

KCDO - NCG EMR Requirement (NER) for Oncology

(Version 2.0)

FOREWORD

Cancer care is changing rapidly worldwide, and use of digital tools and technologies are playing a key role in driving this change – improving quality, access, and cost of care. It is imperative for India to have a strong focus on Digital Health to improve cancer care – make it more consistent, evidence based, accessible and affordable.

National Cancer Grid (NCG) is embarking on a very important mission of helping its 300 member hospitals in the country leverage digital health tools and technologies. NCG has recently set up the Koita Centre for Digital Oncology (KCDO) to support the NCG affiliated hospitals move towards digital transformation to meaningfully improve cancer care in India.

NCG- KCDO's first initiative towards this objective is to create a comprehensive EMR requirements document for cancer care. The last couple of months witnessed a committee of NCG experts, and practitioners from cancer care and health technology space in the country coming together and working tirelessly to create an exhaustive and extensive oncology specific EMR requirements document – the NCG EMR Requirement (NER). We share the version 2.0 of the NER document and welcome feedback, suggestions, and guidance from the healthcare technology companies and healthcare providers.

We are certain that NCG's Digital journey will bring a paradigm shift in cancer care and serve as an example for other disease areas. Your inputs will help create EMRs with strong cancer care workflows which in turn will ensure better care, outcomes, and value-based care for patients with cancer across India.

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TABLE OF CONTENTS

1. NCG EMR INITIATIVE OVERVIEW ABOUT NCG	03
2. NCG EMR REQUIREMENTS METHODOLOGY	04
3. NER–PART A: ONCOLOGY SPECIFIC REQUIREMENTS	06
4. NER–PART B: ONCOLOGY SPECIFIC ENHANCEMENT	14
5. NER–PART C: GENERAL EMR REQUIREMENTS	17
6.NER- PART D: NON- FUNCTIONAL EMR REQRUMENTS	28
7. APPENDICES	33

1. NCG EMR INITIATIVE OVERVIEW

In August 2022, NCG conducted a large scale survey across its network hospitals to understand their digital focus areas. The survey findings showed that the NCG hospitals recognised the importance of using digital systems and 80% of the NCG hospitals felt that Electronic Medical Record (EMR) implementation and usage was their top priority area.

Use of EMR continues to be a big challenge for NCG hospitals. Only 15% of NCG hospitals have EMRs today. The key challenges in adoption include - lack of oncology capabilities in current EMR products, high costs of buying EMRs, and lack of training of doctors, nurses and IT staff in effective use of EMRs. In addition, hospitals lack of the technical understanding about the quality of EMRs in the market, and find it difficult to determine which one is the best fit for them.

The Koita Centre for Digital Oncology (KCDO) has taken up EMR adoption in NCG hospitals as a key focus area and has launched the NCG EMR initiative. As part of this initiative, KCDO worked with NCG to establish a NCG EMR Core team consisting of senior experts from NCG hospitals across the country (Appendix 1). KCDO is working with the NCG EMR Core team to develop comprehensive NCG EMR Requirements (NER) for cancer care. In addition, KCDO and NCG are drawing inputs from cancer specialists, healthcare technology companies, hospitals and external consultants in reviewing and validating the NER. The NER V2.0 is covered in this document.

2. NCG EMR REQUIREMENTS (NER) METHODOLOGY

Cancer as a disease has specific EMR requirements. Though many HMIS/EMRs provide core patient care functionalities, few offer the necessary cancer care features. Recognizing this need, KCDO and NCG have formed the NCG EMR Core team (Appendix 1). This eminent team of members developed the cancer specific EMR requirements based on their experience, market research, literature reviews, discussions, and deliberation. To further ensure the completeness of the NER and ascertain that the ground realities and expectations are aligned, multiple field assessments were done across hospitals of varying sizes and specialties across the country.

NER CATEGORIES

The NCG EMR Requirements which were developed were categorised into 4 subgroups as explained below:

NER – Part A: Oncology Specific Requirements - These EMR requirements are specific to cancer care e.g., chemotherapy, radiation oncology

NER – Part B: Oncology Specific Enhancement – These EMR requirement are not exclusive for cancer care, but need specific enhancement to support cancer care e.g., additional details for cancer patient registration, clinical templates for chemotherapy

NER – Part C: Common EMR Requirements – These EMR requirements are not exclusive for cancer care but important for cancer care as well

NER – Part D: Non-functional EMR Requirements – These are non-functional requirements e.g., interoperability, clinical terminology, security and data privacy

NER LEVELS

The NCG member hospitals have significant diversity and vary significantly:

Size: Many are large (over 500 beds) while many are small (around 100 beds)

Specialty: Some are multi-specialty while others treat only patients with cancer

Location: Many are based in large metros, while others are based in small towns and rural areas

Ownership: About 40% are government funded, 30% are run by charitable trusts, and 30% are private hospitals

To ensure that the NER is appropriate to the varying needs of the market, the objectives of the NER are divided into Silver, Gold, and Platinum Levels. Silver Level are core requirements that encompass all the essential elements of an EMR and are applicable for all hospitals. Gold and Platinum Levels have incremental requirements for mid-sized and large hospitals.

