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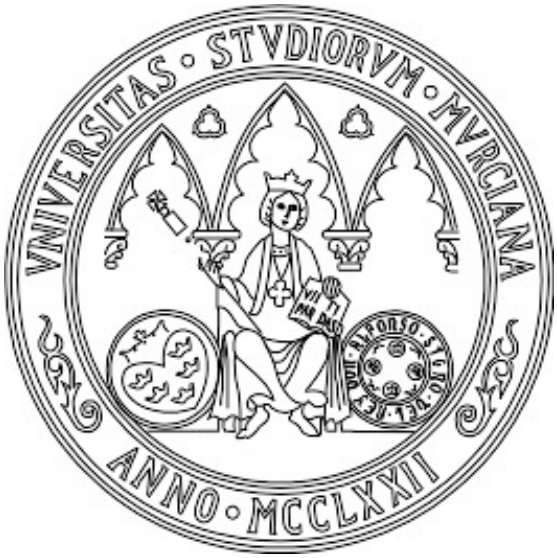
Quality Management in the Imaging Departments from Algarve Region: The Radiographers Perspective

Gestión de Calidad de los Departamentos de Radiología de la Región del Algarve: La Perspectiva de los Técnicos Superiores en Radiología

D. Rui Pedro Pereira de Almeida

2020



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TESIS DOCTORAL

Quality Management in the Imaging Departments from Algarve Region: The Radiographers Perspective

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Múrcia, 2020
Programa de Doctorado en Ciencias de la Salud

ACKNOWLEDGMENTS

To one of my supervisores, Full Professor - Doctor Carlos Alberto da Silva, for the constant encouragement, support and guidance throughout the development of this thesis, for his constant constructive criticism, and for all the knowledge he has provided me for a long time.

To Professor Doctor Zenewton Gama, also my supervisor, for his advice, for encouraging me to do more and better in order to improve and overcome all challenges, and for systematically sending me bibliographic resources of interest to this field of research.

My journey in the postgraduate research level started with the master's degree in “Quality management in healthcare facilities” from the Faculty of Medicine - University of Murcia, which provided me with knowledge and tools for a more efficient development of this work. As such, many thanks for all professors, colleagues and staff with whom I had the opportunity to meet and exchange enriching experiences. Especially to my tutor Maria Pilar and to Mariana Garrido for helping with all procedures over the past few years.

To all radiographers from the Algarve region, for the time they spent to participate in this study, thus contributing to a potential improvement of their professional practice and, consequently, to a better health care in this region that I appreciate so much.

To my friends and colleagues for their support and for understanding.

Many thanks to my family, my greatest emotional support, in so many ways. Especially to my lovely wife Roxane, to whom my thanks are unmeasurable and to my daughter Constança, who is still in her belly (looking forward to meeting you soon and thanking you for the added inspiration in the final writing of this thesis).

Ando to all those who, directly or indirectly, supported this long journey and who contributed to the achievement of this research work.

Thank you all!

ABSTRACT

Background and Purpose: The development of a valid and comprehensive framework for the assessment of quality of care requires the analysis of processes and procedures using several attributes/dimensions that are important in an imaging department. Despite being a complex process that involves different stakeholders, radiographers emerge as the key professionals who make the connection between the patient and the technology used in the imaging procedures. Therefore, this thesis aims to explore and analyse, the radiographer's perspective regarding the conditions for quality of care in the imaging departments and the respective use of evidence-based practices (EBP), as an essential means to deliver an excellent quality service to patients.

Methods and materials: A descriptive approach was used, supported by frameworks of healthcare quality and EBP and through the application of three paper-based questionnaires to assess the radiographer's perspective, who works in medium and large imaging departments from the Algarve region. A nonprobability sampling, chosen out of convenience was used as strategy to know more deeply the context of their clinical practice. A total of 101 radiographers from four different institutions were considered and a response rate of 61.4% was achieved. The questionnaire number 1 was addressed to evaluate the quality systems implemented in the departments under study, using the following dimensions: A - Quality policy (QP), B – Patient involvement, C – Standards, D – Human resources management (HRM), and E – Quality assurance (QA) and improvement activities. In addition, some overall aspects were used to assess the impact and satisfaction with the quality systems. In relation to the questionnaires number 2 and 3, both were used to study the EBP and information-seeking behavior by radiographers, respectively, through the following dimensions: G – Evidence-based actions, H – Significance of research activities, I – Support in research activities, J – Current use of research evidence in practice, K – Sources of evidence, and L – Knowledge of research.

Results: Significant differences were found ($p<0.05$) in several items from dimensions A (QP), C (Standards), D (HRM) and E (QA and improvement), as well as in the overall quality, overall image and overall organization and management, according to the radiographer's perspective from different imaging departments. However, differences were not verified in dimension B, since there is no involvement of patients in the quality systems from the perspective of most radiographers from all institutions, neither in the overall services provided. Through Exploratory Factorial Analysis the most revealing factors to take into account from the perspective of radiographers in relation to the Conditions for Quality of Care and EBP in imaging departments are the Organizational Capability to Quality of Care (Factor 1), Evidence-based

Radiology (Factor 2), Support for Information (Factor 3) and Patients Involvement (Factor 4), which explained 68.7% of the total variability.

Conclusion: The structure of "Conditions for Quality of Care and EBP model in imaging departments" is valid and translates the perspective of radiographers from their clinical practice in Algarve region. Patient involvement and support for information appear as two necessary requirements for an adequate organizational capability for the quality of care, which, together, constitute the necessary conditions for the proper use of Evidence-Based Radiology. In addition, the patient participation must be improved to increase the stage of quality systems development, which requires its inclusion in meetings with radiographers and quality committees, in the development of quality criteria, protocols and standards, and their participation in quality improvement processes and projects. Based on this model, a more specific knowledge about the intrinsic procedures of the medical imaging was obtained, which should be now considered in the establishment of strategic policies that better define the provision of diagnostic procedures and professional practices, based on quality systems established in accordance with the best scientific evidence available, systematically reviewed and aiming at better patient safety.

Keywords: Continuous improvement, Evidence-based radiology, Imaging department, Quality of care, Quality system, Radiographer.

RESUMEN EXTENDIDO

Contextualización y objetivos: El desarrollo de un marco válido e integral para la evaluación de la calidad asistencial requiere el análisis de procesos y procedimientos utilizando varios atributos / dimensiones que son importantes en un departamento de radiología. A pesar de ser un proceso complejo que involucra a diferentes partes interesadas, los Técnicos Superiores en Radiología emergen como los profesionales clave que hacen la conexión entre el paciente y la tecnología utilizada en los procedimientos de imágenes médicas. Dado que el Sistema Nacional de Salud de Portugal ha incluido en sus objetivos estratégicos de calidad de la atención médica una preocupación creciente con la cultura organizacional de mejora de la calidad, se necesitan registros de evaluaciones sistemáticas de los indicadores de calidad, especialmente en los departamentos que son reconocidos como esenciales para el diagnóstico clínico. Sin embargo, debido a la crisis económica en el país, asociada con una cultura organizacional inadecuada y una desalineación política entre los organismos centrales, la educación y los proveedores de servicios, ha habido una falta de evaluación sistemática de los sistemas de calidad, y no hay registros de medición de los indicadores de calidad asistencial en los departamentos de radiología en la región del Algarve (Cruz y Ferreira, 2012; Mateus, 2018; Simões, Augusto y Hernández-quevedo, 2017). Esta región se identifica como muy pobre en términos de atención médica, ya que los últimos informes publicados refuerzan las barreras experimentadas por la población para acceder a la atención hospitalaria (Simões et al., 2017; World Health Organization, República Portuguesa, & European Observatory on Health Systems and Policies. Final Report., 2018). En vista de lo anterior y que los principales objetivos estratégicos de un departamento de radiología deben garantizar procedimientos y procesos de acuerdo con las expectativas y necesidades de los pacientes, con base en la evidencia más reciente y en los principios subyacentes a la cultura organizacional de mejora de la calidad, que considera el compromiso e la participación de todas las partes interesadas dentro del departamento (Almeida et al., 2017), esta tesis tiene como objetivo principal explorar y analizar la perspectiva del Técnico Superior en Radiología con respecto a las condiciones para la calidad de la atención en los departamentos de radiología y el uso respectivo de prácticas basadas en evidencia (PBE), como un medio esencial para ofrecer un servicio de excelente calidad a los pacientes. Como objetivos secundarios, se definieron los siguientes: (1) caracterizar el sistema de calidad asistencial, su nivel de desarrollo y las actividades de mejora relacionadas en los departamentos de radiología de la región del Algarve, utilizando un instrumento de encuesta de evaluación y monitoreo; (2) analizar el comportamiento informativo y el uso de

PBE por parte de los Técnicos Superiores en Radiología durante su práctica clínica, y (3) analizar la influencia de PBE en la justificación y optimización de los procedimientos de imagen.

Metodología: Se llevó a cabo un enfoque descriptivo, respaldado por marcos de calidad de atención médica y PBE, mediante la aplicación de tres cuestionarios en papel para evaluar la perspectiva del Técnico Superior en Radiología, que trabaja en departamentos de radiología medianos y grandes de la región del Algarve. Se utilizó un muestreo no probabilístico, elegido por conveniencia, como estrategia para conocer más profundamente el contexto de su práctica clínica. Por lo tanto, se consideró un total de 101 Técnicos Superiores en Radiología de cuatro instituciones diferentes y se logró una tasa de respuesta del 61,4%. El cuestionario número 1 se dirigió a los Técnicos Superiores en Radiología con y sin responsabilidades en las tareas de gestión, para evaluar los sistemas de calidad implementados en los departamentos en estudio, utilizando las siguientes dimensiones: A - Política de calidad (PC), B - Participación del paciente, C - Estándares, D - Gestión de recursos humanos (GRH), y E - Garantía de calidad (GC) y actividades de mejora. Además, se utilizaron algunos aspectos generales para evaluar el impacto y la satisfacción con los sistemas de calidad. Para evaluar el nivel de desarrollo del sistema de calidad de los departamentos, se utilizó un modelo basado en los principios de Gestión de Calidad Total propuesto por Wagner et al. (1999) se utilizó, que considera cuatro etapas, a saber: etapa 0 (orientación para el cambio), etapa 1 (preparación para el cambio), etapa 2 (implementación de actividades de mejora de la calidad) y etapa 3 (establecimiento de la innovación). Con relación con los cuestionarios número 2 y 3, ambos se aplicaron al mismo tiempo que el cuestionario 1 y a los mismos participantes, y ambos se utilizaron para estudiar el PBE y el comportamiento de búsqueda de información por Técnicos Superiores en Radiología, respectivamente, a través de las siguientes dimensiones: G - Acciones basadas en evidencia, H - Importancia de las actividades de investigación, I - Apoyo en actividades de investigación, J - Uso actual de evidencia de investigación en la práctica, K - Fuentes de evidencia, y L - Conocimiento de investigación. Teniendo en cuenta que los fundamentos de la PBE no pueden disociarse del comportamiento de búsqueda de información, la aplicación de ambos cuestionarios pretendía establecer asociaciones potenciales e identificar áreas clave para la implementación de medidas de mejora relacionadas con la Justificación y Optimización de los procedimientos de imagen. Las encuestas se distribuyeron en las instalaciones de radiología mencionadas de la región del Algarve entre noviembre de 2018 y junio de 2019. Para el análisis estadístico descriptivo, uni, bi y multivariado se utilizó el programa estadístico IBM-SPSS® V.25. Para identificar la estructura del modelo de las" Condiciones para la calidad asistencial y PBE en

los departamentos de radiología" se utilizó el análisis factorial exploratorio con rotación *varimax*. Esto se logró a través de las dimensiones / factores extraídos del Análisis Factorial Exploratorio, para identificar los factores más importantes e identificar cuáles fueron las respectivas variables explicativas. Este estudio se realizó de conformidad con todas las consideraciones de investigación ética y de conformidad con la regulación general de protección de datos de la ley de la República Portuguesa.

Resultados: En este estudio, se encontraron diferencias significativas ($p < 0.05$) en varios ítems de las dimensiones A, C, D y E, así como en la calidad general, la imagen general y la organización y administración general, de acuerdo con la perspectiva del Técnico Superior en Radiología de los diferentes departamentos de radiología. Sin embargo, las diferencias no se verificaron en la dimensión B, ya que no hay participación de los pacientes en los sistemas de calidad desde la perspectiva de gran parte de los Técnicos Superiores en Radiología de todas las instituciones, ni en los servicios generales proporcionados. Además, a través del análisis de Pareto, se identificó una gran cantidad de defectos de calidad, especialmente en relación con las dimensiones B, D y A, que constituyen el 67.92% del total de defectos encontrados, por lo que deben considerarse prioritarios en las acciones de mejora, de acuerdo con el principio de Pareto. También se encontraron diferencias significativas en la perspectiva entre los Técnicos Superiores en Radiología con y sin tareas de gestión con respecto a los sistemas de calidad implementados y también relacionados con la importancia de las actividades de investigación. De acuerdo con las etapas propuestas por Wagner et al. (1999), los departamentos de este estudio se encuentran en una etapa de orientación y conciencia (etapa 0), donde no hay actividades sistemáticas para el control de calidad y la mejora de los servicios prestados. También se verificó que varios ítems de las dimensiones de PBE tienen correlaciones significativas muy fuertes ($p<0.05$) con la etapa de desempeño de los Técnicos Superiores en Radiología en el uso de bases de datos electrónicas, con cómo evalúan los resultados de su bibliografía, con la aclaración de dudas frecuentes en su práctica clínica, con el resultado obtenido de la información recopilada y con el impacto de esa información. A través del análisis factorial exploratorio, los factores más reveladores desde la perspectiva de los Técnicos Superiores en Radiología con relación con las condiciones para la calidad de la atención y la PBE en los departamentos de radiología son la capacidad organizacional para la calidad técnica de la atención (factor 1), la radiología basada en la evidencia (factor 2), Apoyo a la información (Factor 3) y participación de los pacientes (Factor 4). Se han cumplido todos los supuestos estadísticos para llevar a cabo la Análisis Factorial Exploratorio y se ha permitido reducir el número de dimensiones iniciales (11) a un total de cuatro factores, lo que explica el 68,7%

de la variabilidad total. Las nuevas cuatro variables latentes mantuvieron la integridad de las dimensiones iniciales, ya que el factor 1 solo contiene dimensiones del cuestionario 1 (actividades de garantía de calidad y mejora, gestión de recursos humanos, política de calidad y estándares). La única dimensión del instrumento de sistemas de calidad que quedó fuera de este factor 1 fue la dimensión B (participación del paciente), que se convirtió exclusivamente en el factor 4 después de la Análisis Factorial Exploratorio, con una varianza obtenida del 10.8%. Del mismo modo, el factor 2 se define por 4 dimensiones del instrumento PBE, a saber, la importancia de las actividades de investigación (H), el conocimiento de la investigación (L), las acciones basadas en evidencia (G) y el uso actual de la evidencia de investigación en la práctica (J). Y el factor 3 incluye las dos dimensiones restantes del instrumento PBE: fuentes de evidencia (K) y apoyo en actividades de investigación (I). Finalmente, con base en estos resultados, se diseñó un modelo conceptual para traducir las condiciones relacionadas con la calidad asistencial y la práctica basada en la evidencia en la práctica clínica de los Técnicos Superiores en Radiología

Conclusiones: La estructura del modelo de las "Condiciones para la calidad de la atención y PBE en los departamentos de radiología" es válida y traduce la perspectiva de los Técnicos Superiores en Radiología en su práctica clínica de la región del Algarve. La participación del paciente y el apoyo a la información aparecen como dos requisitos necesarios para una capacidad organizativa adecuada para la calidad de la atención, que, en conjunto, constituyen las condiciones necesarias para la implementación adecuada de la radiología basada en la evidencia. Además, se debe mejorar la participación del paciente para aumentar la etapa de desarrollo de sistemas de calidad, lo que requiere su inclusión en reuniones con los Técnicos Superiores en Radiología y comités de calidad, en el desarrollo de criterios, protocolos y estándares de calidad, y su participación en procesos y proyectos de mejora. Así, los Técnicos Superiores en Radiología parecen tener las condiciones previas necesarias para el PBE, aunque todavía no está implementado adecuadamente en sus departamentos. La creación de condiciones adecuadas para el desempeño de su práctica clínica con calidad técnica, basada en el conocimiento científico y en la implementación respectiva de los resultados de la investigación, puede contribuir a una mejor implementación del PBE, siendo esencial el uso apropiado de las fuentes de evidencia, el apoyo adicional en las actividades de investigación, e incluir al paciente como un elemento extremadamente importante en los sistemas de calidad. Con base en este nuevo modelo, se obtuvo un conocimiento más específico sobre los procedimientos intrínsecos de la radiología, que ahora deben considerarse en el establecimiento de políticas estratégicas que definan mejor la provisión de

procedimientos de diagnóstico y prácticas profesionales, basados en sistemas de calidad establecidos en de acuerdo con la mejor evidencia científica disponible, revisada sistemáticamente y con el objetivo de mejorar la seguridad del paciente.

Limitaciones y recomendaciones del estudio: La muestra se limitó geográficamente a los departamentos de radiología del Algarve y, por lo tanto, se debería emprender un enfoque más amplio en el futuro cercano. Sin embargo, fue la estrategia de muestreo más adecuada considerando las limitaciones temporales y financieras. La aparente falta de una cultura de calidad ha llevado a los Técnicos Superiores en Radiología a seleccionar a menudo la opción "No sé", mereciendo una mejor conciencia entre los profesionales en este asunto. Así, el hecho de que el estudio fuera puramente cuantitativo, basado en el análisis de perspectivas, proporcionó cierta inexactitud asociada y debería emprender un enfoque cualitativo complementario. El uso de grupos focales y entrevistas podría aportar información útil adicional, que podría ayudar a explicar algunas de las dudas que quedan en el presente estudio, ya que los nuevos factores obtenidos solo explican menos del 70% de la varianza total. El mismo análisis llevado a cabo en este estudio debería extenderse a las restantes partes interesadas (pacientes, radiólogos, asistentes operativos y técnicos), así como a la alta dirección (lo que podría agregar evidencia importante sobre la perspectiva política y de gestión). Los resultados de estos análisis holísticos deberían permitir mejorar la eficacia de los sistemas de calidad y las actividades respectivas de control de calidad y mejora. Dado que el tema de esta tesis trató de explorar las interacciones humanas a nivel de los departamentos de radiología y los datos de comportamiento respectivos nunca pueden ser completamente objetivos, lo que justifica la varianza total en el modelo de análisis factorial exploratoria por debajo del 70%. En cualquier caso, nos permitieron obtener un modelo válido que ahora debería ser objeto de estudios posteriores utilizando metodologías complementarias. La implementación de mecanismos de auditoría clínica también es esencial, no solo porque permiten el cumplimiento de los requisitos legales, sino sobre todo porque son una herramienta eficiente de mejora de la calidad. Este poderoso instrumento, que se complementa con nuevas auditorías, permite la identificación sistemática de áreas focales para la mejora, proporcionando una mejor calidad de atención, un uso eficiente de los recursos e identificación de las necesidades de capacitación y educación dentro del departamento de radiología. Además, la implementación de esta herramienta demostrará el compromiso del departamento con la seguridad y las necesidades del paciente, con base en los principios subyacentes del PBE.

Palabras clave: Mejora continua, Radiología basada en evidencia, Departamento de radiología, calidad de la atención, sistema de calidad, Técnico en Radiología.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACSA (Modelo Nacional de Acreditação em Saúde)

AHRQ (Agency for Healthcare Research and Quality)

ALARA (As Low as Reasonably Achievable)

CT (Computed Tomography)

DRL (Diagnostic Reference Levels)

EBP (Evidence-based practice)

EBR (Evidence-based radiology)

EFA (*Exploratory Factorial Analysis*)

EFQM (European Foundation for Quality Management)

EQF (European Qualification Framework)

EQS (Evaluation of Quality Systems)

ESR (European Society of Radiology)

FA (Factor analysis)

HRM (Human resources management)

IAEA (International Atomic Energy Agency)

ICRP (International Commission on Radiological Protection)

ISO (International Organization for Standardization)

IBR (Information-seeking behavior in radiology)

JCAHO (Joint Commission on Accreditation of Health Care Organizations)

KMO (*Kaiser-Meyer-Olkin)*

NHS (National Health System)

QA (Quality Assurance)

QI (Quality Improvement)

QP (Quality Policy)

QMS (Quality management system)

RH (Research hypotheses)

RQ (Research questions)

TQM (Total Quality Management)

WHO (World Health Organization)

CHAPTER I – INTRODUCTION

1.1. Background and Justification

The healthcare provision which promotes quality and safety requires organizational structures that have support resources focusing on continuous improvement and adapting systematically their standards and practices in function of the best available scientific evidence (Furnival, Boaden, & Walshe, 2017; Zygmont et al., 2017).

In the current context of change, the relevance of quality issues in the organizational healthcare facilities requires a rigorous and systematic investigation of the multiple actors involved in the healthcare service delivery process (patients, providers, middle managers and top managers), as they are often underestimated, even in hospitals and departments with accreditation and certification systems (Aggarwal, Aeran, & Rathee, 2019; Alijanzadeh et al., 2016; Saturno, 1995). In this field, research emerges as a current need to recognize the problems, key barriers and facilitators with influence on the quality of care provided in the healthcare organizations (Kisembo et al., n.d.; Sommerbakk, Haugen, Tjora, Kaasa, & Hjermstad, 2016; Torrens et al., 2020).

Since there is a lack of evidence in relation to the measurement and evaluation of those that should be the main elements to take into account when defining healthcare policies (patient safety, quality perception and patient satisfaction, continuous quality improvement, certification and accreditation processes based on evidences), additional efforts and studies must be carried out with the inclusion of such elements (Alkhenizan & Shaw, 2011; Busse, Klazinga, Panteli, & Quentin, 2019; Fadlallah et al., 2019; Langlois, Straus, Jesmin, King, & Tricco, 2019; Pomeroy & Sanfilippo, 2015; Soulis et al., 2015).

These concerns are even more notorious in the specific case of Radiology/Imaging departments, as the literature reveals little evidence of studies involving the measurement of quality issues and quality management in the several imaging modalities (ultrasound, general radiology, computed

tomography, magnetic resonance, among others) (Kruskal et al., 2011; Papp, 2019; Staver & Caramella, 2018).

It is notorious that studies carried out related to healthcare quality management mostly consider hospital organizations globally, not differentiating the various departments and services that constitute them individually. It is certainly true that stakeholders do not use or evaluate all types of services and departments in the same way, as they transcend different realities (Al Khamisi, Khan, & Munive-Hernandez, 2018; Alijanzadeh et al., 2016; Sower, JoAnn, William, Kohers, & Jones, 2001; Taner & Antony, 2006). Although there are some specific studies in the field of quality, in fact most of them only focus on very concrete aspects without performing an multidimensional and holistic approach to the quality of care (De Man et al., 2002; Mamede, Gama, & Saturno-Hernández, 2017; Tilkemeier, Hendel, Heller, & Case, 2016). Therefore, it is pertinent to investigate individually each type of department in a hospital setting, as well as individual facilities which are external to hospital units, such as private clinics.

Nowadays, a rigorous and coherent technical and scientific interaction of healthcare professionals with the patient (as the central element of the national healthcare service), is increasingly necessary. In this context, it is essential to point out that the provision of care to the patient underlies the technical quality and functional quality (Reardon & Davidson, 2007; Yesilada & Direktor, 2010). The technical or internal quality is defined according to the technical rigor of the diagnostic procedures or the compliance with professional specifications while the functional or external quality concerns how the service is provided to the patient (Lam, 1997; Yesilada & Direktor, 2010). However, most patients can only perceive and evaluate the functional quality, since they do not have knowledge, literacy or information necessary to effectively assess the quality of the diagnostic or the therapeutic process (Bowers, Swan, & Koehler, 1994; Yesilada & Direktor, 2010).

Given the above, it can be seen that most patients can only perceive and evaluate functional quality, while other stakeholders in the healthcare process,

within their intervention areas, can perceive and evaluate the internal or technical quality.

But what is known about quality in an imaging department? The original definition of quality of care was set by the IO (Institute of Medicine) as "*the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge"* (Institute of Medicine (US) Committee to Design a Strategy for Quality Review and Assurance in Medicare, 1990, p. 21), and later adapted to the imaging department:

> *"Specifically, with regard to diagnostic imaging and image-guided treatment, quality is the extent to which the right procedure is done in the right way, at the right time, and the correct interpretation is accurately and quickly communicated to the patient and referring physician. The goals are to maximize the likelihood of desired health outcomes and to satisfy the patient*" (Hillman, Amis, & Neiman, 2004, p. 34).

Thus, the quality of the final product that is obtained in a radiological procedure consists of accurate diagnostic images obtained with radiation exposure levels to all risk factors as low as reasonably possible, and at minimal real cost (Erturk, Ondategui-Parra, & Ros, 2005). Repeated exposures and the application of excessive radiation doses "should be avoided due to poor image quality" (p. 393) (in the first scenario) and malpractices (in both scenarios) as it increases costs to the department and compromises patient safety (Almeida, Gama, Saturno-Hernandez, & da Silva, 2017).

Besides that, may decrease the accuracy and performance of imaging procedures and it can also cause dissatisfaction of patient, physicians, radiographers, radiologists and for the department and institution itself (Almeida et al., 2017; Blackmore, 2007; Erturk et al., 2005; Felício & Rodrigues, 2010).

The absence of dose optimization practices it's even more worrying in pediatric patients due to their increased radiosensitivity, in which an efficient approach is mandatory for optimizing practices and improve patient safety (Arthurs & Bjørkum, 2013; England, Azevedo, Bezzina, Henner, & McNulty, 2016;

European Society of Radiology (ESR) & European Federation of Radiographer Societies (EFRS), 2019).

It should also be noted that, among all available diagnostic imaging techniques, computed tomography (CT) has contributed the most to medical exposure to ionizing radiation, representing 66% of the effective collective dose in the United States of America, 47% in the United Kingdom and 60% in Germany (Power et al., 2016; Schauer & Linton, 2009; Shrimpton, Hillier, Meeson, & Golding, 2011). This is explained by the fast-technological advancement of CT equipment's and its massive and uncritical use, even if in some cases there are other less "invasive" diagnostic and therapeutic procedures. Therefore, the choice is not based on the best available scientific evidence, disregarding the fundamental principles of imaging examinations: "Justification[1]" and "Optimization[2]".

In addition, this number will continue to grow due to the emergence of new equipment's with new technologies and the increasing number of imaging devices worldwide (Almeida et al., 2017; Teles et al., 2012; UNSCEAR, 2010). Thus, there should be an increased concern with the quality of this kind of exams, being relevant the optimization of the procedures performed since they influence the overall quality and safety of imaging departments.

Given the above, considering the multiple fields of intervention in this area, and in order to define the research problem, **there is a deep need to study and understand the aspects involved in technical and functional quality**, considering the quality attributes/dimensions[3] in the imaging departments from the perspective of the various actors (managers, including radiographers with

[1] Justification principle: 'any decision that alters the radiation exposure situation should do more good than harm" (ICRP, 2007, p. 14).

[2] The principle of optimization refers that exposures to radiation "should all be kept as low as reasonably achievable" (ICRP, 2007, p. 14). "Optimization is a multidisciplinary task involving the medical physicist, radiologist, radiographer, hospital or vendor engineer and department management" (Dance, Christofides, Maidmend, MsLean, & Ng, 2014, p. 590), and "implies that measures will be taken to reduce exposures until the benefits of further reductions do not justify their cost" (Sumner, Hu, & Woorward, 1997, p. 10).

[3] The dimensions of Quality of Care are several according different studies but the most used are: "Effectiveness; Efficiency; Access; Safety; Equity; Appropriateness; Timeliness; Acceptability; Responsiveness; Satisfaction; Health; Improvement; Continuity" (Frija, 2015; Towbin, 2018).

management tasks; healthcare service providers, as radiographers; and patients). **In an imaging department, the development of a valid model for the assessment of quality of care involves the analysis of processes and procedures related to the technical quality based on scientific evidences**, in order to continually improve.

For those attending the imaging department services (patients), the ability to produce diagnostic image quality, by itself, is not a sustainable and measurable indicator that provides real outcomes regarding the quality of service and satisfaction. Thus, it would be necessary to develop a valid and comprehensive model regarding the evaluation and measurement of all quality attributes/dimensions that are considered important in an imaging department. Since the development of this model is a very complex process and requires, in the first place, to know the internal phenomena (technical quality) underlying the professionals who perform these diagnostic procedures (providers/radiographers), the component of functional quality will not be focused in this work.

In Portugal, the National Health System (NHS) has included in its strategic objectives of healthcare quality, a growing concern with the quality culture and its continuous improvement in public institutions (Direção-Geral da Saúde, 2015; Escoval & Fernandes, 2010). In these, imaging departments are assumed to be units of high importance in an organizational network healthcare structure, since their contribution to clinical diagnosis is essential (Almeida et al., 2017).

However, due to the economic crisis in the country, associated with an inadequate organizational culture, and a political misalignment between central bodies, education and service providers, there has been a lack of systematic assessment of the quality systems, and there is no record of measuring quality of care indicators in imaging departments from the Algarve region (Cruz & Ferreira, 2012; Mateus, 2018; Simões, Augusto, & Hernández-quevedo, 2017). This region is identified as very poor in terms of healthcare as the latest published reports reinforce experienced barriers by population in accessing

hospital care (Simões et al., 2017; WHO, República Portuguesa, & European Observatory on Health Systems and Policies, 2018).

Nevertheless, there are studies indicating that quality improvement (QI) can be achieved through an internal approach to the quality systems (formal or informal), with the participation of the professionals themselves involved in the healthcare process, without any additional monetary costs (Cameron et al., 2018, 2010; Mamede et al., 2017; Saturno, 1995). Even the World Health Organization (WHO) in the report "*Delivering quality health services: A global imperative for universal health coverage*" mentions the need to implement QI at all levels of the health system, since "there are gaps globally in all the domains of quality health services. These gaps present opportunities to improve the quality of care" (World Health Organization, Organisation for Economic Co-operation and Development, & The World Bank, 2018, p. 37).

Given the above and considering that the main strategic objectives of an imaging department should ensure procedures and processes in accordance to the patients' expectations and needs, based on the latest scientific evidence and on the principles underlying the organizational culture of QI, which considers the involvement and commitment of all stakeholders inside the department (Almeida et al., 2017), studies that address the quality of care in imaging departments, in an integrated and multidimensional way, should be developed.

To this end, through a descriptive approach, the present thesis was supported by frameworks of healthcare quality and evidence-based practice (EBP), through the application of three different instruments to the Radiographers who work in the imaging departments mentioned above.

1.2. Objectives, Research Questions and Hypotheses

After defining the research problem, to evaluate the quality of care level in the imaging departments and whether the procedures implemented are the most appropriate, based on EBP, and based on continuous QI policies, several research objectives, questions and hypotheses were set.

Therefore, the main goal of the present research was:

- To analyse, in an integrated and multidimensional way, the conditions related to the quality of care and evidence-based practice in the clinical practice of radiographers.

As specific objectives, the following were defined:

1) To characterize the healthcare quality system (formal or informal), its developmental stage and related improvement activities in imaging departments of the Algarve region using an assessment and monitoring survey instrument;
2) To analyse the informational behavior and the use of EBP by radiographers during their clinical practice;
3) To analyse the influence of EBP on justification and optimization of the imaging procedures.

To achieve these aims, some research questions (RQ) were addressed:

RQ1 – How do radiographers evaluate the quality systems of their imaging departments?
RQ2 – In the radiographers' perspective, what is the overall quality, image, organization and management, and services provided by imaging departments?
RQ3 – Which quality dimensions should be considered a priority in the establishment of improvement activities and policies?
RQ4 – What are the preconditions of radiographers' for EBP?
RQ5 – What are the radiographers' informational needs in the clinical practice?

RQ6 – There are associations between the use of EBP by radiographers during their clinical practice and the justification and optimization of the imaging procedures?

RQ7 – In the radiographers' perspective, what are the main attributes that should be considered as the conditions for Quality of Care and EBP in the imaging departments?

Regarding the research hypotheses (RH), the following were defined:

RH1 – Radiographers from different imaging departments equally evaluate their quality systems.

RH2 – Overall quality, image, organization and management, and services provided are assessed equally by radiographers from different imaging departments.

RH3 – There are no differences in the perspective between radiographers with and without management tasks regarding the implemented quality systems and the use of EBP.

RH4 – There are associations between the informational behavior and the use of EBP by radiographers during their clinical practice, namely on the justification and optimization of the imaging.

RH5 – There is a valid model which explain the Conditions for Quality of Car and EBP in the imaging departments, from the radiographers' perspective.

1.3. Thesis Structure

The present thesis is structured following the traditional phases of a research study:

Chapter 1 – Introduction: A brief approach to this research is carried out, which includes the main arguments and studies that its need, as well as the general and specific objectives. The established research questions and hypotheses are also presented.

Chapter 2 – Literature Review: The main evidence in this field of intervention is included, with an emphasis on the quality of care and EBP concepts related.

An overview of the main studies is provided, as well as their potential implications for improving quality and patient safety in imaging departments.

Chapter 3 – Materials and Methods: The adopted methodological procedures are presented and justified, including sampling, the characterization of the questionnaires and their variables, ethical considerations, and the statistical analysis protocols adopted to answer to the formulated research hypotheses.

Chapter 4 – Results: Presents the main results from the surveys. The overall results are presented following the order of the applied questionnaires, including all the statistical analysis included in the methodology.

Chapter 5 – Discussion: The main results are compared with the studies published in the literature following the SQUIRE[4] methodology. Thus, the key findings, their comparison with data from other studies, the identification of potential divergences and the respective impact on practice, as well as the main limitations of the study are presented here.

Chapter 6 (Conclusions): The main conclusions and their implications are included here. The contributions that the work adds to this area of knowledge, as well as the future recommendations and suggestions for improvement, are also mentioned.

[4] *Standards for Quality Improvement Reporting Excellence*

CHAPTER II – LITERATURE REVIEW

2.1. Quality of Care and Quality Management Systems in Healthcare Facilities

Over the years, the word "Quality" has taken on different meanings depending on who defines it and to whom it applies, but in the specific case of healthcare services, it is important to highlight that the current paradigm is to provide patient-centred quality of care and the healthcare systems increasingly implement new strategies focused on patient-centred care (Archer, 2016; Bokhour et al., 2018; Fix et al., 2018).

Regardless of the care culture in different organizations and countries, there are two published definitions of quality of care that are recognized and adopted worldwide. One of them was mentioned previously in the introduction chapter and was set by the Institute of Medicine Committee on Quality of Health Care in America (2001), which define it as “safe, effective, patient-centered, timely, efficient and equitable” (p. 21). Since then, different initiatives to develop and implement models with multiple dimensions of quality have been carried out, and the most recent design includes, in addition to the six dimensions previously mentioned, a new dimension called “integration” (World Health Organization et al., 2018). This intends to include an adequate coordination between different services/departments in a perspective of continuity of care, where it is most appropriate for the patient at every moment. In this way, “high-quality health care is the right care, at the right time, in a coordinated way, responding to the service users’ needs and preferences, while minimizing harm and resource waste” (World Health Organization, Organisation for Economic Co-operation and Development, et al., 2018, p.32), and this is the path to be followed that should improve the quality of care and the patient's outcomes.

Other definition of quality of care was established by the Agency for Healthcare Research and Quality (AHRQ), “*as doing the right thing for the right patient, at the right time, in the right way to achieve the best possible results*” (AHRQ *cit* in Al Khamisi, Khan, & Munive-Hernandez, 2018, p. 3). This definition, although

adapted for imaging departments, was also referred to in the introduction chapter.

In a perfect scenario, all healthcare organizations in the world should provide quality of care with high standards, centered on the patient, with respect for their needs and expectations, and in a safe environment. However, we know that different economics, policies, population size and many other factors affect the quality of care provided. Thus, World Health Organization (WHO) highlights 10 measures to be adopted for quality improving in healthcare facilities, namely (WHO, 2017):

1. Right care provided at the right time;
2. Essential care for newborns immediately after birth;
3. Adequate facilities to care for small and sick babies;
4. Preventive care for nosocomial infections;
5. Healthcare facilities with an appropriate physical environment;
6. Communication with patients and their families must be effective and according to their needs;
7. Patients should be properly referred without delay;
8. No one should be subjected to harmful practices while providing healthcare;
9. Health professionals must have adequate training and be motivation and availability to provide patient care;
10. Medical records must be complete, accurate and standardized.

Through these measures, we can question whether the several institutions and services, including in Portugal, have considered them in the establishment of quality policies.

And what about the imaging departments specifically? To answer this question, we can find in the scientific literature several documents that refer to the special care that we should take into account, especially when patients are pregnant, newborns or children; about infection control measures; about the most appropriate physical environment in the imaging rooms; about the right communication strategies between the patient and radiographer; about the

need to perform the most appropriate and timely imaging procedures; and the need for well-trained and motivated professionals who use the best scientific evidence available to provide the most appropriate care (Abrantes et al., 2020; Conselho da União Europeia, 2014; Linet et al., 2012; Chandra R. Makanjee, Bergh, & Hoffmann, 2015; Nyirenda, Williams, & Ham-Baloyi, 2019; Olisemeke, Chen, Hemming, & Girling, 2014; Schwartz, Panicek, Berk, Li, & Hricak, 2011; van den Berg, Yakar, Glaudemans, Dierckx, & Kwee, 2019).

