QC program on the immobilization equipment?	○	○	○	○

OBI

Are the tests on on-board imaging well implemented and documented for:

	YES	In progress	No	N/A
Portal imaging	○	○	○	○
Volumetric imaging	○	○	○	○
External kV imaging	○	○	○	○
6D-couch	○	○	○	○

	YES	In progress	No	N/A
Has the personnel received initial training?	○	○	○	○

By whom?

_____

SGRT systems

	YES	In progress	No	N/A
Does the department possess SGRT systems?	○	○	○	○
Are the tests on the SGRT systems well implemented and documented?	○	○	○	○
Has the personnel received initial training?	○	○	○	○

By whom?

_____

3D printers

	YES	In progress	No	N/A
Does the department possess a 3D printer?	○	○	○	○
Are specific QC procedures carried out for material generated through a 3D printer?	○	○	○	○

If yes, which ones? (please describe)

_____

Comments:

_____

Overall Score

Are the QA/QC procedures correctly implemented for the equipment used for patient setup and verification?

_____
Commendations/ Recommendations _____

CHECKLIST 25. Equipment for Treatment planning and Patient QC

	YES	In progress	No	N/A
Has the personnel received training for the TPS and QC equipment used?	○	○	○	○
Has the TPS equipment been officially accepted?	○	○	○	○
Is a report of the TPS commissioning available and signed by a MPE RT?	○	○	○	○
Are the treatment couches modelled in the TPS?	○	○	○	○

Which recommendations are followed? (i.e. AAPM, NCS, IAEA, ...)

_____

	YES	In progress	No	N/A
Is a QC procedure performed after each TPS upgrade?	○	○	○	○
Do test calculations / sample plans exist as guidance in the TPS upgrade QC?	○	○	○	○
Is a TPS QC procedure performed on a yearly basis?	○	○	○	○
Is the treatment execution verified by machine log files?	○	○	○	○
Is the treatment plan dosimetrically verified (2D/3D)?	○	○	○	○

Comment on type of detector used:

_____

Comment on the frequency (all plans?):

_____

	YES	In progress	No	N/A
Is this QC performed prior to the treatment?	◯	◯	◯	◯

Comment on the timing:

_____

Comments:

_____

Overall Score

Are the QC procedures sufficiently developed and correctly implemented for TPS and pre-treatment QC?

_____

Commendations/ Recommendations _____

CHECKLIST 26. Dosimetry Equipment

Is the equipment for dosimetric QC calibrated on a regular basis?

	YES	In progress	No	N/A
Equipment for machine output	◯	◯	◯	◯
Equipment for pre-treatment QC	◯	◯	◯	◯

	YES	In progress	No	N/A
Is the local standard ionisation chamber calibration traceable to a PSDL/SSDL?	◯	◯	◯	◯

Which PSDL/SSDL?

_____

	YES	In progress	No	N/A
Is the local standard ionisation chamber calibrated at least every two years?	◯	◯	◯	◯
Are the field instruments regularly cross calibrated?	◯	◯	◯	◯
Is the dosimetry equipment well stored?	◯	◯	◯	◯
Are specific procedures/dosimetry equipment in place for non-reference and small field dosimetry?	◯	◯	◯	◯

Comments

_____

Overall Score

Are the QC procedures for dosimetry equipment correctly implemented?

_____

Commendations/ Recommendations _____

CHECKLIST 27. IT Safety

	YES	In progress	No	N/A
Is the radiotherapy network integrated in the HIS network?	◯	◯	◯	◯

Where are the radiotherapy servers located?

	YES	In progress	No	N/A
In the department?	◯	◯	◯	◯
In the HIS	◯	◯	◯	◯

	YES	In progress	No	N/A
Are the servers easily accessible?	◯	◯	◯	◯
Is there dedicated IT support for maintenance and repair?	◯	◯	◯	◯

If yes, who?

◯ Dedicated person within the department
◯ Dedicated personnel in the hospital IT team
◯ Other

Please comment on the accessibility of IT support

_____

	YES	In progress	No	N/A
Has the personnel received specific IT safety training?	◯	◯	◯	◯
Is there a policy of logging off when not using an application?	◯	◯	◯	◯
Is there a policy on the use of USB sticks/external hard drive?	◯	◯	◯	◯
Is there a specific back-up policy?	◯	◯	◯	◯
How is the data stored --> Physically?	◯	◯	◯	◯
How is the data stored --> Virtually?	◯	◯	◯	◯
Is the format DICOM or DICOM compatible?	◯	◯	◯	◯
Does the department possess a resilience plan in case of cyber-atttack?	◯	◯	◯	◯

Overall Score

Has the IT network sufficiently been integrated within the radiotherapy QA procedures?