3.NER-PART A: ONCOLOGY SPECIFIC REQUIREMENTS

The below requirements in the NER enlist those that are specific to cancer care. They are further categorised as Silver, Gold, and Platinum

Sr. No.	Module	Objective elements	Priority
A-1	OPD EMR	There is a provision to include patients in research/trials by using a check box, and a template can also be created with fields specific to the facility.	Gold
A-2	OPD EMR	There is a provision to view ongoing/past research trials conducted and sign up patients with their consent.	Platinum
A-3	OPD EMR	The system should be able to generate basic BI reports as defined by business	Platinum
A-4	OPD EMR	There is a provision to have the capability for recording the site/organ of diagnosis using ICD 10/11 codes. The system should have an easy search option and it should record the name of the user who enters the information, along with the date and time of the entry. It should also have an audit trail of any modifications/ updates, including the username and date, and the latest entry should be displayed in all relevant fields.	Silver
A-5	OPD EMR	There is provision to capture morphology and grade using ICD-03 codes	Silver
A-6	OPD EMR	There is a provision to mention the list of tests which led to the confirmation of the diagnosis.	Silver

Sr. No.	Module	Objective elements	Priority
A-7	OPD EMR	There is provision to capture clinical or pathological stage using Tumour(T), Regional Lymph Nodes (N) and Metastasis (M) classification	Silver
A-8	OPD EMR	There is provision to update and confirm Cancer Staging (Common to all oncologists)-medical, radiation and surgery integrated	Silver
A-9	OPD EMR	There is a provision to automatically provide the code for the cancer grade and stage using TNM classification.	Platinum
A-10	OPD EMR	There is provision to create/integrate with standard guidelines like AJCC for staging a cancer based on the site of the cancer with automatic updates	Platinum
A-11	OPD EMR	There is provision to track and update the stage of a cancer patient's illness based on diagnostic test results, recording the progression of the patient's disease stage, as well as the date and time of entry and the name of the person who entered it. An audit trail is also maintained for the entered diagnosis, including the name of the user, date, and time stamp, with the latest diagnosis being displayed in all relevant areas	Gold
A-12	OPD EMR	There is a feature that allows for the creation, modification, and updating of treatment plans, types of treatment, and care protocols based on standard guidelines, such as those set by NCG or by individual clinicians (specific to the organ/disease group, staging, and tumor site, etc.). An audit trail is kept with all relevant details as specified by the facility.	Gold

Sr. No.	Module	Objective elements	Priority
A-13	OPD EMR	There is provision to automatically suggest treatment protocols to doctors based on the staging site and the diagnosis of disease.	Platinum
A-14	OPD EMR	The system should have a provision to record/modify/update/view plan of care with sequence and type of treatment to be given with option to enter reasons for modifications, record outcomes and any user remarks.	Silver
A-15	OPD EMR	There is provision to mark follow ups - status (as defined), mark appointments, date of visits planned, actual outcome (death/survivorship, left treatment etc. against the treatment plan/protocol. - as defined by the physician.	Silver
A-16	OPD EMR	There is provision to generate alerts when standard treatment pathways (as per defined rules) are modified (with escalation matrix of notifications as per defined rules)	Platinum
A-17	OPD EMR	There is provision to create a variance report for standard and modified protocols with reasons of modification and outcome.	Gold
A-18	OPD EMR	There is provision to capture number of cycles and cycle intervals, date, time and type of chemotherapy	Silver
A-19	OPD EMR	There is provision to create pre-defined order sets (including drug dosage and capping as required) based on defined pathways or custom defined as per physician requirements - as per disease group/organ with checklists (as defined by business)	Silver

Sr. No.	Module	Objective elements	Priority
A-20	OPD EMR	There is provision to modify a Chemotherapy order set with option (e.g drop down list) to enter justification/ reasons for modification	Silver
A-21	OPD EMR	There is provision to classify medications as pre-meds, meds to be administered during session and post-meds	Silver
A-22	OPD EMR	There is provision to add instructions for administration of each drug as required e.g route of drug administration - Oral, I/V, dosage etc	Silver
A-23	OPD EMR	There is provision to view all previous chemotherapy orders of the patient date-wise with status as completed or cancelled with reason (defined drop-down list) if any etc.	Silver
A-24	OPD EMR	There is provision to capture date, time and type (e.g adjuvant) of the planned and actual chemotherapy session	Silver
A-25	OPD EMR	There is provision for automated dosage generation based on BSA, AUC, BMI, Height, Weight, Creatine, Age and GFR etc (as per defined rules)	Silver
A-26	OPD EMR	There is a feature to create, modify, and update treatment plans, care protocols & types of treatment, based on standard guidelines such as those set by NCG, the clinician or healthcare facility. It enables tracking of nursing care reassessment, marking the start & end of chemotherapy sessions and recording progress details, vital signs, as well as allergies, adverse events, drug toxicity or complications that may occur. Additionally, it gives the option to halt a chemotherapy session before completion in case of an adverse event. It should capture the reason in case of delay or extension and create discharge summary for the episode.	Silver