Therefore, scientific evidence is available and, imaging departments in particular, can implement several strategies to improve the quality in accordance with WHO priority measures. But we will look at this more deeply in the next sub-chapter. For now, we will continue to focus on the overall aspects of the quality in general healthcare services and facilities.

2.1.1. Emerging Quality Policies in the National Health System

The last *Health at a Glance* 2018 and 2019 reports, which present the most recent data on the health status of populations, quality of care delivered, performance of healthcare systems and access to healthcare, help us to understand which quality policies must be defined, aiming to improve the patient health outcomes (OECD/EU, 2018; OECD, 2019).

According to these reports, when analyzing the evolution of the indicators over the time, several positive trends are observed in Portugal. Thus, with regard to life expectancy, Portugal appears slightly above the OECD average at 81.5 years (OECD average is 80.7), and with a 180 avoidable deaths per 100 000 people against 208 deaths of average in OECD. However, Portugal appears with higher numbers with respect to self-rated poor health (13.6% above 15 years old), chronic disease morbidity of 9.9%, people living with two or more chronic diseases with 42.2%, high liters of alcohol consumed per capita (10.7) and overweight/obese population (67.6%). These data, associated with an aging population (21.5% of the Portuguese population has 65 years old and over), point to a need to ensure adequate access and continued care in the Portuguese NHS.

As a result of the changing demographics in Portugal, the sustainability of the NHS will be put under pressure and the decision makers will have to change the thinking about the provision of health care and to establish new quality policies, which allow an adequate response to the patient's needs and avoiding inequality and social injustice (Kleinert & Horton, 2017).

Portugal seems to have good indicators in relation to safe prescribing of antibiotics, good effective primary care and good effective cancer care (OECD, 2019). And, if on the one hand it appears in the third position, in the total of 45 countries, in relation to the indicator "total number of doctors per capita", on the other hand there seems to be less health spending per capita (less investment), less number of other health professionals and high differences in the doctors density between urban and rural regions.

Besides that, the absence from work due to illness has been increasing in Portugal in the last years, from 6.2 days lost per person per year in 2013 to 7.6 in 2017 (OECD.Stat, 2020). Thus, the data presented previously, associated with the significant increase of people with multiple and chronic pathologies that demand an unquestionable complexity of care, led the Portuguese Government to stress the need to modify quality policies focused on health promoting and disease prevention (Ministério da Saúde, 2018).

This need for change is also highlighted in the XXI Constitutional Government's Program 2015-2019), where they state that the crisis and the weak definition of policies, led to poor management of health resources and serious problems in access to care (Governo Constitucional, 2020). Thus, in order to reverse this situation, the Portuguese government says that it is necessary to respond better and faster to the patients' needs, simplifying access and expanding the response capacity in the several health specialties.

In this context, diagnosis and therapy procedures are also highlighted, and which must have the necessary resources (staff and equipment's) so that they can give an effective response (Ministério da Saúde, 2018). To achieve better health outcomes, preventive strategies, the provision of quality and safe care for the patient and better communication and proximity to citizens are needed

(Governo Constitucional, 2020). In addition, healthcare providers need to examine their knowledge continuously, in order to promote the valorization of health professionals and to foster new models of cooperation and division of responsibilities between different health professions (Kleinert & Horton, 2017; Serviço Nacional de Saúde, 2020).

To achieve these goals, health technology assessment organizations and policy makers should work in close collaboration, in the delimitation of new management models focused on transparency and accountability, that allow the effective health care with quality (Kleinert & Horton, 2017).

2.1.2. Clinical Governance

The current governance models of the healthcare organizations, when applied to imaging departments, aim to maximize the effectiveness and efficiency of processes and imaging procedures, minimize the occurrence of errors and promote continuous QI in the services provided (Seckler, Regauer, Rotter, Bauer, & Müller, 2020). This must be the model for achieving facilities of excellence based on principles of accountability and transparency, which are two key concepts of clinical governance models.

The Clinical Governance model was introduced in the United Kingdom in 1997 and emerged as a measure to be implemented in the English NHS, to ensure quality of care with high standards (Department of Health, 1998). This system was created to modernize and promote QI in the NHS, by ensuring compliance with clinical standards and continuous improvement of processes, supported by new legal quality requirements in the NHS:

> *"a new system of clinical governance in NHS Trusts and primary care to ensure that clinical standards are met, and that processes are in place to ensure continuous improvement, backed by a new statutory duty for quality in NHS Trusts"* (Department of Health, 1997, p. 25).

Additionally, it also refers to the need to develop primary care, through the sharing of skills and competences, continuous professional development, clinical audit and peer review, quality assurance (QA) and control, and the

proper and effective implementation of resources (Department of Health, 1997; Specchia et al., 2010; Wilson, 1998).

Subsequently, the document “A First Class Service - Quality in the new NHS” emerges in 1998, which characterizes the Clinical Governances as “a framework through which NHS organizations are accountable for continuously improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish” (Department of Health, 1998, p. 3).

Beyond the organizational dimension, it also introduces the concept of “accountability”. The definition and creation of national standards but with responsibility for application at the local level should be supported by consistent control mechanisms, and through joint work between the department of health and the healthcare professionals, aiming at the local guidance of decisions (Department of Health, 1998). However, this approach should not be considered as a simple and easy activity, and its underlying principles must be integrated at all levels and by all stakeholders of health organizations, with the involvement of users/patients, so that the improvement is fully successful, and with effective intra and inter-organizational communication (Lugon, 2005).

Therefore, it is possible to verify that the attribution of responsibilities will be addressed together with the accountability for performance, and it is also easy to see that the concepts of “Clinical governance” and “Quality” are inextricably linked (Flynn, 2002). Over the years, the evolution and transformation of the quality of care concept, reveals the definition of Clinical Governance as a means of requiring healthcare organizations to have greater control and accountability over the quality of their own processes, aiming at continuous improvement and quality of excellence (Bunch, 2001; Price et al., 2020).

Among the different types of organizations, the hospital structure represents the one that makes the most intensive resources usage (human, technology, capital and knowledge), therefore needing a management framework with its government bodies and a team of managers (Observatório Português dos Sistemas de Saúde, 2008, 2019). At the same time, it plays a fundamental role

in the context in which it is inserted, related to the provision of healthcare and, consequently, with the responsibility it has towards the Government in the direct provision of healthcare, but also in the promotion, prevention and protection of health (Observatório Português dos Sistemas de Saúde, 2008, 2019).

Thus, it is relevant to note that in organizations providing healthcare services, the concept of governance has been used systematically, despite being more oriented towards aspects of clinical practice (clinical governance) and issues based on relationships established between the governing bodies (integrated governance and hospital governance), based on the principles underlying the corporate governance (du Plessis et al., 2012; Raposo, 2007).

In Portugal, the Portuguese Observatory of Health Systems has carried out an annual analysis of health governance based on the WHO assumptions, aiming at the development of health systems in a culture of governance and using instruments of influence that establish an interconnection between the objectives of health policies with the devices that regulate the distribution of healthcare resources, the organizational management devices, the horizontal networks that influence performance and ensure quality, and the competitive mechanisms of the healthcare market (Observatório Português dos Sistemas de Saúde, 2019; Raposo, 2007).

Currently, clinical governance emerges as a system to improve the clinical standards and practices of services / departments, based on EBP principles, clinical audit, patient involvement, clinical monitoring, risk management, education and training, and professional development, improving quality of care and ensuring that professionals are accountable and responsible for their own acts during the clinical practice (Department of Health, 1998; Rawlins & Donaldson, 2018; Starey, 2003; WHO, 2004).

According to Barros (2010), clinical governance continually improves quality, the promotion of high performance standards, transparency, accountability and the promotion of high satisfaction levels of users and professional fulfillment, addressing dimensions as “safety, efficiency, effectiveness, equity, accessibility, continuity of care and respect”. So, in summary, Clinical

Governance model allows healthcare institutions to be responsible for monitoring and systematically improving their quality, by maintaining high standards in all clinical departments.

2.1.3. Total Quality Management

Regarding the quality management models currently established, it should be remembered that in the early days of the English NHS (after the II World War), quality management was seen in a paternalistic way, it was implicit and was ensured by the skills and training of professionals, and users were merely seen as passive subjects in the health care provision process (Rawlins & Donaldson, 2018).

Important individuals in the industrial quality management framework were adding values and new concepts, and healthcare services were implementing some of these ideas. Deming defined the quality of the product or service as meeting the customer's needs, in a measurable way, guaranteeing their satisfaction and in a way that they are willing to pay for the product or service (Deming, 1986). In addition, he dedicated himself to the process of continuous QI, through a systematic problem-solving approach, known worldwide as Deming or PDCA (Plan, Do, Check, Act) cycle (Ribeiro, Ribeiro, & da Silva, 2019).

Likewise, Juran also made an important contribution to improving healthcare quality, by identifying some key concepts such as identifying service needs, establishing action plans, implementing corrective measures and monitoring (Juran, 1988). But its greatest contribution is mainly due to the trilogy of activities/processes: (1) Quality planning, (2) Quality monitoring / control and (3) Quality improvement cycles, which are essential for quality management and continuous improvement. Similarly, Crosby has a focus on prevention activities, arguing that quality initiatives must come from top to bottom management and that professionals must be trained to use QI tools (Crosby, 1979).

However, major changes appeared due to the work developed by Avedis Donabedian (1960s), in transposing the quality models of the industrial sector to a unified model in the healthcare sector, based on the triad: structure, process and results (Best & Neuhauser, 2004; Rodkey & Itani, 2009). In this model, the structure includes the configurations of the healthcare unit (facilities, equipment, professionals and resources), the process refers to the set of activities that professionals perform for users (how they are technically delivered) and the results refer to healthcare outcomes, associated costs and user satisfaction (Ayanian & Markel, 2016; Sousa, 2010).

In subsequent years, several approaches to the quality of care concept emerged (quality of healthcare services, quality assessment, QA and quality control), but the essence of Donabedian's Quality triad still exists today, focusing mainly on the analysis of results, which should be taken into account in all its dimensions, in a process of clinical governance (Arah, Custers, & Klazinga, 2003; Ayanian & Markel, 2016; Vuori, 1982).

The paradigm of quality management with production-oriented, adopted since the industrial revolution was implemented by healthcare facilities, which adapted the concept to a paradigm of patient-oriented, and, as such, quality management is increasingly an important issue in healthcare organizations (Gottwald & Lansdown, 2014). Although it always has to incorporate the necessary adaptations due to the special services provided, since patients cannot be compared to customers from other kind of services.

The principles underlying Total Quality Management (TQM) are also important to highlight, as they continue to be an important contribution to improving quality. Its concept consists of "a firm-wide management philosophy of continuously improving the quality of the products/services/processes by focusing on the customers' needs and expectations to enhance customer satisfaction and firm performance" (Sadikoglu & Olcay, 2014, p. 1).

Such TQM model intends to promote positive changes to seek continuous improvement, especially through the use of scientific data in the decision-

making process, and involving all stakeholders in the management process (Wan & Connell, 2003).

Despite the several tools associated with the evaluation of quality management systems (QMS), we must consider that their integration is influenced by the "type of quality" that we intend to evaluate at each moment, given the ambiguity of the quality concept in healthcare organizations, as it involves the perceived quality of the service provided (determined mainly by patient satisfaction), but also the technical quality (determined and evaluated by health professionals) (Aggarwal et al., 2019).

The application of the TQM principles are fundamental for a proper and effective implementation of QMS with the objective of providing high quality of service and to measure it (Sadikoglu & Olcay, 2014). The quality assessment, in healthcare organizations committed to continuous QI, can be done through several tools, including the Deming cycle that we mentioned earlier (Buetow & Roland, 1999). For that, it is necessary to have adequate staff to define objectives, define quality goals, identify innovative ideas and test changes in real healthcare settings (Buetow & Roland, 1999; Ribeiro et al., 2019).

Since it is a program aimed at all the direct and indirect processes that constitute health organizations (including diagnostic services), obviously, radiographers must assume their role and contribute to the successful implementation of such programs in their departments, in collaboration with the quality departments (Aggarwal et al., 2019).

Currently, several conceptual frameworks and models of QMS are essentially based on internationally recognized models [5] (Almeida, Gama, Saturno, & da Silva, 2019; Carbal, Colaço, & Guerreiro, 2001; Rodríguez, 2011). In Portugal, a new model called the "*National Health Accreditation Model"* (ACSA model) was recently adopted, which is in line with the "*National Strategy for Quality in Health"* and with the management plans and tools that are being developed,

[5] Such as EFQM (European Foundation for Quality Management), ISO (International Organization for Standardization), JCAHO (Joint Commission on Accreditation of Health Care Organizations), and King's Fund Organizational Audit (Almeida, Gama, Saturno, & da Silva, 2019; Carbal, Colaço, & Guerreiro, 2001; Rodríguez, 2011).

aiming at continuous improvement of the Portuguese NHS, namely, the clinical management, process management, competence management and knowledge management (Estratégia Nacional para a Qualidade na Saúde, 2016; Ministério-da-Saúde, 2009). So, it constitutes the official and reference model for the NHS facilities.

This ACSA model carries out an approach by TQM through a certification process directed to the different areas that constitute health system, namely, hospitals and hospital centers, services or clinical management units, functional units, research centers, continuous training centers, among others (Departamento da Qualidade na Saúde & Direção-Geral da Saúde, 2014). The quality dimensions considered in this model are based in the citizen (in the centre of the health system), patient-centred care, professionals, support processes and outcomes.

However, adopting one of these quality management systems does not mean that the services provided are in fact of quality, since it requires having necessary resources to provide these services, to access and monitor the processes and to improve quality, in order to keep up with the growing level of demand from professionals and patients (Almeida et al., 2019). Anyway, it is a fact that these systems tend to have a better focus on the different components of institutions and services, and that a formal QMS is an almost mandatory requirement for the introduction, implementation and monitoring of QA activities (Ribeiro et al., 2019).

The complexity of QMS in healthcare facilities and their implementation, requires a balance between the three fundamental aspects mentioned by Donabedian (Structure, Process and Outcome), where the involvement of professionals can be essential.

Besides that, the importance of systematic evaluation of the QMS implemented allows to identify the most problematic areas, the stage of development of the system, and also to compare the different services and institutions, in a perspective of mutual and constant learning (Ribeiro, 2018; Wagner, De

Bakker, & Groenewegen, 1999). In this sense, this investigation is intended to be an added contribution in the specific field of diagnostic imaging.

2.2. Quality and Safety in the Imaging Departments

An increase in the knowledge and skills of radiographers has been seen in European imaging departments and, at the same time, an increase in the expectations of these professionals within organizations, especially regarding their autonomy and a more differentiated professional and social recognition (da Silva et al., 2018).

This increasing autonomy is due, on the one hand, to the creation of leadership and management positions with their own legislative content, and, on the other hand, to the scientific content applied to the clinical practice of radiographers. The scope of more fields of knowledge and the deepening of more specific content, has contributed for the development of radiographer profession. Also, the inclusion of radiographers in the quality management teams and their respective involvement in certification processes and in the definition of quality policies, has created a strong dependence of health care organizations on these professionals (Lau & Ng, 2015).

Due to the nature of imaging departments, quality and safety topics have specific components that are not observed in other services and departments, as they have the particularity of performing procedures that involve the application of ionizing radiation, in most cases (ICRP, 2007). Within the complexities of these procedures, the patient's inability to choose the best procedure stands out, leaving the healthcare professionals involved to select the best patient-centred procedure, with the application of the most effective and efficient protocol depending on the patient clinical situation, based on the available evidence and applying the lowest radiation dose possible.

In this sense, the *Royal College of General Practitioners*, the *Society and College of Radiographers* and the *Royal College of Radiologists*, determine some underlying principles for QI in the imaging departments that should

include: (1) imaging procedures should be undertaken for the benefit of patients, (2) improving access to medical imaging procedures should shorten the patient pathway, (3) imaging procedures should be undertaken based on the most recent scientific evidence, and (4) imaging department should have consistent clinical governance structures, proper up-to-date equipment and trained staff (Royal College of General Practitioners, Society and College of Radiographers, & Royal College of Radiologists, 2013).

The same professional bodies also state that the key considerations of an imaging department should include “patient safety, patient outcomes, patient and user experience and efficiency”; and that among all aspects of quality of care, imaging departments should pay particular importance to the “patient access, patient information, referrer access, clinically appropriate imaging and integration into pathways of care”.

In order to better understand the entire health care process of an imaging department, we will then discuss the overall imaging pathway and the respective implications in terms of quality that we can face.

2.2.1. Measuring Quality in Imaging Departments

There is no doubt that imaging procedures play a key role in medical diagnosis, and the adoption of a culture of QI and radiological protection must be an essential premise in imaging departments (Macedo & Rodrigues, 2009).

The promotion of a systematic review of imaging procedures, motivated by the risks related to ionizing radiation, is essential to improve the quality and patient outcomes (EURATOM, 2014; Lau & Ng, 2015). The focus on QI should be based on the performance of imaging procedures, obtaining images with quality and safety (Kruskal et al., 2011).

Due to its complexity, the definition of quality in imaging can contain several elements and be characterized in many ways, which can be more or less objective (Blackmore, 2007; Van Moore, 2006). For example, when we talk about imaging equipment, the necessary and systematic quality controls are

recognized in order to comply with the requirements. But when we talk about dynamic exam procedures with patients in different clinical settings, the concept may seem more subjective, and the need arises to create indicators or metrics that allow quality assessment.

Therefore, a systematic search for the measurement and comparison of quality between similar departments has been verified, promoting a more objective standardization of the results achieved. Only in this way is it possible to improve, because without a robust model of quality measurement, we cannot establish improvement interventions and implement the necessary changes (Busse et al., 2019).

To identify quality defects and improvement opportunities, and to set quality indicators, it is important to understand the dynamics existing in an imaging department and the main health professionals involved in each process. Although there are some quality models and metrics developed for radiologists, in fact with regards to radiographers we cannot verify the same (Liu, Johnson, Miranda, Patel, & Phillips, 2010). As radiographers are the imaging professionals who have a closer and longer contact with the patient, it is necessary to rethink these models and also to identify potential sources of error throughout the workflow, increasing patient safety.

Thus, through figure 1 a simplified scheme of the path of patient through imaging department can be observed, where the main professionals involved in each part of the process (Physician, Radiographer and Radiologist) are highlighted. At the same time, a quality framework defined by Lau and Ng (2015) was also included, which consists of the integration of “quality and safety measures”, the “implementation of strategies” and the “performance enhancements” in the imaging departments, with the goal of developing innovative actions to achieve continuous QI and patient safety (Lau & Ng, 2015).

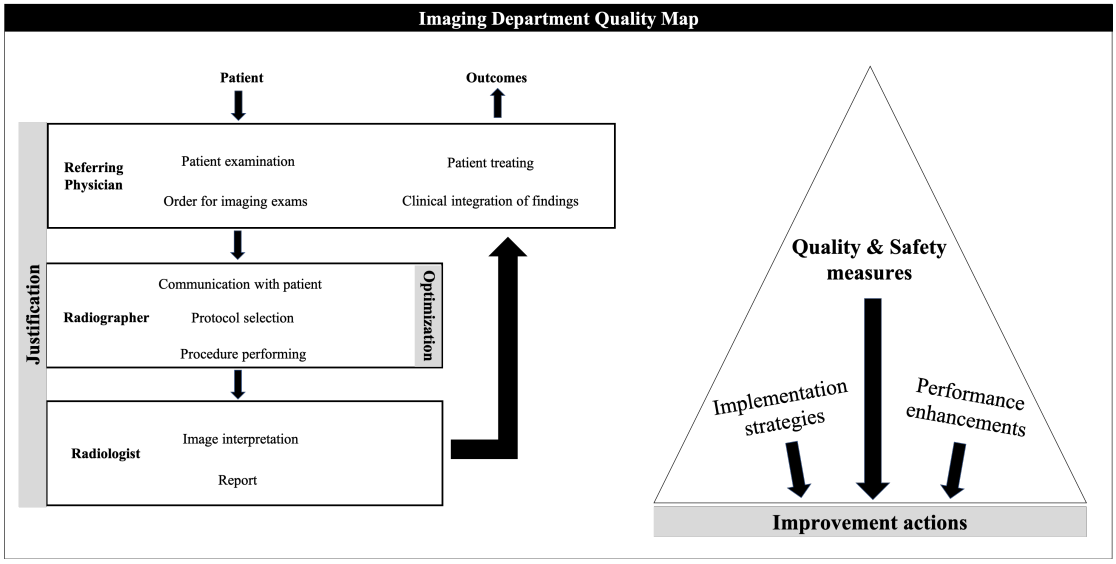

Figure 1 – Imaging department quality map, integrating the patient journey and a quality framework for improvement (adapted from Lau and Ng (2015), Swensen and Johnson (2005)).

In the different steps along the process, countless opportunities to fail can be identified, and the practice of health professionals must always be based on scientific evidence (Abrantes et al., 2020; Swensen & Johnson, 2005). In other words, there is a clear association between the establishment of a quality model and the practices adopted by professionals.

It is also known that preventive medicine currently exists, with a tendency to overuse imaging procedures, disregarding one of the basic pillars of quality and safety in an imaging department: the principle of Justification (Berwick, 2017; Lau & Ng, 2015; Saini, Brownlee, Elshaug, Glasziou, & Heath, 2017). This principle will be discussed in more detail below, but it is inherent in the practices of the professionals identified in the figure, who must, in a spirit of collaboration, find the best available and adequate procedure to clarify the patient's clinical doubt, in a safe way.

The other fundamental pillar, the principle of optimization, is intrinsically linked to the specific practices of radiographers, which is characterized by the mediation of radiation risks through training and education that allow an improvement in the suitability of patient-centered protocols, and also in

accordance with the best available evidence (Abrantes et al., 2020; Lau & Ng, 2015).

Therefore, the principles of Justification and Optimization, associated with minimizing errors, are the quality and safety measures highlighted in the Quality Framework above. The strategies that should be implemented include research activities, promoting awareness, education and training, quality policies and continuous QI; and the performance enhancements aim to promote strong leadership that commits professionals to a culture of quality and safety, involving them at all stages (Kruskal et al., 2011; Lau & Ng, 2015; Zygmont et al., 2017).

Regarding the specific aspects of measuring quality in imaging, different authors highlight several indicators (observed in table 1).

Table 1 – Different indicators can be established in order to measure quality. Adapted from Blackmore (2007); Liu et al. (2010); Swensen and Johnson (2005); Van Moore (2006).

Step in patient journey	Quality indicators
Patient Access	- Waiting time and facility to schedule the exam - Communication between referring physician and imaging department (e.g. imaging requests and their written information; referring physician satisfaction)
Imaging Planning	- Communication with patients (compliance with instructions before imaging)
Imaging Procedure	- Waiting time in imaging department - Radiation Safety (repeat rates, diagnostic reference levels (DRL), technical standards) - Protocol selection (evidence-based imaging practice and guidelines) - Safety (e.g. contrast administration, comfort)
Image Interpretation	- Double reads by radiologists
Report	- Time from imaging exam to report - Standardization (e.g. structured reports, accuracy)
Patient Outcome	- Effect of imaging on patient care outcome (e.g. rates of specific interventions after imaging; health improving; patient satisfaction)

Through the indicators exemplified in table 1, it becomes possible to carry out a more objective measurement of quality, to identify opportunities for quality improvement and other potential indicators of recognized importance to monitor (Ahonen & Liikanen, 2010; Liu et al., 2010; Swensen & Johnson, 2005; Van Moore, 2006; WHO, 2004). Likewise, it provides a better information regarding the causes of possible errors, allowing to intervene and minimize them.

Defining imaging-specific indicators seems to be best way to operationalize quality, and radiographers must be involved in its implementation, measurement and monitoring, as they are a fundamental key-element of the medical imaging process (Busse et al., 2019)

2.2.2. Justification and Optimization of Imaging Procedures

Although there are two fundamental principles that must be respected when performing imaging procedures, there is a great asymmetry in imaging practices and radiation dose values between different departments, suggesting a need for standardization of practices based on evidence, patient-centred and respecting the established DRL (European Commission, 2012; Suliman & Abdelgadir, 2018; Tsapaki, 2017).

There are several guidelines available, which standardize the practice based on the available evidence and help to determine the most appropriate imaging procedure for each patient and according to their clinical suspicion (Hentel, Sharma, Wladyka, & Min, 2011; Sierzenski et al., 2014). Nonetheless, due to different orientations in patterns of practice, a clear definition of what constitutes the most proper imaging examination for a given situation is not sufficiently defined (Hentel et al., 2011).

The latest report by the European Commission on medical exposures for diagnostic purposes of the European population, indicates that the total annual frequency of procedures using ionizing radiation is 660 million (1100 procedures per 1000 inhabitants), corresponding an effective dose average of 1.05 mSv per caput (European Commission*, 2014)*. Portugal emerges as the fourth country with the highest annual total frequency of procedures using ionizing radiation (1576 exams per 1000 inhabitants), corresponding to an effective dose is 1.17 mSv per caput, mainly due to the contribution of computed tomography (0.85 mSv per caput) and general radiology (0.19 mSv per caput) procedures.

Considering the risks associated to the use of ionizing radiation for medical purposes, quality systems in imaging departments must include the established radioprotection recommendations and standards, based on the most recent evidence on the effects that can be caused on professionals and patients (Conselho da União Europeia, 2014; IAEA, 2011).

Thus, considering that the risks arising from ionizing radiation are cumulative and in order to avoid or decrease the probability of the emergency of harmful effects, the procedures must be duly justified, and the applied protocols must be constantly optimized (Chambers et al., 2016).

However, several studies reveal that the majority of referring physicians perform a defensive medicine, leading to the order of imaging procedures that were not motivated by clinical need, not respecting the principle of Justification (Catalano et al., 2007; Schmidt, 2012; Sierzenski et al., 2014). Unstructured and defensive writing of reports also leads to an increase in the imaging exams performed, as they become less useful to those who requested them (referring physicians) and, consequently, to the patient (García, 2019). Improving reports, structured and standardized, with accurate terminology and without ambiguous statements, is also referred to in the literature as a measure to increase the quality of care (Waite et al., 2018).

According to the most recent EURATOM Directive, the principle of justification is based on three levels: (1) an imaging procedure will always have more benefits than harm at society level, and that economic and social issues will have to be considered; (2) the objective of a imaging procedure must be well reported and justified, should contribute to a better diagnosis or treatment, or provide useful data for the patient care; and (3) the imaging procedure is justified for a given patient, it will improve the health status of that patient in particular (Decreto-Lei n.º 108, 2018; European Society of Radiology, 2015; García, 2019; Lau & Ng, 2015).

The radiographer, to properly apply the principle of Optimization, adapting the protocols to be applied in each situation, through research evidence, must

always respect the ALARA[6] principle (Catalano et al., 2007; Martin, 2011), aim to minimize the patient radiation exposure. To achieve this goal, there must be awareness, responsibility, and decision-making capacity by radiographers, which is mainly obtained through periodic education and training (Lau & Ng, 2015).

DRL are also an excellent contribution to good imaging practices, since they can be used to improve of imaging departments at local, regional or national level, as they establish reference dose values for different protocols and clinical situations, which provide risk estimates for certain imaging tasks (Do, 2016; Vom & Williams, 2017). Therefore, should be continuously monitored, as it can be considered as a good quality indicator for the optimization principle.

2.2.4. Clinical Audit and Quality Improvement of the Imaging Departments

Clinical audit, EBP and Guidelines, represent a set of tools aiming to assess professional performance and encourage changes in the practices adopted, and that can be integrated in the concept of clinical governance as a system of measures and procedures to deliver the best care (Gerada & Cullen, 2004; Serapioni, 2009). These tools are an integral part of the TQM process.

Although clinical audits have been applied for many years, they have gained increasing importance at the level of imaging departments, as an integrated measure in QA programs, in order to ensure that medical exposures to ionizing radiation comply with radiation protection standards and good practices (Schillebeeckx, 2017).

This importance began to be more recognized by the *International Atomic Energy Agency (IAEA)*, which developed a document on the use of clinical audit in medical imaging as an efficient instrument for QI, called QUAADRIL: “Quality

[6] ALARA (as low as reasonably achievable). Respecting this principle, the optimization is achieved.

Assurance Audit for Diagnostic Radiology Improvement and Learning" (IAEA, 2010).

Among different fields of application, the principles underlying good practices in medical imaging and which need to be evaluated, should include infrastructure, radiation protection, staff and patient safety, equipment, QA and control, optimization and dosimetry (Faulkner, 2016). In addition, the imaging department's policies and description of procedures must be well documented and updated regularly based on the latest evidence, and made available to all professionals.

Recently, the transposition of the European Directive 2013/59 EURATOM into the Portuguese legal framework (Law Decree 108/2018), clinical audit in imaging departments has become mandatory in order to try to improve the quality of care (Conselho da União Europeia, 2014; Danoso-Bach & Boland, 2018), through a structured review, clinical audit "consists of measuring a clinical outcome or procedure against predefined evidence-based standards" (European Society of Radiology, 2018, p. 899). Thus, it allows to identify differences between the current practice and the implemented standards, changing the practice when needed to achieve compliance. In sequence, the process will be completed with a re-audit (the audit cycle, as shown in figure 2).

Clinical audits are focused "to improve the quality of patient care, promote the effective use of resources, enhance the provision and organisation of clinical services and finally to organise professional education and training" (Schillebeeckx, 2017, p. 244).

Clinical audit approach can be internal or external, and the combination of both will allow to achieve the desired results, namely to evaluate the current status of the imaging department and to identify focal areas for improvement in terms of structure, processes and results (figure 2), namely in the quality of patient care, efficient resources usage and promoting education and professional training (European Commission, 2009). In addition, it also intends to emphasize the need for justification of medical exposure.

In last years, ESR has promoted a set of initiatives aimed at promoting the implementation of clinical audits, and the "ESPERANTO Booklet - a guide to clinical audit in radiology and clinical audit tool" is the latest strategy (European Society of Radiology, 2018, 2019). Their main goal is to "increase awareness and understanding of clinical audit within European imaging departments" (p. 3), to include the regulatory aspects of medical exposures with ionizing radiation, and also include the clinical audit processes related to the provision of imaging examinations (European Society of Radiology, 2019).

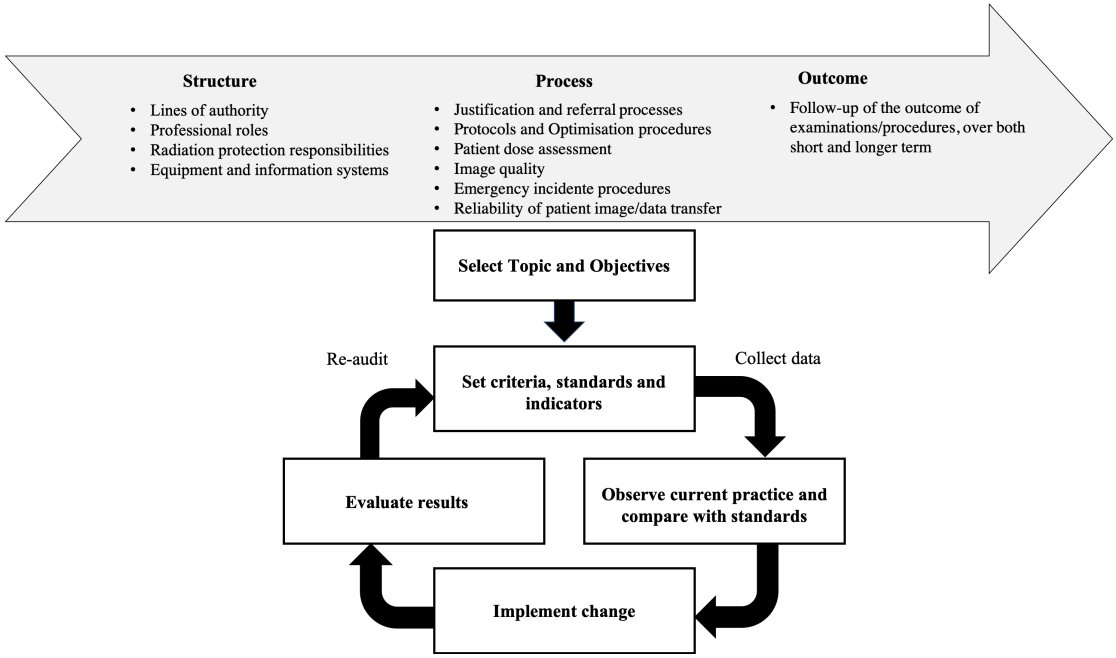

Figure 2 - Scope of Clinical Audit components of the patient care pathway and the audit cycle steps. Adapted from European Society of Radiology (2019).

When clinical audit mechanisms are in place, ESPERANTO Booklet indicates that the main benefits for patients and the imaging department are the promotion of high quality medical care, providing training and teaching opportunities, promoting quality improvement and showing the departments' commitment to patient safety (European Society of Radiology, 2019).

Imaging departments from Europe have demonstrated an adequate implementation of the different requirements and standards, as compliance levels when audited are over 80% (Schillebeeckx, 2017). This must be the way forward.

However, it should also be remembered that the audit process is primarily a tool for improving quality and, as such, when more negative results are obtained, there should be no attempt to blame those involved, but rather to find the necessary solutions to the problems encountered (European Society of Radiology & ESR Subcommitte on Audit and Standards, 2010).

In view of the above, the proposed clinical audit for imaging departments, shares the same basic assumptions as QI cycles, also called internal quality assessment cycles, which begins with the recognition of an opportunity for improvement (also known as quality defect), with the immediate objective of "taking advantage" of the opportunity for improvement or "solving" the quality defect (Almeida et al., 2019; Saturno & Gascón, 2008). These cycles are similar to the Deming Cycle (mentioned in the previous sub-chapter), since they combine the planning of interventions followed by their implementation and evaluations to point out where to act (Saturno & Gascón, 2008).

Thus, imaging departments must be constantly concerned with the quality of care, making systematic use of these tools and ensuring that they correspond to the patients' needs and that imaging procedures are performed according to best practices and based on the most recent scientific evidence.

2.3. Evidence-Based and Information-Seeking Behavior of Radiographers

In the context of health care provision, practices are constantly changing in line with the emergence of new evidence, which arises from rigorous scientific investigations, enhancing the continuous improvement of the quality of care (El Dib, 2007).

The EBP concept in medicine, emerged from the 90s and, since then, has been widely used by different professionals and health care settings (Howich, 2011). Is defined as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients'' (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71). As such, in medical

imaging these principles must also be followed throughout the patient path, referred to in the previous subchapter, and with special emphasis on the Justification and Optimization principles. Therefore, the choice of a particular imaging procedure and its optimization should reflect the best available evidence, in any case and any clinical situation (Murphy & Sharp, 2009).

As stated above, health care must be patient-centred and, as such, the implementation of new evidence makes sense whenever it allows improving the patient's health outcomes, always considering their values and expectations (Lavelle, Dunne, Carroll, & Malone, 2015).

If, on the one hand, the application of the EBP principles appears to be global, the proper selection of the level of evidence to be applied in each case appears to be less appropriate in some situations, especially because in such a technological area, the change of equipment and procedures is constant (Snaith, 2016). Thus, different levels of evidence are associated with different types of evidence with different strength, which can be viewed hierarchically in figure 3.

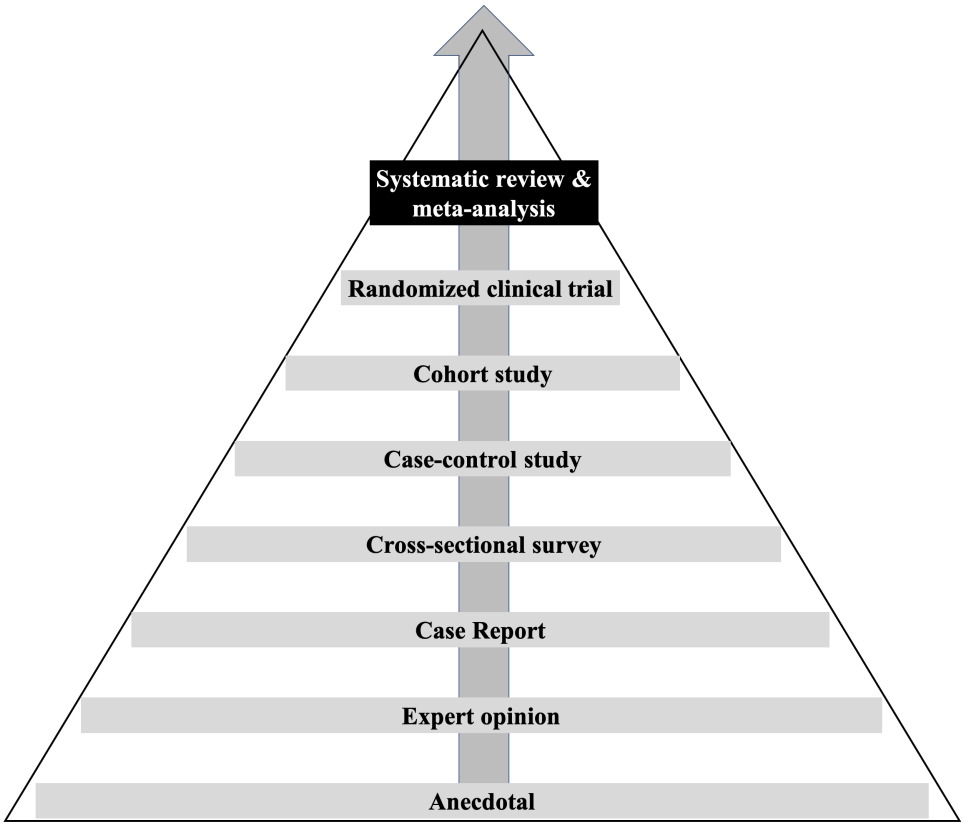

Figure 3 - The 8 hierarchical levels of evidence. Adapted from Murphy and Sharp (2009).