_____

Commendations/ Recommendations _____

QUALITY MANAGEMENT SYSTEM

Record ID

_____

Auditor

◯ Internal Self-Assessment (ISA)
◯ External Peer Audit (EPA)

General quality management system

CHECKLIST 28. QMS strategy

	YES	In progress	No	N/A
Is there a QM in the department?	◯	◯	◯	◯

FTE:

_____

How many and who ? OR, MP, Nurse, Admin, RTT, other...?

_____

	YES	In progress	No	N/A
Is there a quality policy?	◯	◯	◯	◯
Has the institutional quality policy been adapted to the radiotherapy department?	◯	◯	◯	◯
Are improvement actions originating from different sources/inputs/origins (patient satisfaction, audits, QIs...) centrally managed?	◯	◯	◯	◯
Does the department possess a quality manual?	◯	◯	◯	◯
Is the quality manual regularly reviewed?	◯	◯	◯	◯
Are the legal requirements and regulations monitored?	◯	◯	◯	◯
Are changes within the department (TPS, change in TPS/treatment units...) properly planned and documented?	◯	◯	◯	◯
Are the necessary resources required for QMS implementation, maintenance and continuous improvement available?	◯	◯	◯	◯

Are tools applied for the implementation of continuous improvement (Kaizen, 5M, lean ...)?	○	○	○	○
Does the department regularly organize a strategic meeting to define its missions, visions and values?	○	○	○	○
Are the results of the meetings communicated? --> To the RT team	○	○	○	○
Are the results of the meetings communicated? --> To the patients	○	○	○	○
Is quality management system planning implemented to maintain the integrity of the quality management system (audits, document/procedure review, projects...)? Is the Department Certified by any Quality/Safety Label?	○	○	○	○

Quality review meetings

	YES	In progress	No	N/A
Are quality review meetings organized on a regular basis?	○	○	○	○

At what frequency?

_____

Who attends these meetings?

_____

	YES	In progress	No	N/A
Are the corrective and preventive actions monitored and follow-up?	○	○	○	○
Are analyses of the results periodically performed (audits, customer satisfaction, indicators ...)?	○	○	○	○
Are the results and the actions taken reported in the department?	○	○	○	○

Comments

_____

Overall Score

Is a quality management system implemented within the department?

_____
Commendations/ Recommendations _____

Document management system

CHECKLIST 29. Document Management System

	YES	In progress	No	N/A
Is there and existing document management system (departmental level or hospital level)?	○	○	○	○

Is this DMS at the departmental level or hospital level? _____

	YES	In progress	No	N/A
Is there a procedure that describes how documents and procedures are managed (=document management procedure)?	○	○	○	○
Does it ensure that documents are approved prior to its distribution?	○	○	○	○
Does it describe the renewal/update process for distributed documents?	○	○	○	○
Are changes and current revision statuses of documents identified?	○	○	○	○
Are relevant versions of the applicable documents available at points of use?	○	○	○	○
Are documents legible and readily identifiable?	○	○	○	○
Are documents of external origin identified and controlled?	○	○	○	○
Are the different types of documents easily identifiable?	○	○	○	○
Are there department specific document models?	○	○	○	○

	YES	In progress	No	N/A
Is it possible to identify the person involved in the verification and/or approval of the document?	○	○	○	○

On the approved documents

	YES	In progress	No	N/A
Is it possible to identify the reference number, the version and the date of approval?	○	○	○	○
Are the documents regularly updated/revised?	○	○	○	○
Is there an existing system to disseminate the documents?	○	○	○	○
Is there an existing archiving system for outdated documents?	○	○	○	○
Are outdated documents inaccessible?	○	○	○	○
Is it possible to track the different versions of a document?	○	○	○	○
Are the changes or updates to the procedures easily visible and communicated to the team?	○	○	○	○
Can the personnel easily access the approved documents and procedures?	○	○	○	○

Comments

_____

Overall Score

Is a proper document management system implemented within the department?

_____

Commendations/ Recommendations _____

Quality indicators

CHECKLIST 30. Quality Indicators

	YES	In progress	No	N/A
Does the Department report QI to the health Admininstration ? (e.g PDO)	○	○	○	○

Are there defined QI in the department?	○	○	○	○
Are the QI evaluated/measured?	○	○	○	○
Are the defined QI in accordance with the quality review meetings?	○	○	○	○
Are the QI SMART?	○	○	○	○
Are the QI periodically reviewed?	○	○	○	○
Are improvement actions put into place after QI analysis?	○	○	○	○
Are the improvement actions followed-up on?	○	○	○	○
Does the department possess the tools necessary to facilitate the collection of data necessary for QI analysis?	○	○	○	○
Are the QI results communicated?	○	○	○	○

If yes, how?