Sr. No.	Module	Objective elements	Priority
A-27	OPD EMR	The system must show an alert of any past adverse event that occurred during chemotherapy administration	Platinum
A-28	OPD EMR	There is provision for Radiotherapy planning requisition portal - number of Radiotherapy sessions, cycle intervals, define and record Radiotherapy planning protocol with option to capture site of incidence, region of interest, procedure date, details/findings of test (PET-CT/CT) etc - fields as defined by business	Silver
A-29	OPD EMR	There is provision to enter scan details including patient position details, cast details etc	Silver
A-30	OPD EMR	There is provision to capture e signature of the technologist/medical physicist/ radiation oncologist enter total dose in cGy, number of fractions and doses per fraction to select the technique of therapy (SSD/SAD/Rotational), the treatment type (Conventional ,3DCRT, IMRT, IMRT/VMAT, IGRT, IGRT/VMAT, SRT, SBRT, SRS, GATING) and the intent (Radical, Intent Radical, Palliative, Prophylactic, Neo Adjuvant, Adjuvant, Others)	Silver
A-31	OPD EMR	There is provision to record details of radiation therapy treatment, including the ability to select the type of procedure, imaging modality (CT, CT+MRI, CT+PET), and pretreatment verification, as well as view and mark checklists for the treatment as specified by business rules.	Silver

Sr. No.	Module	Objective elements	Priority
A-32	OPD EMR	There is provision to suggest recommendations basis standard guidelines as defined in system or by integration with org like ICRU in accordance with patient needs	Platinum
A-33	IPD EMR	There is a provision to order and enter details of Histopathology sample - site, no. etc	Silver
A-34	Pathology	There is a provision to view the report, update the diagnosis and/or staging of the tumor basis Histopathology report.	Silver
A-35	Imaging & Diagnostics	There is provision to search the radiology/lab/nuclear medicine/ diagnostic test from the lists of tests and place order with modality details	Silver
A-36	Imaging & Diagnostics	There is provision to view the report and image against order in the system	Silver
A-37	Imaging & Diagnostics	There is provision to send alerts in case of abnormal results	Silver
A-38	Imaging & Diagnostics	There is provision to view the cumulative test results	Silver
A-39	Imaging & Diagnostics	There is provision to update the billing sheet of the patient once the test is marked as completed and validated	Silver
A-40	Imaging & Diagnostics	There is provision to upload the report and/or image and link to patient id	Silver
A-41	Tumour Board	There is provision to select the patient for tumour board, assign a tumour board ID and schedule the tumour board basis disease/organ as per schedule - as defined by business rules	Silver

Sr. No.	Module	Objective elements	Priority
A-42	Tumour Board	There is provision to view the list of patients scheduled for the tumour board	Silver
A-43	Tumour Board	There is provision to select the patient and view the patient dashboard with required details (e.g notes, lab tests, procedure details, images etc) in a single screen view	Silver
A-44	Tumour Board	There is provision to record the agreed treatment plan/protocol in a structured template which is available in-patient record.	Silver
A-45	Tumour Board	There is provision to enter final diagnosis (ICD 10/11 code based) - integrated with medical/surgical/radiation	Silver
A-46	Tumour Board	There is provision to enter and confirm the staging of tumour as per TNM classification	Silver
A-47	Tumour Board	There is provision to enter the list of doctors available during discussion	Silver
A-48	Tumour Board	There is a system in place to document and track the summary of decisions made, treatment plans, and diagnostic investigations for each patient, with the ability to record the outcome after each stage of treatment. Additionally, an audit trail is maintained for any changes or updates made to the treatment plan, including the user who made the changes, the date, and the time	Gold
A-49	Outreach	There is provision to enter details of the screening programs and forms filled with patient details including screening test results	Silver
A-50	Outreach	There is provision to enter the outcome of the treatment and mark the final status of the patient.	Silver

Sr. No.	Module	Objective elements	Priority
A-51	Outreach	There is provision to capture details of patients under survivorship program as per defined business rules	Silver
A-52	Outreach	There is provision to manage patients requiring palliative care and pain management - structured templates and forms as defined	Silver
A-53	Interoperability	There is provision to share required information with cancer registry or any other agency as per the requirement in defined format.	Gold
A-54	Interoperability	There is a feature to generate custom clinical and quality care dashboards and reports, as per business requirements, for sharing with National Clinical Governance/Indian Council of Medical Research in the specified format.	Silver
A-55	Interoperability	There is provision to integrate with BI/Analytic tools	Gold
A-56	Auxiliary Module	requirements to be defined - in roadmap	Platinum
A-57	Auxiliary Module	requirements to be defined - in roadmap	Platinum
A-58	Auxiliary Module	1. There is a provision to enter donor and recipient details in defined templates with fields as defined by the facility for bone marrow transplant 2. There is a provision to enter approvals for transplant 3. There is a provision for sharing reports with authorised agencies 4. Any other requirements as defined by the facility	Silver

4. NER PART B - ONCOLOGY SPECIFIC ENHANCEMENT

These set of features include those EMR features which are common to all patient care but will require cancer specific enhancements.