As it turns out, the eight levels vary between “Anecdotal” which consist of the professionals' own experiences and opinions (lowest level) and systematic reviews and meta-analyzes (highest level), immediately above the RCT, and which provide data and reviews of all the available literature on a particular research problem (Murphy & Sharp, 2009).

The levels of evidence presented in the pyramid indicate the design used in the study (if any) in order to assess the effectiveness of a given imaging procedure. Although the lowest level has weak evidence, it is of paramount importance to formulate hypotheses that can later be tested using proper research methodologies (National Health and Medical Research Council, 2000).

Implementation of EBP in medical imaging has made a paradigm shift, recognizing that pure practice based on tradition and personal experience is no longer acceptable (Craig & Smyth, 2004). The radiographer’s role should not be to accept non-valid assumptions and information from experts, but to critically evaluate the evidence from existing research in the literature to guide decision making (Medina & Blackmore, 2007).

Making decisions supported by the most recent available evidence can avoid the use of unnecessary procedures and avoid ineffective procedures, increasing the quality of service and patient safety (Abrantes et al., 2020; Dias et al., 2013). Therefore, the practice must be constantly reviewed, constantly questioned and, when appropriate, decisions must be made on the available evidence, thus helping to formulate the right questions, to develop the skills they need, to explore and evaluate the evidence, aiming at possible patient benefits (Craig & Smyth, 2004).

EBP is concerned with information, with the individual analysis of problems, as well as with the use of the internet and informatic systems to obtain the last scientific evidence to improve the professional practice. This requires adequate information-seeking behavior, research knowledge, cognitive skills and mental habits characteristic of *Critical Thinking*, as necessary preconditions for the application of EBP (Hillman, 2005).

Currently, the internet is a key element that facilitates the application of EBP in imaging departments, since the radiographers during his professional practice, and in order to obtain answers to his clinical doubts, can efficiently explore the most relevant literature, according to the highest level of evidence and to apply it in its practical context with the aim of improving patient outcomes (Sheehan et al., 2007a).

Evidence-Based Radiology (EBR) "is defined as the decision that results from the integration of the clinical pattern with the most appropriate imaging procedure, based on the available scientific evidence" (Abrantes et al., 2020; p. 27) considering the radiographer and radiologist experience, and the patient needs and expectations (Abrantes et al., 2020; García Villar, 2011). Thus, during clinical practice, from the emergence of the radiographer clinical doubt to the application of the evidence results in practice and their evaluation, there are six steps that must be followed, and which can be observed in figure 4.

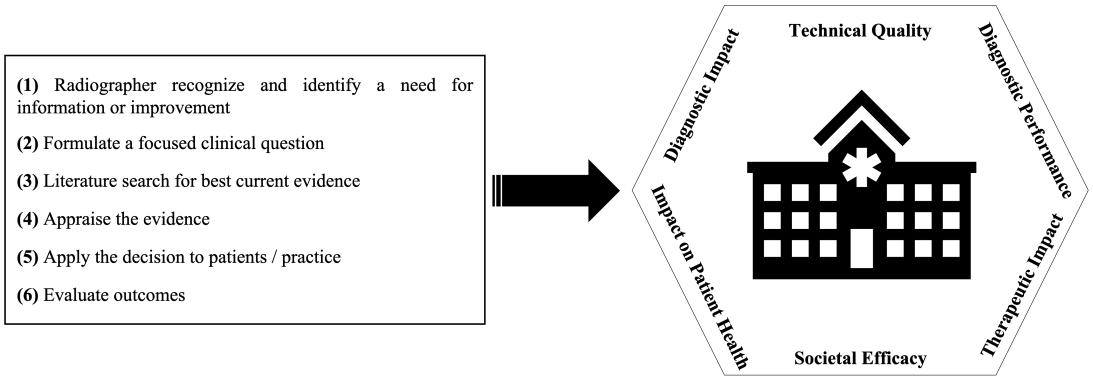

Figure 4 - The six-step process of EBP by radiographers and the six-level model for efficacy of imaging procedures. Adapted from Hafslund, Clare, Graverholt, and Nortvedt (2008); Sheehan et al. (2007); Sardanelli, Hunink, Gilbert, Leo, and Krestin (2010).

Since radiographers are increasingly assuming new roles and responsibilities, it is also necessary for their practices to be more effective and safer. Thus, when the Health Technology Assessment principles (second part of the figure) are applied simultaneously, which relate the practice of imaging to patient care, in terms of efficacy, effectiveness and efficiency, then six different levels can

be obtained depending on the initial question for which an answer is needed (Abrantes et al., 2020; Sheehan et al., 2007).

Continuous education and training of radiographers is also a requirement of EBP, since only then they will have the necessary skills and tools to critically evaluate scientific articles, carry out the appropriate search in the databases, as well as controlling all components related to electronic search strategies (Hafslund et al., 2008). In fact, education focused in research methodology, EBP and HTA in medical imaging should be provided as mentioned by some authors (Gadeka & Esena, 2020; Sardanelli et al., 2010).

The inability to perform these functions will constitute a barrier to the EBP implementation in the role of radiographers and the main challenge to its incorporation into clinical practice (Kyei, Antwi, & Suapim, 2015). The acquisition of knowledge by radiographer through EBP will have to be the key to change, both for the development of radiographer profession, but mainly to support the implementation of new practices that will improve the quality of imaging departments (Paulo, 2020).

Ideally, all radiographers should have proper training on the different research strategies, since it is a necessary condition for any adequate search based on the most available and effective information (Miles, 2018). Although this does not happen in the “real world”, this must be a concern to be overcome, to reduce the existing variability and ensuring systematization in the use of resources (Erturk, Ondategui-Parra, Otero, & Ros, 2006). To achieve this goal, imaging departments and academic institutions must collaborate strictly, in order to enable and train radiographers with these strategies, as well as knowledge about research methodologies and how to translate clinical research data into practice (Abrantes et al., 2020; C. da Silva et al., 2018; Erturk et al., 2006).

Thus, it is well known that to monitor the implementation of EBP actions, radiographers have seen their information needs increase, to rigorously use the underlying EBP principles.

However, the literature is weak with regard to the radiographer’s behavior in relation to his informational needs. The use of electronic resources to update

knowledge, the preconditions for implementing EBP and for their participation in research activities, and informational needs are scarce when compared to other healthcare professions (Ahonen & Liikanen, 2010; Sancho et al., 2013; Shanahan, 2010).

Several studies recognize the complexity of informational behaviors (social, cognitive, affective) and the need to adopt strategies for planning, monitoring and evaluating the results of research (Blummer & Kenton, 2014; Zare-Farashbandi & Lalazaryan, 2014) Thus, the development stage in the information research process by radiographers must be identified, to provide the necessary support and implement strategies to improve the effectiveness of research (Martinez-Silveira & Oddone, 2008).

The organizational culture is also a factor to take into account, as healthcare organizations must encourage the use of internet-based tools by health professionals, since they do not have full knowledge of all the existing clinical issues that they face (Blummer & Kenton, 2014). The same authors also refer that future investigations should explore what are the main doubts that lead professionals to use information resources and their effectiveness in patient care.

Thus, an effective EBP needs an appropriate and standardized information-seeking behavior, allowing the transfer of this information for their effective use and to improve the quality of care provided (Clarke et al., 2013; Zare-Farashbandi & Lalazaryan, 2014).

In view of the different studies covered in this theoretical framework chapter, it is quite clear that the concepts of quality of care, EBP and information-seeking behavior in radiology (IBR) are intrinsically related, and when they are properly applied and respected, they benefit the patient outcomes. As such, it is a path that must be followed by radiographers in the imaging departments where they work, through practitioner-oriented information.

CHAPTER III – MATERIALS AND METHODS

3.1. Research Design

Based on the considerations already identified, and the lack of information and empirical studies on the theme of quality assessment relating to radiology departments, a quantitative research design with a descriptive comparative approach was used.

This type of research design is the most appropriate strategy to achieve the objectives set for this study, as the researcher is limited to observing, measuring and analyzing certain variables, without any intervention or control, and using a form of inquiry, such as the questionnaire (Creswell, 2014; Silva, 2008).

Thus, this particular method was found suitable to achieve the purposes of this study, in analyzing the healthcare quality system level as well as describing the informational behavior and the use of practices based on scientific evidences by radiographers. These variables were also considered according to workplace and responsibility for management tasks in a comparative perspective.

3.2. Participants and Sample Characterization

The target population consists of all radiographers (including radiographers with management tasks) who works in the healthcare facilities of the Algarve region. These healthcare institutions may be publicly or privately managed.

In the case of public institutions, Algarve region has a university hospital center that is divided into two hospital units, and a primary healthcare institution, consisting of eight healthcare centres with a general radiology room in eight different cities.

Regarding private institutions, Algarve region is dominated by a large private group with four hospital units and five clinics. There are also some smaller

private clinics in the region (less than 10 radiographers), which were not considered in this study.

Since the research aimed to collect specific data on the perspective of radiographers working in the Algarve region, to know more deeply the context of their clinical practice, the strategy used was a nonprobability sampling, chosen out of convenience (Teddie & Tashakkori, 2009).

In addition, it was not the aim of this study to have statistical representativeness of the radiographers to make inferences at national level. The aim of the sample was to select participants from medium or large regional imaging departments in order to collect enough data to extract conclusions and recommendations at the local and regional level.

Only institutions with more than 10 radiographers were included. Thus, the total number of radiographers considered in this study was 101 (Institution A = 30; Institution B = 21; Institution C = 31 and Institution D = 19).

3.3. Instruments and related variables

To obtain the data for this research, three different but complementary instruments were used to achieve the goals.

Thus, for the fulfillment of the **first specific objective**, the original questionnaire developed by Wagner, De Bakker, and Groenewegen (1999) was adapted and validated to the Portuguese reality of an imaging department **(questionnaire 1)**. This instrument was addressed to radiographers and radiographers with management responsibilities/tasks, in order to carry out a multidimensional approach to the QMS implemented (formal or informal) in the institutions under study.

With the objective of performing a cross-cultural adaptation and validation of this questionnaire, the method proposed by Beaton, Bombardier, Guillemin and Ferraz (2007) was used, as it is one of the most internationally recognized, with sixth main steps: (1) Translation, (2) Synthesis, (3) Back-translation, (4) Experts committee review, (5) Pre-testing and (6) Reassessment of measures and

indices (psychometric study), if applicable. The methodological steps proposed by this method are described in detail in Appendix A, Appendix B and Appendix C.

In addition, during the cross-cultural adaptation, a Portuguese version of this instrument adapted by Costa (2006) was found in the literature as part of his master's thesis in Policy and Healthcare Administration at the University of Évora. Therefore, permission for use of this instrument was requested (Appendix D) and allowed. In any case, the previous methodological procedure was maintained, and a comparison between the results obtained through Beaton et al. (2007) method and the instrument used by Costa (2006) was made, in order to verify the differences between both instruments (Appendix E). These differences were taken into account by the experts committee review (step 4) and in the definition of the final questionnaire (Appendix F).

The final questionnaire number 1 contains different dimensions, which were evaluated using different variables with different types of scales (table 2). For the items/questions concerning dimensions A, B, C, D, E and F, close questions using two different types of scale was used.

In dimension A, a nominal scale (1- No; 2- Yes; 3 - Under development; 4 - Don't know) was used to assess the existence of quality policy (QP) related documentation. In case of existence, an ordinal scale (Likert scale ranged from 1 to 8) was used to assess their appropriateness level. In dimension B, a nominal scale (1- Never; 2- Few times; 3 – Many times; 4 – Always) was used to assess the patient involvement in QA and improvement activities, and, in case of involvement, the same ordinal scale as dimension A was used to assess the appropriateness level. In dimensions C, D and E, the nominal scale was coded as follows: "1- No; 2- Don't know; 3- Yes" and the ordinal scale was the same as the previous dimensions. In dimension F, through an ordinal scale (1 - None; 2 - Unsatisfied; 3 - Satisfied; 4 - Don't know), the overall impact and satisfaction, in relation to the QMS and the QA and improvement activities was evaluated. In the case of radiographers being satisfied or unsatisfied, through

an ordinal scale they indicated their degree of satisfaction (Likert scale ranged from “completely unsatisfied” (1) to “completely satisfied” (8)).

Table 2 – Identification and characterization of variables from questionnaire 1.

Sections	Aims	Related Questions	Number of Items	Scale
A - Quality Policy	Assess availability / existence of documentation	A1.Q1.EQS to A1Q8.EQS	8	Nominal
	Check the appropriateness level of the documents	A1.Q1.EQS to A1Q8.EQS	8	Ordinal
B - Patient Involvement	Assess the patient involvement in QA and improvement activities	B1.Q1.EQS to B1Q6.EQS	6	Nominal
	Check the appropriateness level of the patient involvement	B1.Q1.EQS to B1Q6.EQS	6	Ordinal
C - Standards	Assess availability / existence of written procedures	C1.Q1.EQS to C1Q8.EQS	8	Nominal
	Check the appropriateness level of procedures / standards	C1.Q1.EQS to C1Q8.EQS	8	Ordinal
D - Human Resources Management	Assess availability / existence of programs for the implementation of QA and improvement activities	D1.Q1.EQS to D1Q7.EQS	7	Nominal
	Assess the relationship between HRM and QP	D2.Q1.EQS to D2Q5.EQS	5	Nominal
	Assess the incentive by managers for the radiographer participation in QA and improvement activities	D3.Q1.EQS to D3Q6.EQS	6	Nominal
	Check the appropriateness level of programs and indicators	D1.Q1.EQS to D3Q6.EQS	18	Ordinal
E - Quality Assurance and Improvement Activities	Assess availability / existence of QA and improvement activities	E1.Q1.EQS to E3Q25.EQS	25	Nominal
	Check the appropriateness level of the activities	E1.Q1.EQS to E3Q25.EQS	25	Ordinal
F - Overall Aspects	Assess the impact and satisfaction with the quality system	F1.Q1.EQS to F1Q4.EQS	4	Nominal
	Assess the degree of Satisfaction	F1.Q1.EQS to F1Q4.EQS	4	Ordinal
Sample Characterization	Analyze the professional profile of radiographer, using the following variables:			
	- Local (Public Vs Private; Hospital Vs Clinic Vs Healthcare Center)	Q1.	1	Nominal
	- Gender	Q2.	1	Nominal
	- Age	Q3.	1	Ratio
	- Academic Qualification	Q4.	1	Ordinal
	- Management Tasks	Q5. to Q8.	4	Nominal
	- Quality committee	Q9.	1	Nominal
	- Professional Experience	Q10.	1	Ratio
	- Schedule	Q11. to Q12.	2	Nominal

The last part of this questionnaire had a section to a brief socio-demographic characterization of the radiographers. To this end, issues related to their workplace, gender, age, academic qualifications, management positions, participation in quality committees, professional experience and type of schedule were included.

To assess the development stage of the QMS in the imaging departments, the original authors of the questionnaire (Wagner et al., 1999), with the collaboration of experts in this field, developed a model based on the principles of TQM (Costa, 2006). Thus, four stages of development that organizations follow during the implementation of quality systems have been described by the authors, namely: “stage 0 (orientation for change), stage 1 (preparation for change), stage 2 (implementation of QI activities) and stage 3 (establishment of innovation)”.

As an assumption of transition from development stage 0 to stage 1, it is required that most of the activities described in stage 0 and at least one of stage 1 are implemented (and so on until stage 4 of development is reached – table 3). The results obtained for one dimension will influence the other focal areas (dimensions), being necessary that imaging department ensure the development of simultaneous actions in the different dimensions mentioned above (Costa, 2006; Wagner et al., 1999).

In this way, the imaging department is at stage 1 of development, when it satisfies most of the indicators of stage 0 (> 50%) and, at least, one indicator related to preparation stage (1), following the same rule for stages 2 and 3 (Wagner et al., 1999).

Table 3 -Indicators to assess the development stages for QMS in the imaging departments by dimension (adapted from Costa, 2006 and Wagner et al., 1999).

	Dimensions				
Stages	**A - Quality Policy**	**B - Patient Involvement**	**C - Standards**	**D - Human Resources Management**	**E - Quality Assurance and Improvement Activities**
Stage 0: Orientation	Written mission statement Procedures for patients with special needs	Patient is not involved	Standards for performing invasive imaging examinations	Encouraging professional development, including in QP issues	Performance evaluation carried out by peers Performance evaluation carried out by other professionals
Stage 1: Preparation	Procedures in the imaging department Procedures outside the imaging department	Meetings with radiographers	Standards for patient communication Standards for performing imaging examinations Standards for safety and radiation protection	Training / education of radiographers Training / education of other professionals / staff The management indicates what is expected from radiographers with respect to QA Participation of radiographers in QI projects is mandatory Continuous education based on priorities in QP	Radiographers performance evaluation with their own participation Use of complaints registration for QI
Stage 2: Implementation	Quality action plan QP document	Sometimes involved in: Developing quality criteria Developing protocols and standards Quality committees QI projects QI process	Standards for management adverse reactions to contrast media Standards for co-operation with other departments Standards for utilization of imaging equipment	Training new radiographers in QI methods Radiographers has support by quality experts / consultants Management checks whether radiographers stick to commitments Management encourage the radiographer's involvement in the quality system Monitoring imaging department action plans	Satisfaction survey among professionals from imaging department Satisfaction survey among referring physician Needs and expectations survey among professionals
Stage 3: Establishment	Annual quality report Quality handbook	Systematic involved in: Developing quality criteria Developing protocols and standards Quality committees QI projects QI process	Standards for patient routing from intake to exit	Selection of new radiographers with positive attitude to QA Feedback to radiographers about results achieved	Computer record of radiological exams scheduling Internal Clinical Audit

Regarding the **second specific objective**, two questionnaires were used to study the EBP and the information-seeking behavior by radiographers. The EBP questionnaire (**questionnaire 2**) was developed by Ahonen Liikanen (2010) in a study conducted with radiographers from Finland and validated to Portuguese context in 2013 (Appendix G) by Dias et al. (2013) (Evidence-based practice in radiology).

This questionnaire contains a total of 23 groups of questions, with different dimensions and sections in order to evaluate the radiographer's preconditions for EBP (table 4). For the items/questions included in dimensions G, H, I, J and L, close questions using an ordinal scale were applied (Likert scale ranged from "Disagree strongly" (1) to "Agree strongly" (5)). The dimension K also used a 5-point Likert scale ranged from "Not important" (1) to "Very important" (5).

The sections "Attitudes towards research" and "Reading of scientific publications" included nominal scales (multiple choice and single choice questions), and also open questions to collect additional qualitative information. Similarly, the last question of the questionnaire included an open question, thus allowing to add additional information regarding suggestions for improving the work environment and organization of the imaging department.

Table 4 - Identification and characterization of variables from questionnaire 2.

Sections	Aims	Related Questions	Number of Items	Scale
Attitudes Towards Research	Assess background characteristics and the radiographers involvement in scientific research activities	Q1.EBP; Q2.EBP; Q6.EBP; Q7.EBP and Q14.EBP	8	Nominal (multiple choice)
		Q4.EBP and Q8.EBP		Open questions
		Q5.EBP		Nominal
Reading of Scientific Publications	Evaluate the factors that promote and hinder the reading of scientific publications and the frequency of reading	Q9.EBP and Q10.EBP	8	Nominal (multiple choice)
		Q16.EBP; Q17.EBP; Q18.EBP; Q19.EBP; and Q21.EBP		Nominal
		Q.20.EBP		Open question
G – Evidence-Based Actions	Evaluate the use of evidence-based actions by radiographers	Q3.1.EBP to Q3.5.EBP	5	Ordinal
		Q3.12.EBP to Q3.14.EBP	3	Ordinal
H – Significance of Research Activities	Evaluate the importance and the participation of radiographers in research activities in their professional practice	Q3.3.EBP to Q3.11.EBP	6	Ordinal
I – Support in Research Activities	Assess whether radiographers receive support and incentives to participate in research activities	Q11.1.EBP to Q11.4.EBP	4	Ordinal
		Q12.EBP	1	Open question
J – Current Use of Research Evidence in Practice	Assess the current usage of research evidence in the clinical practice of radiographers	Q13.1.EBP to Q13.8.EBP	8	Ordinal
K – Sources of Evidence	Assess the importance of the different sources of evidence in the performance of the radiographers duties	Q15.1.EBP to Q15.10.EBP	10	Ordinal
L – Knowledge of Research	Evaluate the radiographers perceptions of their abilities, knowledge and self-confidence related to research activities	Q22.1.EBP to Q22.11.EBP	11	Ordinal
Suggestions for Improvement	To include additional information regarding suggestions for improving the work environment and organization of the imaging department	Q23.EBP	1	Open question

The information-seeking behavior questionnaire (**questionnaire 3**) was developed by Martinez-Silveira and Oddone (2008) to study the information-seeking behavior of medical residents and then validated to the Portuguese context (Appendix H) by Sancho et al. (2013). This questionnaire contains a total of five sections (table 5), namely the information needs of radiographers, their habits and preferences for search information, bibliographic search skills and informational needs when faced with specific situations in the clinical practice (Martinez-Silveira & Oddone, 2008). In addition, it also contains three

questions for sample characterization, which complements the characterization of the instrument 1.

Table 5 - Identification and characterization of variables from questionnaire 3.

Sections	Aims	Related Questions	Number of Items	Scale
Information Needs of Radiographers	Assess the information sources used by radiographers	Q4.1.IBR to Q4.9.IBR	9	Nominal (multiple choice)
	Identify the reasons motivating information searches and the encountered barriers	Q5.1.IBR to Q5.8.IBR; and Q6.1.IBR to Q6.9.IBR	18	
Habits and Preferences for Information Resources Management	Identity the main reasons to attend or don't the healthcare-related libraries	Q7.IBR	8	Nominal (multiple choice)
	Identity the preferred methods	Q8.IBR		
	Assess the preferred information sources	Q9.IBR and Q10.IBR		
	Identity the most used bibliographic resources	Q11.IBR		
	Identity the preferred scientific information formats	Q12.IBR and Q13.IBR		
	Assess the essential resources for a good professional practice	Q14.IBR		
Bibliographic Research Skills	Evaluate who conduct bibliographic searches	Q15.IBR	9	Nominal
	Assess how radiographers learned the techniques and methods for bibliographic searches	Q16.IBR		Nominal (multiple choice)
	Assess the different stages in the use of electronic databases	Q17.IBR		Nominal
	Assess how radiographers evaluate the results of their bibliographic research	Q18.IBR		Nominal
	Evaluate the frequency of databases use by radiographers	Q19.IBR		Nominal (multiple choice)
	Identify the problems most frequently encountered when searching scientific literature	Q20.IBR		Nominal (multiple choice)
	Identify the factors that radiographers prioritize to select scientific documents	Q21.IBR		Nominal (multiple choice)
	Assess how radiographers obtain documents from databases and how they read them	Q22.IBR and Q23.IBR		Nominal
Information Needs of Radiographers in the Clinical Practice	Identify the most frequent doubts in the clinical context	Q24.IBR and Q25.IBR	7	Nominal
	Analyse a real situation during the last 30 days	Q26.IBR and Q30.IBR		Nominal (multiple choice)
Sample Characterization	Analyze the professional profile of radiographer, using the following variables:		3	
	- Imaging modalities available in the imaging department	Q2.IBR		Nominal
	- Hours of work per day	Q1.IBR		Open questions
	- Number of examinations performed by day by modality	Q3.IBR		

This instrument 3 is constituted mainly by closed questions with nominal response scales (mainly multiple-choice options), as identified in the table below. Permission for use both instruments (2 and 3) can be seen in Appendix I.

The instruments 2 and 3 were applied at the same time as instrument 1 and to the same participants. Considering that EBP fundamentals cannot be dissociated from the information-seeking behavior, the application of both instruments would allow the establishment of potential associations and identify key-areas for the implementation of improving measures regarding the Justification and Optimization of the imaging procedures.

In view of the above, the **dependent variables** defined for this study are the "Quality Systems" and the "Evidence-based Practice". Since these cannot be measure or observed directly, they are also known as latent variables, as they are defined by a set of other variables, which measure something in common (designated as component variables) (Bollen, 2002; Kline, 2011; Maia, 2020). Since these variables can be observed and measured, they are also designated by component, manifest or **independent variables**, which are also visible in the previous tables, grouped into different sections and dimensions (Hill & Hill, 2002; Maia, 2020).

3.4. Data Collection Procedure

Paper-based questionnaires were used in this research. In order to encourage greater cooperation from the radiographers to answer three time-consuming questionnaires, the researcher delivered the questionnaires in person to explain in detail the objectives of the study and their importance for improving healthcare quality in imaging departments, as well as the recognition of radiographer as a core profession in a healthcare organization.

The surveys were distributed in the imaging facilities of the Algarve region between November 2018 and June 2019.

It was also indicated that the answers should be related to their workplace and their daily professional practice. Each questionnaire took about 15 to 20 minutes to be answered (total of 45 to 60 minutes for the three questionnaires) and completed questionnaires were collected by the researcher.

3.5. Data Analysis

Several data analysis techniques were used.

Descriptive, uni, bi and multivariate statistics analysis were used through IBM-SPSS® (*Statistical Package for Social Science* V.25) and the following statistical procedure was considered (Maia, 2020; Maroco, 2018; Ribeiro, 2018):

1) Sample characterization using descriptive statistics;
2) Descriptive statistics of each dimension and for the most relevant items and sections of the different instruments;
3) Pareto analysis to map and rank the quality defects, using a 95% confidence interval;
4) Scale reliability of the model under study through the measure of internal consistency (Cronbach's alpha);
5) Comparative analysis between the imaging departments under study, between radiographers with and without management tasks and between gender of radiographers;
6) Analysis of the EBP influence in the information needs of radiographers clinical practice;
7) Identify the structure of the model under study through Exploratory Factorial Analysis (EFA) of the main components (dimensions under study).

So, through this last point (7), the objective is to "explore the underlying structure of correlations among observed variables in an attempt to reduce the dimensionality, wherein a small(er) number of factors significantly account for the correlation among the set of measured variables" (Onwuegbuzie, Leech,

and Collins, 201, p.354). This means that it reduces a large number of variables that correspond to a data set into a smaller number of factors, which consist of the underlying factor structure or model" (Burns & Burns, 2008).

Below, the statistical procedure overview can be observed in more detail.

Table 6 – Summary of the statistical procedure applied in the present research.

Instrument	Related Sections / Dimensions	Aims	Statistical Procedure
Questionnaire 1	Dimensions A, B, C, D and E	Evaluation of the dimensions related to Quality System and their appropriateness level	Descriptive statistics
		Assessment of the compliance level Map and rank the Quality defects	Pareto Analysis
		Development stage assessment of the quality system	Indicators for the achievement of development stages
	Dimension F	Assessment of the impact and satisfaction with the quality system by imaging department	Descriptive statistics
Questionnaire 2	Dimensions G, H, I, J, K and L Sections "Attitudes towards research" and "Reading of scientific publication"s	Assessment of the radiographer preconditions for EBP	Descriptive statistics
Questionnaire 3	Sections "Overall Information Needs", "Habits and Preferences", "Bibliographic Research Skills" and "Information Needs in the Clinical Practice"	Assessment of the informational behaviour of radiographers	Descriptive statistics
Questionnaire 1, 2 and 3	All Dimensions (Overall Dimensions Analysis)	Sample Distribution	*Kolmogorov-Smirnov* and *Shapiro-Wilk* tests
		Reliability analysis	*Cronbach's alpha*
		Comparison between Imaging Departments	*Kruskal-Wallis* test and *Mean Ranks*
		Comparison between radiographers with and without management tasks Comparison between male and female radiographers	*Mann-Whitney* test and *Mean Ranks*
		Influence of EBP in the information needs of radiographers clinical practice	*Chi-square* test of independence and *Cramer's V* correlation test
		Structure of the model "Conditions for Quality of Care and EBP"	Exploratory Factorial Analysis of the main components

3.5. Ethical Considerations

This study was conducted in compliance with all ethical research considerations and with the Portuguese Republic law on data protection (Diário da República n.º 151, 2019).

To obtain research permission for this study, preliminary meetings were held with the radiographers with management tasks (coordinators) of the imaging departments. Then, a cover letter with the purpose of the study, a sample of the research project, a participant consent form (Appendix J), and a sample of questionnaires were sent to the institutions and their authorization was obtained.

Radiographers were contacted personally to participate (voluntarily), on the basis of informed consent in order to inform them about the implications of participation in the study and to reach a fully informed, considered and freely given decision. Informed consent was provided prior to the delivery of the questionnaires (Marsee, Silverthorn, & Frick, 2005).

Privacy and anonymity of the radiographers has been guaranteed and data collection was done accordingly to the convenience of the participants without hindering their daily operations.

CHAPTER IV – RESULTS

4.1. Sample characterization

Although the population comprises a total of 101 radiographers, those who agreed to participate in the study and answered to the different instruments used were 62 (survey response rate of 61.4%) as can be seen from table 7.

Table 7 – Sample characterization by imaging department

Institutions	n	%	Response rate (%)
Institution A	26	41.9	86.7
Institution B	11	17.7	52.4
Institution C	16	25.8	51.6
Institution D	9	14.5	47.4
Total	62	100	61.4

Although the response rate was not optimal, additional data collection was not pursued due to time and resource constraints.

Regarding the gender of participants, 28 are female (45.2%), aged between 25 and 59 years old (mean = 38.1; std. deviation = 8.84). In relation to the academic qualifications, from the total of 62 radiographers (figure 5), three have the bachelor's degree[7], 42 the bachelor's degree with honours, 14 the master's degree[8] and three the doctoral degree[9].

The main imaging modalities in which radiographer works were also recorded. Thus, CT and general radiology are their main areas of expertise (29.3% and 42.2%, respectively), followed by Magnetic Resonance Imaging (12.2%), bone densitometry (8.8%), mammography (6.8%) and ultrasound (only one radiographer, 0.7%). The minimum, maximum and mean number of examinations performed in these modalities by radiographers per day are in the table 8.

[7] Level 6 in the European Qualification Framework (EQF) (European Commission, 2019)
[8] Level 7 in the European Qualification Framework (European Commission, 2019)
[9] Level 8 in the European Qualification Framework (European Commission, 2019)

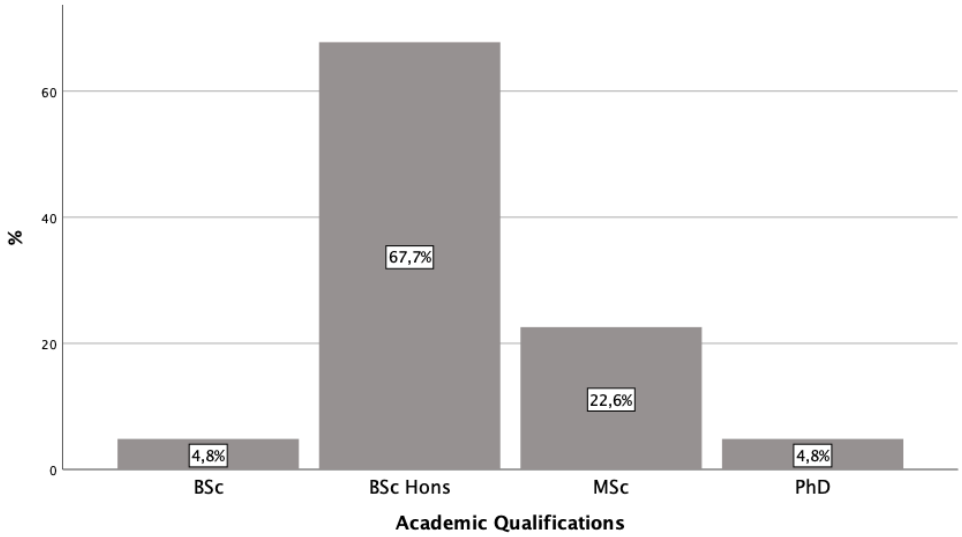

Figure 5 – Academic qualifications of radiographers (n=62)

Table 8 -Examinations performed in the different imaging modalities by radiographers per day.

Imaging modalities	n	Min.	Max.	Mean	Std. Deviation
General radiology	61	10	150	42.2	26.38
Computed tomography	42	2	90	31.3	16.03
Magnetic Resonance Imaging	18	2	20	9.4	4.59
Bone densitometry	13	1	30	7.2	8.45
Mammography	10	1	35	14.6	9.71
Ultrasound	2	2	4	3.0	1.41

Almost all of the radiographers (98.4%) works in rotate shift schedules, mainly involving night work, extended hours and weekend work.

Professional experience ranges from 1 to 39 years, with a mean of 12.2 (std. deviation = 8.85).

In addition, seven radiographers (11.3%) hold leadership positions (management tasks) in their imaging departments. Only one radiographer (1.6%) integrates the quality committee of the institution, and none of the facilities have specific quality committees for the imaging department.

4.2. Evaluation of Quality Systems in the Imaging Departments

Through the questionnaire 1 - EQS (Evaluation of Quality Systems), quality systems of the imaging departments were evaluated from the radiographer's perspective. Thus, this subchapter presents the main descriptive results regarding this instrument.

As mentioned in the methodology chapter, this instrument contains five main dimensions (A, B, C, D and E) and a dimension to evaluate the overall aspects, namely the overall perception and the level of satisfaction of radiographers in relation to the QMS and QA and improvement activities.

Given the above, through **Dimension A (QP)** and using eight items, it was possible to assess if the imaging department has QA documents (table 9). As we can verify, in the perspective of a large number of radiographers, there are no documents related to QA and improvement in their imaging departments. More specifically, 50% of radiographers indicate that there isn't any document with procedures for patients with special needs, 48.4% refer that there is no annual quality report and 46.8% says there isn't any document with procedures to be performed outside the imaging department.

Table 9 – Evaluation of dimension A (Quality Policy) on the existence of Quality Assurance and improvement documents, from the radiographer's perspective (n=62).

	No		Yes		Under development		Don't know	
Items	n	%	n	%	n	%	n	%
A1.Q1.EQS - Written mission statement	20	32.3	29	46.8	2	3,2	11	17,7
A1.Q2.EQS – Procedures for patients with special needs	31	50	15	24.2	3	4.8	13	21
A1.Q3.EQS – QA document	24	38.7	19	30.6	5	8.1	14	22.6
A1.Q4.EQS – Quality action plan	23	37.1	20	32.2	7	11.3	12	19.4
A1.Q5.EQS – Annual quality report	30	48.4	16	25.8	2	3.2	14	22.6
A1.Q6.EQS – Quality handbook	26	41.9	20	32.3	7	11.3	9	14.5
A1.Q7.EQS – Procedures in the imaging department	22	35.5	26	41.9	6	9.7	8	12.9
A1.Q8.EQS – Procedures outside the imaging department	29	46.8	16	25.8	7	11.3	10	16.1

Only two items have a higher percentage of radiographers that claim that these documents exist (written mission statement and procedures to be performed inside the imaging department) comparing to the radiographers that claim not

to have them. It should also be noted that a small percentage of radiographers claim that these documents are under development. In addition, between 12.9% to 22.6% of radiographers are unaware of at least one of the listed documents.

If the documents were available, radiographers were asked to indicate the level of appropriateness of their content on a scale from "1 (low appropriateness) to 8 (high appropriateness)". Through the figure below, we can observe the mean values of appropriateness level for the eight documents mentioned in the table above. Mean values between 5.0 (std. deviation = 2.06) and 5.6 (std. deviation = 1.52) were observed indicating an appropriate level, but there is still room to reach better levels.