_____

	YES	In progress	No	N/A
Are QI tarnsmitted to tand evaluated by the Direction?	○	○	○	○

Comments

_____

Overall Score

Are quality indicators actively being monitored in the department?

_____

Commendations/ Recommendations _____

Process management

CHECKLIST 31. Process Management

	YES	In progress	No	N/A
Is the treatment workflow clearly defined/described?	○	○	○	○
Is this treatment workflow managed through a digital platform/OIS? (ARIA Carepaths, MOSAIQ, Raycare, self-developed tool, ...)	○	○	○	○

Is this workflow paperless for simulation?	○	○	○	○
Is this workflow paperless for contouring?	○	○	○	○
Is this workflow paperless for treatment planning?	○	○	○	○
Is this workflow paperless for treatment delivery?	○	○	○	○
Are the defined workflow's processes & sub-processes organized in a logical and efficient manner?	○	○	○	○
Is the workflow reviewed on a regular basis (and further optimized)?	○	○	○	○
Is the involved personnel clearly identified at each sub process?	○	○	○	○
Are the processes linked to the department's procedures?	○	○	○	○

Comments

_____

Overall Score

Have the department's main processes been clearly defined?

_____

Commendations/ Recommendations _____

Organizational chart

CHECKLIST 32. Department's Organizational Chart

	YES	In progress	No	N/A
Is the organisational chart defined (in the department)?	○	○	○	○
Does the organizational chart clearly represent the actual status of the department's organisation?	○	○	○	○
Is the QM included in the department's organizational chart?	○	○	○	○

Is the connection between the RT QM and the rest of institution clear?	○	○	○	○
Is the organisational chart clear enough?	○	○	○	○

Comments

_____

Overall Score

Is there a clear organisational chart at the departmental level?

_____

Commendations/ Recommendations _____

Task and responsibility definition

CHECKLIST 33. Personnel's Tasks and Responsibilities

	YES	In progress	No	N/A
Are the job descriptions of the radiation oncologists clearly defined?	○	○	○	○

Is there a documented job descriptions for each professional group. (DLT,s)

_____

	YES	In progress	No	N/A
Are the job descriptions of the medical physicists clearly defined?	○	○	○	○

By whom and how was it defined?

_____

	YES	In progress	No	N/A
Are the job descriptions of the medical physicics assistants (MPA) clearly defined?	○	○	○	○

By whom and how was it defined?

_____

	YES	In progress	No	N/A
Are the job descriptions of the nurses/RTTs clearly defined?	○	○	○	○

By whom and how was it defined?

	YES	In progress	No	N/A
Are the job descriptions of the quality manager clearly defined?	○	○	○	○

By whom and how was it defined?

	YES	In progress	No	N/A
Are the job descriptions of the administrative personnel clearly defined?	○	○	○	○

By whom and how was it defined?

	YES	In progress	No	N/A
Are the job descriptions of the logistics personnel clearly defined (technical support staff, engineers, ...)?	○	○	○	○

By whom and how was it defined?

	YES	In progress	No	N/A
Are the job descriptions of the supportive staff clearly defined (nurse specialists, psychologists, social worker, dieticians...)?	○	○	○	○

By whom and how was it defined?

In the RT process

	YES	In progress	No	N/A
Are the tasks of the different professional groups evenly distributed?	○	○	○	○
Are the radiation oncologist's tasks clearly defined?	○	○	○	○

Are the medical physics' tasks clearly defined?	◯	◯	◯	◯
Are the MPA's tasks clearly defined?	◯	◯	◯	◯
Are the RTTs' tasks clearly defined?	◯	◯	◯	◯
Are the technical-engineer's tasks clearly defined?	◯	◯	◯	◯
Are the administrative personnel's tasks clearly defined?	◯	◯	◯	◯
Are the logistic personnel's tasks clearly defined?	◯	◯	◯	◯
Are the QM's tasks clearly defined?	◯	◯	◯	◯

Comments

_____

Overall Score

Are the department's professional group's job descriptions and tasks clearly defined?

_____

Commendations/ Recommendations _____

Resource management (human and equipment)

CHECKLIST 34. Resource Management

Human resources

Is there an existing formalized training plan for new recruits for the following professional groups?

	YES	In progress	No	N/A
RO	◯	◯	◯	◯
MPE	◯	◯	◯	◯
MPA	◯	◯	◯	◯
RTT	◯	◯	◯	◯
QM	◯	◯	◯	◯
Administrative staff	◯	◯	◯	◯

Other item?