Sr. No.	Module	Objective elements	Priority
B-1	Registration	There is a system in place for registering new patients, which includes capturing basic information such as their name, date of birth/year, phone number, ABDM ID, and confidentiality level, as well as any additional details as specified	Silver
B-2	Registration	There is a provision to use basic and advanced options to search patient's history basis defined criteria/parameters with an ability to use and/or/not filters and a feature to download and print search result as a report (in formats - excel, csv, pdf, word doc etc.)	Silver
B-3	Appointment	There is a provision to mark a patient as new or a follow up.	Silver
B-4	ADT	There is a provision to enter and view all the IPD activities/transactions on a dashboard.	Silver
B-5	OPD EMR	There is a provision to send notification for recorded drug allergy/adverse event or any other interaction as defined while ordering medication with an option to enter the justification and prescribe the medication.	Silver
B-6	OPD EMR	There is a feature that allows for the recording of previous medical history including hospitalizations and procedures, along with their respective dates	Silver
B-7	OPD EMR	There is a feature that allows users/ doctors to create orders, note templates, disease-specific instructions, order sets, and care protocols based on the specific organ/disease group and stage	Gold

Sr. No.	Module	Objective elements	Priority
B-8	OPD EMR	There is provision to share patient info with other authorized physician for second opinion within / outside the hospital via e mail in pdf. The option to share is to be enabled post mandatory check box tick for patient consent.	Silver
B-9	OPD EMR	There is a provision to highlight a patient for a specific medical condition (as defined by the facility)	Gold
B-10	OPD EMR	The system should have provisions for notifications with option to overrule with justification: 1. Drug to allergy/adverse event 2. Drug dosage on exceeding set limit/ threshold (per dose/total dose)	Silver
B-11	OPD EMR	The system should have provisions for notifications with option to overrule with justification: 1. Drug to drug interaction 2. Duplicate drug order 3. Drug to food	Platinum
B-12	OPD EMR	There is a structured pre-defined Pre-procedure/ Assessment form with defined fields as per business	Silver
B-13	OPD EMR	Provision to view and/or update details of the patient scheduled for Chemotherapy which include and as defined per rules 1. Indications 2. Vitals 3. Allergies 4. Past medical history 5. Past Surgical History 6. Isolation precautions 7. Mental state 8. Menstrual history 9. Fall risk assessment 10. Pain assessment 11. Mental health assessment diagnostic - Laboratory results, radiology reports/images	Silver
B-14	OPD EMR	There is provision to update time of administering medications with option to add -medication lot no and expiration date	Silver

Sr. No.	Module	Objective elements	Priority
B-15	IPD EMR	There is provision is for entering the initial evaluation and documenting the patient's progress using structured templates that are specific to the organ or disease	Silver
B-16	IPD EMR	There is provision to document any complication/s during or post-surgery and outcome of surgery	Silver
B-17	Pharmacy	There is provision to create order sets and favourites for easy and quick order placing - disease/organ specific	Silver
B-18	Lab	There is a provision to place histopathology test order in the system - with details of sample.	Silver
B-19	Lab	There is a provision to send an alert once the test result is available.	Silver
B-20	Emergency	There is a feature in place for recording and managing information about cancer patients in the emergency room, including the use of forms and templates to capture necessary information, administering medications, and making referrals or admissions as needed.	Gold
B-21	Outreach	There is a provision to record follow-up visits and send alerts if no transaction is recorded within a defined duration	Silver
B-22	Outreach	There is provision to view the list of follow up patients and enter details as required	Silver
B-23	Outreach	There is provision to retrieve a chronological summary of the user encounters and take print outs as required.	Silver
B-24	Inter operability	There is provision to record second opinions	Silver

5.NER-PART C: GENERAL EMR REQUIREMENTS

Sr. No.	Module	Objective elements	Priority
C-1	Registration	There is a provision to create unique patient ID, generate ABHA.	Silver
C-2	Registration	There is a provision to link/delink with ABHA.	Silver
C-3	Registration	There is a provision to generate & print registration card (including regional languages).	Silver
C-4	Registration	There is a provision to digitally capture identifiers for PMJAY, or other insurance identifiers.	Silver
C-5	Appointment	There is a feature that allows for the viewing of daily, weekly, and monthly appointments by doctor, department, team, or priority, and the ability to confirm appointments based on the patient's preference and the doctor's availability	Gold
C-6	Appointment	There is a provision to create new slots, modify/ block slots, create priority slots based on requirement or patient type - walk ins or appointments.	Silver
C-7	Appointment	There is a provision to view and manage appointment schedules (dashboard) for the patient, for department, for a specific care provider (doctor) or service with provision to reschedule/cancel the appointment and send notifications to doctors and patients for appointments/ updates.	Gold

