PARCA Certified PACS System Analyst (CPSA2020) Requirements

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This document contains the detailed requirements for the certification of a CPSA2020, or Certified PACS System Analyst. These requirements are similar to the original CPSA requirements published in 2005 and updated in 2014 but updated to reflect changes in technology and practice. The requirements for the Systems Analyst focus on general understanding of the PACS components. There is a strong emphasis on understanding the clinical and technical workflow aspects of the System Administration functions.

1. PACS Overview:

1.1 PACS architecture and components: PACS has several components, i.e. acquisition devices, with or without a preview monitor and/or QA station, archiving, and display/print, as well as output media such as optical disc burners. Images flow a certain way in this system. – Know how to distinguish between the different PACS components, and how their roles differ.

1.2 PACS scenarios: PACS systems are used in different applications and scenarios such as Teleradiology, in the ICU or OR setting, etc. - Know the most common scenarios and specific workflow concerns.

1.3 Architecture: PACS systems can use a thin or thick client, which could also be zero footprint, to connect their workstations to the PACS backend. – Know how to distinguish between both architectures, and the cons and pros of each.

1.4 Acquisition rate and typical data generation: To size a PACS system infrastructure as well as databases and archiving capacity, one must calculate the data generation and retrieval rate. – Know how to develop a spreadsheet with the data rate generation, do a forecast of the required data storage capacity and infrastructure.

1.5 Communication: Image communication is facilitated over ~~a~~ dedicated and/or shared networks. Dedicated connections, such as VPN over broadband, can be used to connect with satellite offices and/or other outside facilities. Proper sizing, appropriate service level agreement, and support are critical. – Know how to size network capacity and recognize the need for proper support.

2. PACS Components: acquisition and viewing

2.1 Image Acquisition: Digital modalities such as CT, MR, US, RF, and NM typically connect directly to the PACS system. Digital X-ray systems (CR/DR), film digitizers, frame grabbers, document scanners and interface boxes also serve as data generators. – Know differences between various acquisition devices and typical applications.

2.2 Image viewing general: Viewing stations can be categorized depending on their category (diagnostic, review), application (specialty, general), usage (hospital, web-based) and require often specialized video boards. – Know the characteristics of each type, category and application.

2.3 Workstation requirements: Workstations can be characterized by several parameters, including performance, user-friendliness, image quality, security provision,

architecture, display technology used, and level of integration. – Know to specify parameters for each of these characteristics.

2.4 Viewing functionality: The viewing functionality can be divided in several groups, i.e. Image and Information Management, basic display features, image manipulation, metrics, advanced features and modality/application specific features. – Be able to differentiate between these features and list the most critical features in these categories.

2.5 Hard and soft-copy output: Printers can be connected to create a film or paper copy in a color or grayscale format. – Know the requirements for hardcopy i.e. true size printing and matching image quality.

2.6 Artificial Intelligence: Computer Aided Diagnosis (CAD) was the precursor to Artificial intelligence. AI which uses machine and deep learning to improve the automatic detection and diagnosis capability by computer software. – Know the different AI paradigms (detection, diagnosis, segmentation, triage, and acquisition support), importance of training and test data sets, requirements for anonymization and workflow issues.

3. PACS components, Image and information management core

3.1 Core components: A PACS core has several components, i.e. image manager, image store/archive, workflow manager, and system administration features. Redundancy in the form of Business Continuity, High Availability and Disaster recovery for these components to provide a reasonable uptime guarantee is critical. – Know how to distinguish between the different components and the function of each one of these.

3.2 Exchange methods and media: Images can be shared in multiple manners, i.e. direct communication, through an intermediary or using cloud services. Optical discs are most commonly used to exchange patient information to be given to a patient or sent to a physician. – Know the advantages of the various images sharing alternatives and the typical applications for optical disc exchange media.

3.3 Application Service Provider (ASP) and cloud services: Archiving can be outsourced either for storing the primary data, or for back-up and/or data recovery purposes. – Know the advantages and disadvantages of ASP, as well as cloud storage management services.

3.4 Data Migration: The information of PACS databases and archives often has to be migrated when upgrading or changing vendors. –Know of the issues and problems regarding migration, such as proprietary data conversion and the time and resources required to migrate the information

3.5 Vendor Neutral Archives: Information can be stored in a vendor-neutral manner at an enterprise level. Know the different levels of vendor neutral archive solutions and the characteristics including necessary customization, normalization and the use of tag morphing. Understand the advantages and disadvantages of a deconstructed PACS system.

4. Integration

4.1 Different levels of integration: Applications can be integrated in different manners, tight or loose, using different types of protocols such as DICOM, HL7, IHE, CCOW, or SOA or FHIR and DICOMWeb. – Know how to distinguish a certain level of integration, and the related advantages and disadvantages impacting modality integration.