◯ Yes, 1 more ◯ Yes, 2 more
◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯
Is there an existing formalized training plan for interns (if applicable)?	◯	◯	◯	◯

Are the personnel's competencies monitored through regular assessments for the following professional groups?

	YES	In progress	No	N/A
RO	◯	◯	◯	◯
MPE	◯	◯	◯	◯
MPA	◯	◯	◯	◯
RTT	◯	◯	◯	◯
QM	◯	◯	◯	◯
Administrative staff	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯
Is there an existing formalized training plan for interns (if applicable)?	◯	◯	◯	◯

Are the personnel's competencies monitored through regular assessments for the following professional groups?

	YES	In progress	No	N/A
RO	◯	◯	◯	◯
MPE	◯	◯	◯	◯

MPA	◯	◯	◯	◯
RTT	◯	◯	◯	◯
QM	◯	◯	◯	◯
Administrative staff	◯	◯	◯	◯

Other item? ◯ Yes, 1 more ◯ Yes, 2 more ◯ No

Other item (1) - name _____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name _____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

	YES	In progress	No	N/A
Based on this assessment, is there a defined action plan/training plan?	◯	◯	◯	◯

Is there an existing Continuous Professional Education program/policy for:

	YES	In progress	No	N/A
ROs	◯	◯	◯	◯
MPEs	◯	◯	◯	◯
MPAs	◯	◯	◯	◯
RTTs	◯	◯	◯	◯
Others	◯	◯	◯	◯

If others, which professional group? _____

Do the Continuous Professional Education provided to different professional groups coincide with the legal requirements (ex: FANC regulation, ..)?

	YES	In progress	No	N/A
ROs	◯	◯	◯	◯
MPEs	◯	◯	◯	◯
MPAs	◯	◯	◯	◯
RTTs	◯	◯	◯	◯

	YES	In progress	No	N/A
Is internal training organized?	◯	◯	◯	◯

Are all members of the radiotherapy team encouraged to attend external training and are sufficient time and resources available?	○	○	○	○
Are these trainings coordinated by a person or a platform?	○	○	○	○
Is external training funded by the department/by the hospital?	○	○	○	○
Are minimal numbers of staff for external training/ meetings defined?	○	○	○	○

Comments

_____

Equipment resources

	YES	In progress	No	N/A
Is a list of equipment established?	○	○	○	○
Does this list coincide with the needs of the department?	○	○	○	○

Comments

_____

Overall Score

Are human and equipment resources properly managed?

_____

Commendations/ Recommendations _____

Risk management

CHECKLIST 35. Deviations in Radiotherapy Administration

Reactive risk management

	YES	In progress	No	N/A
Is there an existing event reporting and analysis system?	○	○	○	○
--- Is it easily accessible?	○	○	○	○
--- Is this system integrated within the hospital's system?	○	○	○	○

Is the RT QM made aware of the main events declared at the hospital level?	○	○	○	○
Is the hospital Quality team made aware of the significant events that are declared in radiotherapy?	○	○	○	○

Please comment on the interactions between the RT QM and the hospital quality team

_____

	YES	In progress	No	N/A
Is there a formal procedure on the declaration of events within the department?	○	○	○	○
Is the PRISMA Methodology used for the analysis of events?	○	○	○	○
Are the context variables used for the description of root causes?	○	○	○	○
Does the department participate in the national benchmark database?	○	○	○	○

Please comment if the department uses other reactive tools (Ishikawa, ORION...)

_____

Annual number of reported events (proportion of incidents and near incidents): Total number of events declared in the last year

_____

- Of which incidents?

_____

- Of which near-incidents?

_____

% PRISMA analysis on total number of events:(ideally ≥25%)

_____

	YES	In progress	No	N/A
Is there a formal procedure on the management of significant reportable events?	○	○	○	○
Are significant deviations reported to regulatory authorities (AFCN/FANC/AFMPS/FAGG)?	○	○	○	○

Number of reports sent to the FANC/AFCN in the past year:

_____

	YES	In progress	No	N/A
Is there a just culture policy?	○	○	○	○
Is the radiation oncologist in charge of the patient notified of an incident?	○	○	○	○
Is there a formal policy regarding informing patients about incidents?	○	○	○	○
Are there regular meetings held for event analysis and determination of improvement actions?	○	○	○	○
Is this a multidisciplinary team?	○	○	○	○
Are improvement actions determined on the basis of event reporting and analysis?	○	○	○	○
--- Are these improvement actions listed and accessible?	○	○	○	○

What is the mechanism for the implementation and monitoring of the improvement actions?

_____

	YES	In progress	No	N/A
Is feedback given to the reporter of the event?	○	○	○	○
Is feedback given to the entire radiotherapy team?	○	○	○	○

If yes, how?