Sr. No.	Module	Objective elements	Priority
C-8	Appointment	There is a provision to view the schedule of a doctor, patient, and resource and create recurring appointments, identify conflicts, and synchronise with Microsoft Outlook/ other calendars.	Platinum
C-9	Appointment	There is a feature to record the time at which a patient checks in, the start and end of their consultation, and when the appointment is finished, based on established guidelines	Silver
C-10	Appointment	Provision to send notifications to patients through SMS or WhatsApp messages in case of a delay in the start time of their consultation.	Gold
C-11	Appointment	There is a provision to summarise patient's activities in the facility - daily/overall and create summary with an option to take a printout	Gold
C-12	Billing	There is provision for creating, updating, and viewing billing information for individual or all patients, including charges for beds, package or service prices, orders for medications, procedures, lab tests, and radiology, as well as consultations	Silver
C-13	Billing	There is a provision to create new billing/ pricing categories of bed, orders etc. (master sets) based on requirements from the facility.	Silver
C-14	ADT	There is a provision for automatic generation of admission no. linked to the unique patient ID and allow user to manage ADT (Admit, Discharge, Transfer) for patients.	Silver

Sr. No.	Module	Objective elements	Priority
C-15	OPD EMR	There is provision of giving access to users as per defined roles and responsibilities.	Silver
C-16	OPD EMR	There is provision to view time wise appointments scheduled with the patient's name and reason for appointment.	Silver
C-17	OPD EMR	There is provision to select, move up or down basis vulnerability (priority) of patient from the list of scheduled patients	Silver
C-18	OPD EMR	There is provision to track the status of appointments, including those that are pending, completed, or cancelled within a specified time frame as determined by the business rules	Silver
C-19	OPD EMR	There is provision to document and review patient information, including observations, past medical history, social background, medical history, and treatment instructions. This can be done by updating and viewing them in the system.	Silver
C-20	OPD EMR	There is provision to record and/or update vitals, allergies (to medications or others), past adverse reactions etc	Silver
C-21	OPD EMR	There is provision to order medications/lab and radiology tests during consultation	Silver
C-22	OPD EMR	There is provision of generating automatic alerts and send notifications in case of abnormal lab values or any other (as per business rule)	Silver

Sr. No.	Module	Objective elements	Priority
C-23	OPD EMR	There is provision to view previous consultations, previous hospitalizations, and procedures of the patient with date	Silver
C-24	OPD EMR	There is provision to record/modify/confirm chief complaints and diagnosis in ICD10/11/SNOMED-CT as per defined rules of authorization	Silver
C-25	OPD EMR	There is a feature that allows for the uploading of various patient documents, such as prescriptions, images, lab reports, and discharge summaries, both within and outside of the facility, and links them to the patient's ID and indexes them.	Silver
C-26	OPD EMR	There is provision to refer patients to other specialties/doctors within the hospital/outside hospital as required	Silver
C-27	OPD EMR	There is provision to capture referral of a patient from an outside clinic/hospital.	Silver
C-28	OPD EMR	There is provision to upload patient documents (OP prescriptions, lab reports, discharge summary etc) onto the patient portal (as per defined business rules).	Silver
C-29	OPD EMR	There is provision for record keeping (images, documents, notes etc) and storing of patient safety protocols for reference - overall and patient wise	Gold
C-30	OPD EMR	There is provision to confirm the primary diagnosis	Silver

Sr. No.	Module	Objective elements	Priority
C-31	OPD EMR	The system is integrated with the pharmacy/inventory stock to notify the availability/quantity available for easy ordering	Gold
C-32	OPD EMR	There is provision to alert and prevent the ordering of medication if the dosage exceeds the recommended limit, with the ability to provide justification and receive authorisation for the exception.	Gold
C-33	OPD EMR	There is provision to order medications and any procedure required for the patient	Silver
C-34	OPD EMR	There is provision to notify the primary doctor and the doctor the patient was referred to upon the completion of the consultation	Gold
C-35	OPD EMR	There is provision to send alert to all necessary physicians in case of adverse reaction (as per defined doctor teams)	Gold
C-36	OPD EMR	There is provision to view all nurse assessments and drug administration in chronological order	Silver
C-37	OPD EMR	There is a feature that allows for the creation of a summary of the patient's treatment and care upon discharge, using predefined templates specific to the department and allowing multiple doctors to view and add their own notes	Silver