4.2 HIS/RIS/PACS integration: The HIS and/or EMR communicates the admission, demographic and order information with the RIS as part of the CPOE functionality, the RIS communicates demographic and order information with the PACS, while the results are being exchanged between the PACS and the RIS. – Know how to distinguish the different interfaces, the importance of the actor definition by IHE and to avoid overlap and/or gaps between the HIS/RIS/PACS.

4.3 Report Integration and Speech Recognition: For report integration it is critical to determine how speech recognition is integrated with the RIS and workstation, whether the work list is RIS or PACS "driven" and the whether one operates in real-time or batch mode. In addition, one should determine the continuing role of the transcriptionist, i.e. whether they are still involved. – Know different methods and technologies for integrating speech recognition into radiology workflow.

4.4 Electronic Health Record: The Electronic Health record is critical for exchanging information within the enterprise. – Know difference between CPR, EMR, and EHR. Know at least 6 of the 8 eight core functionalities, and the three domains defined by the EHR standard.

4.5 IHE: Integration the Healthcare Enterprise is a definition of actors, transactions, and subsequent profiles. – Know the basic functionality and purpose for the most critical radiology, cardiology and ITI IHE profiles.

5. Workflow:

5.1 Workflow analysis: A workflow study is critical, before, and after PACS implementation. Workflow consists of the activities and interactions between people and devices. Workflow optimization is critical to achieving higher efficiency. – Know why and when a workflow analysis is critical.

5.2 Workflow tools: Several tools can be used to perform a workflow study such as pictorial charts, flow charts, diagrams, time/motion studies, etc. – Know the advantages and disadvantages of each and when to use each workflow assessment tool. Be able to perform a workflow study for radiology, cardiology and radiation therapy.

5.3 Workflow issues: There are several common bottlenecks in the workflow, for example, the absence of a radiology order, absence of previous images for comparison, unscheduled patients, where to perform the QA and by who, changing procedures, etc. – Know the most common workflow issues and how to potentially deal with these.

5.4 CR/DR workflow: The most dramatic changes from a technologist perspective is the introduction of CR/DR. Compared with the film based workflow, there are additional

steps, some of which will be eliminated. – Know the basic CR/DR workflow and major differences between them and film.

5.5 Non-imaging workflow: Other information also has to be exchanged such as paper, and critical results as well as ER discrepancy reports. Peer reviews require also a special workflow. When there is no order, the workflow will fall back to an encounter-based workflow. – Know how to address these special workflow cases.

6. PACS System Administration:

6.1 Project management: Project management skills are required, including the use of tools such as project management software. In addition, planning, workflow mapping, post installation management and training can be considered part of this activity. – Know basic project management methodologies and how to use project management tools to determine the list of tasks, their dependencies and the critical path and plan and schedule these activities.

6.2 System Maintenance: This includes the first line of support, managing configurations, participating in a management or oversight committee, performing and/or coordinating preventive maintenance, general system maintenance, and acceptance testing. – Know how to organize a support infrastructure, and coordinate and manage configuration support.

6.3 Image and Information Management (IIM): Image quality, data integrity, QA, communication issues, and off-line storage management are critical tasks to maintain the system integrity. – Know the importance and functions of the IIM tasks and how to implement a Quality Improvement and Quality Control program.

6.4 Continuity of care: A SA is not only responsible for the support but also the planning, anticipation and implications of computer / network systems failures. This includes downtime planning, testing the back-ups, determining and implementing fail-over capabilities and assessing the business impact & continuity of care. – Be able to assess and anticipate critical areas and downtime scenarios and implement solutions.

6.5 DB integrity and maintenance: Databases require certain integrity otherwise; it is “garbage-in garbage-out”. In order to maintain integrity, most databases provide a “holding area” where improperly identified images as well as images that contain conflicts with information already stored are kept to be rectified by an administrator. – Know of the most common database integrity problems.

7. Outside radiology:

7.1 Cardiology: Cardiology has specific requirements with regard to performance, storage, compression and the availability of special applications on the workstations. In addition, integrating with other instruments in the cath lab is essential as well as the resulting reporting such as procedure logs, hemodynamics, QVA, and QCA and the waveform data. – Know the specific requirements for integrating cardiology with radiology and the additional data that might have to be managed in conjunction with the images.

7.2 Radiation therapy: RT is not only a user for radiology imaging, but also generates their own specific DICOM objects such as the RT Structure sets, plans, RT images, Dose and treatment records. – Know about the specific requirements of the RT department, the DICOM objects that could be generated and a typical workflow.