- ☐ Newsletter
- ☐ Mailing list
- ☐ Dashboard
- ☐ Meetings
- ☐ Other

Other

_____

Are there regular safety awareness sessions organized?

_____

Proactive risk management

	YES	In progress	No	N/A
Is proactive risk analysis carried out?	○	○	○	○

If yes, in which case?

	YES	In progress	No	N/A
New equipment (LINAC, TPS, OIS, ...)	◯	◯	◯	◯
New project (paperless, tatooless..)	◯	◯	◯	◯
New clinical procedure/technique	◯	◯	◯	◯

Other item?

◯ Yes, 1 more ◯ Yes, 2 more
◯ No

Other item (1) - name

_____

	YES	In progress	No	N/A
Other item (1)	◯	◯	◯	◯

Other item (2) - name

_____

	YES	In progress	No	N/A
Other item (2)	◯	◯	◯	◯

Which method is used (FMEA, bowtie, ...)?

_____

	YES	In progress	No	N/A
Does the proactive analysis lead to a preventative action plan?	◯	◯	◯	◯

At which frequency are these proactive analyses redone?

_____

	YES	In progress	No	N/A
Is there a regular analysis carried out on the efficiency of the existing barriers to error propagation?	◯	◯	◯	◯

Comments

_____

Overall Score

Is there a comprehensive risk management system within the department?

_____
Commendations/ Recommendations _____

Breakdown management

CHECKLIST 36. Breakdown Management

	YES	In progress	No	N/A
Are machine/software breakdowns monitored (including loss of treatment time, types of fault/errors...)?	○	○	○	○
Is an analysis of existing data regularly carried out?	○	○	○	○

If yes, who carries out this analysis?

_____

	YES	In progress	No	N/A
Are corrective and preventive actions defined in accordance with breakdown data analysis?	○	○	○	○
Are specific QIs put into place? (ex: rate of breakdowns, loss of treatment time, ...)	○	○	○	○
Is there a defined procedure for patient workflow management in case of breakdowns?	○	○	○	○
Are there procedures describing the measures to be taken in case of emergency radiation protection situations?	○	○	○	○
Are these emergency radiation protection measures known by the personnel?	○	○	○	○

Comments

_____

Overall Score

Are procedures concerning breakdown management properly implemented?

_____

Commendations/ Recommendations _____

Patient feedback

CHECKLIST 37. Patient Satisfaction/experience

	YES	In progress	No	N/A
Is patient satisfaction evaluated in the department?	◯	◯	◯	◯

Specific of the Department or General by Institution ?

_____

Number of patient survey received in the past year or proportion of feedback

_____

	YES	In progress	No	N/A
Is patient experience evaluated in the department?	◯	◯	◯	◯
Are statistical analyses of patient surveys carried out?	◯	◯	◯	◯
Are these results of the analysis communicated?	◯	◯	◯	◯
Do improvement actions originate from the results of the patient surveys?	◯	◯	◯	◯

Comments

_____

Overall Score

Is patient satisfaction and/or experience monitored in the department?

_____

Commendations/ Recommendations _____

Audits

CHECKLIST 38. Audits

	YES	In progress	No	N/A
Are internal audits carried out in the department?	◯	◯	◯	◯
Are internal audits planned?	◯	◯	◯	◯
Are there existing internal audit procedures?	◯	◯	◯	◯
Are external audits carried out in the department?	◯	◯	◯	◯

Are external audits planned? (This also refers to "physics" audits such as BELdART)	○	○	○	○
Is the hospital management made aware of external audits organised in the RT department?	○	○	○	○
Are there existing external audit procedures?	○	○	○	○
Is the QM involved in the internal audits?	○	○	○	○
Is the QM involved in the external audits?	○	○	○	○
Are the Observations and No Conformities managed, solved and closed?	○	○	○	○
Process Safety Items are monitored by periodic audits (e.g mensual revision)?	○	○	○	○
Are the results of the audits communicated to the institution?	○	○	○	○
Do improvement actions originate from the results of the audits?	○	○	○	○

Comments

_____

Overall Score

Does the department use audits as a quality improvement tool?

_____

Commendations/ Recommendations _____

COMMUNICATION MANAGEMENT

Record ID

_____

Auditor

◯ Internal Self-Assessment (ISA)
◯ External Peer Audit (EPA)

CHECKLIST 39. Communication

	YES	In progress	No	N/A
Are meetings open to all professionals in the Department	◯	◯	◯	◯

Types of meetings that are regularly organised (ex: physics meeting, management meeting, quality meeting ...)