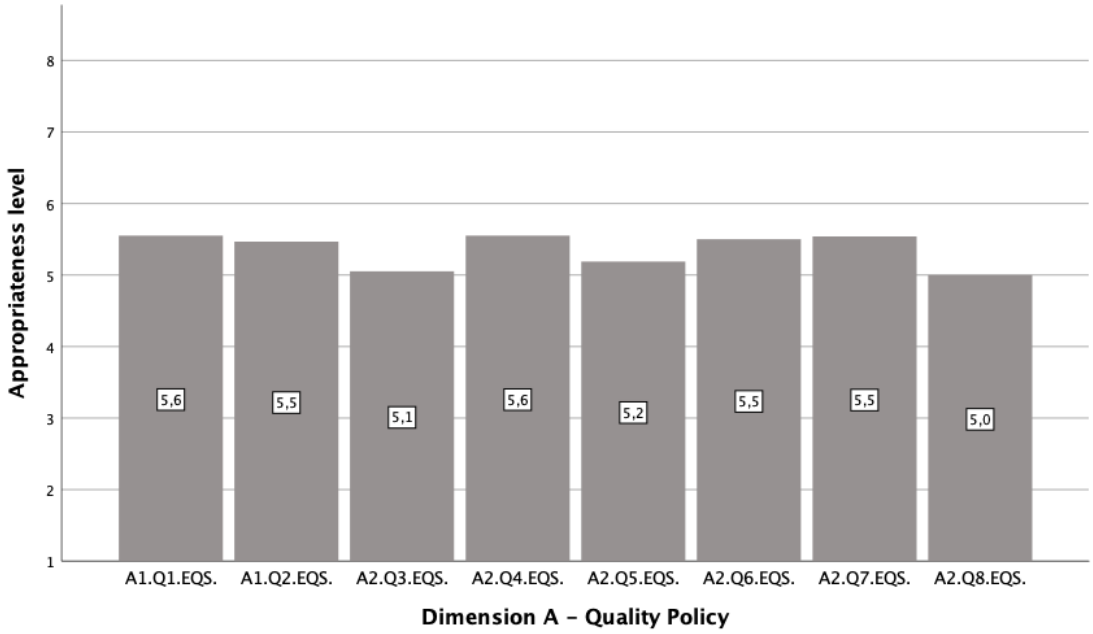

Figure 6 – Appropriateness level (mean values) of the Quality Assurance and improvement documents, from the radiographer perspective.

Regarding **Dimension B (Patients involvement)**, it was possible to assess how the patients are involved in QA or improvement activities in the imaging departments (table 10). The responses to the six items of this dimension were practically unanimous. As we can verify, 100.0% of radiographers say that patients do not participate in meetings with them about results of satisfaction surveys and complaints and do not participate in quality committees. There also

appears to be a high degree of consensus on patient non-participation with regard to developing quality criteria (74.2%), protocols and standards (83.9%), QI projects (95.2%) and in the evaluation of the QI process (90.3%).

Table 10 - Evaluation of dimension B on the patient's involvement, from the radiographers perspective (n=62).

Items	Never		Few times		Many times		Always	
	n	%	n	%	n	%	n	%
B1.Q1.EQS – Developing quality criteria	46	74.2	13	21.0	3	4.8	-	-
B1.Q2.EQS – Developing protocols and standards	52	83.9	9	14.5	1	1.6	-	-
B1.Q3.EQS – Meetings with radiographers about results of satisfaction surveys and complaints	62	100	-	-	-	-	-	-
B1.Q4.EQS – Participation in quality committees	62	100	-	-	-	-	-	-
B1.Q5.EQS – Participation in QI projects	59	95.2	3	4.8	-	-	-	-
B1.Q6.EQS – Evaluating QI process	56	90.3	4	6.5	2	3.2	-	-

In cases where patient involvement was reported, radiographers were asked to indicate the level of appropriateness (figure 7), and mean values between 3.3 (std. deviation = 0.95) and 4.2 (std. deviation = 1.64) were observed indicating a range from slightly inappropriate to slightly appropriate level. So, in the radiographer perspective, in the few cases in which patient participation was reported, this participation doesn't seem to be the most appropriate.

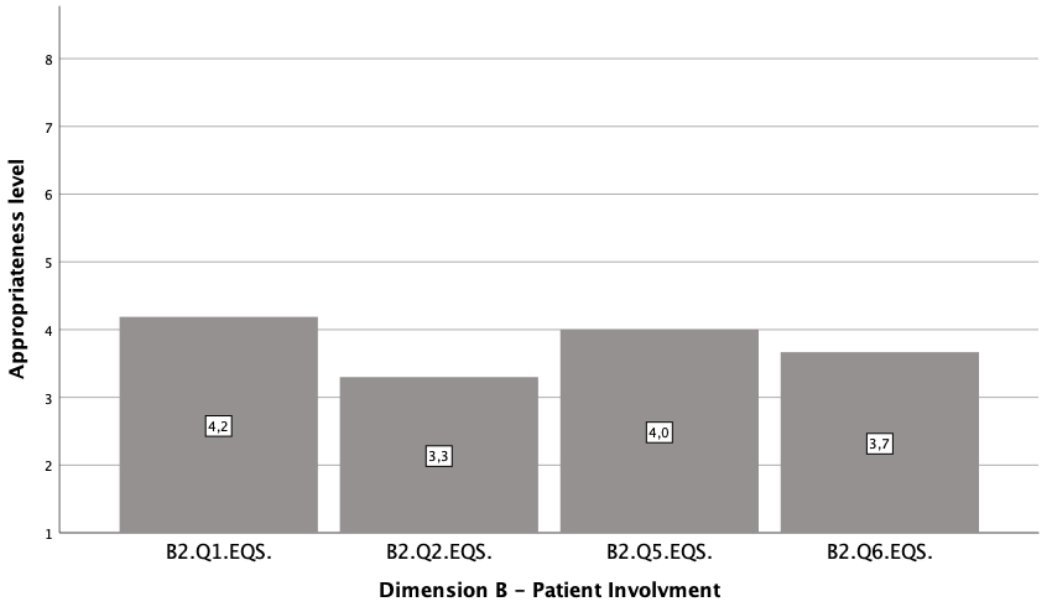

Figure 7 - Appropriateness level (mean values) on the patient's involvement and collaboration in Quality Assurance and improvement activities, from the radiographer perspective.

In relation to the **Dimension C (Standards)**, the existence of written procedures (standards) that are used in clinical practice by radiographers was assessed (table 11). In this topic, we can see that more than 50% of radiographers report there are standards for safety and radiation protection (66.1%), for safety utilization of imaging equipment's (51.6%) and for performing imaging procedures (51.6%). On the other hand, it is noteworthy that a considerable percentage of radiographers claim that there are no standards for performing invasive imaging examinations (51.6%), for co-operation with other departments (50.0%) and for patient communication (46.8%).

Table 11 – Evaluation of dimension C on the existence of standards that are used in clinical practice by radiographers (n=62).

	No		Yes		Don't know	
Items	n	%	n	%	n	%
C1.Q1.EQS - Standards for performing invasive imaging examinations	32	51.6	19	30.6	11	17.7
C1.Q2.EQS – Standards for patient communication	29	46.8	20	32.3	13	21.0
C1.Q3.EQS – Standards for safety and radiation protection	15	24.2	41	66.1	6	9.7
C1.Q4.EQS – Standards for utilization of imaging equipment	21	33.9	32	51.6	9	14.5
C1.Q5.EQS – Standards for management adverse reactions to contrast media	27	43.5	29	46.8	6	9.7
C1.Q6.EQS – Standards for performing imaging examinations (CT, MRI …)	22	35.5	32	51.6	8	12.9
C1.Q7.EQS – Standards for patient routing from intake to exit	24	38.7	21	33.9	17	27.4
C1.Q8.EQS – Standards for co-operation with other departments	31	50.0	18	29.0	13	21.0

In cases where standards were reported, radiographers were asked to indicate the level of appropriateness (figure 8), and mean values between 4.4 (std. deviation = 2.09) and 6.1 (std. deviation = 1.78) were observed indicating an appropriate level, especially in the questions that obtained higher mean values "C1.Q3.EQS" and "C1.Q6.EQS".

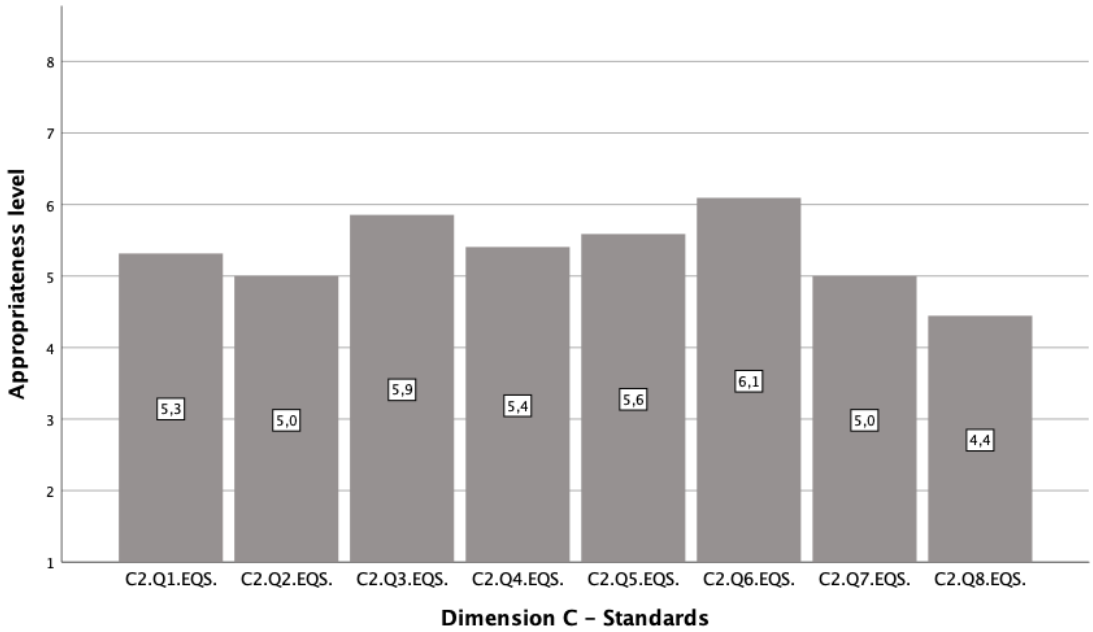

Figure 8 - Appropriateness level (mean values) on the existence of standards that are used in clinical practice by radiographers.

The results obtained for sub-dimension D1 (table 12), reveal a high percentage of radiographers who claim to exist training and education programs for themselves (83.9%) and for other staff members (62.9%). The existence of a radiographer responsible for the coordination related to QI activities is also mentioned by 51.6%. Regarding the less positive aspects, the absence of an image archive for training and education purposes, the lack of support by quality experts or consultants and the lack of budget for quality management, is mentioned by 51.6%, 50.0% and 46.8% of radiographers, respectively.

The results obtained for sub-dimension D2 are more worrying (table 12), because there seems to be no relationship between the QP and the HRM. On all issues, at least half of the radiographers refer that continuous education is not based on quality policies (58.1%), there is no training for the new radiographers in QI methods (56.5%), participation in QI projects not seem to be required (53.2%) and they aren't motivated to develop themselves in radiography profession, including in QP issues (50.0%).

As for sub-dimension D3 (table 12), the results are also far from the ideal, since the percentage of negative responses was higher in all the items. There is the lack of management encourage for the radiographer's involvement in the

quality system (67.7%), there seem to be no feedback to radiographers about results achieved (62.9%) and there also doesn't seem to be an adequate oversight over radiographer commitments (58.1%).

Table 12 - Evaluation of dimension D on the Human Resources Management, divided into three sub-dimensions**:** D1 (existence of special provisions), D2 (relationship between HRM and the Quality policy) and D3 (encouraging the radiographers participation in Quality Assurance and improvement) (n=62).

	No		Yes		Don't know	
Items	n	%	n	%	n	%
D1.1.Q1.EQS – Training / education of radiographers	7	11.3	52	83.9	3	4.8
D1.1.Q2.EQS – Training / education of other professionals / staff	13	21.0	39	62.9	10	16.1
D1.1.Q3.EQS – Radiographers has support by quality experts / consultants	31	50.0	14	22.6	17	27.4
D1.1.Q4.EQS – Quality coordinator (radiographer) for improvement activities	16	25.8	32	51.6	14	22.6
D1.1.Q5.EQS – Quality working groups	25	40.3	14	22.6	23	37.1
D1.1.Q6.EQS – Image archive for training / education purposes	32	51.6	11	17.7	19	30.6
D1.1.Q7.EQS – Budget for quality management	29	46.8	1	1.6	32	51.6
D2.1.Q1.EQS – Selection of new radiographers with positive attitude to QA	24	38.7	16	25.8	22	35.5
D2.1.Q2.EQS – Training new radiographers in QI methods	35	56.5	14	22.6	13	21.0
D2.1.Q3.EQS – Continuous education based on priorities in QP	36	58.1	10	16.1	16	25.8
D2.1.Q4.EQS – Radiographers are encouraged to develop the radiography profession, including in QP issues	31	50.0	22	35.5	9	14.5
D2.1.Q5.EQS – Participation of radiographers in QI projects is mandatory	33	53.2	17	27.4	12	19.4
D3.1.Q1.EQS – Radiographers pay enough attention to QA/improvement (no other incentives are necessary)	34	54.8	19	30.6	9	14.5
D3.1.Q2.EQS – The radiographer with management tasks indicates what is expected from radiographers with respect to QA	35	56.5	18	29.0	9	14.5
D3.1.Q3.EQS – The radiographer with management tasks checks whether radiographers stick to commitments	36	58.1	12	19.4	14	22.6
D3.1.Q4.EQS – Feedback to radiographers about results achieved	39	62.9	16	25.8	7	11.3
D3.1.Q5.EQS – Management encourage the radiographer's involvement in the quality system	42	67.7	11	17.7	9	14.5
D3.1.Q6.EQS – Monitoring imaging department action plans	25	40.3	13	21.0	24	38.7

Thus, considering the positive responses of the radiographers, the level of appropriateness was once again assessed (figure 9). Mean values between 4.4 (std. deviation = 2.13) and 5.8 (std. deviation = 1.53) were obtained, indicating an appropriate level. In addition, the items of sub-dimension D2 obtained lower mean values.

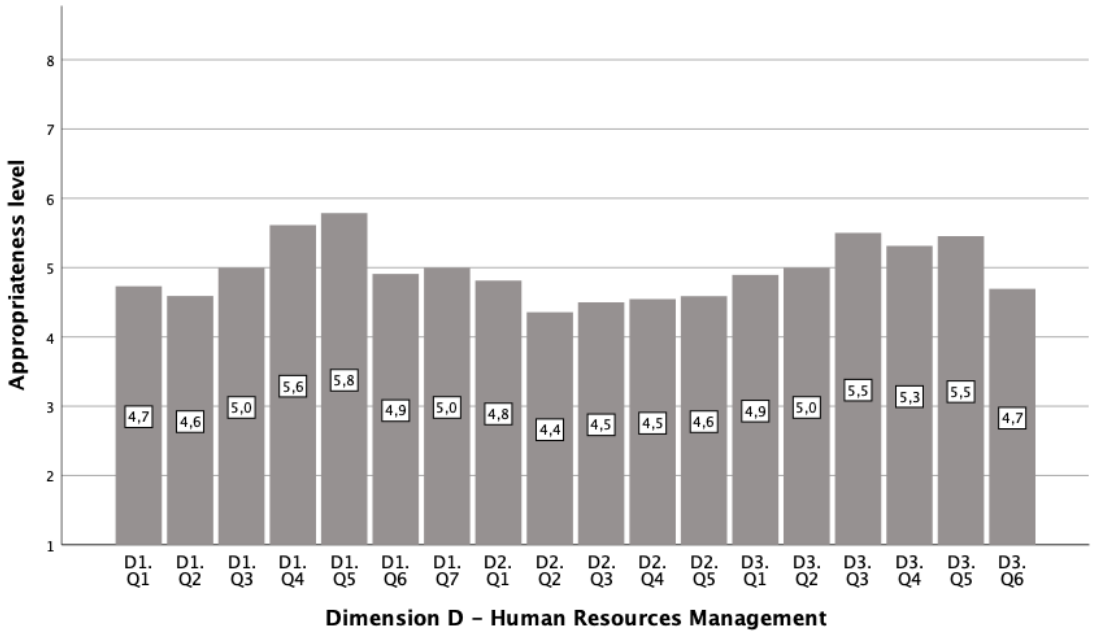

Figure 9 - Appropriateness level (mean values) on the Human Resources Management of the imaging departments, from the radiographer perspective.

With regards to **Dimension E (QA and improvement activities)** it evaluates the existence of QA and improvement activities in the imaging department, using a total of 25 items (table 13). A percentage of negative responses equal to or greater than 50% was obtained in nine of the items, highlighting the absence of satisfaction surveys among professionals from imaging department (71.0%) and referring physician (66.1%), the absence of needs and expectations surveys among patients (62.1%) and professionals (51.6%), and the lack of analyses of waiting times in the imaging department (58.1%). Also, the DRL do not seem to be set (50.0%), and the rejection of imaging examinations without justification (53.2%) should also be highlighted.

On the other hand, in the positive responses of radiographers, it is important to emphasize that the imaging departments have highlight signs to alert pregnant women to the risks of ionizing radiation (98.4%), there is a periodic safety assessment of imaging rooms and equipment's (85.5%), the departments have digital radiology systems (80.6%) and all imaging examinations performed in the department are formally requested by referring physicians (79.0%).

Table 13 - Evaluation of dimension E on the existence of QA and improvement activities in the imaging department, from the radiographer perspective (n=62).

	No		Yes		Don't know	
Items	n	%	n	%	n	%
E1.Q1.EQS – Radiographers performance evaluation carried out by peers	15	24.2	36	58.1	11	17.7
E1.Q2.EQS – Radiographers performance evaluation carried out by other professionals	36	58.1	10	16.1	16	25.1
E1.Q3.EQS – Radiographers performance evaluation with their own participation	13	21.0	45	72.6	4	6.5
E1.Q4.EQS – Internal audit	28	45.2	20	32.3	14	22.6
E1.Q5.EQS – Satisfaction survey among patients	31	50.0	14	22.6	17	27.4
E1.Q6.EQS – Satisfaction survey among professionals from imaging department	44	71.0	7	11.3	11	17.7
E1.Q7.EQS – Satisfaction survey among referring physician	41	66.1	4	6.5	17	27.4
E1.Q8.EQS – Needs and expectations survey among patients	39	62.9	4	6.5	19	30.6
E1.Q9.EQS – Needs and expectations survey among professionals	32	51.6	5	8.1	25	40.3
E1.Q10.EQS – Use of complaints registration for QI	25	40.3	13	21.0	24	38.7
E1.Q11.EQS - Computer record of radiological exams scheduling	8	12.9	47	75.8	7	11.3
E1.Q12.EQS – Digital radiology system	8	12.9	50	80.6	4	6.5
E1.Q13.EQS – Structured review of practices, procedures and results against standards of practice in radiology	29	46.8	20	32.3	13	21.0
E1.Q14.EQS – Procedures performed by qualified professionals with knowledge and training in quality	14	22.6	44	71.0	4	6.5
E1.Q15.EQS – When critical findings are detected, the radiologist or in his absence the radiographer, informs the referring physician	10	16.1	45	72.6	7	11.3
E1.Q16.EQS – There are highlighted signs to alert pregnant women to the risks of ionizing radiation	0	0.0	61	98.4	1	1.6
E1.Q17.EQS – Periodic safety assessment of imaging rooms and equipment's	5	8.1	53	85.5	4	6.5
E1.Q18.EQS – QA and control program of equipment's	11	17.7	43	69.4	8	12.9
E1.Q19.EQS – Analysis of waiting times between prescription and imaging examinations	25	40.3	8	12.9	29	46.8
E1.Q20.EQS – Analysis of patient waiting times in the imaging department	36	58.1	5	8.1	21	33.9
E1.Q21.EQS – Analysis of waiting times until report is delivered to the patient	30	48.4	5	8.1	27	43.5
E1.Q22.EQS – Medical prescription for all imaging examinations	8	12.9	49	79.0	5	8.1
E1.Q23.EQS – Rejection of imaging examinations without justification	33	53.2	27	43.5	2	3.2
E1.Q24.EQS – Absorbed dose evaluation, in compliance with ALARA principle	30	48.4	27	43.5	5	8.1
E1.Q25.EQS – Diagnostic reference levels are set	31	50.0	25	40.3	6	9.7

The obtained mean values of the appropriateness level were between 4.3 (std. deviation = 1.25) and 6.9 (std. deviation = 1.49) were obtained, indicating an appropriate level (figure 10). In addition, the highest values were obtained between the items "E1.Q14.EQS" and "E1.Q18.EQS".

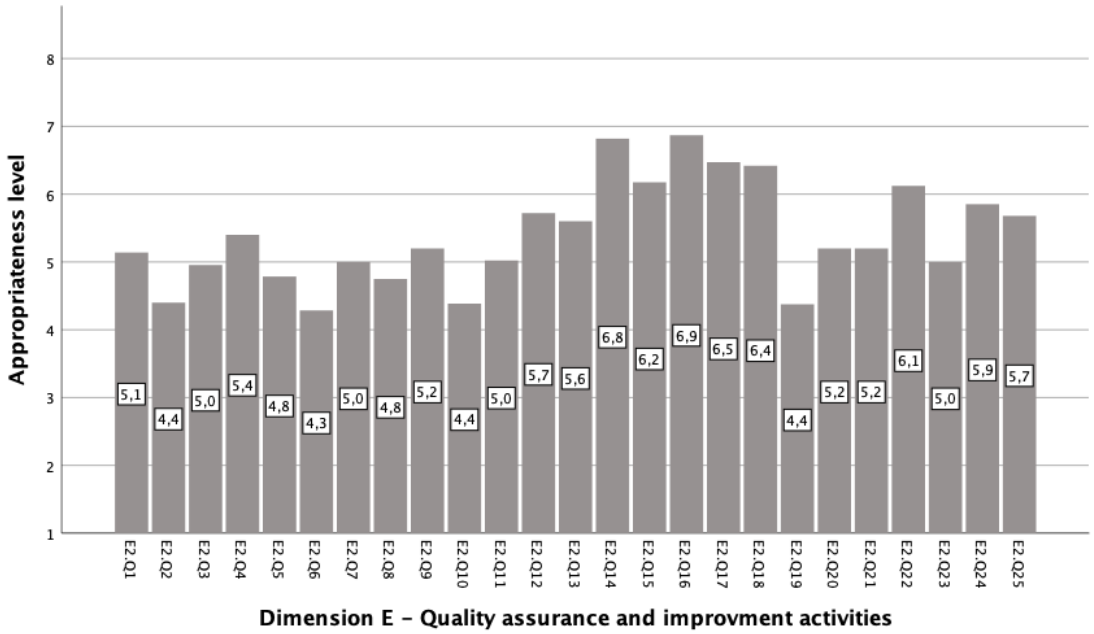

Figure 10 - Appropriateness level (mean values) on the existence of QA and improvement activities in the imaging department, from the radiographer perspective.

Finally, after evaluating the different dimensions of the quality systems, a final section with four items was used to evaluate the impact and satisfaction of radiographers regarding the QMS and QA and improvement activities in the imaging department.

Thus, through table 14, it turns out that regarding the overall quality and overall organization and management of the imaging department, most radiographers are unsatisfied (54.8% and 58.1%, respectively). However, regarding the department's overall image, 58.1% of radiographers are satisfied. The item that presents the highest percentage of satisfaction, concerns the services provided by the imaging department (71.0%).

Table 14 - Evaluation of the overall aspects (F) regarding the quality system and QA and improvement activities in the imaging department, from the radiographer perspective (n=62).

	Unsatisfied		Satisfied	
Items	n	%	n	%
F1.Q1.EQS – Overall quality of the imaging department	34	54.8	28	45.2
F1.Q2.EQS - Overall image of the imaging department	26	41.9	36	58.1
F1.Q3.EQS – Overall organization and management of the imaging department	36	58.1	26	41.9
F1.Q4.EQS – Overall services provided by the imaging department	18	29.0	44	71.0

If we check the individual evaluation of each imaging department, it is observed that in terms of overall quality (figure 11), radiographers are satisfied with imaging departments from institutions B and C (81.8% and 81.2%, respectively). At institution A, a large majority of radiographers are unsatisfied (92.3%), and in institution D the response rates are balanced (55.6% are unsatisfied and 44.4% are satisfied).

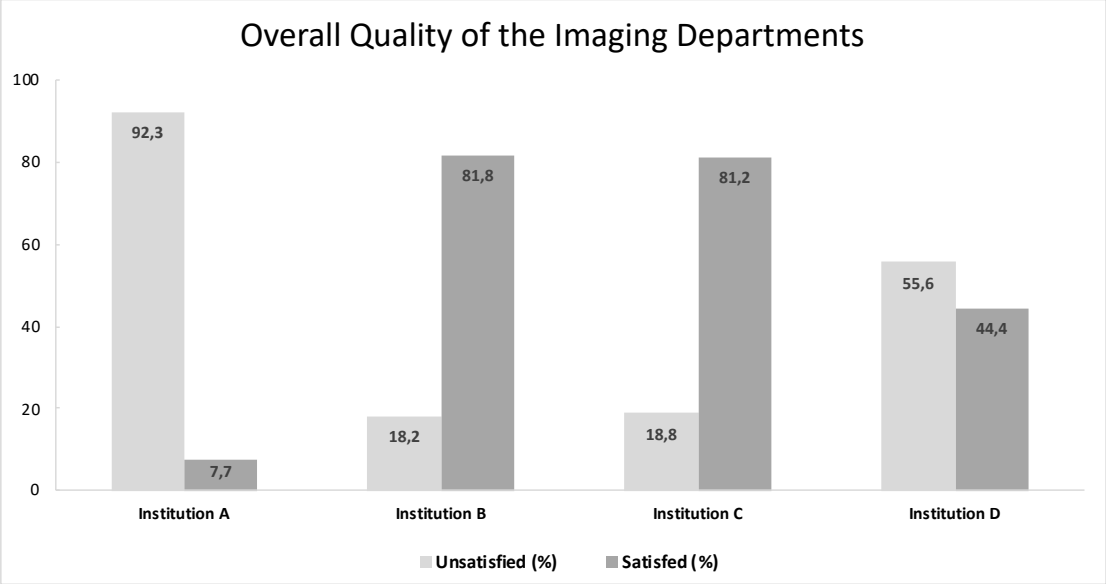

Figure 11 – Percentage of satisfied and unsatisfied radiographers regarding the overall quality of the imaging departments from the institutions A, B, C and D (n=62).

In terms of overall image (figure 12), radiographers are satisfied with imaging departments from institutions B, C and D (71.7%, 93.8% and 100.0%, respectively). At institution A, once again, a large majority of radiographers are unsatisfied (84.6%).

Regarding the overall organization and management of the imaging departments (figure 13), similar results were obtained when compared to the overall quality. Radiographers are satisfied with the departments from institutions B (54.5%) and C (81.2%), and unsatisfied with the departments from institutions A (88.5%) and D (55.6%).

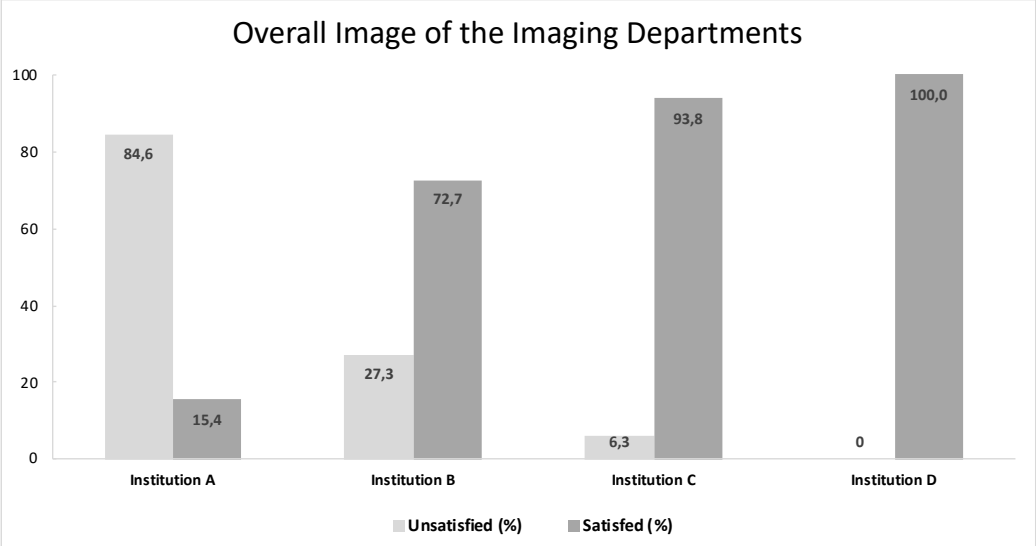

Figure 12 - Percentage of satisfied and unsatisfied radiographers regarding the overall image of the imaging departments from the institutions A, B, C and D (n=62).

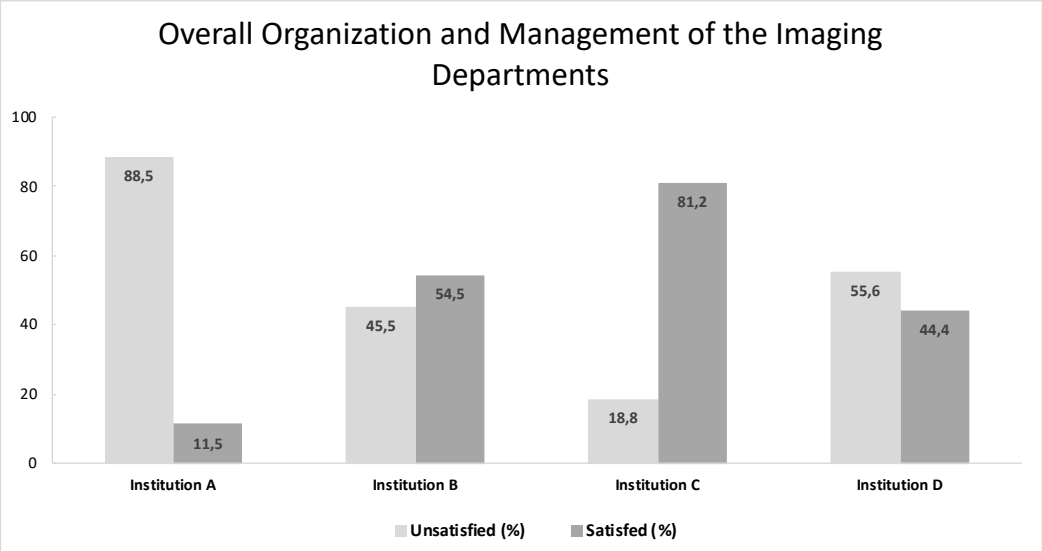

Figure 13 - Percentage of satisfied and unsatisfied radiographers regarding the overall organization and management of the imaging departments from the institutions A, B, C and D (n=62).

Finally, in relation to the overall services provided by the imaging departments, it seems to be the item where there is greater unanimity among the different institutions. Through figure 14, we can see that most radiographers refer that they are satisfied, with institutions B and D having higher values (90.9% and 88.9%, respectively).

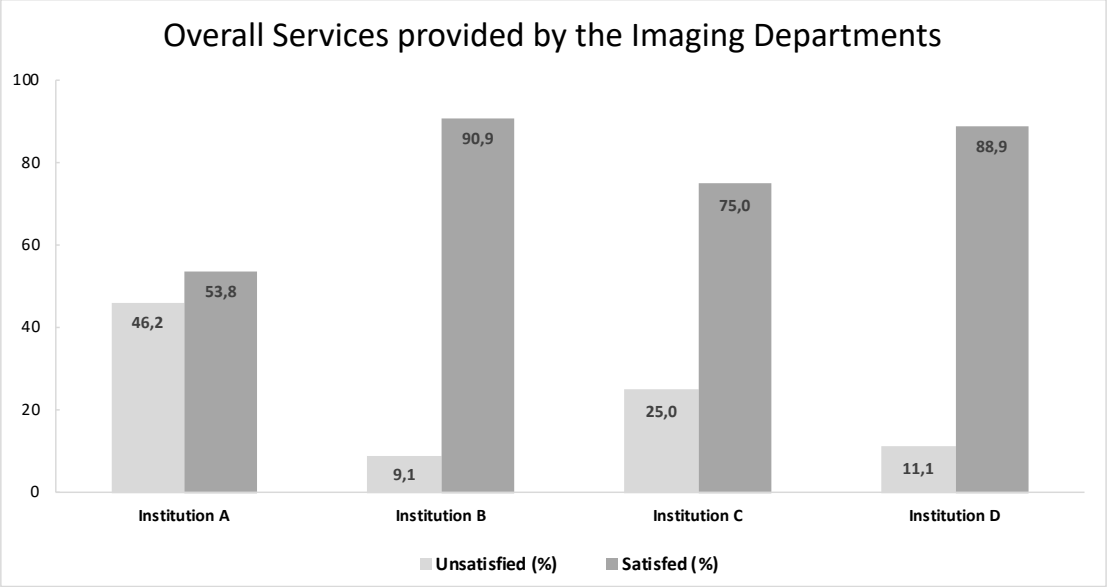

Figure 14 - Percentage of satisfied and unsatisfied radiographers regarding the overall services provided by the imaging departments from the institutions A, B, C and D (n=62).

After the descriptive analysis of the quality system assessment instrument was completed, we tried to find out which dimensions had the most quality defects.

4.2.1. Quality Defects: What should we prioritize?

Through a well-known quality tool (Pareto analysis), which is a statistical technique used to map and rank quality problems from the most to the least frequent in order to prioritize intervention measures, we tried to verify which dimensions had the greatest negative impact on the QMS of the imaging departments (Saturno & Gascón, 2008).

Thus, the level of compliance for each quality dimension was determined based on the frequency of positive responses from radiographers (in percentage) and considering a 95% confidence interval (CI) (table 15). It was found that the percentages of compliance were between a minimum of 8.87% and a maximum of 43.07%.

In addition, the calculations made allow us to state that the highest percentages of compliance correspond to the dimension E (QA and improvement activities) with 43.04% (CI from 30.74 to 55.34), dimension C (standards) with 42.74% (CI

from 30.44 to 55.04), and sub-dimension D1 (special provisions related to HRM) with 37.56% (CI from 25.46 to 49.66).

Table 15 – Compliance level of the quality dimensions (A, B, C, D and E) for a 95% confidence interval.

Dimensions	Compliance level (n=62)	
	Mean (%)	CI (95%
A – Quality Policy	32.45	20.85 – 44.05
B - Patient involvement	8.87	1.77 – 15.97
C - Standards	42.74	30.44 – 55.04
D1 – Human Resources Management (special provisions)	37.56	25.46 – 49.66
D2 - Human Resources Management (quality policy)	25.48	14.78 – 36.18
D3 - H Human Resources Management (radiographers involvement)	23.92	13.32 – 34.52
E – Quality Assurance and improvement activities	43.04	30.74 – 55.34

Then, the absolute, relative and accumulated frequencies of non-compliance (quality defects) were calculated. Based on the obtained values, a Pareto diagram was created (figure 15), in order to have a complete and informative graphic representation of the main quality defects identified, to facilitate the prioritization of intervention strategies.

Based on figure 15, the most problematic quality criteria (few vital) were identified according to the Pareto principle (Figueiredo & Gama, 2012; Saturno & Gascón, 2008). Thus, we highlight four quality dimension which, together, accounted for 67.92% of the total defects found, so they should be considered as priority in the actions and strategies to be established for QI (Almeida et al., 2017; Saturno & Gascón, 2008).

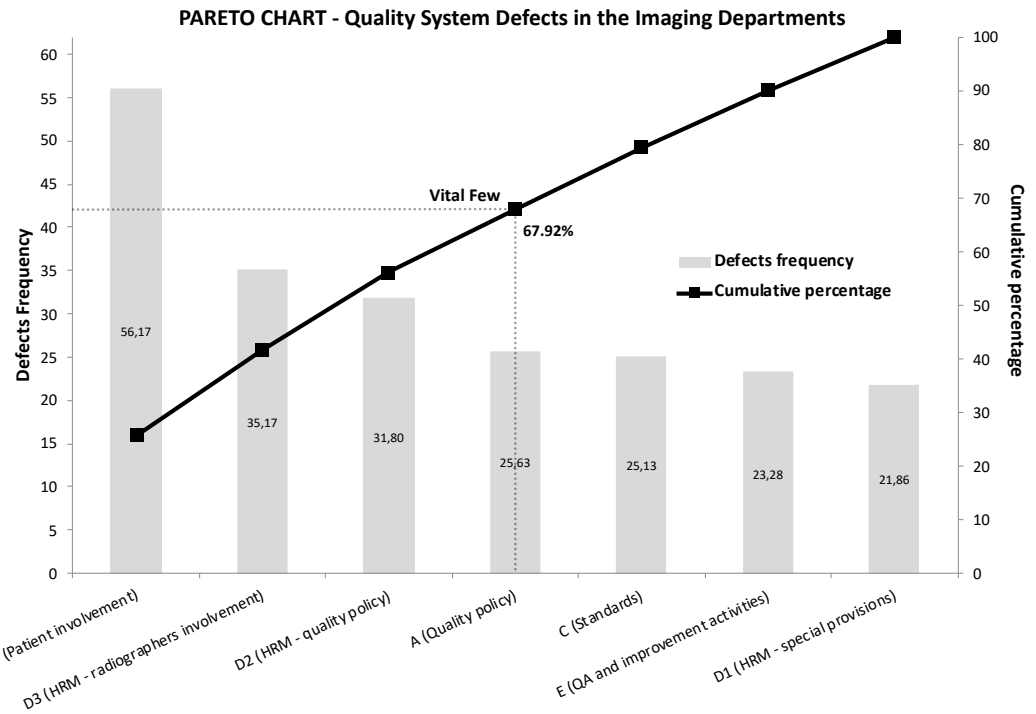

Figure 15 – Pareto chart of the quality system defects of the imaging departments (dimensions on the x-axis; defects frequency on the left y-axis; ranked bars in ascending order; cumulative percentage on the right y-axis, and cumulative percentage curve traversing the categories from left to right).