Sr. No.	Module	Objective elements	Priority
C-38	OPD EMR	There is provision to share completed and saved discharge summary on patient portal	Gold
C-39	Auxiliary Module	There is provision to maintain record of each patient's completed PAC with option to upload PAC chart in system linked to patient ID	Silver
C-40	Auxiliary Module	There is provision to create a PAC chart in the system with fields to enter patient details including patient ID, Name, Age, Address, and procedure details (as per defined format)	Silver
C-41	Auxiliary Module	There is provision to order PAC tests and record results for PAC and add remark	Silver
C-42	Auxiliary Module	There is provision to identify and mark patients who have not cleared their pre-anesthesia checkup, had abnormal test results, or met other specified criteria as determined by the organization's policies	Silver
C-43	Auxiliary Module	There is provision to integrate with OT scheduler to schedule PAC dates	Platinum
C-44	Auxiliary Module	There is provision to write any remark for the patient which should be visible on OT scheduler	Platinum

Sr. No.	Module	Objective elements	Priority
C-45	Auxiliary Module	There is provision to request for early/ priority surgery to OT scheduler which should be visible as an alert to OT scheduler	Platinum
C-46	IPD EMR	There is provision to view the clinical summary of the patient during the course of stay	Silver
C-47	IPD EMR	There is provision to record vitals/ allergies etc for the patient	Silver
C-48	IPD EMR	There is a provision to order medications, diagnostic tests, and other procedures for the patients.	Silver
C-49	IPD EMR	There is provision to view the test results and radiology reports anywhere within the system	Silver
C-50	IPD EMR	There is a provision to send alerts whenever there is an abnormal study/test result is available	Silver
C-51	IPD EMR	There is a feature in place that allows for the marking of a patient for discharge, whether planned or unplanned, and the creation of a discharge summary using predefined formats and fields, with the ability for multiple doctors to view and add their own comments	Silver
C-52	IPD EMR	The system must allow user/doctor to view list of planned discharges	Gold

Sr. No.	Module	Objective elements	Priority
C-53	IPD EMR	There is provision to plan and schedule surgery for patients - whether planned or emergency - with the ability to block resources and input specific details such as primary or secondary surgery, the names of the surgeon and anesthetist, the time of entering and exiting the operating room, and the time for anesthesia.	Platinum
C-54	IPD EMR	There is provision to view/modify OT list - patients planned for surgery (OT wise)	Platinum
C-55	IPD EMR	There is provision to create and enter OT /ICU notes as per defined format	Silver
C-56	IPD EMR	There is provision to enter pre op/intra op and post op details	Silver
C-57	IPD EMR	There is provision to enter details of surgery - patients' details, date and time, surgeons name (surgery team – doctors, nurses, anaesthetist), time and types of surgery (description), pre surgery and during surgery parameters, consent, etc.	Silver
C-58	IPD EMR	There is provision to enter progress notes as per defined format and fields	Silver
C-59	IPD EMR	There is provision to upload a file (Video) of surgery and link to the patient's ID/EMR	Gold

Sr. No.	Module	Objective elements	Priority
C-60	IPD EMR	There is a provision system has a provision for online charting in OT/ICU (pre, intra, and post-operative care, ventilator management, emergency readiness)	Gold
C-61	IPD EMR	There is provision for pre and post OT checklist and clearance status as per defined rules.	Silver
C-62	IPD EMR	There is provision for maintaining WHO safety chart.	Silver
C-63	IPD EMR	There is provision to automatically capture physiological data (monitors, ventilators, IV infusion pumps etc.) where it become part of the patient record.	Platinum
C-64	IPD EMR	The system has provision to record and verify site markings for surgery, upload, mark and annotate any image as required linked with patient Id.	Gold
C-65	IPD EMR	There is provision to allow notification alerts if critical checkpoints are not met - PAC clearance, Physician clearance, Consent received, blood arranged etc.	Silver
C-66	Pharmacy	There is provision to search the medication from the drug database (in house or standard like CIMS) and place order with defined dose, route and frequency with modifications as may be required.	Silver
C-67	Pharmacy	There is provision to integrate with the Pharmacy to manage to dispense against the order	Silver

Sr. No.	Module	Objective elements	Priority
C-68	Pharmacy	The system should have provision to record administration details against the order.	Silver
C-69	Pharmacy	There is provision to update inventory and billing against the order.	Gold
C-70	Pathology	There is provision to enter test result for tests done from outside.	Silver
C-71	Pathology	There is provision to upload patient's lab reports and link to patient id.	Silver
C-72	Imaging	There is provision to upload the report and image and link to patient id.	Silver
C-73	Auxiliary Module	There is a feature available for viewing and modifying patient consent information through an online platform, including options for creating, viewing, and updating consent checklists for procedures and surgeries as determined by the business.	Silver
C-74	Auxiliary Module	There is provision to generate patient consent forms electronically using predefined templates that are standardized according to established guidelines	Gold
C-75	Auxiliary Module	There is a provision for consent forms to be personalised and printed by the clinician.	Silver
C-76	Auxiliary Module	There is provision to take digital signature of the patient or patient's relative.	Gold