_____

	YES	In progress	No	N/A
Is an agenda proposed for all meetings?	◯	◯	◯	◯
Are minutes generated after meetings?	◯	◯	◯	◯
Are meetings organized between Department and Management Direction?	◯	◯	◯	◯
Are communication tools implemented in the department?	◯	◯	◯	◯
Are improvement actions communicated?	◯	◯	◯	◯
Are department's memos communicated?	◯	◯	◯	◯
Does the department easily communicate with other departments inside the hospital?	◯	◯	◯	◯
Does the department easily communicate with other hospitals?	◯	◯	◯	◯
Does the department easily communicate with outside companies/suppliers?	◯	◯	◯	◯
Does the department's management communicate in an optimal matter with the department's personnel?	◯	◯	◯	◯

Do the different disciplines in the department communicate with each other in an optimal matter?	○	○	○	○
Are significant incidents communicated to the department?	○	○	○	○
Are significant incidents communicated to the management of the hospital?	○	○	○	○
Are significant incidents communicated to authorities?	○	○	○	○
Is there an existing dashboard/ information delivery system that present a clear overview of quality indicators, safety issues and important elements to be communicated?	○	○	○	○

Comments

_____

Overall Score

Overall, is communication properly managed?

_____

Commendations/ Recommendations _____

RADIATION PROTECTION OF STAFF AND POPULATION

Record ID

_____

Auditor

◯ Internal Self-Assessment (ISA)
◯ External Peer Audit (EPA)

CHECKLIST 40. Radiation protection of staff and population

	YES	In progress	No	N/A
Is the RPO involved in the periodic radiation protection (RP) controls carried out in the radiotherapy department?	◯	◯	◯	◯

Comments on radiation protection controls

_____

	YES	In progress	No	N/A
Are the recommendations and corrective actions emitted by the RP control followed up on by the department?	◯	◯	◯	◯
Is training in radiation protection regularly provided to the department staff?	◯	◯	◯	◯

By whom?

_____

	YES	In progress	No	N/A
Can staff easily access personal dose monitoring values (dosimeter values)?	◯	◯	◯	◯
Is there a procedure for handling overexposure of staff?	◯	◯	◯	◯
Is there a radiation safety procedure for visitors of the radiotherapy department?	◯	◯	◯	◯

Comments

_____

Overall Score

Are staff and population radiation protection requirements correctly implemented?

_____
Commendations/ Recommendations _____

RTT ROLES AND RESPONSIBILITIES

Record ID _____

Auditor

◯ Internal Self-Assessment (ISA)
◯ External Peer Audit (EPA)

CHECKLIST 41. RTT roles and responsibilities

	YES	In progress	No	N/A
Is there an orientation program for newly hired RTTs?	◯	◯	◯	◯

- If yes, please comment on the orientation program (length, content, clinical trainer, exams...) _____

	YES	In progress	No	N/A
Do RTTs formally participate in equipment selection?	◯	◯	◯	◯
Do RTTs participate in training by the vendor upon arrival of new equipment/software	◯	◯	◯	◯
--- Is there sufficient time allotted to RTTs for equipment/software training?	◯	◯	◯	◯

Comments on training of RTTs relative to new equipment/software _____

	YES	In progress	No	N/A
Is radiation protection part of a yearly CPD program?	◯	◯	◯	◯
Are RTTs familiar with radiation protection protocols?	◯	◯	◯	◯
Do RTTs actively carry out quality control procedures on the treatment modalities?	◯	◯	◯	◯

If yes, list them

If no, who does them _____

	YES	In progress	No	N/A
Do RTTs actively carry out quality control procedures on the simulation unit?	◯	◯	◯	◯

If yes, list them

If no, who does them _____

	YES	In progress	No	N/A

Do RTTs actively participate in the quality management?	○	○	○	○
Do RTTs actively carry out checks on immobilization and fixation devices?	○	○	○	○

If yes, list them

If no, who does them _____

	YES	In progress	No	N/A
Is rotation of staff ensured?	○	○	○	○

If yes, how many times a year? _____

Comments _____

Overall Score

Are RTTs actively involved in department's managerial decisions and quality control procedures?