7.3 Nuclear Medicine: NM is special because it has dedicated NM processing stations, which often maintain their unprocessed, raw data, and, last but not least, has had a poor track record integrating due to poor implementations of the DICOM NM multiframe object which caused the IHE to specify a dedicated profile. – Know about the NM issues and why it is important to require IHE profile support for viewing.

7.4 Other clinical specialties: Ophthalmology, endoscopy, dermatology, pathology, surgery and other "-ologies" which will need to be integrated with the PACS systems for availability to the physicians. – Know the specific DICOM SOP Classes to be supported for these specialties and the main issues that might be expected especially when there is no order, one cannot rely on a DICOM worklist, and one has to deal with an encounter-based workflow.

7.5 EMR, EHR, PHR: Images might have to be exchanged with electronic medical records. – Know the main difference between the types of electronic health records and how the information is to be exchanged between the PACS and these records using image enabling.

8. Security and patient privacy (HIPAA) requirements for PACS

8.1 Security and Privacy requirements for PACS: A PACS system deals with Protected Health Information (PHI) and is therefore subject to regulatory regulations, which in the case of the US are covered under the US federal HIPAA regulations. The security components that are applicable are the Transactions and Codes, Identifiers, Privacy and Security sections. The privacy/security regulation defines PHI, and specifies "minimally necessary information which can be implemented by role-based access. – Know which standard is used for Electronic Data Interchange (EDI), and some of the coding systems that are applicable, the PHI, Business Associate (BA), Covered Entity (CE) definition, impact of minimally necessary information availability, and Treatment, Payment, Operations (TPO) rule.

8.2 Implementation zones: From a device perspective, there is always a trade-off between the implementation of policies/procedures and appropriate technical means that complement the procedures. The specific implementations and trade-offs depends on the locations, i.e. the different zone in which the technical means are used. – Know to identify the different zones applicable to the privacy and security implementation.

8.3 Administrative safeguards: These safeguards cover the processes and procedures that have to be in place to meet security and privacy requirements. This includes a risk management process, with as important part the risk analysis. In addition, it covers assigned security responsibility, workforce security, information access management, security awareness and training, incident procedures and contingency plans. – Know the major sections of the privacy and security administrative safeguards.

8.4 Physical Safeguards: The physical safeguards deal with physical access to information, including facility access controls, workstation use and security as well as device and media controls. – Know the major sections of the physical safeguards.

8.5 Technical safeguards: These safeguards deal with the technical aspects, including the access control, audit controls, preserving the integrity of the information, authentication and transmission security. – Know the major sections of the technical safeguards.

9. PACS implementation:

9.1 The implementation process: PACS systems are implemented with proper planning in several phases, with a clear deliverable for each phase and identification of responsibility for that phase. – Know about the different phases of the PACS implementation and their function.

9.2 RFP components: A Request for Information (RFI) or Proposal (RFP) is used in most cases to allow one or more vendors to specify how the requirements of a specific institution could be met using the vendor's PACS system.- Be able to identify several components of the RFP.

9.3 Economic justification: Return on investment (ROI) is critical for a PACS system, whether it is a financial return, better physician or patient satisfaction, or better outcomes from a healthcare perspective. There are several models that can be used to justify the purchase, i.e. the input, output, analytical decision and strategic decision model. – Know when to use what model and the characteristics of each one.

9.4 Test systems and validation: Each healthcare information and management system typically has a test system that is used for testing, temporary back-up and redundancy if needed. – Know the important of a test system and how to use it effectively for testing and validation.

9.5 Configuration: Configuration management is critical to manage a complex health care information and management system. – Know what to manage and how to coordinate changes.

10. Miscellaneous:

10.1 FDA approvals: All medical devices are subject to US regulations defined by the FDA. They are classified in different classes and require a PMA or 510(k) depending on whether there is already a "substantial equivalent" device on the market. – Know the impact of the FDA approval process on medical devices and the classifications for PACS and PACS components.

10.2 Dose Reporting: X-ray dose reporting has become a requirement in many locales. – Know about the different manners to export the dose and how to manage it. Similarly for contrast management.

10.3 Documentation Management: Paper documents such as previous reports, requisitions, release forms, lab results, etc. need to be digitized and managed. –Know the scanning technology, including OCR, scanning workflows and where and how to manage these documents.

10.4 Policies and procedures: A healthcare imaging and information management system requires many policies and procedures to operate effectively. These policies address downtime, maintenance, authorities (who is doing what), good practices, and many more. – Know the most important policies and procedures and how to manage them.

10.5 High Availability, Business Continuity and Data Recovery: A healthcare image and information management system is critical for the operation of a healthcare facility and its availability directly impact patient care. – Know the components needed to create a system that addresses the requirements for high availability, business continuity and data recovery.