Sr. No.	Module	Objective elements	Priority
C-77	Interoperability	The system has provision to capture information as per defined coding systems: 1. Disease Classification - ICD10/11 2. Cancer Specific Coding - ICD 03/03.1 3. Laboratory Tests Coding - LOINC 4. Radiology images and reporting - DICOM 3.0	Silver
C-78	Interoperability	The system has provision to capture information as per defined coding systems: 1. Medical Terminology Coding - SNOMED CT 2. Surgery or procedure coding - CPT 3. Cancer Staging - TNM	Platinum
C-79	Interoperability	There is provision to transfer Information from devices through HL7 messages.	Gold
C-80	Interoperability	There is provision to create treatment summaries and share with other doctors (via e mail in pdf) in same or different organisation with patient's consent (mandatory)	Silver
C-81	Auxiliary Module	There is provision to enter details for dietary requirements during the stay at hospital.	Silver
C-82	Auxiliary Module	There is a system in place for recording information about blood transfusions, including blood type and cross matching, blood requisition details, and any allergies or adverse reactions that occur during or after the transfusion. Users can also mark the start and end of the transfusion, record vital signs, and document any reasons for stopping the transfusion prematurely	Silver

6. NER PART D - NON- FUNCTIONAL EMR REQUIREMENTS

Sr. No.	Module	Objective elements	Priority
D-1	Accessibility and User Interface	The system shall provide support for widely used browsers – Chrome, Firefox, Internet explorer and Edge.	Silver
		The system shall provide backward compatibility to at least latest minus one version of browsers	Silver
		Provide a native mobile app for clinicians with support for both android as well as iOS devices	Platinum
		The system shall support multiple form factors to support accessibility of URL based web-based interface on mobile devices	Silver
		The system should provide ability to view offline shared referred cases (See requirements on interoperability)	Gold
D-2	Security	System shall provide two factor authentication capabilities to authenticate different profile of users. Different classification of users includes,	Gold
		1. Doctors and Clinicians	
		2. Nursing and pharmacy staff	
		3. IT, System and database administrators	Silver
		Provide capability to configure role-based access with ability to control read, write and modification of data capabilities	
		Support single sign on capabilities with support for SAML based identity management integration	Platinum

Sr. No.	Module	Objective elements	Priority
D-3	Audit & Non-Repudiation	The system shall provide extensive, analysable audit capabilities.	Silver
		Audit each end user transaction with data, time and performer time stamp.	Silver
		Audit each system administration transaction with date/ time, performer and end user IP address tracking.	Silver
		System should provide a self-certification of cybersecurity testing for connected systems.	Silver
		· Penetration testing	Silver
		· Vulnerability and threat analysis	Silver
D-4	Privacy and Confidentiality	System should encrypt all data at rest (in database) and in motion (Data accessed from database from middle and UI layers, Transfer of data compliant to interoperability and integration protocols with other systems.	Silver
		The encryption algorithms shall minimum support 256-bit encryption with secure keys that are recycled periodically	Silver
		The systems should track consent status and provide ability to configure privacy settings at individual user and/or role level based on patient consent	Gold
D-5	Integrations	The system should support integration with other hospital systems with secure exchange of data in the backend. The key systems include (Not limited to)	Gold
		· Imaging systems – PACS/ RIS to view diagnostic images and radiologist reports for end users.	
		· Lab information management systems – Pathology lab systems for access to reports and diagnostics data	
		· Integration and data exchange with ABDM	

Sr. No.	Module	Objective elements	Priority
D-5	Integrations	System shall support the following modes of data transfer	Silver
		Secured File Transfer(SFTP), Socket transfer (for HL7 messages as per MLLP specifications) HTTP and file share.	Silver
		Integration with biobanking systems for sample tracking	Platinum
		The system should be capable of integrating and sharing patient data with NCG and across NCG hospitals (specifications to be published separately by NCG)	Silver
D-6	Interoperability and Standards	The system should support key interoperability standards for capturing and bidirectional exchange of data	Silver
		· DICOM for medical imaging data capture and exchange	
		· ICD-O for oncology diagnostics	
		· LOINC for lab data exchange	Gold
		· CPT for procedures	Gold
		The system should support common drug codes for India – NRCES published national drug extensions	Gold
		The system should support key HL7 2.7 formats	Silver
		1. HL7 2.7 ADT messages	
		2. ORU for observations, lab & radiology results	
		3. RDE for prescription and medication data.	
		The system should support HL7 FHIR format:	Platinum
		1. HL7 2.7 ADT resource.	
		2. Observation resource.	
		3. Medication administration resource.	
		· The system shall provide ability to process inbound and outbound referrals support with minimum patient referral dataset.	Silver