_____

Commendations/ Recommendations _____

APPENDIX B: QUALITY INDICATORS

Author	Group	Number	Definition	Formula	Green	Yellow	Red	Action Level	Frequency	Value	SD	Comments	Reference
Ferran Guedea	Process Start	3	Average time between biopsy diagnosis and start of radiotherapy	Median in days +/- SD of all patients who started radiotherapy treatment for prostate cancer with curative intent	≤30 days	30-60 days	>60 days		annual (cross-sectional)			core	
Ferran Guedea	Process Start	4	Percentage of patients with PSMA-PET prior to radiotherapy indication for oligometastatic disease	n patients with PSMA-PET and oligometastatic disease treated with radiotherapy / n patients with oligometastatic disease by CT/GGO treated with radiotherapy	≥90%	70–89%	<70%		annual			optional	
Ferran Guedea	Process Start	5	% of patients with documented and specific informed consent for radiotherapy	n patients with signed informed consent for pelvic radiotherapy / n without specific signed consent	≥90%	80–89%	<79%		semestral (cross-sectional)			core	
Joel Mases	Optimization	8	% of re-planning requirements due to non-compliance with setup or critical organs	n patients requiring re-simulation due to non-compliance with setup limits or critical organ discrepancies in IGRT / procedures without re-simulation	≤5%	6-10%	>10%		semestral (cross-sectional)			core	
Joel Mases	Optimization	12	Existence of peer review procedures for volume delineation	Active peer review procedures for prostate cancer radiotherapy treatments	yes	partial	no		annual			optional	
Joel Mases	Optimization	13	% of patients with dosimetric planning reviewed by independent double-check	n patients with dosimetric planning reviewed by independent double-check for prostate cancer / n patients planned for prostate cancer	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Xavi Maldonado	Individualization	16	% of patients receiving hypofractionated radiotherapy based on risk criteria	n patients with localized prostate cancer (non-postoperative) receiving hypofractionated RT / n patients receiving treatments with 2 Gy/fraction	≥90%	70–89%	<70%		annual (cross-sectional)			optional	
Xavi Maldonado	Individualization	18	% of treatments integrating simultaneous modulated boost (SIB)	n patients with integrated boost technique treatment / n patients with sequential treatments (includes radical and postoperative)	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Xavi Maldonado	Documentation	21	% of medical records with structured toxicity registration (CTCAE v4.0 or v5.0)	n medical records of prostate cancer patients treated with radiotherapy registering toxicity in a structured way / medical records without structured toxicity registration	≥90%	70–89%	<70%		semestral (cross-sectional)			core	
Xavi Maldonado	Documentation	22	% of treatment reports including detailed and structured mandatory information	n treatment reports including detailed and structured mandatory information on fractionation, dose, and technique used / n reports not meeting criteria	≥95%	90-94%	<89%		annual (cross-sectional)			core	
Noe Ventosa	Documentation	23	% of patients with documented baseline functional assessment (urinary, intestinal, sexual)	n patients with correct assessment at follow-up / total patients treated with radiotherapy for prostate cancer	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Noe Ventosa	Documentation	25	% of patients with documented treatment summary in medical record	n prostate cancer patients treated with radiotherapy with correct summary / n prostate cancer patients treated with radiotherapy	≥95%	90-94%	<89%		annual (cross-sectional)			optional	
Noe Ventosa	Follow-up	28	Prevalence of urinary toxicity grade 2 or higher at 6 months	n prostate cancer patients treated with radiotherapy presenting grade 2 or higher toxicity at six months / n patients treated with radiotherapy for prostate cancer	≤15%	15-20%	>20%		annual (cross-sectional)			Core	
Noe Ventosa	Follow-up	29	% of patients with rectal toxicity registered in medical record	n prostate cancer patients with rectal toxicity registered in medical record / n prostate cancer patients treated with radiotherapy	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Joan Lozano	Leadership and Clinical Management	31	% of treatment decisions validated in multidisciplinary tumor board or following the guidelines approved in the department	n patients with decision recorded in urological tumor board or following the guidelines / n patients treated with radiotherapy for prostate cancer	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Joan Lozano	Leadership and Clinical Management	33	Review/update of Service clinical protocol for prostate cancer	Review/update of Service clinical protocol for prostate cancer by years	annual	1-2 years	> 2 years		annual			optional	
Joan Lozano	Patient Safety	34	% of Safety checklists performed by technicians before first radiotherapy session	n safety checklists before first radiotherapy session for prostate cancer / n treatment starts for prostate cancer	≥95%	90-94%	<89%		semestral (cross-sectional)			core	
Joan Lozano	Patient Safety	36	Existence of an active serious AE, incidents and quasi incidents communication process to the safety manager and registration protocol	Existence of an active serious AE, incidents and quasi incidents communication process to the safety manager and registration protocol	yes	in progress	no		annual (cross-sectional)			core	
Jady Vivian Rojas	Patient Safety	38	Average downtime due to critical event during prostate cancer treatment	Average downtime in days due to critical event or failure during prostate cancer treatment	≤7 days	8–14 days	> 14 days		annual			core	
Jady Vivian Rojas	Clinical Outcomes	39	Biochemical progression-free survival at 3 years	Biochemical progression-free survival at 3 years in patients treated with radiotherapy for curative intent for prostate cancer	≥85%	70–84%	<70%		annual (cross-sectional)			core	
Jady Vivian Rojas	Clinical Outcomes	40	% of patients with local control at two years	n prostate cancer patients treated with radiotherapy with local control / n prostate cancer patients treated with radiotherapy with radical intent	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Silvia Comas	Patient Experience	43	% of patients with improvement or stability in IPSS at 12 months post-radiotherapy	Percentage of patients who, one year post-treatment, show improvement or stability in prostate symptom severity defined by the International Prostate Symptom Score (IPSS). Pre-treatment and 12-month IPSS.	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Silvia Comas	Patient Experience	44	% of patients satisfied with received information (post-treatment survey)	n Patients with favorable scores in post-treatment satisfaction survey / n surveys of prostate cancer patients treated with radiotherapy	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Silvia Comas	Innovation	49	% of patients with daily IGRT control	n prostate cancer patients treated with daily IGRT / n prostate cancer patients treated	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Maria Soledad López	Innovation	50	Active participation in prostate cancer clinical trials	Prostate cancer clinical trials program	yes	planned	no		annual			optional	
Maria Soledad López	Training	51	Training program for advanced techniques in prostate cancer	Documented and registered training program for advanced techniques in prostate cancer	yes	in progress	no		annual			core	
Víctor Hernández	Efficiency	55	Average time from simulation to first treatment	Average time from simulation to first treatment in prostate cancer patients in days	≤10 days	11-20 days	> 21 days		annual (cross-sectional)			optional	
Víctor Hernández	Efficiency	56	% of treatments without interruptions >2 days due to technical issues	n prostate cancer patients stopping treatment due to technical issues > 2 days / n prostate cancer patients not stopping	≥90%	70–89%	<70%		annual (cross-sectional)			core	
Víctor Hernández	Efficiency	58	Average time from referral to radiotherapy oncology consultation	Average time from referral to radiotherapy oncology consultation in days	≤7 days	8-14 days	> 14 days		annual (cross-sectional)			optional	
Víctor Hernández	Workload and Control Procedures	60	Annual number of treatments per radiotherapy oncologist	New treatments and second treatments per radiotherapy oncologist annually	<200	200-250	> 250		annual			core	