4.2.2. Quality Management Systems: What is the Development Stage?

As explained in the methodological procedure, "indicators for the achievement of development stages for quality systems" in the imaging departments by dimension were used, as defined by Wagner et al. (1999). Since the imaging departments can only reach a certain stage of development if they have "developed at least one activity in that stage" and if they have "completed all the activities of the previous stage". As we can see in table 16, if they are considered globally, then they are in stage 0.

Thus, imaging departments are in a stage of "orientation and awareness", where "there are no systematic activities for QA and improvement" of the services provided (Costa, 2006; Wagner et al., 1999).

Table 16 – Developmental stage of each dimension in the imaging departments under study.

Dimensions	Percentage per developmental stage (%)			
	Stage 0	Stage 1	Stage 2	Stage 3
A – Quality Policy	39.5	44.4	41.1	36.3
B - Patient involvement	90.6	0.0	11.7	3.2
C - Standards	30.6	50.0	42.5	33.9
D – Human Resources Management	21.0	39.1	20.7	25.8
E – Quality Assurance and improvement activities	78.3	21.0	8.1	52.4

In stage 0, only two of the dimensions fulfill the requirements for obtaining a percentage greater than 50%, namely the dimensions B about patient involvement (90.6%) and E about QA and improvement activities (78.3). Thus, there is no patient involvement and the performance evaluation of radiographers is done by peers. The remaining three dimensions have percentages below of 50%, indicating weaknesses in terms of the mission description, regarding the description of the procedures for patients with special needs, the lack of standards for invasive procedures, and a low motivation of radiographers in aspects related to QP.

In stage 1, there is a dimension that reaches 50%, which reveals a good consistency in terms of standards for patient communication, for safety and radiation protection and for performing imaging examinations. All the others quality indicators do not have a good assessment as necessary, in order to be considered at that stage.

4.3. Evidence-Based Practice by Radiographers

Through the questionnaire 2 - EBP, radiographers' preconditions for EBP and radiographer's participation in research activities were evaluated.

Using different groups of questions, attitudes towards research and reading of scientific publications were analysed, and six evidence-based practice dimensions were assessed: evidence-based actions (dimension G), the

significance of research activities (dimension H), support for research activities (dimension I), current use of research evidence in practice (dimension J), sources of evidence (dimension K), and research knowledge (dimension L).

4.3.1. Radiographers attitudes towards research

In order to assess the background characteristics and the involvement of radiographers in scientific research activities, including facilitating and hindering factors, several items were considered (table 17).

For items Q1.EBP and Q2.EBP, multiple response options were allowed, and we can see that the majority of radiographers obtained training about research in the radiography graduation (83.9%) and also during postgraduate studies (33.9%). Their participation in research activities occurred mainly as radiography students (95.2%), or during the role as professor or monitor (22.6%).

It should also be noted that only one radiographer never had any training in research (1.6%), but everyone has already participated in some research project. However, it appears that hospital or institutional initiatives in relation to radiographers are not encouraged, since only one reports having received research training from the hospital, and only two report having integrated research teams in the hospital.

When asked about who should carry out research projects (Q5.EPB), we can group the answers into three main groups. 45.2% believe that research should be carried out together with external bodies such as universities and research centers; 29.0% consider that they should be performed in collaboration with medical physicists and radiologists, and 22.6% consider that should be teams consisting only of radiographers.

Table 17 – Background characteristics and involvement of radiographers in scientific research activities (n=62).

Items	Answers	n	%
Q1.EBP – Radiographer research training	Graduation studies at university	52	83.9
	Specialization studies at university	4	6.5
	Postgraduate studies at university	21	33.9
	Training organized by the employer / hospital	1	1.6
	Without any research training	1	1.6
Q2.EBP – Radiographer participation in research projects	As a student (radiography graduation)	59	95.2
	As a professor / monitor / tutor	14	22.6
	As a member in the imaging department research team	8	12.9
	As a member in the hospital research team	2	3.2
	As responsible researcher in a research project	7	11.3
	Never participated in a research project	0	0
Q5.EBP – Who should carry out research projects?	Radiographer (individually)	2	3.2
	Radiographers teams	14	22.6
	Physicians and /or radiologists	0	0.0
	Radiographers in collaboration with physicians and radiologists	18	29.0
	In collaboration with external bodies (universities, research centers ...)	28	45.2
Q6.EBP – Factors that promote the radiographer participation in research activities	Support from fellow radiographers	20	32.3
	Support from department heads (hierarchical superior)	34	54.8
	Support from department manager	22	35.5
	Support from physicians and other clinical professionals	11	17.7
	Taking time for research activities	23	37.1
	Have enough information about research activities	12	19.4
	Interest in research activities	32	51.6
Q7.EBP – Factors that hinder the radiographer participation in research activities	Lack of time	23	37.1
	Lack of funding	3	4.8
	Lack of motivation	11	17.7
	Lack of information on research activities	4	6.5
	Lack of support	20	32.3
	No hindering factors	1	1.6
Q14.EBP – Tasks performed in previous research projects	Identification of research problem	39	62.9
	Literature searches	53	85.5
	Definition of research questions	41	66.1
	Planning of research methods	45	72.6
	Data collection	51	82.3
	Data processing	45	72.6
	Research Report	42	67.7
	Research project presentation	46	74.2
	Never participated in any research project	4	6.5

In relation to the "factors that promote and hinder the participation of radiographer in research" (Q6.EBP and Q7.EBP), multiple response options were allowed and it turns out that the major promoting factors are the support from imaging department heads (54.8%), the interest of radiographer in

research activities (51.6%) and taking time for research activities (37.1%). The main hinder factors are the lack of time (37.1%), lack of support (32.3%) and lack of motivation (17.7%).

Regarding the tasks performed by radiographers in previous research projects (Q14.EBP), it is clear that most of them have already participated in the most diverse phases of research. The most marked task corresponds to literature search (85.55), followed by data collection (82.3%), and presentation of the research project (74.2%). On the other hand, the answer "Never participated in any research project" was marked by four radiographers (6.5%).

4.3.2. Reading of scientific publications

In order to evaluate the factors that promote and hinder the reading of scientific publications by radiographers (table 18) and the frequency of this reading (table 19), several items were considered.

The interest in reading scientific publications (72.6%), its easy access (46.8%) and the possibility of talking with colleagues in the workplace about scientific publications (27.4%) are the facilitating factors pointed out by radiographers. However, the lack of time (57.9%), the lack of motivation (41.9%) and the difficulties in obtaining scientific publications, are the biggest hinder factors mentioned.

There is a lack of frequent reading by radiographers, namely from national (Q16.EBP) and international (Q17.EBP) professional journals, since most of them report only read a few times a year (40.3% and 35.5%, respectively). In addition, 24.2% and 27.4% never read national and international journals, respectively. Radiographers who read professional journal (Q18.EBP), say that they do it for personal development (37.1%), to keep up to date (30.6%) and also because it is an intrinsic characteristic of healthcare professionals (19.4%).

Table 18 - Facilitating and hindering factors for reading scientific publications (n=62).

Items	Multiple-choice options	n	%
Q9.EBP – Factors that promote the reading of scientific publications by radiographers	Take time to read scientific publications	11	17.7
	Interest in reading scientific publications	45	72.6
	Have sufficient knowledge to read scientific publications	11	17.7
	Easy access to scientific publications	29	46.8
	Have sufficient English skills	9	14.5
	Talk to colleagues in the workplace about scientific publications	17	27.4
	Other factors	1	1.6
Q10.EBP – Factors that hinder the reading of scientific publications by radiographers	Lack of time	37	59.7
	Lack of motivation	26	41.9
	Lack of information on research activities	4	6.5
	Insufficient English skills	8	12.9
	Difficulties in obtaining scientific publications	22	35.5
	No hindering factors	6	9.7

Table 19 - Frequency of reading scientific publications (n=62).

Items	Answers	n	%
Q16.EBP – How often do you read national professional journals?	Every week	2	3.2
	Monthly	8	12.9
	A few times a year	25	40.3
	Yearly	12	19.4
	Do not read	15	24.2
Q17.EBP – How often do you read international professional journals?	Every week	6	9.7
	Monthly	7	11.3
	A few times a year	22	35.5
	Yearly	10	16.1
	Do not read	17	27.4
Q18.EBP – Why do you read professional journals?	Colleagues do it too	0	0
	To keep me updated on new practices	19	30.6
	Management / department incentive	0	0
	Personal development	23	37.1
	It's part of being a healthcare professional	12	19.4
	Another reason	1	1.6
	Do not read	7	11.3
Q19.EBP – How often do you read scientific journals?	Every week	6	9.7
	Monthly	7	11.3
	A few times a year	32	51.6
	Yearly	8	12.9
	Do not read	9	14.5
Q21.EBP – Why do you read scientific journals?	Colleagues do it too	0	0
	To keep me updated on new practices	21	33.9
	Management / department incentive	1	1.6
	Personal development	22	35.5
	It's part of being a healthcare professional	8	12.9
	Another reason	1	1.6
	Do not read	9	14.5

Similar results were obtained in relation to the frequency of reading scientific journals (Q19.EBP), where 51.6% reported reading only a few times a year and the same reasons mentioned above were presented again. A total of nine radiographers (14.5%) reported never reading this kind of scientific publication.

4.3.3. Evidence-Based Practice Dimensions

As previously mentioned, this instrument contained a total of six dimensions. Thus, through **Dimension G (evidence-based actions)** and using eight items, it was intended to evaluate the use of evidence-based actions by radiographers in their professional activity (table 20).

Table 20 – Agreement level of radiographers in relation to evidence-based actions statements (n=62; scale from "1 – Disagree strongly" to "5 – Agree strongly converted" in "Negative Answer" (percentage of score 1 and 2), "Neutral answer" (percentage of score 3) and "Positive answer" (percentage of score 4 and 5); Q3.12 to Q3.14 were reversed to analyse the positive and negative responses).

Items	Negative Answer (%)	Neutral (%)	Positive Answer (%)
Q3.1.EBP – Evidence-based action has relevance to radiographer's work	1.6	9.7	88.7
Q3.2.EBP – Evidence-based action is part of the radiographer's role	6.4	8.1	85.4
Q3.3.EBP – It is useful to use evidence-based data to support radiographer role during their practice	6.4	-	93.6
Q3.4.EBP – Evidence-based action is useful for developing / improving radiographer practices	-	8.1	91.9
Q3.5.EBP – Research activities provide information on the radiographer's work	1.6	6.5	91.9
Q3.12.EBP – Tacit knowledge is a sufficient scientific basis of knowledge in the radiographer's work	6.5	16.1	77.4
Q3.13.EBP – The radiographer's work is practice-based, so the contribution of scientific research is not necessary	1.6	3.2	95.2
Q3.14.EBP – Scientific data research takes time off radiographer's work	33.9	27.4	38.7

Radiographers have positively expressed that evidence-based actions are relevant to their work (88.7%) and that it is part of their role (85.4%). In addition, they also positively affirm that these actions are necessary for their practice (93.6%), for their improvement (91.6%), and that they provide information they need (91.6%).

Questions Q3.12.EBP, Q3.13.EBP and Q3.14.EBP were formulated in a negative way, and the radiographers stated that tacit knowledge was not a sufficient basis for their work (77.4%), that the contribution of research was necessary (95.2%), and that scientific data research does not take time away of their work (38.7%).

As for **Dimension H (significance of research activities)**, it evaluated the importance and the participation of radiographers in research activities in their professional activity (table 21). For all questions of this dimension, mostly positive answers were obtained, varying between 50% in item "Q3.7.EBP – Participate in research activities improves the possibilities for career promotion / progression" and 83.9% in item "Q3.9.EBP - Participate in research activities helps in professional and personal development".

Thus, from the perspective of most radiographers, research activities are important at different levels (professional role, career promotion, monitor role, personal development). In addition, 79.0% say they "are available to participate in research activities" and 80.7% say that the imaging department should develop research projects.

Table 21 - Agreement level of radiographers in relation to significance of research activities (n=62; scale from "1 – Disagree strongly to 5 – Agree strongly" converted in "Negative Answer" (percentage of score 1 and 2), "Neutral answer" (percentage of score 3) and "Positive answer" (percentage of score 4 and 5)).

Items	Negative Answer (%)	Neutral (%)	Positive Answer (%)
Q3.6.EBP – Participate in research activities is part of the professional activities	9.6	25.8	64.5
Q3.7.EBP – Participate in research activities improves the possibilities for career promotion / progression	22.5	27.4	50.0
Q3.8.EBP – Participate in research activities is part of the teacher / monitor role in student education	8.0	9.7	82.2
Q3.9.EBP – Participate in research activities helps in professional and personal development	4.8	11.3	83.9
Q3.10.EBP – Radiographers are available to participate in research activities	6.5	14.5	79.0
Q3.11.EBP – The imaging department should develop research projects	1.6	17.7	80.7

Regarding **Dimension I (support in research activities)**, the radiographers experiences in relation to support in research activities was assessed. This group of questions was only answered if the radiographers were participating

or participated in research activities (table 22). Thus, 33 responses were obtained, where there is a lack of "support and encouragement from other healthcare professionals" (48.5%) and "from the department director" (42.5%) for the radiographer participation in research activities.

However, in relation to the "support and encouragement from the colleagues" (39.5%) and "from imaging department manager" (51.5%), it seems to be more positive in the radiographer perspective.

Table 22 - Agreement level of radiographers in relation to support in research activities (n=33; scale from "1 – Disagree strongly" to "5 – Agree strongly" converted in "Negative Answer" (percentage of score 1 and 2), "Neutral answer" (percentage of score 3) and "Positive answer" (percentage of score 4 and 5)).

Items	Negative Answer (%)	Neutral (%)	Positive Answer (%)
Q11.1.EBP – Support and encouragement from colleagues to participate in research activities	24.2	36.3	39.5
Q11.2.EBP – Support and encouragement from other healthcare professionals to participate in research activities	48.5	36.3	15.2
Q11.3.EBP – Support and encouragement from imaging department manager to participate in research activities	24.2	21.3	51.5
Q11.4.EBP – Support and encouragement from department director to participate in research activities	42.5	33.3	24.2

With respect to **Dimension J (current use of research evidence in practice),** the current usage of research results in the radiographers clinical practice was assessed (table 23).

The responses were mostly positive for all items, where it is highlighted that 85.0% of radiographers try to change or adapt practices based on scientific data, 75.8% question their own practices based on scientific data and 72.7% refer that their actions are carried out based on scientific data and that they talk to radiography students about these data. Thus, for those who participate or have participated in research activities (n = 33), there seems to be a concern with using scientific data in practice.

Table 23 - Agreement level of radiographers in relation to current use of research evidence in practice (n=33; scale from "1 – Disagree strongly" to "5 – Agree strongly" converted in "Negative Answer" (percentage of score 1 and 2), "Neutral answer" (percentage of score 3) and "Positive answer" (percentage of score 4 and 5)).

Items	Negative Answer (%)	Neutral (%)	Positive Answer (%)
Q13.1. EBP – Talk about scientific data with colleagues	15.1	18.2	66.7
Q13.2. EBP – Talk about scientific data with the hierarchical superior	39.4	15.2	45.4
Q13.3. EBP – Actions are based on scientific data	3.0	24.3	72.7
Q13.4. EBP – Question the practices based on scientific data	6.0	18.2	75.8
Q13.5. EBP – Try to change / adapt practices based on scientific data	6.0	9.0	85.0
Q13.6. EBP – Talk about scientific data with the students (if applicable)	6.0	3.0	72.7
Q13.7. EBP – Talk about scientific data with the teachers who guide research work (if applicable)	12.0	12.2	54.7
Q13.8. EBP – Teach students to search scientific data during clinical internship periods (if applicable)	6.0	21.3	54.7

Dimension K (sources of evidence) assesses the "importance of the different sources of evidence" in the performance of the radiographer's duties (table 24).

Table 24 – Importance level of different sources of evidence in the accomplishment of the radiographer's duties (n=62; scale from "1 – Not important" to "5 – Very important" converted in "Not Important or Slightly Important" (percentage of score 1 and 2), "Don't' Know" (percentage of score 3) and "Important or Very Important" (percentage of score 4 and 5)).

Items	Not Important or Slightly Important (%)	Don't Know (%)	Important or Very Important (%)
Q15.1. EBP – Knowledge acquired during graduation	-	3.2	96.8
Q15.2. EBP – Scientific research	-	8.1	91.9
Q15.3. EBP – Reference Manuals	-	3.2	96.8
Q15.4. EBP – Medical literature	11.3	9.7	79.1
Q15.5. EBP – Practices not registered in the department	12.9	43.5	43.6
Q15.6. EBP – Practices registered in the department (quality manuals, instructions and procedures)	14.5	25.8	59.7
Q15.7. EBP – The tacit knowledge	8.1	12.9	79.0
Q15.8. EBP – Colleagues	14.5	11.3	74.2
Q15.9. EBP – Instructions and orders from physicians / radiologists	24.2	21.0	54.8
Q15.10. EBP – Training days (e.g. safety and radiation protection)	9.7	9.7	80.7

As we can see, radiographers attach special importance to the knowledge acquired during graduation (96.8%), reference manuals (96.8%), results of scientific research (91.9%) and training days (80.7%).

In relation to **Dimension L (knowledge of research),** the radiographer's perceptions of their "abilities, knowledge and self-confidence in terms of research process and research activities" were evaluated (table 25).

Table 25 - Agreement level of radiographers in terms of knowledge of scientific research (n=62; scale from "1 – Disagree strongly" to "5 – Agree strongly" converted in "Negative Answer" (percentage of score 1 and 2), "Neutral answer" (percentage of score 3) and "Positive answer" (percentage of score 4 and 5)).

Items	Negative Answer (%)	Neutral (%)	Positive Answer (%)
Q22.1.EBP – Ability to participate in research activities	4.8	21.0	74.2
Q22.2.EBP – Basic knowledge about the research process	8.1	14.5	77.5
Q22.3.EBP – Knowledge about the stages of the research process	6.5	27.4	66.2
Q22.4.EBP – Knowledge about scientific studies in the field of imaging	17.7	41.9	40.3
Q22.5.EBP – Research capabilities are sufficient to search scientific data	11.3	25.8	62.9
Q22.6.EBP – Know how to use research results during professional practice	6.5	21.0	72.6
Q22.7.EBP – Know well the results of current investigations in the field of imaging	29.0	41.9	29.0
Q22.8.EBP – Sufficient English skills to read and understand scientific reports	16.1	21.0	62.9
Q22.9.EBP – Sufficient knowledge of research methods to understand the scientific studies	11.3	24.2	64.5
Q22.10.EBP – Sufficient knowledge of statistical methods to understand the results of scientific studies	24.2	29.0	46.8
Q22.11.EBP – Be able to critically evaluate scientific studies	14.5	25.8	58.1

The results observed in the previous table, indicate that radiographers consider that they have "basic knowledge about the research process" (77.5%), have skills to integrate research activities (74.2%), "know how to apply the results of research into clinical practice" (72.6%) and know the different "stages of research process" (66.2%).

4.4. Informational Behavior of Radiographers

Through the questionnaire 3 – IBR (informational behaviour of radiographers) was evaluated using several items divided into different categories, namely "the information needs, habits and preferences for information resources management, bibliographic research skills and the most frequent information needs" of radiographers in their clinical practice and when they face specific situations.

4.4.1. Information needs of Radiographers

In order to assess the information needs of radiographers in the previous 30 days, three questions were used. First, the information sources most frequently used in the last 30 days by radiographers were recorded and can be seen in the table 26.

The most frequently used source of information is the internet search engines (48.4%), followed by more experienced colleagues (38.7%) and health websites or other medical research tools (37.1%). It should be noted that only 9.7% did not use any source of information during the last month.

Table 26 - Information sources used by radiographers in the past 30 days (n=62; radiographers "were allowed to choose more than one option" (a total of 133 options were obtained)).

Information sources used in the past 30 days by radiographers	n	%
Q4.1.IBR – Library (general or from imaging department)	9	14.5
Q4.2.IBR – Radiographer with management tasks or a colleague with more experience	24	38.7
Q4.3.IBR – Other healthcare professional	13	21.0
Q4.4.IBR – Databases (PubMed, Web of Science, Lilacs, amog others)	19	30.6
Q4.5.IBR – Health websites or other medical research tools (Scielo, Bibliomed, etc)	23	37.1
Q4.6.IBR – Private collection	12	19.4
Q4.7.IBR – Internet search engines (Google, Yahoo, etc)	30	48.4
Q4.9.IBR – Didn't use any information source	6	9.7

Then, the reasons motivating radiographers information searches were recorded in the table 27 and the encountered barriers in the table 28.

The main reasons cited by radiographers to search for information was the fact that they found a rare or unknown imaging case (67.7%), curiosity (59.7%) and doubts or insecurity (48.4%). Patient questions, special interest in a case and fear of making mistakes were also mentioned by 29.0%.

Table 27 - Reasons motivating radiographers information searches (n=62; radiographers "were allowed to choose more than one option" (a total of 184 options were obtained)).

Reasons motivating radiographers information searches	n	%
Q5.1.IBR – Patient questions	18	29.0
Q5.2.IBR – Special interest in the case	18	29.0
Q5.3.IBR – Evidence of a rare or unknown imaging case	42	67.7
Q5.4.IBR – Curiosity	37	59.7
Q5.5.IBR – Doubts or insecurity	30	48.4
Q5.6.IBR – Fear of making mistakes	18	29.0
Q5.7.IBR – Interest in researching or publishing about the case	14	22.6
Q5.8.IBR – Need to present the case to the superior or in a teaching context	7	11.3

On the other hand, the main barriers encountered by radiographers were the lack of time (64.4%), difficulties in locating/searching documents (27.1%), libraries not available (23.7%) and linguistic obstacles (16.9%). We emphasize that the option "lack of skills in the use electronic resources" was checked only twice (3.4%), indicating that most radiographers consider it not to be a barrier to searching information.

Table 28 - Encountered barriers for information searches by radiographers (n=62; radiographers "were allowed to choose more than one option" (a total of 96 options were obtained)).

Encountered barriers for information searches by radiographers	n	%
Q5.1.IBR – Libraries not available	14	23.7
Q5.2.IBR – Difficulties in locating/searching documents	16	27.1
Q5.3.IBR – No computer available	6	10.2
Q5.4.IBR – No private collection	2	3.4
Q5.5.IBR – Linguistic obstacles	10	16.9
Q5.6.IBR – Lack of skills in the use electronic resources	2	3.4
Q5.7.IBR – Lack of time	38	64.4
Q5.8.IBR – Cost of documents	7	11.9
Q5.9.IBR – Other obstacles	1	1.7

4.4.2. Habits and preferences for information resources management

In order to assess the habits and preferences of radiographers for information resources management, several items were used. Thus, in the first place, it was asked whether it is part of their professional routine to attend healthcare-related libraries (figure 16) and it was found that only 9.7% of radiographers do it routinely.

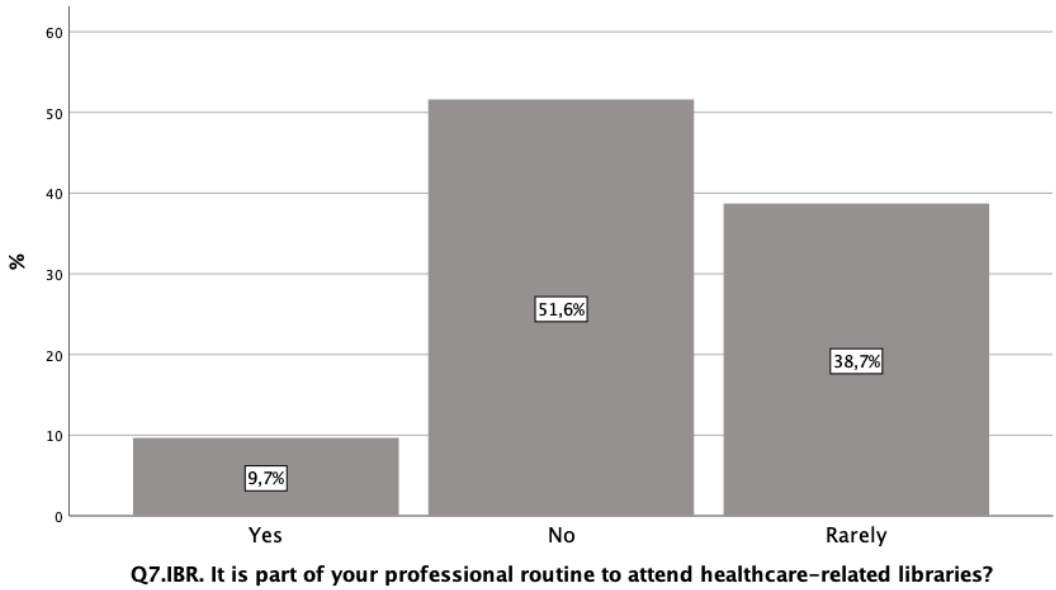

Figure 16 – Bar chart for the answers to the question: It is part of professional routine of radiographers attend to healthcare-related libraries? (n=62).

The main reasons mentioned by the respondents for not using, or rarely using, are because the libraries are unnecessary due to the use of the internet (37.1%), not knowing or not having access to a good library (19.4%) and the documents needed are not available in a library (14.5%) (table 29).

Table 29 - Reasons mentioned by radiographers for not using (or rarely using) libraries (n=55).

Reasons mentioned by the respondents for not using (or rarely using) libraries	n	%
Q7.2.1.IBR – Not knowing or not having access to a good library	12	19.4
Q7.2.2.IBR – Outdate contents	6	9.7
Q7.2.3.IBR – Documents needed not available	9	14.5
Q7.2.4.IBR – Inadequate opening hours	2	3.2
Q7.2.5.IBR – Not needed because of the internet	23	37.1
Q7.2.6.IBR – Other reasons	3	4.8

Most radiographers indicated that they prefer to use electronic sources (82.3%) instead of printed ones (Q8.IBR). And when asked about what resources they prefer to use when searching for information (Q9.IBR), they refer, in the first place, electronic databases (30.6%) followed by internet searches (24.2%) in second place, and websites (33.9%) in third place (table 30).

Table 30 – Ranking of information sources preferred by radiographers (n=62).

	Ranking											
	1st		2nd		3rd		4th		5th		6th	
Resources	n	%	n	%	n	%	n	%	n	%	n	%
Electronic databases	19	30.6	12	19.4	10	16.1	2	3.2	2	3.2	3	4.8
Radiographer (management tasks) / colleague with more experience	14	22.6	7	11.3	5	8.1	5	8.1	2	3.2	3	4.8
Internet search engines	13	21.0	15	24.2	5	8.1	5	8.1	2	3.2	4	6.5
Private collection	6	9.7	8	12.9	5	8.1	7	11.3	3	4.8	5	8.1
Health websites	5	8.1	13	21.0	21	33.9	4	6.5	6	9.7	-	-
Other healthcare professional	3	4.8	5	8.1	4	6.5	8	12.9	7	11.3	2	3.2
Library	2	3.2	1	1.6	5	8.1	-	-	2	3.2	5	8.1

Regarding the composition of the private collections of radiographers, as seen in the table 31, books and conference proceedings are the most suitable resources.

Radiographers when asked about what bibliographic resources they use most (Q11.IBR), they mentioned, in the first place, electronic papers (32.3%), followed by books (35.5%) in second place, and conference proceeding (17.7%) in third place (table 32).

In addition, considering that scientific information can be found in different formats (Q12.IBR), the radiographers have indicated in which formats they prefer to use in their readings (table 33). So, they mentioned that they use it more often as first choices are the original papers pointed out in the first two places (37.1% and 25.8%), review articles and protocols or guidelines.

Table 31 - Composition of the private collections of radiographers (n=62)

	Books		Scientific CD-ROMS		Scientific Vídeos		Conference procceding	
Number of items	n	%	n	%	n	%	n	%
Between 1-10	36	58.1	9	14.5	4	6.5	13	21.0
Between 1-20	8	12.9	1	1.6	1	1.6	10	16.1
More than 20	12	19.4	1	1.6	3	4.8	2	3.2
Total	56	90.3	11	17.7	8	12.9	25	40.3

	Portuguese printed subscriptions		International printed subscriptions	
Number of subscriptions	n	%	n	%
Between 1-10	4	6.5	5	8.1
Between 1-20	1	1.6	2	3.2
More than 20	-	-	1	1.6
Total	5	8.1	8	12.9

	Portuguese electronic subscriptions		International electronic subscriptions	
Number of subscriptions				
Between 1-10	7	11.3	11	17.7
Between 1-20	-	-	-	-
More than 20	2	3.2	1	1.6
Total	9	14.5	12	19.4

Access to a computer with internet at home: n=60; 96.8%

Table 32 – Ranking of bibliographic resources used by radiographers (n=62).

	Ranking											
	1st		2nd		3rd		4th		5th		6th	
Resources	n	%	n	%	n	%	n	%	n	%	n	%
Electronic papers	20	32.3	7	11.3	7	11.3	3	4.8	2	3.2	-	-
Other online resources (websites)	18	29.0	12	19.4	11	17.7	3	4.8	1	1.6	-	-
Books	15	24.2	22	35.5	6	9.7	8	12.9	7	11.3	-	-
Conference proceedings	7	11.3	14	22.6	11	17.7	6	9.7	3	4.8	1	1.6
Printed papers	2	3.2	5	8.1	9	14.5	7	11.3	2	3.2	3	4.8
Scientific Videos	-	-	2	3.2	1	1.6	1	1.6	4	6.5	7	11.3
CD-ROMS	-	-	-	-	5	8.1	1	1.6	-	-	6	9.7

Table 33 – Ranking of scientific information formats preferred by radiographers (n=62).

	Ranking											
	1st		2nd		3rd		4th		5th		6th	
Resources	n	%	n	%	n	%	n	%	n	%	n	%
Original papers	23	37.1	16	25.8	6	9.7	2	3.2	1	1.6	1	1.6
Protocols / Guidelines	17	27.4	9	14.5	9	14.5	11	17.7	2	3.2	2	3.2
Review papers	10	16.1	11	17.7	14	22.6	4	6.5	4	6.5	-	-
Research reports	10	16.1	10	16.1	8	12.9	8	12.9	3	4.8	6	9.7
Systematic reviews	1	1.6	10	16.1	7	11.3	3	4.8	3	4.8	6	9.7
Conference proceedings	1	1.6	6	9.7	6	9.7	4	6.5	12	19.4	6	9.7

In relation to the resources that most often provide information regarding news or recent discoveries in the professional area of radiology / imaging (table 34), radiographers highlight the information provided by colleagues or professors (66.1%), the scientific events such as congresses (53.2%), health websites (45.2%) and also printed or electronic papers (38.7%).

Table 34 - Information resources regarding news or recent discoveries in imaging field (n=62; radiographers "were allowed to choose more than one option" (a total of 147 options were obtained)).

Information resources regarding news or recent discoveries in imaging field	n	%
Colleagues or Professors	41	66.1
Scientific events (congresses)	33	53.2
Health websites	28	45.2
Printed or electronic papers	24	38.7
Mailing lists or emails	11	17.7
Informal events (department meetings)	10	16.1

Finally, the radiographers mentioned that the resources they believe to be essential for a good professional practice (table 35) are having a computer with free internet access in the workplace environment (85.5%) and have articles/papers (printed and electronic) available in the imaging department (54.8%).

Table 35 - Essential resources for good professional practice of radiographers (n=62; radiographers "were allowed to choose more than one option" (a total of 179 options were obtained)).

Essential resources for good professional practice of radiographers	n	%
Computer with free internet access in the workplace	53	85.5
Printed and electronic papers available in the workplace	34	54.8
Books in the workplace	28	45.2
Conference proceedings available in the workplace	28	45.2
Subscription of databases in the workplace	21	33.9
Library with updated specialized information	15	24.2

4.4.3. Bibliographic research skills

In order to evaluate the bibliographic research skills of radiographers, a total of nine questions were used. First, we tried to check whether radiographers personally carry out their bibliographic searches in the databases, or if they ask someone to do it (Q15.IBR). On this point, we found that 62.9% of radiographers conduct their own bibliographic researches, 1.0% ask someone to do it, 9.7 % performs both previous situations and 25.8% (n=17) don't do any research.

Then, we looked at how they learned the techniques and methods of bibliographic research (Q16.IBR). As observed on the table 36, most radiographers were trained by a professor during radiography graduation (32.5%), 27.5% learned with practice and 18.8% referred that it was a topic addressed as a part of some discipline during their graduation.

Table 36 - How radiographers learned the techniques/methods of bibliographic research (n=45; radiographers "were allowed to choose more than one option" (a total of 80 options were obtained)).

How radiographers learned the techniques/methods of bibliographic research	n	%
Guidance or training from a librarian	2	2.5
Guidance or training from a professor during radiography graduation	26	32.5
Topic addressed as a part of some discipline during radiography graduation	15	18.8
Tutorials and "help" option from databases	6	7.5
Practice	22	27.5
Reading books, papers and other texts on the subject	6	7.5
Online courses	1	1.3
Not sure if use the right techniques	2	2.5

To assess the different stages in the use of electronic databases, radiographers "were asked to select the option that best represented their performance". Forty-eight answered this question (Q17.IBR), and of these, 37.8% indicated that they use the "advanced search" option, 26.7% use keywords in the first search box, 15.6% use strategies with specific terms, 13.3% combine keywords with Boolean operators (AND, OR, NOT). The rest refer they use the "search history" feature (2.2%); other resources such as "limits", "fields" or "index"

(2.2%); and descriptors (MeSH or DeCS) and qualifiers that combine different themes (2.2%).

Then, the result most frequently obtained by radiographers in this kind of research was evaluated. As shown in table 37, the results are dispersed, but it should be noted the answers to the options "despite the large amount of results, radiographers can find what they needed" with 33.3%, the option "keeps a sufficient and accessible number of references (less than 100)" with 31.1%, and the option "realize the need to learn how to better use research strategies" with 13.3%.

Table 37 - How do radiographers evaluate the results of their bibliographic research (n=55).

How do radiographers evaluate the results of their bibliographic research	n	%
Quickly find what they need	4	8.9
Keeps a sufficient and accessible number of references (less than 100)	14	31.1
Despite the large amount of results, can find what they needed	15	33.3
Obtain very broad results, most of them do not apply to the topic	3	6.7
Don't know if the research was exhaustive and, in general, don't have time to deepen the results	3	6.7
Realize the need to learn how to better use research strategies	6	13.3

The frequency of use of some of the most well-known databases was also evaluated (table 38). *Medline*, *Web of Science* and *Cochrane Library* are the most frequently used databases by radiographers (35.6%, 22.2% and 4.4%, respectively), since they use them more than 2 times a month. The remaining databases, when used, have a frequency of less than 4 times a year. It should be noted that more than 40% never used any of the mentioned databases, except *Medline* and *Web of Science*.

Table 38 – Frequency of databases use by radiographers (n=62).

Databases	Often		Rarely		Never		Don't use	
	n	%	n	%	n	%	n	%
MEDLINE	16	35.6	21	46.7	5	11.1	3	6.7
LILIACS	-	-	8	17.8	24	53.3	13	28.9
PSYCINFO	-	-	4	8.9	28	62.2	13	28.9
WEB OF SCIENCE	10	22.2	26	57.8	6	13.3	3	6.7
EMBASE	-	-	6	13.3	28	62.2	11	24.4
THE COCHRANE LIBRARY	2	4.4	11	24.4	20	44.4	12	26.7

In relation to the problems most frequently encountered when searching scientific literature in electronic databases and over the internet (table 39), radiographers claim to have difficulty in selecting from the large number of documents found in research (46.7%), lack of time for research (35.6%), and the fact that some of the documents have financial costs (26.7%).

Table 39 - Problems most frequently found when searching scientific literature (n=45; radiographers radiographers "were allowed to choose more than one option" (a total of 70 options were obtained)).

Problems most frequently found when searching scientific literature	n	%
Difficulty in using electronic resources	3	6.7
Difficulty in selecting from the large number of documents found in research	21	46.7
Financial cost of documents	12	26.7
Lack of time for research	16	35.6
To find specific sites in the area of interest/expertise	10	22.2
Finding suitable keywords for a good search strategy	8	17.8

As for the factors that radiographers prioritize to select scientific documents, which they would like to read to clarify the doubts that arise during the course of their clinical practice (table 40), stands out the fact that the full text of the article "is free of charge" (60.0%) and the "timeliness and /or novelty of the scientific information" (53.3%).

Table 40 - Factors that radiographers prioritize to select scientific documents (n=45; radiographers "were allowed to choose more than one option" (a total of 96 options were obtained)).

Factors that radiographers prioritize to select scientific documents	n	%
Content in Portuguese	12	26.7
Content isn't extensive	6	13.3
Content is free of charge	27	60.0
Easy access	14	31.1
Timeliness and /or novelty of the scientific information	24	53.3
Content in PDF format	13	28.9

It should be noted that the radiographers, in order to access the full texts of the selected documents, 60.0% of them only obtain the free of charge documents from the databases, 33.3% search other sites on the internet that only provide

open access information (*Scielo, Free Medical Journal*, etc.) and only a small percentage (6.7%) go to a library to find out if the documents are available. None of the radiographers claimed to pay the user fees to access the content of the papers.

For reading the selected documents, 44.4% prefer to read on the computer screen and 55.6% prefer to print.