Sr. No.	Module	Objective elements	Priority
D-5	Integrations	System shall support the following modes of data transfer	Silver
		Secured File Transfer(SFTP), Socket transfer (for HL7 messages as per MLLP specifications) HTTP and file share.	Silver
		Integration with biobanking systems for sample tracking	Platinum
		The system should be capable of integrating and sharing patient data with NCG and across NCG hospitals (specifications to be published separately by NCG)	Silver
D-6	Interoperability and Standards	The system should support key interoperability standards for capturing and bidirectional exchange of data	Silver
		· DICOM for medical imaging data capture and exchange	
		· ICD-O for oncology diagnostics	
		· LOINC for lab data exchange	Gold
		· CPT for procedures	Gold
		The system should support common drug codes for India – NRCES published national drug extensions	Gold
		The system should support key HL7 2.7 formats	Silver
		1. HL7 2.7 ADT messages	
		2. ORU for observations, lab & radiology results	
		3. RDE for prescription and medication data.	
		The system should support HL7 FHIR format:	Platinum
		1. HL7 2.7 ADT resource.	
		2. Observation resource.	
		3. Medication administration resource.	
		· The system shall provide ability to process inbound and outbound referrals support with minimum patient referral dataset.	Silver

Sr. No.	Module	Objective elements	Priority
D-6	Interoperability and Standards	- The inbound and outbound referrals shall support published format by National cancer grid – Excel/JSON format. (To be published separately by NCG) - The system shall provide ability to export the referral dataset including unstructured notes on a detachable media for sharing with the patient and offline exchange	Silver
D-7	Performance & Scalability	The system shall provide a response time of under 3 seconds for OPD modules (ADT screens, Consultation screens/ Nursing / pharmacy screens)	Silver
		The system shall provide a response time of under 5 seconds for complex IPD modules (Procedure planning / Tumour review board screens/ Admin screens)	Gold
D-8	Availability	The system shall provide an uptime of 99% including scheduled maintenance	Silver
		The system shall provide an uptime of 99.9% including scheduled maintenance	Gold
D-9	Data Backup	Support for data archival and retrieval – The system shall support availability of historical patient for minimum of 5 years in active database and minimum 15 years in archive.	Silver
D-10	Redundancy	The system should provide capability to perform data and application-level backup and restoration capabilities	Silver
		Ability to implement real time data synchronization for disaster recovery	Platinum
D-11	Secondary use of Anonymized data	Provide ability to export and synchronize data with data lakes and warehouses in batch mode for secondary use.	Silver
		· Anonymized data extract that can be shared with the grid and/ or other research organizations.	
		· Capability to configure the fields to be anonymized.	

Sr. No.	Module	Objective elements	Priority
D-11	Secondary use of Anonymized data	· Ability to de- anonymize specific identified patients on request for follow up or recruitment into clinical studies.	Silver
		· Ability to control export of data to consent patients only.	
		· Ability to query data for identification of patient cohorts.	
		Data Deidentification: Ability to deidentify and export data for statistical analysis/ public health reporting and clinical research.	

7.APPENDICES

Appendix 1. KCDO Core Team

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Director, Koita Foundation

Dr. Amrut Kadam

Prof & Head, Radiation Oncology, Victoria Hospital, Bengaluru

Dr. Indranil Mallick

Radiation Oncologist, Tata Medical Center, Kolkata

Dr. Prakash Nayak

Asso. Prof / Sarcoma Surgeon, Tata Memorial Hospital

Dr. C. S. Pramesh

Director, Tata Memorial Hospital Convenor, National Cancer Grid

Dr. Manju Sengar

Prof. Medical Oncology, Tata Memorial Hospital

Appendix 2

JCC	American Joint committee on cancer
ADT	Admit, Discharge, Transfer
ABHA	Ayushman Bharat Health Account
ABDM	Ayushman Bharat Digital Mission
cGy	Total amount of radiation that the patient is exposed to
DICOM	Digital Imaging and Communications in Medicine

EMR	Electronic Medical Record
IPD	Inpatient department
ICD-10	International classification of disease
ICD-O	International classification of disease for Oncology
KCDO	Koita Centre for Digital Oncology
LOINC	Logical Observation Identifiers Names and Codes
Metastasis	Metastasis is a spread of cancer cells from an initial or primary site to a different or secondary site within the body.
NCG	National Cancer Grid
NCCN	National Comprehensive Cancer Network
NER	NCG EMR Initiative
NEP	NCG EMR Partner
NDHB	National Digital Health Blueprint
NABH	National Accreditation Board for Hospitals
Oncology	The study and treatment of Tumours
OPD	Outpatient department
PACs	Picture archiving and communication system
SNOMED CT	Systematized Nomenclature of Medicine Clinical Terms
TNM staging	Tumour, Node, and Metastasis staging
Tumour Board	A tumour board is a group of doctors and other health care providers with different specialties that meets regularly at the hospital to discuss cancer cases and share knowledge.
WHO	World Health Organization

Appendix 3

1. NCG Hospital Survey
2. <https://ascopubs.org/>
3. <https://www.healthit.gov/>
4. <https://www.ehrinpractice.com/>
5. <https://www.nhp.gov.in/NHPfiles/EHR-Standards-2016-MoHFW.pdf>



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