Víctor Hernández	Workload and Control Procedures	63	Written quality procedures in accessible document management system	Procedures for prostate cancer treatment written and registered in accessible document databases	yes	partial	no		annual			core	
David Garcia	Workload and Control Procedures	64	External audits (quality or dosimetric) conducted in the last three years	Audits conducted and documented	yes	planned	no		annual			core	
David Garcia	Workload and Control Procedures	65	Frequency of dosimetry equipment calibration and cross-verifications/calibrations	Compliance with annual calibration frequency or as determined by equipment complexity, type of radiation measured, and legal regulations (performed/not performed) in the last three years	100%	90-99%	<90%		annual			core	
David Garcia	Workload and Control Procedures	69	Annual proactive risk analysis (proactive analyses)	Annual proactive risk analysis based on methodology recommended by a national or international organization	yes	partial	no		annual			core	
			Action Level:										
			· Green:										
			If an indicator result is at the green action level, it shows the established target has been achieved and no actions are required. (If the indicator trend shows targets are being exceeded by wide margins, targets may be adjusted and actions taken to consolidate these values).										
			· Yellow:										
			If an indicator result is at the yellow level, it shows the target has been met but corrective and/or preventive actions are recommended to identify causes of fluctuations and improve the indicator's results.										
			· Red:										
			If an indicator result is at the red level, it means targets are not being met. Corrective actions should be taken, such as adjusting targets, reallocating resources, or modifying current actions to achieve them										

APPENDIX C: POST-AUDIT SATISFACTION SURVEY

Section	Question	Response Type
A. Organisation & Logistics	The audit was well organised and clearly scheduled.	5-point Likert (Strongly disagree – Strongly agree)
	The pre-audit instructions were clear and easy to follow.	5-point Likert
B. Audit Team Interaction	The auditors were professional and respectful.	5-point Likert
	The auditors communicated clearly during the visit.	5-point Likert
C. Tools & Methodology	The audit checklists and templates were relevant and useful.	5-point Likert
	The self-assessment tool helped us reflect on our practices.	5-point Likert
D. Outcomes	The audit findings were constructive and applicable.	5-point Likert
	The audit will help improve our department's quality and safety.	5-point Likert
E. Overall	Overall, how satisfied are you with the audit process?	5-point Likert
F. Comments	What worked well?	Open text
	What could be improved?	Open text