4.4.4. Information needs of radiographers in the clinical practice

In the clinical practice of radiographers, sometimes, there is a need to clarify certain doubts. Thus, through two questions, we tried to verify which are the most frequent doubts in their clinical context. The sum of the frequencies of the two questions was performed, and it was found that the doubt that arises most frequently is the Optimization (29.8%), followed by the Technical acquisition parameters (16.1%) and Justification (13.7%). Moreover, the individual analysis of the frequencies of each of these questions can be seen in figures 17 and 18. In first place, the most raised questions concern the procedure optimization (33.9%) and justification (17.7%) (figure 17).

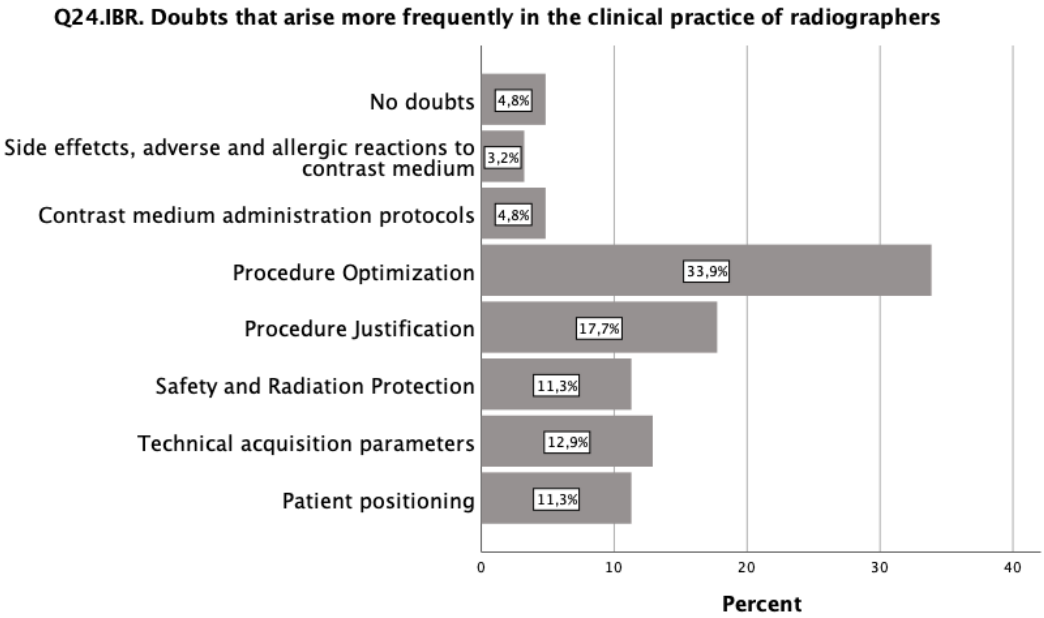

Figure 17 – Bar chart of doubts that arise more frequently in the clinical practice of radiographers (n=62).

Then, through the second question (figure 18), we identified again the procedure optimization (25.8%), and the technical acquisition parameters (19.4%) as the second most frequent doubts that arise in the clinical practice of radiographers.

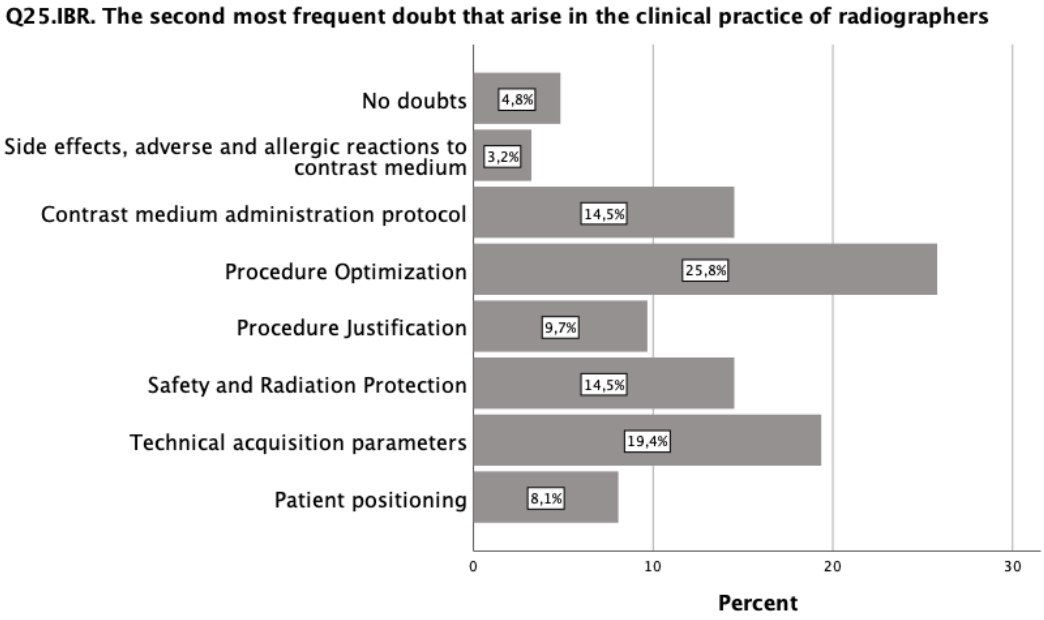

Figure 18 - Bar chart of the second most frequent doubt in the clinical practice of radiographers (n=62).

Thus, it appears that the major concerns of radiographers in their work context are related to optimization and justification principles, but also related to technical parameters for image acquisition, and safety and radiation protection.

The last 5 questions in this study were intended to assess specific or particular situations during the last month prior to completing the questionnaires. Namely, about the need for information related to a procedure performed on a patient by radiographers. Once again, the need for procedure optimization (33.9%) and justification (19.4%) was observed. And it should be noted that 19.4% reported that they did not need any information search during the last month.

The search for information to clarify their doubts (table 41), it was carried out mainly through the consultation of documents from their private collection (21.0%); 21.0% asked for advice from a more experienced colleague and

17.7% asked for advice from another healthcare professional. Only 11.3% of radiographers used electronic databases in the last month.

Table 41 - Information sources used in the past 30 days by radiographers (radiographers "were allowed to choose more than one option" (a total of 77 options were obtained)).

Information sources used in the past 30 days by radiographers	n	%
Q27.1.IBR – Library (general or from imaging department)	1	1.6
Q27.2.IBR – Radiographer with management tasks or a colleague with more experience	13	21.0
Q27.3.IBR – Other healthcare professional	11	17.7
Q27.4.IBR – Databases (PubMed, Web of Science, Lilacs, amog others)	7	11.3
Q27.6.IBR – Private collection	13	21.0
Q27.5.IBR – Health websites or other medical research tools (Scielo, Bibliomed, etc)	10	16.1
Q27.7.IBR – Internet search engines (Google, Yahoo, etc)	9	14.5
Q27.9.IBR – Didn't use any information source	13	21

In addition, 71.4% reported that they found the information they needed; 26.5% reported having had partial success (incomplete information, lack of time or need for additional resources); and only 2.0% did not get the information they needed. In cases where the information was found (totally or partially), 27.1% indicated that it was possible to use at least some part of the information for their clinical practice; 25.0% recalled details or facts; 22.9% obtained new knowledge; 14.6% proved what they already knew; 8.3% said that interest was sparked to go deeper into the topic; and 2.1% say that the information obtained had no impact for the clinical practice.

In cases where the information found allowed to modify or assist in the decision-making process, 47.9% of radiographers reported that the procedure performed was optimized, 22.9% chose acquisition parameters more appropriate to the patient; 18.8% obtained support to justify the referred exam; 18.8% performed a more adequate administration of the contrast medium; 18.8% performed a more appropriate patient positioning and only 4.2% did not modify the procedure or was duly clarified after consulting the information.

4.5 – Overall Dimensions Analysis: Implications of the Quality Management Systems and Evidence-Based Practices in the Imaging Departments

After performing the exploratory analysis by item, the normality of the sample was verified using the "*Kolmogorov-Smirnov* and *Shapiro-Wilk* tests" (Maroco, 2018). Through these tests, whose results are attached (Appendix K), it was possible to verify that the sample isn't normally distributed (p value < 0.05 for all items) due to a lack of symmetry (negative skewness) of the data distribution and, therefore, it would be necessary to perform non-parametric tests.

Then, the reliability analysis was verified for the main 109 items that integrate the dimensions of questionnaires 1 and 2, and it was found that "Cronbach's alpha coefficient" had a value of 0.921 (table 42). The same procedure was performed individually for each dimension.

This coefficient measures the internal consistency, which "is typically a measure based on the correlations between different items on the same test (Green et al., 2015). It measures whether several items that propose to measure the same general construct produce similar scores" (Chen, 2018, p.45).

Table 42 – Reliability Statistics.

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Overall	,921	,915	109
Dimension A	,883	,891	8
Dimension B	,493	,461	4
Dimension C	,901	,899	8
Dimension D	,832	,830	17
Dimension E	,865	,848	25
Dimension G	,654	,726	8
Dimension H	,716	,728	6
Dimension I	,829	,831	4
Dimension J	,811	,825	8
Dimension K	,788	,786	10
Dimension L	,920	,892	11

The acceptable value for the internal consistency coefficient is between 0.6 and 0.9, assuming that the instrument causes few errors and is considered highly accurate (Budak & Kaygin, 2015; Fortin, 2003). Thus, considering the "Cronbach's alpha based on standardized items", the dimensions B, C and D, presented low values. However, through the overall obtained coefficient, it is possible to affirm that this scale is reliable and that it has a very good internal consistency (Garson, 2012).

Posteriorly, "Cronbach's alpha" coefficient was also verified for each of the items separately, to verify (if future investigations were carried out with this scale) if removing any of the items, the scale coefficient would improve, concluding that it would not be necessary to delete any of the items (Appendix L).

Since "Cronbach's alpha" is calculated using the sample variance, the total scores and the number of items, the variance analysis was also carried out. In the analysis of variance, through table 43, it is reported as the sum of squares within the group and represents the variation due to individual differences in item scores. In this case, given the p value < 0.05, it can be seen that the means of the groups (radiographers) are different when evaluating between items. In other words, the result suggests rejecting the null hypothesis that all group averages are equal and, simultaneously, confirms that at least one group average differs from the other group average between items (Kim, 2014).

Table 43 – Analysis of variance regarding the items related to the conditions for Quality of Care and EBP, from the perspective of radiographers.

		Sum of Squares	df	Mean Square	F	Sig
Between People		618.035	61	10.132		
Within People	Between Items	5737.533	108	53.125	66.530	0.000
	Residual	5260.619	6588	0.799		
	Total	10998.152	6696	1.642		
Total		11616.186	6757	1.719		

After assessing the sample distribution, the reliability of the instrument and the analysis of variance, and before carrying out the EFA, several tests were carried out to assess "differences between groups" and the "correlation between variables", in order to respond to the established hypotheses.

4.5.1. Comparison between Imaging Departments

To verify whether there were differences between the radiographer's perceptions for the considered imaging departments (A, B, C and D), *Kruskal-Wallis* test was performed. For a total of 112 items considered, statistically significant differences were observed in 15 items (table 44). It should be noted that all the differences verified are in terms of the items related to the dimensions of the QMS (dimensions of QP (A), standards (C), HRM (D) and QA and improvement activities (E)). No significant differences in EBP-related items were verified.

Table 44 - Comparison between imaging departments "A, B, C and D" with the observed significant differences ($p<0.05$) from the radiographers perspective ($n=62$; $df=3$**).**

Items	*Kruskal-Wallis H*	*Asymp. Sig*
A1.Q7.EQS – Procedures in the imaging department	9.026	0.029
C1.Q1.EQS - Standards for performing invasive imaging examinations	8.535	0.036
C1.Q5.EQS – Standards for management adverse reactions to contrast media	9.377	0.025
D1.1.Q1.EQS – Training / education of radiographers	14.191	0.003
D1.1.Q4.EQS – Quality coordinator (radiographer) for improvement activities	10.618	0.014
D2.1.Q2.EQS – Training new radiographers in QI methods	11.702	0.008
D2.1.Q3.EQS – Continuous education based on priorities in QP	11.684	0.009
E1.Q1.EQS – Radiographers performance evaluation carried out by peers	8.787	0.032
E1.Q3.EQS – Radiographers performance evaluation with their own participation	9.949	0.019
E1.Q5.EQS – Satisfaction survey among patients	8.611	0.035
E1.Q6.EQS – Satisfaction survey among professionals from imaging department	8.644	0.034
E1.Q7.EQS – Satisfaction survey among referringphysician	7.942	0.047
E1.Q17.EQS – Periodic safety assessment of imaging rooms and equipment's	10.996	0.012
E1.Q19.EQS – Analysis of waiting times between prescription and imaging examinations	16.667	0.001
E1.Q24.EQS – Absorbed dose evaluation, in compliance with ALARA principle	11.844	0.008

Once the differences were verified, we tried to understand which of the imaging departments had higher values for the items. Through the mean rank values for each item and each imaging department, it was possible to identify the departments that obtained the highest score in the radiographers perception.

Through the table 45, we observed that imaging department C obtained higher scores for most items, related to radiographer training, continuous education in quality issues and radiographers performance evaluation (dimensions D and

E). Imaging department D had higher scores at the level of procedures and standards (dimensions A and C), the role of quality coordinator for improvement activities (dimension D) and satisfactions surveys among radiographers (dimension A).

Imaging department B only obtained a significantly higher score related to patient satisfaction surveys (dimension E). Imaging department A scored higher on two items of dimension E, namely with regard to satisfaction surveys among referring physicians and the analysis of waiting times.

Table 45 - Mean Rank values for items with "significant differences ($p<0.05$)" between imaging departments (A, B, C and D) from the radiographers perspective (n=62; df=3).

Items	*Mean Rank*			
	Institution A (n=26)	**InstitutionB** (n=11)	**Institution C** (n=16)	**Institution D** (n=9)
A1.Q7.EQS – Procedures in the imaging department	25.65	38.50	30.53	41.56
C1.Q1.EQS - Standards for performing invasive imaging examinations	26.98	33.14	21.00	43.44
C1.Q5.EQS – Standards for management adverse reactions to contrast media	26.90	30.82	31.00	46.50
D1.1.Q1.EQS – Training / education of radiographers	21.62	39.55	39.88	35.33
D1.1.Q4.EQS – Quality coordinator (radiographer) for improvement activities	31.98	19.41	32.06	43.89
D2.1.Q2.EQS – Training new radiographers in QI methods	31.19	20.82	38.38	33.22
D2.1.Q3.EQS – Continuous education based on priorities in QP	32.63	20.95	35.19	34.56
E1.Q1.EQS – Radiographers performance evaluation carried out by peers	24.98	32.82	41.22	31.44
E1.Q3.EQS – Radiographers performance evaluation with their own participation	24.88	38.91	40.03	26.39
E1.Q5.EQS – Satisfaction survey among patients	27.50	40.27	29.50	35.89
E1.Q6.EQS – Satisfaction survey among professionals from imaging department	32.00	23.91	33.84	35.17
E1.Q7.EQS – Satisfaction survey among referring physician	33.15	26.45	32.00	32.00
E1.Q17.EQS – Periodic safety assessment of imaging rooms and equipment's	23.77	30.82	41.41	37.06
E1.Q19.EQS – Analysis of waiting times between prescription and imaging examinations	34.52	19.82	33.50	33.50
E1.Q24.EQS – Absorbed dose evaluation, in compliance with ALARA principle	26.33	24.91	42.19	35.50

The differences in overall aspects of the QA and improvement system, were also assessed.

It were observed significant differences in the impact and satisfaction of radiographers regarding the quality system and QA and improvement activities

in the imaging departments, on three of the four items, including the overall quality, overall image and overall organization and management of the imaging department (table 46).

Then, through the mean rank values for each item and each imaging department (table 47), we observed that the overall quality (*mean rank* = 42.31; p = 0.000), the overall image (*mean rank* = 45.13; p = 0.000) and overall organization and management (*mean rank* = 44.44; p = 0.000) is higher in the imaging department C. On the opposite side we found the imaging department A with the lowest scores on all items.

Table 46 - Comparison between imaging departments "A, B, C and D" in relation to the overall aspects of the QA and improvement system, from the radiographers perspective (n=62; df=3).

Items	*Kruskal-Wallis H*	*Asymp. Sig*
F1.Q1.EQS – Overall quality of the imaging department	20.833	0.000
F1.Q2.EQS - Overall image of the imaging department	24.488	0.000
F1.Q3.EQS – Overall organization and management of the imaging department	22.020	0.000
F1.Q4.EQS – Overall services provided by the imaging department	7.731	0.052

Table 47 - Mean Rank values for items with "significant differences (p<0.05)" regarding the overall aspects of the QA and improvement system between imaging departments (A, B, C and D) from the radiographers perspective (n=62; df=3).

Items	*Mean Rank*			
	Institution A (n=26)	**InstitutionB** (n=11)	**Institution C** (n=16)	**Institution D** (n=9)
F1.Q1.EQS – Overall quality of the imaging department	19.88	41.91	42.31	33.11
F1.Q2.EQS - Overall image of the imaging department	17.71	36.91	45.13	40.50
F1.Q3.EQS – Overall organization and management of the imaging department	20.38	34.77	46.44	33.06

4.5.2. Comparison between radiographers

In order to check if there were differences in perception between radiographers with and without management tasks for the considered imaging departments, *Mann-Whitney* test was performed. For a total of 112 items considered, statistically significant differences were observed in nine items (table 48), seven

related to the all dimensions of the quality systems and two related to the dimension H of EBP (significance of research activities).

Table 48 – Comparison between radiographers with (n=7) and without (n=55) management tasks, with the observed significant differences (p<0.05) from the radiographers perspective.

Items	*Mann-Whitney U*	*Z*	*Asymp. Sig*
A1.Q5.EQS – Annual quality report	79.000	-3.270	0.001
A1.Q7.EQS – Procedures in the imaging department	96.500	-2.386	0.017
A1.Q8.EQS – Procedures outside the imaging department	89.000	-3.065	0.002
B1.Q5.EQS – Participation in QI projects	162.000	-2.216	0.027
C1.Q2.EQS – Standards for patient communication	114.000	-2-271	0.023
D2.1.Q1.EQS – Selection of new radiographers with positive attitude to QA	40.000	-4.411	0.000
E1.Q6.EQS – Satisfaction survey among professionals from imaging department	130.500	-2.510	0.012
Q3.6.EBP – Participate in research activities is part of the professional activities	62.000	-3.034	0.002
Q3.9.EBP – Participate in research activities helps in professional and personal development	108.000	-2.044	0.041

Once the differences were verified, through the mean rank values for each item (table 49), we checked whether the obtained scores were higher for radiographers with or without management tasks. As observed, the scores were higher for all items in the perspective of radiographers with management tasks, and are related to dimensions A, B, C, D2, E and H.

In relation to the differences in overall aspects of the QA and improvement system between radiographers with and without management tasks, significant differences were observed only in the overall organization and management of the imaging departments ($U = 92.000$; $p = 0.023$), with a higher mean rank for those who have management responsibilities (45. 86 vs. 29.67).

Table 49 - Mean Rank values for items with significant differences (p<0.05) between radiographers with (n=7) and without (n=55) management tasks.

Items	*Mean Rank*	
	Management Tasks - **No**	Management Tasks - **Yes**
A1.Q5.EQS – Annual quality report	29.45	47.64
A1.Q7.EQS – Procedures in the imaging department	29.75	45.21
A1.Q8.EQS – Procedures outside the imaging department	29.62	46.29
B1.Q5.EQS – Participation in QI projects	30.95	35.86
C1.Q2.EQS – Standards for patient communication	30.07	42.71
D2.1.Q1.EQS – Selection of new radiographers with positive attitude to QA	28.73	53.29
E1.Q6.EQS – Satisfaction survey among professionals from imaging department	30.37	40.36
Q3.6.EBP – Participate in research activities is part of the professional activities	29.13	50.14
Q3.9.EBP – Participate in research activities helps in professional and personal development	29.96	43.57

Regarding the differences in perception between female and male radiographers, we found several items with significant differences, namely two items related to quality systems (dimensions D and E) and 12 items related to EBP dimensions. Data obtained for these items can be seen in tables 50 and 51.

Table 50 - Comparison between gender of radiographers (female=28; male=34), with the observed significant differences (p<0.05) from the radiographers perspective.

Items	*Mann-Whitney U*	*Z*	*Asymp. Sig*
D1.1.Q5.EQS – Quality working groups	361.500	-2.214	0.027
E1.Q2.EQS – Radiographers performance evaluation carried out by other professionals	356.000	-2.651	0.008
Q3.2.EBP – Evidence-based action is part of the radiographer's role	335.500	-2.164	0.030
Q3.6.EBP – Participate in research activities is part of the professional activities	305.500	-2.521	0.012
Q3.14.EBP – Scientific data research takes time off radiographer's work	330.500	-2.121	0.034
Q11.2.EBP – Support and encouragement from other healthcare professionals to participate in research activities	330.000	-2.194	0.028
Q13.7. EBP – Talk about scientific data with the teachers who guide research work (if applicable)	346.000	-2.061	0.039
Q22.1.EBP – Ability to participate in research activities	308.500	-2.514	0.012
Q22.2.EBP – Basic knowledge about the research process	290.000	-2.928	0.003
Q22.3.EBP – Knowledge about the stages of the research process	335.500	-2.131	0.033
Q22.4.EBP – Knowledge about scientific studies in the field of imaging	317.500	-2.424	0.015
Q22.5.EBP – Research capabilities are sufficient to search scientific data	282.000	-2.950	0.003
Q22.7.EBP – Know well the results of current investigations in the field of imaging	252.000	-3.368	0.001
Q22.8.EBP – Sufficient English skills to read and understand scientific reports	335.000	-2.134	0.033

As noted, there are significant differences in items from almost all dimensions of the EBP, with the dimension L (knowledge of research) being the one with the largest number of items with significant differences between genders.

Through the mean rank values (table 51), we verified higher scores in males in 10 of the 14 items with significant differences. Female radiographers obtained higher scores on items related to quality systems ("quality working groups" and "radiographers performance evaluation carried out by other professionals"), related to evidence-based actions ("scientific data research takes time off radiographer's work") and related to support in research activities ("support and encouragement from other healthcare professionals to participate in research activities").

Table 51 - Mean Rank values for items with "significant differences ($p<0.05$)" between gender of radiographers.

Items	***Mean Rank***	
	Female (n=28)	Male (n=34)
D1.1.Q5.EQS – Quality working groups	35.59	28.13
E1.Q2.EQS – Radiographers performance evaluation carried out by other professionals	35.79	27.97
Q3.2.EBP – Evidence-based action is part of the radiographer's role	26.48	35.63
Q3.6.EBP – Participate in research activities is part of the professional activities	25.41	36.51
Q3.14.EBP – Scientific data research takes time off radiographer's work	36.70	27.22
Q11.2.EBP – Support and encouragement from other healthcare professionals to participate in research activities	36.71	27.21
Q13.7. EBP – Talk about scientific data with the teachers who guide research work (if applicable)	26.86	35.32
Q22.1.EBP – Ability to participate in research activities	25.52	36.43
Q22.2.EBP – Basic knowledge about the research process	24.86	36.97
Q22.3.EBP – Knowledge about the stages of the research process	26.48	35.63
Q22.4.EBP – Knowledge about scientific studies in the field of imaging	25.84	36.16
Q22.5.EBP – Research capabilities are sufficient to search scientific data	24.57	37.21
Q22.7.EBP – Know well the results of current investigations in the field of imaging	23.50	38.09
Q22.8.EBP – Sufficient English skills to read and understand scientific reports	26.46	35.65

4.5.3. Influence of evidence-based radiology in the information needs of radiographers clinical practice

As previously discussed, in the clinical practice of radiographers, sometimes, there is a need to clarify certain doubts, and we found the most raised questions concern the procedure optimization and justification. In this way, I tried to understand how the use of evidence-based practices was related to informational needs, using three variables separately, namely the performance stage in the use of databases, the clarification of frequent doubts and the specific doubts that arose in the 30 days previous to the questionnaire.

Given the categorical nature of the variables, "*Chi-square* test" of independence and the "*Cramer's V* correlation test" were performed, and several significant associations were found between the variables (Akoglu, 2018; Maroco, 2018).

The significant associations between evidence-based practices and the performance stage in the use of electronic databases by radiographer are evident in table 52. Items of dimensions related to significance of research activities (Q3.8.EBP), evidence-based actions (Q3.1.EBP), support in research activities (Q11.2.EBP and Q11.4.EBP) and sources of evidence (Q15.1.EBP and Q15.9.EBP) have very strong correlations ("*Cramer's V* > 0.25; $p < 0.05$") with the radiographers performance stage in the use of electronic databases (Akoglu, 2018).

Table 52 - Significant associations between evidence-based practices and the performance stage in the use of electronic databases by radiographer; n=45).

	Pearson Chi-Square		***Cramer's V***	
Items	Value	Sig.	Value	Sig.
Q3.1.EBP – Evidence-based action has relevance to radiographer's work	25.590	0.012	0.533	0.012
Q3.8.EBP – Participate in research activities is part of the teacher / monitor role in student education	49.195	0.000	0.604	0.000
Q11.2.EBP – Support and encouragement from other healthcare professionals to participate in research activities	37.471	0.039	0.456	0.039
Q11.4.EBP – Support and encouragement from department director to participate in research activities	40.706	0.018	0.476	0.018
Q15.1. EBP – Knowledge acquired during graduation	26.672	0.009	0.544	0.009
Q15.9. EBP – Instructions and orders from physicians / radiologists	42.787	0.011	0.488	0.011

Furthermore, significant associations between evidence-based practices and how radiographers evaluate the results of their bibliographic research are observable in table 53. Items of dimensions related to current use of research evidence by radiographer in clinical practice (Q13.2.EBP), sources of evidence (Q15.4.EBP and Q15.7.EBP), and radiographer knowledge about the research process (Q22.2.EBP and Q22.3.EBP), have very strong correlations ("*Cramer's* $V > 0.25$; $p < 0.05$") in relation to how radiographers evaluate the results of their bibliographic research (Akoglu, 2018).

Table 53 - Significant associations between evidence-based practices and how radiographers evaluate the results of their bibliographic research (n=45).

	Pearson Chi-Square		***Cramer's V***	
Items	Value	Sig.	Value	Sig.
Q13.2. EBP – Talk about scientific data with the hierarchical superior	44.096	0.011	0.443	0.011
Q15.4. EBP – Medical literature	27.313	0.026	0.450	0.026
Q15.7. EBP – The tacit knowledge	30.737	0.010	0.477	0.010
Q22.2.EBP – Basic knowledge about the research process	26.187	0.036	0.440	0.036
Q22.3.EBP – Knowledge about the stages of the research process	29.152	0.015	0.465	0.015

Regarding the association between the use of EBP and the clarification of frequent doubts by radiographers in their clinical practice, very strong correlations were also found ("*Cramer's* $V > 0.25$; $p < 0.05$") (Akoglu, 2018). As shown in table 54, with the exception of the dimension "support in research activities", items from all other dimensions related to the use of evidence-based practices by radiographers are represented here. In addition, from the crosstabulation, we observed (with the exception of Q22.7.EBP and Q22.11.EBP) higher frequencies in the doubts related to the Optimization and Justification of imaging procedures associated with greater degrees of agreement and importance attributed to the items of evidence-based practices, when compared to the expected frequencies.

In relation to the association between the items of EBP and the specific doubts that have arisen in the radiographer clinical practice in the last 30 days prior to the completing of questionnaire, a total of five very strong correlations were found. Similar to the above, the items "Q13.1.EBP – Talk about scientific data

with colleagues" (*Chi-Square* = 56.862; *Cramer's V* = 0.428; *p* = 0.011) and "Q15.4.EBP – Medical literature" (*Chi-Square* = 34.261; *Cramer's V* = 0.429; *p* = 0.034) had a significant association with the most frequent question in the last 30 days, where the optimization and justification of the examinations is emphasized once again (counts higher than expected counts). Besides, also the items "Q11.3.EBP" (*Chi-Square* = 61.095; *Cramer's V* = 0.444; *p* = 0.004), "Q11.4.EBP" (*Chi-Square* = 47.125; *Cramer's V* = 0.436; *p* = 0.013) and "Q22.8.EBP" (*Chi-Square* = 42.139; *Cramer's V* = 0.412; *p* = 0.042) had significant associations with the most frequent doubts in the last 30 days.

Table 54 - Significant associations between EBP and the most frequent doubt of radiographers in their clinical practice (n=62).

	Pearson Chi-Square		***Cramer's V***	
Items	Value	Sig.	Value	Sig.
Q3.8.EBP – Participate in research activities is part of the teacher / monitor role in student education	44.710	0.024	0.425	0.024
Q3.12.EBP – Tacit knowledge is a sufficient scientific basis of knowledge in the radiographer's work	39.607	0.008	0.461	0.008
Q13.1. EBP – Talk about scientific data with colleagues	65.171	0.001	0.459	0.001
Q13.3. EBP – Actions are based on scientific data	49.067	0.008	0.445	0.008
Q13.4. EBP – Question the practices based on scientific data	51.120	0.038	0.406	0.038
Q13.5. EBP – Try to change / adapt practices based on scientific data	58.344	0.008	0.434	0.008
Q15.4. EBP – Medical literature	32.919	0.047	0.421	0.047
Q22.5.EBP – Research capabilities are sufficient to search scientific data	42.453	0.004	0.478	0.004
Q22.6.EBP – Know how to use research results during professional practice	37.098	0.016	0.447	0.016
Q22.7.EBP – Know well the results of current investigations in the field of imaging	43.335	0.032	0.418	0.032
Q22.11.EBP – Be able to critically evaluate scientific studies	57.688	0.009	0.431	0.009

Lastly, regarding the association between the items of evidence-based practice with the result obtained from the information collected by radiographer to clarify the doubts (in the last 30 days) and with the impact of that information (in case it was found), several significant correlations were found (table 55 and table 56).

Thus, very strong correlations ("*Cramer's V* > 0.25; *p* < 0.05") were observed between eight items of evidence-based practice dimensions, with the result obtained from the information collected by radiographer to clarify the doubts,

especially with regard to having found the information they needed with full or partial success (counts higher than expected counts).

Table 55 - Significant associations between evidence-based practices and the impact from the information collected by radiographer to clarify the doubts (in the last 30 days) (n=49).

	Pearson Chi-Square		***Cramer's V***	
Items	Value	Sig.	Value	Sig.
Q3.3.EBP – It is useful to use evidence-based data to support radiographer role during their practice	26.047	0.000	0.516	0.000
Q3.5.EBP – Research activities provide information on the radiographer's work	49.793	0.000	0.713	0.000
Q3.6.EBP – Participate in research activities is part of the professional activities	22.149	0.005	0.475	0.005
Q15.5. EBP – Practices not registered in the department	15.856	0.015	0.402	0.015
Q22.5.EBP – Research capabilities are sufficient to search scientific data	16.244	0.013	0.407	0.013
Q22.6.EBP – Know how to use research results during professional practice	29.810	0.000	0.552	0.000
Q22.11.EBP – Be able to critically evaluate scientific studies	19.896	0.030	0.451	0.030

Table 56 - Significant associations between evidence-based practices and the immediate impact of the information collected by radiographer (in the last 30 days) (n=48).

	Pearson Chi-Square		***Cramer's V***	
Items	Value	Sig.	Value	Sig.
Q3.3.EBP – It is useful to use evidence-based data to support radiographer role during their practice	56.168	0.000	0.625	0.000
Q3.4.EBP – Evidence-based action is useful for developing / improving radiographer practices	27.420	0.002	0.534	0.002
Q3.12.EBP – Tacit knowledge is a sufficient scientific basis of knowledge in the radiographer's work	30.241	0.011	0.458	0.11
Q3.13.EBP – The radiographer's work is practice-based, so the contribution of scientific research is not necessary	57.358	0.000	0.631	0.000
Q22.8.EBP – Sufficient English skills to read and understand scientific reports	36.643	0.013	0.437	0.013
Q22.9.EBP – Sufficient knowledge of research methods to understand the scientific studies	62.930	0.000	0.573	0.000

In cases where the information was found (totally or partially), the same result was verified in relation to six items of evidence-based practice dimensions with the immediate impact of this information on decision making process ("*Cramer's V* > 0.25; $p < 0.05$"). Namely in the use of the obtained information in clinical practice, to remember details or facts, to obtain new knowledge or just to prove what radiographers already knew.

4.5.4. Structure of the Model: Conditions for Quality of Care and Evidence-Based in Imaging Departments

In order to identify the structure of the model under study (Conditions for Quality of Care and EBP in imaging departments), through factorial analysis we tried to examine the underlying factors and the respective dimensions considered as the most relevant in explaining the model (IBM Knowledge Center, 2020; Maroco, 2018).

This was accomplished through EFA of the main components (dimensions under study), by reducing many "variables into few underlying factors to explain the variability of the group characteristics" (Verma, 2013). By potentially diminish variables numbers, the remaining will be correlated to each other which will maximize the explanations of the set of all variables and therefore will allow the possibility to identify subgroups of questions to assess the variables, with a minimum loss of information (Burns & Burns, 2008; Maia, 2020).

To this end, in the first place, a **measure of the sample adequacy** was performed and by interpreting the data obtained in table 57, we can say that there is "suitability of the data for structure detection". "The *Kaiser-Meyer-Olkin* (KMO) *Measure of Sampling Adequacy* is a statistic that indicates the proportion of variance in the variables that might be caused by underlying factors" (IBM Knowledge Center, 2020; Maroco, 2018). It varies between 0 (Factor analysis (FA) is probably inappropriate) and 1 (indicates that the correlations patterns are compact and, probably, FA should generate distinct and reliable factors) (Field, 2009; Verma ,2013).

The obtained value of 0.678, indicates that the sample is adequate for running a factorial analysis. According to the same bibliographic source, the "*Bartlett's test of sphericity* tests the hypothesis that the correlation matrix is an identity matrix, which would indicate that the variables are unrelated and therefore unsuitable for structure detection" (Field, 2009; Verma, 2013). The low significance value obtained ($p = 0.000$) indicate that the variables are

significantly correlated, and FA is executable. Thus, both tests had good results to proceed.

Table 57 - KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.678
Bartlett's Test of Sphericity	Approx. Chi_Suare	178.567
	df	55
	Sig.	0.000

Since the objective of the different questionnaires is to identify and analyse the structure of the conditions for quality of care and EBP in imaging departments, is necessary to map the dimensionality of the data set and calculate the item weights (Maia, 2020). The Principal Component Analysis was the chosen method, since it is concerned with explaining the variance of the observed variables and, therefore, the total variance for the factor extraction is considered (Everitt & Hothorn, 2011).

To this end, in the second place, **communalities** were assessed. Communality can be understood as proportion of common variance present in the variable and when a variable presents low communalities, it should be eliminated from the analysis (Hair et al., 2010). Thus, through table 58, we can see "how much of the variance in each variable has been accounted for by the extracted factors" (Burns & Burns, 2008).

The extraction communalities are considered appropriate (between 0.615 and 0.790), considering that all obtained values are greater than 0.4 for all factors, suggesting a good relation between each variable and all the others (Maroco, 2018; Statistical Agency, 2020).

Table 58 – Communalities after items extraction ("Extraction Method: Principal Component Analysis")

	Initial	Extraction
A – Quality Policy	1.000	0.615
B – Patients Involvement	1.000	0.790
C – Standards	1.000	0.625
D – Human Resources Management	1.000	0.699
E – QA and Improvement Activities	1.000	0.734
G – Evidence-based Actions	1.000	0.654
H – Significance of Research Activities	1.000	0.667
I – Support in Research Activities	1.000	0.693
J – Current Use of Research Evidence in Practice	1.000	0.679
K – Sources of Evidence	1.000	0.751
L – Knowledge of Research	1.000	0.648

In third place, **eigenvalues** (table 59) and **screen plot** (figure 19) were used as methods to select the number of factors to retain in our model. In the initial model, only four dimensions have eigenvalues greater than one suggesting that four latent influences are associated to the model of "Conditions for Quality of Care and Evidence-Based Practice in the imaging departments", from the radiographer's perspective. But there are still unexplained variations.

Thus, a total of four factors were obtained and they explain 68.7%[10] of the variability in the original 11 dimensions (IBM Knowledge Center, 2020). It appears that the most important determinants for "Quality of Care and EBP in imaging departments", are those contained in factor 1 with 25.4% of the total variance explained, followed by factor 2 with 19.3%, factor 3 with 13.1% and factor 4 with 10.8%. The scree plot (figure 19) confirms the choice of four main components.

[10] A threshold of 60% of the total variance is satisfactory (Hair et al., 2010).

Table 59 - Total variance explained ("extraction method: principal component analysis").

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.890	26.269	26.269	2.890	26.269	26.269	2.797	25.427	25.427
2	2.337	21.249	47.518	2.337	21.249	47.518	2.125	19.316	44.743
3	1.201	10.921	58,439	1.201	10.921	58.439	1.444	13.127	57.870
4	1.129	10.265	68.704	1.129	10.265	68.704	1.192	10.834	68.704
5	0.755	6.866	75.569						
6	0.604	5.494	81.063						
7	0.572	5.200	86.263						
8	0.513	4.660	90.924						
9	0.420	3.818	94.741						
10	0.325	2.958	97.699						
11	0.253	2.301	100.000						

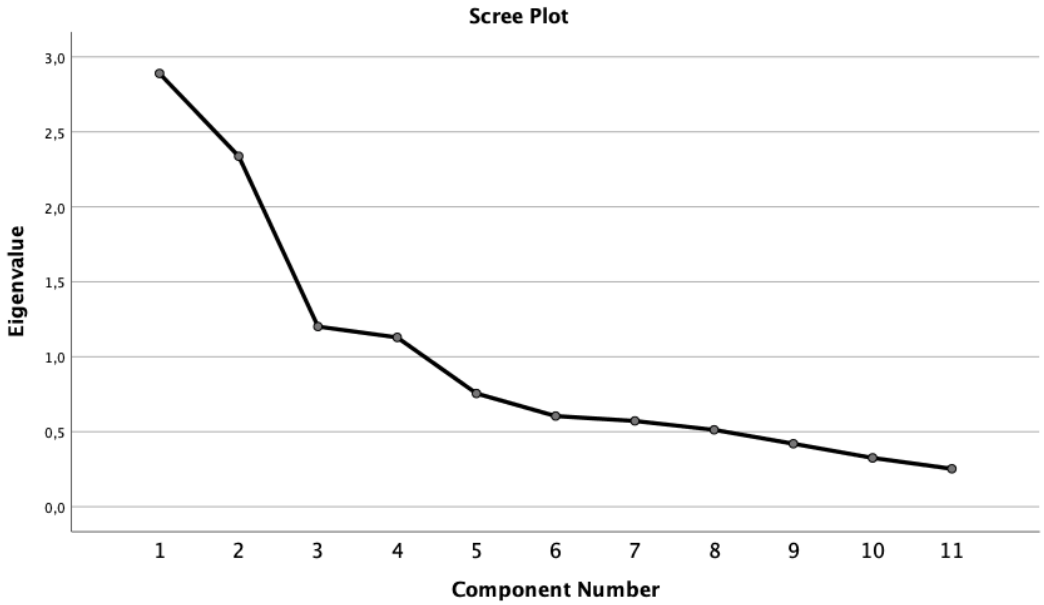

Figure 19 - Screen plot of the initial 11 components, confirming the choice of the new four main components.

Interpreting these results and using a varimax rotation[11], which produces orthogonal factors (table 60), it was possible to determine the initial dimensions that compose the new four factors obtained. The dimensions cluster into these

[11] "The aim of the rotation is to reduce the number of factors on which the variable under investigation have high loadings. The process is called rotation because it involves the rotating of axes on a series of scatter graphs until a more easily interpretable factor structure is obtained" (Maia, 2020).

11 factors were defined by high loadings (Burns and Burns (2008) mentions that the factor loading must be at least 0.60 in order for a variable to unambiguously represent a factor).

Table 60 - Rotated factor matrix ("extraction method: principal component analysis; rotation method: varimax with Kaiser normalization").

Initial Factors	Component			
	1	2	3	4
QA and improvement activities (E)	0.853	-0.005	0.001	0.083
Human Resources Management (D)	0.814	-0.007	-0.098	0.166
Quality Policy (A)	0.766	-0.078	0.140	-0.044
Standards (C)	0.758	0.113	0.195	0.005
Significance of research activities (H)	0.043	0.783	0.226	-0.027
Knowledge of research (L)	-0.177	0.783	-0.032	0.048
Evidence-based actions (G)	0.313	0.734	-0.039	-0.126
Current use of research evidence in practice (J)	-0.237	0.564	0.343	0.433
Sources of evidence (K)	0.078	0.132	0.780	-0.347
Support in research activities (I)	0.132	0.055	0.772	0.276
Patients involvement (B)	0.190	-0.036	-0.028	0.867

Therefore, factor 1 is mostly defined by dimension E (QA and improvement activities), dimension D (HRM), dimension A (QP) and dimension C (standards). This first component is most highly correlated with the "Conditions for Quality of Care and EBP" model. Factor 2 is defined by dimension H (significance of research activities), dimension L (knowledge of research), dimension G (evidence-based actions) and dimension J (Current use of research evidence in practice). Factor 3 is defined by dimensions K and I (sources of evidence and support in research activities) and factor 4 keeps the initial dimension (patients' involvement).

A visual representation of the rotated factor matrix can be seen in the factor loadings plot (figure 20). This offers a clearer picture of the importance and contribution of each variable in the factor.

Thus, we can see through table 61, from now on, the 11 initial dimensions can be represented by new four variables, without considerable loss of information.

The attribution of new names to the factors was essentially a matter of consistency with the results obtained.

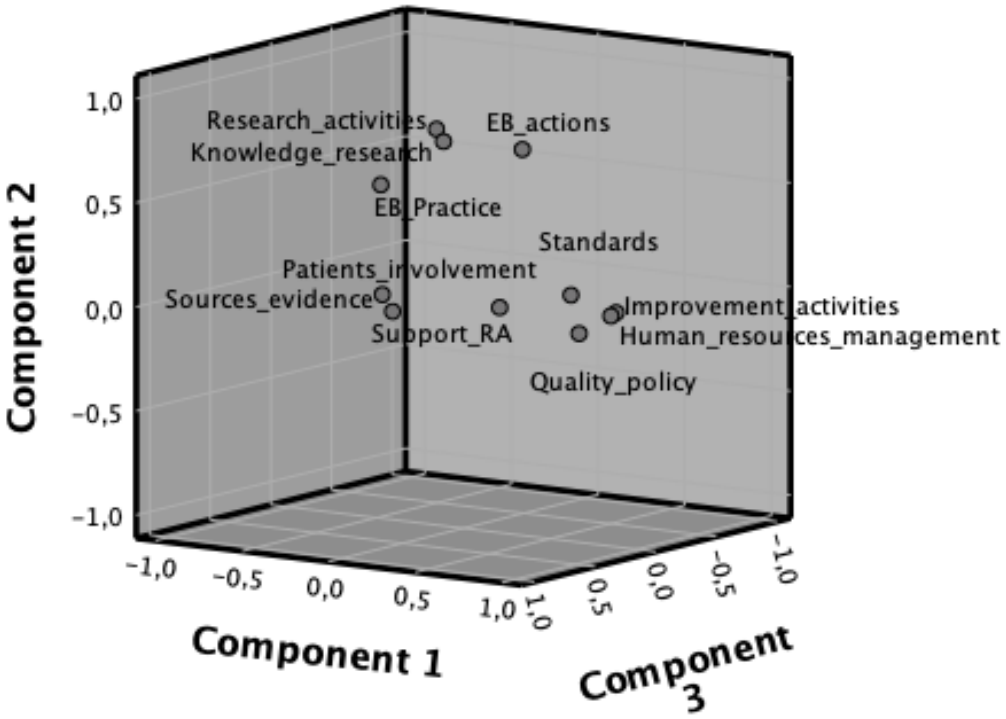

Figure 20 - Component Plot in rotated space.

Table 61 - New dimensions of the Conditions for Quality of Care and Evidence-Based Practice Model, based on the four factors identified.

Factors	Initial Dimensions	New Dimensions
Factor 1 (25.4%)	Quality Assurance and improvement activities (E)	Organizational Capability to Quality of Care
	Human Resources Management (D)	
	Quality Policy (A)	
	Standards (C)	
Factor 2 (19.3%)	Significance of research activities (H)	Evidence-Based Radiology (EBR)
	Knowledge of research (L)	
	Evidence-based actions (G)	
	Current use of research evidence in practice (J)	
Factor 3 (13.1%)	Sources of evidence (K)	Support for Information
	Support in research activities (I)	
Factor 4 (10.8%)	Patients involvement (B)	Patients involvement

According to the results obtained, the "Conditions for Quality of Care and Evidence-Based Practice Model" of this study is then defined according to the **Organizational Capability to Quality of Care** (Factor 1), **Evidence-based Radiology** (Factor 2), **Support for Information** (Factor 3) and **Patients Involvement** (Factor 4). These will be the most revealing factors to take into account, from the perspective of radiographers.

The internal consistency of this new model was also verified through the overall "Cronbach's alpha" and the same procedure was performed individually for each new factor. In the case of factor 4 (patient involvement), following the same procedure previously mentioned, it was possible to verify that by deleting 2 items, the coefficient was improved (the value was 0.462 before deleting). Thus, these values can be seen in the table below.

Table 62 – Reliability Statistics of the new model.

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Fator 1	,938	,938	58
Fator 2	,901	,901	33
Fator 3	,812	,810	14
Fator 4	,594	,723	2

Thus, based on the results of the EFA, a conceptual model was designed, represented in figure 21, which is intended to summarize the main findings of this investigation, and **translates the conditions related to the quality of care and evidence-based practice in the clinical practice of radiographers, answering to the main objective of this research.**

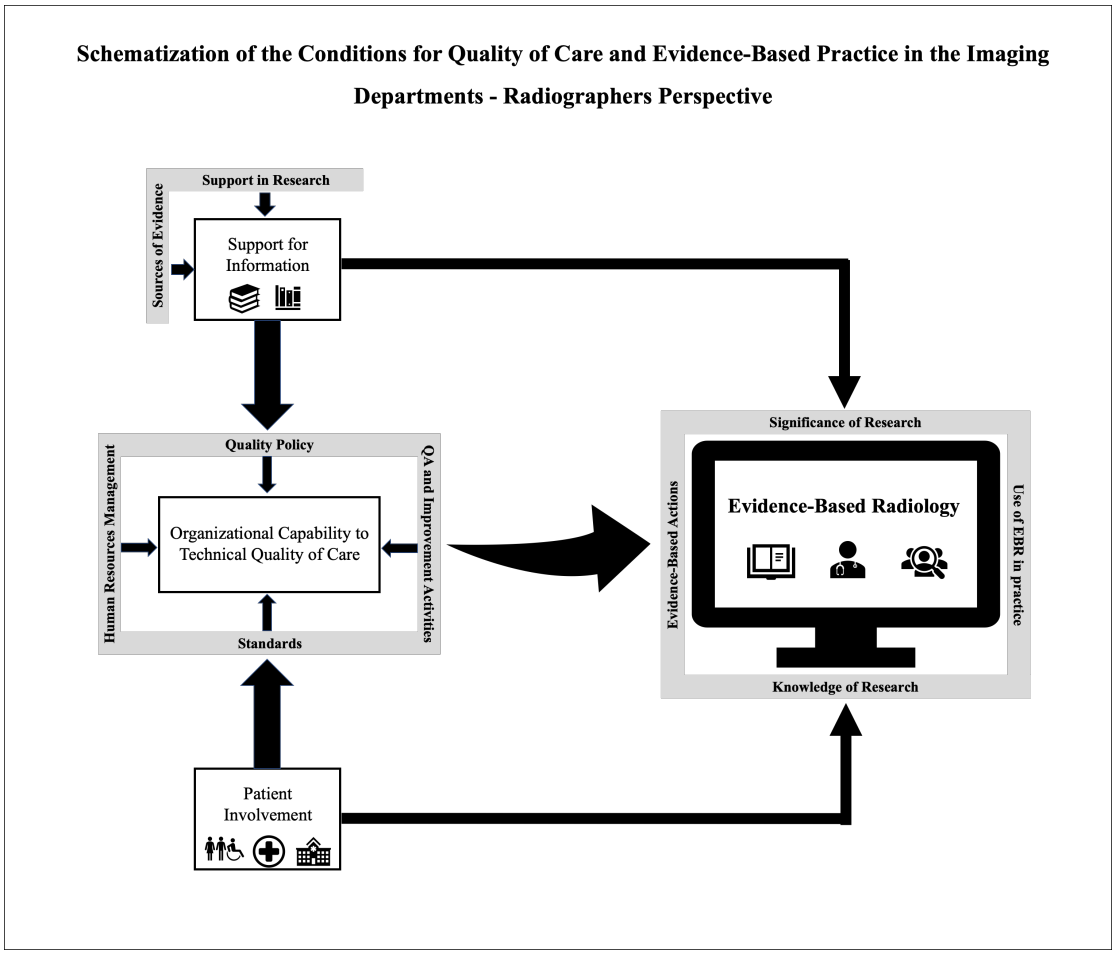

Figure 21 – Conceptual model based on the EFA, describing the different variables and factors.

CHAPTER V – DISCUSSION

The present study sought to explore and analyze the radiographer's perspective regarding the conditions for quality of care in the imaging departments and the respective use of evidence-based practices, as an essential means to deliver an excellent quality service to patients.

To achieve this objective, three different questionnaires were applied simultaneously to the radiographers of the main healthcare institutions in the Algarve region, which allowed the identification of problems, key barriers and facilitating elements, that must be considered in a perspective of continuous improvement and to define most appropriate quality policies.

In terms of sample characterization of this study, the obtained mean age is similar to the other studies (mainly, between 30 and 40 years old), and the response rate of 61.4% is higher compared to most studies in this area with radiographers (usually less than 50%) with the exception of the study of Kyei et al. (2015) with 92.1% and the Abrantes et al. (2020) study which obtained 69%, however with a smaller sample (Ahonen & Liikanen, 2010; Almugeeth, 2013; Jeyasuthan, Niroshani, Jayasinghe, Jayatilake, & Jayasinghe, 2014; Nalweyiso, Kabanda, Mubuuke, Sanderson, & Nnyanzi, 2019).

Regarding academic qualifications, this study contains a higher percentage of radiographers with bachelor's with honours (67.7%) master's (22.6%) and doctoral degree (4.8%), compared to studies of Kyei et al. (2015) (42.2%; 10.8% and 3.6%, respectively) and Almugeeth (2013) (67.0%, 12.1% and 3.0% respectively), suggesting a greater investment in postgraduate education and training by the radiographers included in this study.

In fact, the *European Federation of Radiographers Society* has made a continuous effort for radiographers to increase their educational level, especially at the level 7 of EQF, which allows them to have more consistent bases to develop EBP and radiographer- led research (England et al., 2017; McNulty, Knapp, & Brown, 2017).

In addition, it would allow for a greater uniformity of roles, responsibilities and competences in different health systems at European level and, at the same time, there would be greater recognition of the professionalism and quality of these professionals (England et al., 2017; Nightingale, 2016).

The main areas of expertise also confirm other studies, where the specialties of General Radiology and CT are mentioned (Almugeeth, 2013; McNulty, Knapp, & Brown, 2017; Nightingale, 2017). However, considering the new roles that Magnetic Resonance imaging has assumed in medical diagnosis, as well as its inclusion in hybrid imaging modalities, a specialty in this area must be encouraged and supported by radiographers in order to satisfy the current and future needs of the departments (Nightingale, 2017).

In this research, seven radiographers (11.3%) had management tasks but only one was on the institutional quality committee. The literature states that formal management and leadership roles should be an essential component in the development of the Radiography profession and for the success of healthcare organizations (Ehrlich & Coakes, 2016; Sithole, 2013). Thus, radiographers must increase their management skills to enhance the expansion of their roles, including at the clinical governance level, where they must assume responsibilities in clinical audit, quality management, continuous education and training (Ford, 2010; Kerr & Vinjamuri, 2001). To achieve this goal, support mechanisms are needed, namely, adequate preparation for management positions through mentoring on the main aspects of quality of care, quality improvement tools and communication strategies (Thompson & Henwood, 2016).

In addition, manager (chief or coordinator) radiographers must also have as essential requirements, excellent clinical performance and good relationship skills with team members. Also, their position as manager may also demand different requirements depending on the size of the institution and imaging department (Ehrlich & Coakes, 2016).

5.1. Quality Systems in the Imaging Departments

Quality Systems of the Imaging Departments were evaluated from the radiographer's perspective, considering the quality attributes or dimensions (A, B, C, D and E) and also considering some overall aspects about the QA and improvement system (dimension F), namely the global perception and the level of satisfaction of radiographers.

In this study, regarding the **QP on the existence of documentation on QA and improvement**, a low knowledge of radiographers about the existence of such documents was verified. More specifically, between 32.3% and 50.0% of radiographers said that the referred documentation did not exist in their departments, and between 12.9% and 22.6% said they did not know whether these documents exist. Although the two documents that obtained the highest percentage of positive responses were the written mission statement (46.8%) and the procedures of imaging department (41.9%), they do not reach half of the answers.

In accordance with the principles underlying clinical governance mentioned in the literature review chapter, quality systems should improve the standards of imaging departments, and their managers should be responsible for monitoring and systematically improving the quality, by maintaining high standards. In addition, professionals themselves should be accountable and responsible for their own acts during the clinical practice (Barros, 2010; Department of Health, 1998; Rawlins & Donaldson, 2018; Starey, 2003; WHO, 2004, 2017). Thus, in the imaging departments included in this study, there seems to be a need for greater involvement of radiographers in QA and improvement policies, which can be achieved through adequate training and education, and motivating radiographers to the importance of supporting documentation, such as quality action plans, quality reports, quality handbooks, among others (Wagner et al., 1999; WHO, 2017; Zygmont et al., 2017).

Similar results were obtained by Leão et al. (2013), who found that radiographers consider the implementation of quality systems to be essential, but that they need training in this field (only 25% had training). In addition,

53.2% say they do not know exactly what quality programs are. Thus, it is essential that imaging departments establish strategies for implementing QA and continuous improvement programs, which can be understood by radiographers (Staver & Caramella, 2018; Steele & Schomer, 2009). At the same time, for their effective implementation, these professionals must understand the basic principles of TQM and make an appropriate use of quality tools, because quality improvement can never be a passive process and radiographers must be committed (Erturk et al., 2005; Staver & Caramella, 2018).

In relation to **the involvement of patients in QA and improvement activities**, it seems that meetings with patients about satisfaction surveys and complaints never exist, nor do they ever participate in quality committees. Their involvement in the development of quality criteria, protocols, standards and their participation in quality improvement processes and projects are also mentioned by a small percentage of radiographers. So, in the radiographer's perspective, there is a high agreement regarding non-involvement of patients in this field, similar to the study of Costa (2006).

This absence of a patient involvement culture in the development of QA and improvement activities has to be changed, since they are the main reason for the existence of these departments, and they have a unique perspective as users (Higginbottom & Hurst, 2001). Thus, the results suggest that the quality system should be revised, as quality policies should allow to improve the patient health outcomes and experiences, and this is only possible through an environment of patients integration (Mezomo, 2001; OECD/EU, 2018; OECD, 2019).

Efforts must be made to include patients in decision-making processes, and they must be centered on the patients themselves, allowing the improvement of aspects related to patient safety, patient outcomes and patient experience. The paradigm must change and imaging departments of this study must pay particular attention to the patient involvement in quality issues, in order to

improve their access, literacy, decision-maker power as well as integrating them into pathways of care (Royal College of General Practitioners et al., 2013).

Also, the effectiveness of a TQM system requires a philosophy of continuous quality improvement based on the experiences, expectations and needs of patients, “ensuring their physical and psychological well-being”, and this can never be forgotten (European Society of Radiology (ESR) & European Federation of Radiographer Societies (EFRS), 2019; Kleinert & Horton, 2017; Sadikoglu & Olcay, 2014). However, institutions also need to ensure the necessary resources at all levels so that it is possible to establish better communication and proximity to patients (Governo Constitucional, 2020; Ministério da Saúde, 2018).

Regarding the use of **written procedures (standards) by radiographers in their clinical practice**, we found that more than half claim to have standards for safety and radiation protection, for the proper use of imaging equipment and for performing imaging procedures. However, there is still room for improvement, especially in aspects related to invasive procedures, for communication with the patient and for cooperation with other departments.

The lack of quality perceived by patients and the lack of adequate communication with them are even pointed out as the main reasons for complaints in the imaging departments. Therefore, improving the communication strategy will increase the degree of patient satisfaction and improve the quality of the service provided (van den Berg et al., 2019).

Considering the key role of radiographer in communicating radiation risks to patients, several studies emphasize the need to create consensus documents on how to communicate the risks and benefits of imaging procedures, which must be implemented to achieve a more effective communication (Portelli, McNulty, Bezzina, & Rainford, 2018; WHO, 2016).

Radiographers should also improve the use of standards and protocols in their clinical practice, so that the procedures are more systematized and always updated according to the new evidence (Abrantes et al., 2020; Dias et al., 2013; Kyei et al., 2015). This need for standardization has also been emphasized by

several professional societies, including for the definition of low-dose protocols, which allow greater radiation protection for patients (European Society of Radiology & ESR Subcommitte on Audit and Standards, 2010; Liu et al., 2010; Trattner et al., 2014). In this way, radiographers will have supporting documentation to act appropriately in the most varied clinical and non-clinical situations.

With regards to the **human resources management dimension**, positive responses were obtained in relation to the training and education of radiographers (83.9%) and other professionals (62.9%). However, for the remaining items on the existence of special provisions, quality policy for HRM and encouraging for the participation of radiographers in QA and improvement activities, the responses were mostly negative.

As such, greater attention should be given to the involvement of radiographers in relation to QA and improvement activities, namely through motivation, education and training strategies in terms of quality improvement, and managers should also take the initiative to involve and commit radiographers in quality systems, indicating what is expected and providing feedback systematically.

Crosby argued that quality initiatives should come from the top to bottom management and that radiographers must be trained to use QI tools, what does not seem to happen from the perspective of the radiologists of this study (Crosby, 1979). As mentioned by Lau and Ng (2015), the inclusion of radiographers in quality management activities and their involvement in the definition of quality policies, creates a great dependency on organizations with these professionals. This highly values the radiographer role, assigning new responsibilities and increasing their commitment to the quality system (Kleinert & Horton, 2017; Serviço Nacional de Saúde, 2020).

Accountability underlies the principles of clinical governance, where the need for consistent support mechanisms based on EBP and teamwork are mentioned as essential requirements for continuous improvement (Department of Health, 1998; Rawlins & Donaldson, 2018; Starey, 2003; WHO, 2004). Thus,

it seems unequivocal that to improve the assessment of this dimension (HRM) in imaging departments, the involvement and commitment of radiographers in the management process is mandatory, and the role of radiographer manager in this field can be decisive (Kyei et al., 2015; Murphy & Neep, 2018; Wan & Connell, 2003). On the other hand, the lack of encouragement to be involved in the department's quality systems is an obstacle to the process of implementing TQM and to the culture of continuous improvement (Willemse, Williams, & Grobler, 2020).

As for the **existence of QA and improvement activities in the imaging departments (dimension E)**, most radiographers report that there were no surveys to assess the satisfaction of radiographers, referring physicians and patients. However, it is known that the assessment of users' needs and satisfaction, allows the identification of priority areas for improvement and allows the comparison of several departments from a benchmarking perspective (Steele & Schomer, 2009; Zygmont et al., 2017). Thus, the results of this study suggest that the fulfillment of the needs and expectations of professionals and patients may be compromised, and it is necessary to foster a greater quality culture in these aspects.

The analysis of waiting times in the imaging department also proved to be deficient (58.1%), which may lead to more negative experiences and dissatisfaction (Alijanzadeh et al., 2016). According to Olisemeke et al. (2014), there are different types of waiting time that should be considered in medical imaging, namely between the physician prescription and the imaging procedure; and between the imaging procedure and the medical report. Therefore, the workflow must be continuously optimized in both in order to reduce these waiting times, as they are considered an indicator of patient accessibility to diagnosis, which is of great importance for imaging departments (Saini et al., 2017).

Furthermore, from the perspective of most radiographers, the DRL are also undefined and there seems to be no rejection of medical requests for imaging that do not contain an adequate justification. The current tendency to practice

a defensive medicine means that the principle of justification is not respected often, compromising the patient safety. So, there is an urgent need to establish greater cooperation and communication between referring physicians and imaging departments, in order to clarify the need for imaging examinations in each situation (Berwick, 2017; Lau & Ng, 2015; Saini, Brownlee, Elshaug, Glasziou, & Heath, 2017).

Also, since there is an asymmetry in imaging practices and in the radiation dose values between different departments, a better standardization of practices based on evidence is, patient-centred and respecting the established DRL is needed (European Commission, 2012; Suliman & Abdelgadir, 2018; Tsapaki, 2017). In addition, DRL as a good quality indicator for the optimization principle, should be set and used to improve of imaging departments at local, regional or national level, as they establish reference dose values for different protocols and clinical situations, which provide risk estimates for certain imaging tasks (Do, 2016; Vom & Williams, 2017).

On the other hand, still in relation to dimension E, radiographers value more positively (over 80%) aspects such as “signs to alert pregnant women to the risks of ionizing radiation”, “digital radiology systems”, and the “periodic safety assessment of imaging rooms and equipment’s”.

In the case of pregnant patients, it is especially important to consider the different imaging options in order to minimize the risks, adopting the use of appropriate protections (such as lead aprons) and optimizing the technical exposure parameters (European Society of Radiology (ESR) & European Federation of Radiographer Societies (EFRS), 2019; Kelaranta, Ekholm, Toroi, & Kortesniemi, 2016; Tsapaki, 2017). The implementation of digital radiology systems worldwide has also contributed to the minimization of risks to the most vulnerable patients, such as pregnant women and pediatric patients, since it allows the use of low radiation doses to obtain images with diagnostic quality, with studies reporting reductions of up to 18 times in this type of systems (Medina & Blckmore, 2006; Snaith, 2016; Trattner et al., 2014).

To this end, it is essential that equipment and installations comply with all safety requirements, which is achieved through periodic quality control and monitoring (Cândido et al., 2013; Kim, Gaukler, & Lee, 2016; Leão et al., 2013; Willemse et al., 2020).

Finally, through the last section of the quality systems assessment questionnaire, it was possible to assess the **impact and satisfaction of radiographers** in relation to the quality system and the respective QA and improvement activities. The results obtained indicated that the majority of radiographers consider themselves unsatisfied with the overall quality and with the overall organization and management of the imaging departments. Also, the overall image is only satisfactory for 58.1%. The overall services provided by these professionals, on the other hand, obtained a higher degree of satisfaction (71%).

When we analyze each of the imaging departments individually, we find that institutions A and D are the most problematic, since there is a greater degree of unsatisfaction in these departments. Institution A is the most worrying, since 92.3% are unsatisfied with the overall quality, 84.6% with the overall image and 88.5% with the overall organization and management. Of the 4 institutions, it is also in institution A that there is a lower degree of satisfaction with the overall services provided (53.8%), while in the other institutions, satisfaction is between 75.0% and 90.9%.

Thus, in view of the data discussed above, we can answer to the RH1 and RH2.

- ✓ **RH1 established that "*Radiographers from different imaging departments equally evaluate their quality systems*".**

This hypothesis **is rejected**, since statistically significant differences were found ($p<0.05$) in several items from dimensions A (QP), C (standards), D (HRM) and E (QA and improvement activities). Differences were not verified only in dimension B, since as explained above, there is no involvement of patients in the quality systems from the perspective of most radiographers from all institutions.

In addition, it was also possible to verify that the radiographers from institution A evaluated the items of dimension E in a higher way, namely with regard to satisfaction surveys among referring physicians and the analysis of waiting times. Radiographers from institution B only obtained a significantly higher score related to patient satisfaction surveys (dimension E). Radiographers from institution C where those who obtained the highest scores in the evaluation of most items, namely related to radiographer training, continuous education in quality issues and radiographer's performance evaluation (dimensions D and E). As for radiographers from institution D, they had higher scores at the level of procedures and standards (dimensions A and C), the role of quality coordinator for improvement activities (dimension D) and satisfactions surveys among radiographers (dimension A).

- ✓ **RH2 established that "*Overall quality, image, organization and management, and services provided are assessed equally by radiographers from different imaging departments*".**

This hypothesis **is also rejected**, since statistically significant differences were found ($p<0.05$) in the overall quality, overall image and overall organization and management between the imaging departments. However, in terms of impact and satisfaction, there were no differences in the overall services provided between departments. In addition, it was found that institution C was the one with the highest scores on all items and, on the opposite side, institution A had the lowest scores.

Besides, it was intended to understand which were the biggest **quality defects**, so that it was possible to **establish priority improvement strategies**. Through Pareto analysis, a high number of quality defects were identified, and it is necessary to define new policies and strategies aimed at improving quality systems, especially in terms of patient involvement (dimension B), radiographers involvement (dimension D3), relationship between HRM and quality policy (dimension D3) and QP (A). These aspects constitute 67.92% of the total defects found, so they must be considered as priority in improvement

actions, according to the Pareto principle (Almeida et al., 2017; 2019; Saturno & Gascón, 2008; Towbin, 2018).

As previously mentioned, improvement strategies must include greater involvement of patients and radiographers in QA and improvement activities (Wagner et al., 1999; WHO, 2017; Zygmont et al., 2017). Especially at the patient level, there should be an effort to review the quality systems implemented, so that they can be heard and involved in the processes and, consequently, can improve aspects related to their safety, health outcomes and needs (Royal College of General Practitioners et al., 2013; European Society of radiology & European Federation of Radiographer Societies, 2019; Kleinert & Horton, 2017; Sadikoglu & Olcay, 2014).

Also, for greater involvement of radiographers, there is a need for supporting documentation, as well as education and training on quality topics, and committing and motivating these professionals to continuous improvement, based on the principles of clinical governance (Kleinert & Horton, 2017; Lau & Ng, 2015; Price et al., 2020; Serviço Nacional de Saúde, 2020).

Following the results that have been discussed above, it is not surprising that when the **stage of development of imaging departments** was determined, the stage zero was obtained. Thus, the departments included in this study are in a stage of orientation and awareness, where QA and improvement activities are not properly implemented (Costa, 2006; Wagner et al., 1999). The first step that needs to be taken to reach stage 1, will have to include a written mission statement, written procedures for patients with special needs and standards for invasive procedures, and involve patients and radiographers in the development of QP (Costa, 2006; Wagner et al., 1999).

5.2. Evidence-Based Radiology

The use of EBP by radiographers and their participation in research activities were evaluated with a second questionnaire, since it is essential to realize if they use evidence from existing research in the literature to guide decision

making in the clinical practice (Medina & Blackmore, 2007). Only in this way will it be possible to deliver quality and effective care in imaging departments.

The background characteristics and the involvement of radiographers in scientific research activities can be decisive for meeting the necessary conditions for the proper use of the PBE principles.

The data of this investigation allowed to realize that almost all radiographers received training on research (only 1.6% did not receive it), although in 95% of them carried out research only in the role of students. The values obtained are higher compared to similar studies, indicating that the research bases were provided to these professionals (Abrantes et al., 2019; 2020; Ahonen & Liikanen, 2010; Dias et al., 2013). In this sense, conditions must be created and the participation of radiographers in research projects and activities must be encouraged. In this way they can develop the radiography profession, improve their knowledge and implement new EBP (Paulo, 2020).

Research should also identify and define new strategies and policies that allow reaching the quality goals defined for a department (Peters, 2018). In addition, through the identification of the research needs of a department, gaps are identified, which must be known in order to be filled (Reid & Edwards, 2011).

The results of this study also indicate that the main factors that promote the participation of radiographers in research are the support from imaging departments head / manager radiographer, their interest in research activities and taking time for research activities. On the other hand, the hindering actors pointed out were the lack of time, the lack of support and the lack of motivation. Research should be understood as a normal function of the radiography profession, so it should be integrated into the job description whenever a new radiographer is recruited (Paulo, 2020; Reid & Edwards, 2011). This research culture must begin to be instilled systematically in imaging departments (Zygmont et al., 2017).

Reading scientific publications is also an essential requirement for using EBP. The frequency of reading articles reported in this study is far from ideal, although there is a clear interest in reading this type of publication, but due to

lack of time and motivation it doesn't happen often. The implementation of periodic meetings between team members to analyze the main studies in this area, may act as an element of change (Medina & Blackmore, 2007; Sardanelli et al., 2010).

Regarding the **EBP dimensions** evaluated in this study, it was possible to verify a positive attitude of the radiographers regarding the **evidence-based actions (dimension G)**, with positive responses between 85.4 and 95.2%. They consider that these actions are important for their work, they are part of their profession, they are necessary and that allow the improvement of practices. As mentioned by different authors, making decisions supported by evidence can avoid the use of unnecessary procedures and avoid ineffective procedures, increasing the quality of service and patient safety (Abrantes et al., 2020; Craig & Smyth, 2004; Dias et al., 2013). Besides that, by improving professional practice, patient outcomes will also be improved (Hillman, 2005; Sheehan et al., 2007).

The **significance of research activities (dimension H)**, also obtained mostly positive responses in radiographers' perspective, ranging from 50.0 to 83.9%. Research activities are important at different levels and, as such, radiographers are available to participate, considering that their departments should develop research projects. This culture has to be a commitment made by the leaders and managers of the imaging departments, as other authors point to this need (Nalweyiso et al., 2019; Paulo, 2020). However, it is also necessary to allocate resources for research activities, as several studies consider that radiographers intend to obtain some benefit through these activities, whether in terms of salary or professional progression (Abrantes et al., 2019; Ahonen & Liikanen, 2010).

However, the research must also be seen as an enhancing tool for EBP, updating practices, rationalizing the available resources and increasing the rigor and quality of the procedures performed in the department (Ahonen & Liikanen, 2010; Dias et al., 2013; Nalweyiso et al., 2019).

The results related to **dimension I (support in research activities)**, also reinforce the information mentioned above. Despite the availability of

radiographers for research activities, there is a lack of support that is evident when analyzing items from this dimension. The lack of support and encouragement from colleagues, from other health professionals and from the imaging department manager are pointed out by the radiographers.

The imaging department's management should have the responsibility to provide continuous education and training to radiographers, so that they obtain the skills and tools necessary to conduct research activities, and to incorporate the results of these investigations into their clinical practice (Gadeka & Esena, 2020; Kyei et al., 2015; Sardanelli et al., 2010). This could be a key element in the implementation of new practices that will improve the quality of the departments under their management (Paulo, 2020).

Positive responses in all items of **dimension J (current use of research evidence in practice)** were also obtained, indicating that those who have already participated in research activities, adapt their practices based on scientific data, and also mentioning that their actions are usually based on scientific data. This information is supported by Hillman (2005), who refers that adequate information-seeking behavior and research knowledge are necessary preconditions for the application of EBP. Moreover, imaging departments and academic institutions must collaborate strictly, provide more knowledge to radiographers about research methodologies and how to translate clinical research data into clinical practice (Abrantes et al., 2020; da Silva et al., 2018; Erturk et al., 2006).

Regarding the **sources of evidence (dimension K)**, although the knowledge acquired during graduation is considered important for the clinical practice of radiographers (referred by 96.8%), values above 90% were also obtained for stronger sources of evidence, such as scientific research. Although the knowledge obtained in radiography graduation is important, it must be constantly updated, and radiographers should not accept assumptions or information from experts as valid; they have to critically evaluate the evidence from existing research in the literature to guide their decision making (Abrantes et al., 2020; Medina & Blackmore, 2007).

Therefore, the practice must be constantly reviewed, constantly questioned and, when appropriate, decisions must be made on the available evidence, thus helping to formulate the right questions, to develop the skills they need to explore and evaluate the evidence, aiming at possible patient benefits (Craig & Smyth, 2004).

Finally, in relation to the **dimension L (knowledge of research)**, the results suggest that radiographers consider that they have basic knowledge about research, about the different stages of the research process and how to apply the research results into the clinical practice. On the other hand, their knowledge about current investigations and statistical methods are referred to as negative points. These results are in line with those obtained by other studies, and more training should be provided on the topics listed as the most problematic, in their perspective (Abrantes et al., 2020; Ahonen & Liikanen, 2010; Nalweyiso et al., 2019).

Following the results mentioned above, it is possible to answer to the RH3.

- ✓ **RH3 established that "*There are no differences in the perspective between radiographers with and without management tasks regarding the implemented quality systems and the use of EBP.*".**

This hypothesis **is rejected**, since statistically significant differences were found ($p<0.05$) in several items related to all dimensions of the quality systems and also related to dimension H (significance of research activities) of EBP. Moreover, radiographers with management tasks value all items where differences have been observed more positively. In other words, there is a significant difference between the manager's and the employee's perspective.

There is a natural tendency to respond positively to self-rated questions, which may explain these differences. However, managers must be concerned with knowing the experiences, perspectives and needs of their employees, promoting relationships of trust, understanding their difficulties, and involving them throughout the quality system (Agudo, Quesada, Martín, & Espinosa,

2007; Seret, Pirson, Penson, Lefebvre, & Lecocq, 2018). Even one of the items where differences were found was precisely in relation to “satisfaction survey among professionals from imaging departments”.

Thus, a better understanding of their expectations may lead to an increase in the adherence and commitment to quality systems and to the implementation of EBP actions (Seret et al., 2018). Initiatives that promote the motivation of radiographers, the improvement of working conditions, and an organizational culture that adopts the principles of clinical governance should also be promoted (Alhassan, Beyere, Nketiah-Amponsah, & Mwini-Nyaledzigbor, 2017; Jakobsen & Vik, 2019).

As for the **informational behavior of radiographers**, as seen in the chapter of literature review, the search for adequate information within the scope of their professional practice is an important contribution for the quality improving. In case of informational need, all radiographers admitted to having consulted one or more information sources during the 30 days prior to completing the questionnaires. The sources used to suppress the most mentioned information needs were the non-specialized research tools (internet search engines), followed by the request for help from the radiographer with management tasks or a colleague with more experience, and health websites or other medical research tools.

Similar results have been obtained in other studies, proving the need to change the information search paradigm, respecting the principles of EBP and the different strengths of evidence (Morgan-Daniel & Preston, 2017; Sancho et al., 2013; Scott et al., 2018; Sermeus, Procter, & Weber, 2016). In addition, a better understanding of the level of development in the information search process by radiographers must be identified, to provide them the necessary support and implement strategies to improve the effectiveness of research through education and training (Martinez-Silveira & Oddone, 2008).

Once again, organizational culture can also be considered as a factor to take into account, as organizations and their departments themselves must encourage the use of internet-based tools by health professionals in an

appropriate manner, to complement their knowledge in relation to the clinical issues that they face, improving the effectiveness of patient care (Blummer & Kenton, 2014). Strategies for planning, monitoring and evaluating the results of information search should also be implemented (Blummer & Kenton, 2014; Zare-Farashbandi & Lalazaryan, 2014).

The most frequent information needs in clinical practice mentioned by radiographers are related to the principles of justification and optimization, as well as the exposure technical parameters, and safety and radiation protection.

The participation and involvement of radiographers in the justification process was recently established in the European legal framework, who should work in collaboration with the interdisciplinary team in order to find best available and adequate procedure to clarify the patient's clinical doubt, in a safe way (Berwick, 2017; Conselho da União Europeia, 2014; Lau & Ng, 2015; Vikas Saini et al., 2017). After justifying and selecting the appropriate procedure, radiographer must perform a mediation radiation risks through the optimization of protocols and technical parameters, providing an improvement in the suitability of patient-centered protocols, and also in accordance with the best available evidence (Abrantes et al., 2020; Lau & Ng, 2015). Together, these measures will minimize the occurrence of errors and increase the culture of quality and safety throughout the patient's pathway (Kruskal et al., 2011; Lau & Ng, 2015; Zygmont et al., 2017).

Therefore, it is possible to answer to the RH4.

- ✓ **RH4 established that "*There are associations between the informational behavior and the use of EBP by radiographers during their clinical practice, namely on the justification and optimization of the procedures performed".***

This hypothesis **is confirmed**. According to the results obtained, several items of the EBP dimensions have very strong significant correlations (*Cramer´'s* $V>0.15$; $p<0.05$) with the radiographers performance stage in the use of electronic databases, with how they evaluate the results of their bibliographic search, with the clarification of frequent doubts in their clinical practice, with the

result obtained from the information collected and with the impact of that information. Besides, higher frequencies in the doubts related to the Optimization and Justification of imaging procedures were associated with greater degrees of agreement and importance attributed to the items of EBP.

Due to the asymmetries that exist between the different imaging departments across Europe, it is important to realize that radiographers of this study have instilled respect for the two fundamental pillars: Justification and Optimization. Compliance with these principles is essential for the standardization of practices based on evidence, patient-centred protocols and to improve DRL (European Commission, 2012; Suliman & Abdelgadir, 2018; Tsapaki, 2017).

There are several published and available guidelines that should be used by these professionals when doubts arise as to which imaging method is most appropriate for a specific patient with a specific clinical suspicion (Hentel et al., 2011; Sierzenski et al., 2014). And given the high number of imaging procedures performed in Portugal annually, it is necessary to optimize these practices while fully complying with these principles, improving patient safety (European Commission*, 2014)*.

5.3. Structure of the Model: Conditions for Quality of Care and Evidence-Based Model

In this research, EFA methods were used to determine the structure of the model under study and the respective relationships between variables, from the perspective of radiographers. Therefore, all the necessary statistical requirements to carry out the EFA have been met and allowed to reduce the number of initial dimensions (11) to a total of four factors, which explain 68.7% of the variability.

The new four latent variables maintained the integrity of the initial dimensions, since factor 1 only contains dimensions from questionnaire 1 (QA and improvement activities, HRM, QP and Standards). The only dimension of the quality systems instrument that was left out of this factor 1 was the dimension

B (patient involvement), which became exclusively in factor 4 after EFA. However, the variance obtained for this factor 4 is low (10.8%).

Similarly, factors 2 is defined by 4 dimensions of EBP instrument, namely the significance of research activities (H), knowledge of research (L), evidence-based actions (G) and current use of research evidence in practice (J). And factor 3 includes the remaining two dimensions of the PBE instrument: sources of evidence (K) and support in research activities (I).

Therefore, after EFA, the most revealing factors to take into account from the perspective of radiographers in relation to the "Conditions for Quality of Care and EBP Model" are the **Organizational Capability to Quality of Care** (Factor 1), **Evidence-based Radiology** (Factor 2), **Support for Information** (Factor 3) and **Patients Involvement** (Factor 4). The schematic representation of this conceptual model can be seen in figure 21 (results chapter).

Following the studies cited in the introduction and literature review chapters, radiographers also seem to consider separately the technical quality and the functional quality (Aggarwal et al., 2019; Reardon & Davidson, 2007; Yesilada & Direktor, 2010). For these professionals, organizational capability for technical quality of care (factor 1) encompasses several elements such as the existence of documentation (QP), the rigor of procedures (standards), the involvement and commitment of radiographers (HRM), and the existence of QA and improvement activities (Lam, 1997; Yesilada & Direktor, 2010). Moreover, there is evidence that an internal approach through the professionals themselves can lead to the identification of opportunities for quality improvement without using additional resources (Cameron et al., 2018, 2010; Mamede et al., 2017; World Health Organization, Organisation for Economic Co-operation and Development, & The World Bank, 2018; Saturno, 1995).

On the other hand, patients' involvement in quality systems (factor 4) is related to functional quality, as they do not have the knowledge to effectively evaluate diagnostic procedures, but as the central element of the national healthcare service, their needs and expectations are fundamental in building quality improvement policies and strategies (Bowers et al., 1994; Ribeiro, 2018;

Yesilada & Direktor, 2010). These aspects are especially important in the Algarve region, as the reports reinforce experienced barriers by population in accessing hospital care (Simões et al., 2017; WHO et al., 2018).

In the perspective of radiographers, support for information is also essential for providing organizational capability to quality of care. The organizational structure of an imaging department should support resources focusing on continuous quality improvement and adapting systematically the standards and professional practices in function of the best available scientific evidence (Furnival et al., 2017; Zygmont et al., 2017). A close supervision and good cooperation and communication between radiographers and their managers, also allows to identify potential problems, key barriers and facilitators with influence on the quality of care provided in the imaging departments (Eslava-Schmalbach et al., 2019). Systematic monitoring and the proper use of quality improvement tools can also be a valuable aid in this regard (Calderón et al., 2019; Kruskal et al., 2011; Papp, 2019; Zarb, Rainford, & Mcentee, 2009).

To reinforce the importance of EBP in Quality issues, Lau and Ng (2005) through a quality framework refer the integration of “quality and safety measures”, the “implementation of strategies” and the “performance enhancements” using evidence-based actions, with the goal of developing innovative actions to achieve continuous QI and patient safety (Lau & Ng, 2015).

As stated by other authors, support is essential to establish the radiographers commitment to the organization and to provide quality of care (Makanjee et al., 2015; Makanjee, Hartzer, & Uys, 2005). It should also be noted that to improve the quality of the imaging department, their managers must create all the necessary conditions in the work environment, enhancing the performance of radiographers through the use of standards and practices supported on the best available scientific evidence (Furnival et al., 2017; Kourdioukova, Verstraete, & Valcke, 2011; Makanjee et al., 2005; Zygmont et al., 2017).

Also, support is a desirable precondition for adequate organizational capability to quality of care and, in turn, for EBR, as expressed by Bengoa et al. (2006)

and by World Health Organization, Organisation for Economic Co-operation and Development, et al. (2018), who present the information (research, information systems, sources of evidence, results of research) as a necessary strategy for the quality of care.

The radiographers who participated in the present study seem to have the necessary preconditions for the quality of care and EBR, although it is not yet properly implemented in their departments. The creation of adequate conditions for the support of information based on research and evidence and with the patient involvement as the necessary determinants to provide a proper organizational capability to technical quality of care, may provide the implementation of EBR in the imaging departments (Abrantes et al., 2019; 2020; Ahonen & Liikanen, 2010; Dias et al., 2013; Nalweyiso et al., 2019).

In this sense, a schematization describing the potential relationship between the different variables and factors identified through the EFA was elaborated, allowing to answer the last RH of this study.

- ✓ **RH5 established that** **"**There is a valid model which explain the Conditions for Quality of Care and EBP in the imaging departments, from the radiographers' perspective***".***

This hypothesis **is confirmed**. According to the main findings of this study and the evidence in literature, the structure of the obtained model "Conditions for Quality of Care and Evidence-based" is valid and translates the perspective of radiographers from their clinical practice in Algarve region, answering simultaneously to the main goal of this thesis.

5.4. Study Limitations

The limitations and difficulties faced in any investigation must be described in a way that allows other researchers and future investigations to try to overcome them.

In this study, the response rate is far from ideal (61.4%). The simultaneous application of three questionnaires required a high availability by radiographers in terms of response time, which may have conditioned their participation in the study. Besides that, some of the professionals reported to the researcher that they consider it a waste of time, as they frequently participate in several studies, without observing any improvement in their work context, as recommended in previous works.

The sample was limited geographically to the larger imaging departments of the Algarve region and so, a broader approach should be undertaken in the near future. However, it was the most adequate sampling strategy considering the temporal and financial constraints.

Top management (strategic level) was not included in this study, which could add important evidence on the political and management perspective.

The apparent lack of a quality culture has led radiographers to often select the “I don't know” option, deserving a better awareness among professionals in this matter. In this sense, the fact that the study was purely quantitative, based on the analysis of perspectives, provided some associated inaccuracy and should undertake a complementary qualitative approach. The use of focus groups and interviews could bring additional useful information, which could help to explain some of the doubts that remain in the present study, since the new factors obtained only explain less than 70% of the total variance.

The theme of this thesis tried to explore human interactions at the level of imaging departments and the respective behavioral data can never be entirely objective, which explains the total variance obtained below 70%. In any case, they allowed us to obtain a valid model that should be now the subject of further study using complementary methodologies, including the collection of a larger

number of data that makes it possible to use structural equation modeling through confirmatory factor analyzes.

CHAPTER VI – CONCLUSIONS

6.1. Main Conclusions

The present study clearly achieved the objectives initially defined. It was possible to analyze in an integrated way and using multiple dimensions, the conditions related to the quality of care and the use of EBP in the clinical practice of radiographers.

All the initial dimensions constitute the final conceptual framework of the present research, although grouped into four new factors, which translates the perspective of radiographers in the imaging from the Algarve region. It should be noted that patient participation in the quality systems of the departments in this study is far from being considered adequate. As such, the stage of development of quality systems in this respect was situated at level 0. Therefore, patients must be involved to increase the stage of development, which requires its inclusion in meetings with radiographers and quality committees; in the development of quality criteria, protocols and standards; and their participation in QI processes and projects.

Patient involvement and support for information appear as two necessary requirements for an adequate organizational capability for the quality of care, which, together, constitute the necessary conditions for the proper implementation of the Evidence-Based Radiology.

Moreover, the four dimensions “Quality Policy”, “Human Resources Management”, “Standards” and “QA and improvement” activities explain the new factor **Organizational Capability to Quality of Care**. The four dimensions “Significance of research”, “Evidence-based actions”, “knowledge of research” and the “Use of EBR in practice” explain the new factor **Evidence-Based Radiology**. Two dimensions (Sources of evidence and Support in research) explain de new factor **Support for information**, and the dimension of the Patient's involvement justifies *per se* its own factor.

Based on this new conceptual model, it was possible to obtain a more specific knowledge about the intrinsic procedures of the imaging departments in the

context of the Algarve region, which should now be considered in the establishment of strategic policies that better define the provision of diagnostic procedures and professional practices, based on quality systems established in accordance with the best scientific evidence available, systematically reviewed, and aiming at better patient safety and the enhancement of human capital (healthcare professionals, including radiographers).

The perceived level of quality is far from ideal and new improvement strategies should be prioritized considering:

- ✓ Patient involvement - a greater effort to include patients in the decision-making process should me made;
- ✓ Radiographers involvement - the involvement, participation and commitment of radiographers in the QA and improvement activities should be encouraged;
- ✓ Quality Policy - as there is little knowledge about the existence of documentation related to QA and improvement by radiographers; and the quality policies for HRM must also be improved and adapted to the needs of the imaging departments;
- ✓ Standards - there is a room for improvement in aspects related to invasive procedures, for communication with the patient and for cooperation with other departments; and
- ✓ QA and improvement activities - there is a need for the establishment and monitoring of improvement activities, including the use of satisfaction surveys among radiographers, referring physicians and patients.

Given the improvement needs mentioned above, the majority of radiographers consider themselves unsatisfied with the overall quality and with the overall organization and management of their imaging departments. However, they are globally satisfied with the services provided.

During clinical practice, radiographers face several doubts, mostly related to the principles of justification and optimization of imaging procedures, which leads them to frequently seek information to clarify these doubts. This

demonstrates a concern to follow the European standards, and to actively participate in collaboration with other professionals, seeking to implement a culture of quality and safety.

There is a positive attitude by radiographers towards EBP, where the preconditions for their implementation and systematic use in the imaging departments seem to be met. However, conditions that promote their participation in research projects must be created and research activities in the imaging departments must be encouraged, to develop the radiography profession, improve their knowledge and implement new practices to improve the quality of care. To promote the participation of radiographers in research activities, some factors have been identified, such as the support from imaging departments head / manager radiographer, encourage and motivate them for research activities and providing enough time to participate in these activities.

The lack of support for information was mentioned at several levels, so the managers should have the responsibility to provide continuous education and training to radiographers, so that they obtain the skills and tools necessary to conduct research activities, and to incorporate the results of these investigations into their clinical practice, systematically updating QA and improvement activities.

Finally, a better standardization of practices based on evidence, patient-centred protocols and establish DRL are measures that must be implemented in the imaging departments of this study, since the association between the quality of care and the support for the practices adopted was clear.

In summary, this study provides important insights into the conditions for quality of care and EBP in the imaging departments from Algarve region, and these main considerations should be used in a perspective of continuous improvement culture. Some recommendations can therefore be outlined.

6.2. Further Recommendations

Further studies should be conducted in the field of quality of care and EBP in imaging departments, to obtain more consistent knowledge on these themes, especially in the Portuguese context where the evaluation gaps are evident.

A broader, nationwide study would provide more solid results on the quality of care and use of EBR in public and private imaging departments, allowing to define individual strategies and policies for each one of them.

Through complementary qualitative methodologies, in-depth analysis of the existing documentation in the imaging departments regarding quality systems must be carried out, in order to prove which documentation exists and which does not. The existing documentation may have to be improved before it is disseminated by radiographers in light of the new evidence, and in the case of nonexistent documentation, it will have to be created, with the involvement of patients and radiographers throughout the process.

The same analysis carried out in this study should be extended to the remaining stakeholders (patients, radiologists, operational and technical assistants), as well as to top management. The results from these holistic analyzes, should allow to improve the effectiveness of the quality systems, and the respective QA and improvement activities.

Specific quality indicators should be established, similar to those shown in table 1, using quality tools, considering each step in patient journey and respecting the Donabedian triad (quality indicators for structure, process and result, as shown in figure 2). At the same time, professional practices of radiographers should be optimized in the light of the six-step process of EBP and the six-level model for efficacy of imaging procedures visible in figure 4.

The implementation of clinical audit mechanisms (internal and external) are also essential, not only because they allow the compliance with legal requirements (as they are mandatory), but above all because they are an efficient QI tool. This powerful instrument, which is complemented with new re-audits, allows the systematic identification of focal areas for improvement,

providing better quality of care, efficient use of resources and identification of training and education needs within imaging department. Besides, the implementation of this tool will demonstrate the department's commitment to patient safety and patient needs, based on the principles underlying EBP.

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APPENDIX

Appendix A - Cross-cultural adaptation and validation of instrument number 1

The methodological steps of the cross-cultural adaptation of the instrument number 1 (instrument to study the quality of care systems) were based on the method proposed by Beaton et al. (2000, 2007).

The main purpose of this adaptation was to achieve similarities in the instrument at semantic, idiomatic, cultural and conceptual level in relation to the original instrument so that it can be applied to a population with cultural, geographical and linguistic differences (Beaton et al., 2000, 2007).

STEP 1:

At this stage, translations of the instrument were performed independently by two bilingual translators (Appendix 1.1 and 1.2), both Portuguese native speakers, since the instrument would be used in Portugal. One of the translators had knowledge of the instrument and background on this subject, and the other one had no knowledge on this subject. After both translations were completed, a written report was prepared observing the differences and similarities between the translations, as well as the difficulties encountered.

STEP 2:

After the previous step, a written report was prepared describing the whole process of synthesizing the translations (the translations from step 1, the respective reports and the instrument in the original version) as well as the small differences between the translations. In this step, there was no need to include an additional translator in order to resolve the discrepancies found as they were irrelevant.

STEP 3:

Two independent English native speakers (INPOKULIS translation services company), without any knowledge about the original instrument and without background on the subject, performed the back translation of the translated instrument, and both were similar to the original version.

STEP 4:

At this stage a committee of experts consisting of 5 senior radiographers, 2 language teachers and the translators who participated in the previous steps, all together, verified the cross-cultural equivalence of the instrument and performed the respective content validation. Thus, after rigorous consultation of the several versions of the instrument (original, translations and back-translations) and their reports, the semi-final version of was prepared. This version contains semantic, idiomatic, cultural and conceptual equivalence to the original instrument.

STEP 5:

Using the semi-final version, a pre-test was performed on the target population (radiographers) in order to perform a facial validation of the instrument (to evaluate the verbal comprehension of the questions and their response options).

STEP 6:

In this last step, whenever possible, all the documents developed during the previous stages should be sent to the original authors of the instrument to verify if the adopted procedures are coherent. However, given the language barrier (original authors don't speak Portuguese) and given the semantic, idiomatic, cultural and conceptual equivalence obtained, it was unnecessary to perform this step. However, psychometric assessment of the questionnaire was verified, in order to check its validity and reliability (internal consistency).

Appendix B - Original instrument for translation into Portuguese (template)

O presente modelo contém os items do instrumento original e foi utilizado para os tradutores bilíngues efetuarem as respetivas traduções:

Tradutor (assinalar): ☐#1 ☐#2
Nome do tradutor: _____
Perfil do tradutor (assinalar): ☐ Conhece o instrumento e o tema em estudo
☐ Não conhece o instrumento e o tema em estudo

Item original	Item traduzido (☐#1 ou ☐#
Focal area 1: Quality Policy	
1. Does your organization have one or more of the mentioned documents (Mark "No", "In development" or "Yes"?	
Instructions: "In development", one or more persons of the organization are working on the development of the document	
Documents: **1.1-** Written mission statement: the vision and priorities of the organizations	
1.2- Product descriptions: detailed description of the care for different patient populations	
1.3- Quality profiles: concrete descriptions of quality characteristics and quality standards of health care delivery	
1.4- Quality policy documents: a description of the aims of quality assurance, the desired level of care delivery and the ways of the organizations for achieving these goals	
1.5- Quality action plan for whole organization: written document with measures for implementation and planning of action to realize quality goals	
1.6- Quality action plan for some departments	
1.7- Quality action plan for every departments	
1.8- Annual quality report: a report on all activities that were performed to assure the quality of care and the results of the activities	
1.9- Quality handbook: a description of all procedures that the organization uses for quality assurance and the persons that are responsible for the compliance with the procedures	
Focal area 2: Conditions and human resources management	
2. Does your organization have/make special provisions for the implementation of activities of quality assurance/improvement? (more than one answer is allowed) - No special provisions - Training/education of staff/management - Training/education of professionals - Professionals are allowed to participate in QA-activities within regular working hours - Appoint a quality coordinator - Set up a steering committee - Set up quality working groups - Budget for quality management - Support by consultants	
3. Is there a relantionship between human resources management and the quality policy in your organization? (more than one answer is allowed) - Does not apply - Selection of new personnel with positive attitude to quality assurance - Training new professionals in quality improvement methods - Continuous education takes place based on priorities in quality policy - Professionals are encouraged to develop themselves in their profession - Participation in quality improvement projects is required	
4. How does the management stimulate the involvement of professionals in quality assurance/improvement? (more than one answer is allowed) - Does not apply - Stimulation is not necessary, professionals pay enough attention to quality assurance/improvement - The management indicates what is expected from professionals with respect to quality assurance - Management checks whether professionals stick to commitments - Systematic feedback to professionals about results achieved - Management gives incentives - Monitoring department action plans - Sanctions, namely.....	

Item original	Item traduzido (☐#1 ou ☐#
Focal area 3: Standards	
5. What kind of standards do professionals use in your organization? (more than one answer is allowed) - Standards for specific treatments/interventions - Standards for patient education - Standards for restricted medical actions - Standards for utilization of medical equipment - Standards for critical moments in service provision - Standards for specific target groups and diagnoses - Standards for patient routing from intake to discharge - Standards for co-operation with other organizations	
Focal area 4: Patient involvement	
6. In what way are patients (or patient organizations) involved in quality assurance or improvement activities in your organization? (Mark "No/does not apply", "Depends on the subject" or "Always"?	
Documents: **6.1-** Developing quality criteria	
6.2- Developing protocols/standards	
6.3- Meetings talking about results of satisfaction surveys, complaints	
6.4- Quality committees	
6.5- Quality improvement projects	
6.6- Evaluating quality improvement goals	
Focal area 5: Quality assurance and improvement activities	
7. Does your organization apply the following activities on a regular, systematic basis? (e.g. Deming cycle: plan, do, check, act). (Mark "No*", "Yes*", "Cycl*" or "Syst*"?	
*Explanation: No = no/does not apply; Yes = the activity is not applied on a regular basis Cyclic = the activity is applied based on a quality improvement cycle Systematic = the activity is applied based on a quality improvement cycle and the activity is integrated into normal business routines	
Activities: **7.1-** Peer review monodisciplinary	
7.2- Peer review multidisciplinary	
7.3- Utilization of individual care plans	
7.4- Committees e.g. incident, infection or drugs committes	
7.5- Job assessment interviews	
7.6- Internal audit	
7.7- Visitation/accreditation	
7.8- Management information system	
7.9- Satisfaction surveys among patients	
7.10- Satisfaction surveys among referrers	
7.11- Satisfaction surveys among employees	
7.12- Need survey among patients	
7.13- Need survey among referrers or other stakeholders	
7.14- Complaint registration	
7.15- Patient council	
7.16- Other activities, namely:	

Appendix C - Translation of the instrument into Portuguese language (translators 1 and 2)

O presente modelo contém os items do instrumento original e as respetivas traduções pelos tradutores bilíngues:

Nome do tradutor 1 (#1): Luís Miguel Veloso Morais Madeira
Perfil do tradutor: Não conhece o instrumento e o tema em estudo

Nome do tradutor 2 (#2): Tiago dos Reis Filipe
Perfil do tradutor: Conhece o instrumento e o tema em estudo

Item traduzido (#1)	Item traduzido (#2)
Área focal 1: Politica de qualidade	Área de estudo 1: Politica de qualidade
1. A sua organizaçao tem um ou mais dos documentos mencionados (Assinale "Não", "Em desenvolvimento" ou "Sim")?	1. A sua organização possui um ou mais dos documentos mencionados (Marque "Não", "Em progresso" ou "sim")?
Instruções: "Em desenvolvimento", uma ou mais pessoa da organização estão a trabalhar no desenvolvimento desse documento.	Instruções: "Em progresso", uma ou mais pessoas da organização estão a trabalhar no desenvolvimento do documento.
Documentos: 1.10- Declaração escrita da missão: a visão e a prioridade das organizações	Documentos: 1.10- Declaração escrita da missão: a visão e as prioridades das organizações
1.11 – Descrição do produto: descrição detalhada do cuidado a prestar a diferentes grupos de pacientes	1.11- Descrição do produto: descrição detalhada do tratamento para diferentes grupos de pacientes
1.12- Perfis da Qualidade: descrição concreta das características da qualidade e dos padrões de qualidade da prestação dos cuidados de saúde.	1.12 Perfis da Qualidade: descrição concreta das caracteristicas da qualidade e dos padrões da qualidade na prestação de serviços de saúde
1.13 – Documentos da politica de qualidade: Descrição dos objectivos da garantia da qualidade, o nível desejado de prestação de cuidados e as estratégias para a organização atingir esses objectivos	1.13- Documentos da politica de qualidade: descrição dos objetivos da garantia da qualidade, o nível desejado de prestação de cuidados e as estratégias das organizações para atingirem esses objetivos.
1.14- Plano de acção da qualidade para toda a organização: documento escrito com as medidas para implementação e planeamento de acções para atingir os objetivos da qualidade	1.14- Plano de acção da qualidade para toda a organização: documento escrito com as medidas para a implementação e planeamento de acções para atingir os objetivos da qualidade
1.15- Plano de acção da qualidade para alguns departamentos	1.15- Plano de acção da qualidade para certos departamentos
1.16- plano de acção da qualidade para todos os departamentos	1.16- Plano de acção da qualidade para todos os departamentos

Item traduzido (#1)	Item traduzido (#2)
1.17- Relatorio anual da qualidade: um relatorio sobre todas as actividades realizadas para garantir a qualidade dos cuidados e os resultados das actividades	1.17- Relatorio anual da qualidade: um relatorio de todas as atividades que foram realizadas para assegurar a qualidade dos tratamentos e os resultados dessas atividades
1.18- Manual da qualidade: Uma descrição de todos os procedimentos que a organização usa para garantir a qualidade e as pessoas que são responsáveis para assegurar conformidade com os procedimentos	1.18- Manual da qualidade: uma descrição de todos os procedimentos que a organização utiliza para a garantia da qualidade e as pessoas que são responsáveis para assegurar conformidade com os procedimentos
Area focal 2: Condições e gestao de recursos humanos	Area de estudo 2: Gestão das condições e dos recursos humanos
2 A sua organização tem/faz normas especiais para a implementação de actividades de garantia/melhoria da qualidade? (é permitida mais do que uma resposta) - Sem normas especiais - Treino/formação do staff/gestão - Treino/formação dos profissionais - É permitido aos profissionais participarem em atividades da garantia de qualidade (QA´s) durante as horas de trabalho - Nomeação de um coordenador da qualidade - Criar um comité de direcção -Criar grupos de trabalho da qualidade - Orçamento para a gestão de qualidade - Suporte pelos consultores	2. A sua organização tem/faz algumas providências especificas para a implementação de atividades da garantia/melhoria da melhoria? (é permitida mais do que uma resposta) - Sem providências especificas - Formação do staff/gestão - Formação dos profissionais - É permitido aos profissionais participarem em atividades da garantia de qualidade dentro do seu horário de expediente. - Nomeaçã de um coordenador da qualidade - Criar um comité diretivo - Criar grupos de trabalho da qualidade - Orçamento para a gestão da qualidade - Apoio pelos consultores
3 Existe alguma relaçao entre a gestao dos recursos humanos e a politica de qualidade na sua organização? (é permitida mais do que uma resposta) - Não aplicável - Selecção de novo pessoal com uma atitude positiva acerca da garantia da qualidade - Treino de novos profissionais em métodos de melhoria da qualidade - Educação contínua é feita com base em prioridades na política da qualidade - Os profissionais são encorajados a auto-desenvolverem-se na sua profissão - É exigida a participação nos projectos de melhoria de qualidade	3. Existe alguma relação entre a gestão de recursos humanos e a politica de qualidade na sua organização? (é aceitável mais que uma resposta) -Não se aplica -Selecao de novo pessoal com atitude positiva para a garantia da qualidade -Formação de novos profissionais em métodos de melhoria da qualidade - Educação contínua é realizada com base em prioridades na política da qualidade - Os profissionais são encorajados a auto-desenvolverem-se na sua profissão -É obrigatória a participação em projetos da melhoria da qualidade

Item traduzido (#1)	Item traduzido (#2)
4. Como é que a gestão estimula o envolvimento dos profissionais na garantia/melhoria da qualidade? (é permitida mais do que uma resposta) - Não aplicável - A estimulação não é necessária, os professionais prestam atenção suficiente à garantia /melhoria da qualidade. - A gestão indica o que é esperado dos profissionais no que respeita à garantia da qualidade - A gestão verifica se os profissionais respeitam os compromissos - É dado um "*feedback*" sistemático aos profissionais acerca dos resultados obtidos. - A gestão dá incentivos - Monitorização dos planos de acção do departamento - Sanções, nomeadamente…	4. Como e que a entidade gestora estimula o envolvimento dos profissionais na garantia/melhoria da qualidade? (é aceitável mais que uma resposta) - Não se aplica - O estímulo não é necessário, porque os profissionais prestam a devida atenção na garantia/melhoria da qualidade. - A entidade gestora indica o que é esperado dos profissionais em relação à garantia da qualidade - A entidade gestora verifica se os profissionais cumprem com as obrigações - É fornecido um feedback sistemático aos profissionais sobre os resultados atingidos - A entidade gestora oferece incentivos - Monitorização dos planos de acção do departamento - Sanções, nomeadamente…
Área focal 3: Padrões	Área de estudo 3 - Padrões
5. Que tipo de padrões os profissionais usam na sua organização? (é permitida mais do que uma resposta) - Padrões para tratamentos/intervenções específicos - padrões para a educação do paciente - Padrões para acções médicas restritas - Padrões para a utilização de equipamento médico -Padrões para momentos críticos na prestação de serviços - Normas para grupos alvos específicos e diagnósticos - Normas para encaminhamento dos pacientes da chegada até à alta médica. -Normas para cooperação com outras organizações	5. Que tipo de padroes os profissionais utilizam na sua organização? (é aceitável mais que uma resposta) - Padrões para tratamentos/intervenções específico(a)s -Padrões para a educação do paciente - Padrões para acções médicas restritas -Padrões para a utilização de equipamento médico -Padroes para momentos críticos na prestação de serviços -Padroes para grupos alvo específicos e diagnósticos -Padroes para o trajeto dos pacientes desde a admissão do doente ate à alta medica -Padroes para a cooperação com outras organizações
Area focal 4: Envolvimento do paciente	Area de estudo 4: Envolvimento do doente
6. De que maneira os pacientes (ou a organização dos pacientes) estão envolvidos na garantia da qualidade ou nas actividades de melhoria na sua organização? (Marque "Não/não se aplica", "depende da pessoa" ou "sempre")?	6. Em que medida os doentes (ou associações de doentes) estão envolvidos na garantia da qualidade ou nas actividades de melhoria na sua organização? (Marque "Não/Não se aplica", "Depende da temática" ou "Sempre")?
Documentos: 6.1 Desenvolver critérios de qualidade	Documentos: 6.1- Desenvolvimento de critérios de qualidade

Item traduzido (#1)	Item traduzido (#2)
6.2 Desenvolver protocolos//padrões	6.2- Desenvolvimento de protocolos/padrões
6.3 Reuniões onde se fala acerca dos resultados dos inquéritos de satisfação, reclamações	6.3- Reuniões onde se fala acerca dos resultados dos inquéritos de satisfação, reclamações
6.4 Comités de qualidade	6.4- Comités de qualidade
6.5 Projetos de melhoria da qualidade	6.5- Projetos de melhoria da qualidade
6.6 Avaliação da melhoria dos objetivos da qualidade	6.6- Avaliação da melhoria dos objetivos da qualidade
Área focal 5: Garantia da qualidade e actividades de melhoria	Area de estudo 5: Garantia da qualidade e actividades de melhoria
7. A sua organização aplica as seguintes actividades de forma regular e sistemática (p.e. Ciclo de Deming: planear, efectuar, verificar, agir). (Marque "Não", "Sim", "Ciclica", "sistemática)?	7. A sua organizacao aplica as seguintes atividades de forma regular e sistematica? (ex. Ciclo de Deming: Planear, fazer, verificar, agir). (Marque "Não", "Sim", "Ciclica", "sistemática)?
Explicação Não = Não/não se aplica Sim = A actividade não é aplicada de forma regular Ciclica = a actividade é aplicada baseada num ciclo de melhoria da qualidade Sistematica = A actividade é aplicada baseada no ciclo de melhoria da qualidade e a actividade é ntegrada nas rotinas diárias de trabalho	*Descrição: Não = Não/não se aplica Sim = A atividade não é aplicada de forma regular Ciclo= A atividade é aplicada baseada num ciclo de melhoria da qualidade Sistemática= A atividade é aplicada baseada no ciclo de melhoria da qualidade e a atividade é integrada nas rotinas diárias de trabalho
Actividades: 7.1 avaliação por pares monodisciplinares	Atividades: 7.1- avaliação por pares monodisciplinar
7.2 avaliação por pares multidisciplinares	7.2- avaliação por pares multidisciplinar
7.3 utilização de planos de cuidados individuais	7.3- utilização de planos de cuidados individuais
7.4 Comités p.e. indidentes, infecção ou comités de fármacos	7.4- comités por. ex. Incidentes, infecções ou comités de fármacos
7.5 Entrevistas de avaliação de trabalho	7.5- entrevistas de avaliação de trabalho
7.6 Auditoria interna	7.6- auditoria interna
7.7 Visitação/Acreditação	7.7- Vistoria/acreditacao
7.8 – Sistemas de informação de gestão	7.8- Sistemas de informação de gestão
7.9 – Questionários de satisfação dos pacientes	7.9- Questionários de satisfação dos pacientes
7.10 – questionários de satisfação dos prescritores	7.10- Questionários de satisfação dos prescritores
7.11 – Questionarios de satisfação dos colaboradores	7.11 Questionarios de satisfação dos colaboradores
7.12 – Questionarios sobre as necessidades dos pacientes	7.12 Questionarios sobre as necessidades dos pacientes
7.13 – Questionários sobre as necessidades prescritores ou de outros colaboradores	7.13 Questionários sobre as necessidades prescritores ou de outros colaboradores
7.14 – Registo das reclamações	7.14 registo de reclamações
7.15- Gabinete do paciente	7.15 Gabinete de Aconselhamento do paciente

Appendix D - Permission to use the instrument 1

Request:

Pedido de autorização para uso de instrumento no âmbito de tese de doutoramento - Itens Enviados

Mensagem

Eliminar | Responder | Responder a Todos | Reencaminhar | Mover | Lixo | Regras | Lido/Não Lido | Categorizar | Dar Seguimento | Enviar para o OneNote | Report Message

Pedido de autorização para uso de instrumento no âmbito de tese de doutoramento

RP

Rui Pedro Pereira de Almeida

Para: joao.paulo@estesl.ipl.pt; jpsilvacosta@gmail.com

Cc: casilva

Em: quinta-feira, 19 de abril de 2018, 17:34

Ocultar Detalhes

Esta mensagem tem prioridade alta.

Exmo. Sr. Prof. Doutor
João Paulo Costa

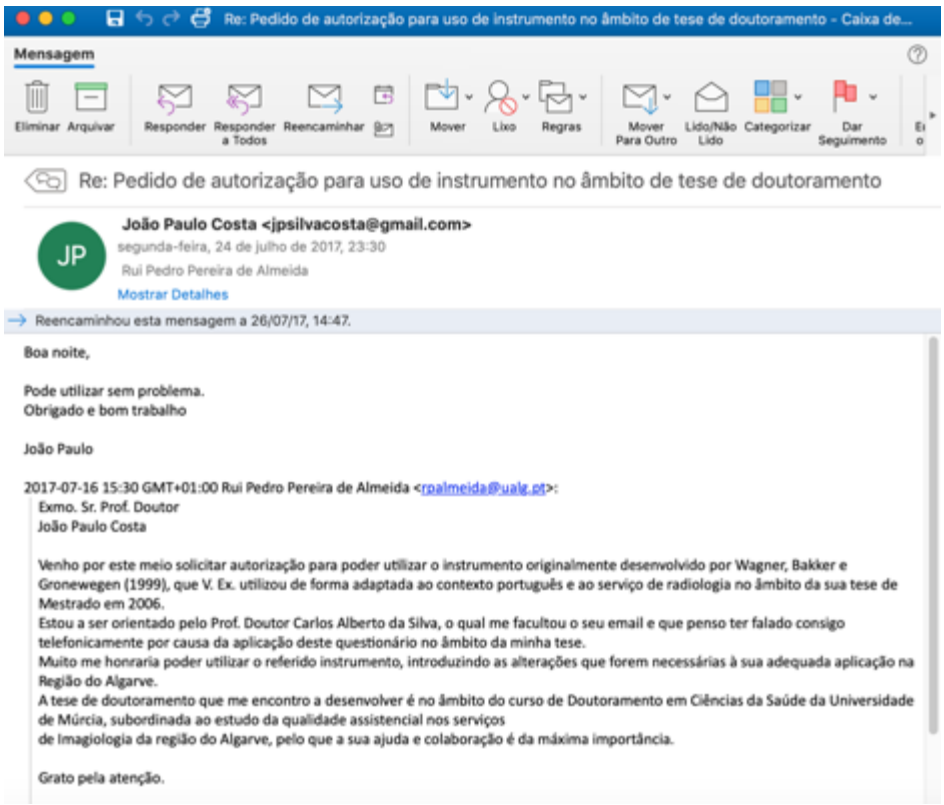
Venho por este meio solicitar autorização para poder utilizar o instrumento originalmente desenvolvido por Wagner, Bakker e Gronewegen (1999), que V. Ex. utilizou de forma adaptada ao contexto português e ao serviço de radiologia no âmbito da sua tese de Mestrado em 2006.
Estou a ser orientado pelo Prof. Doutor Carlos Alberto da Silva, o qual me facultou o seu email e que penso ter falado consigo telefonicamente por causa da aplicação deste questionário no âmbito da minha tese.
Muito me honraria poder utilizar o referido instrumento, introduzindo as alterações que forem necessárias à sua adequada aplicação na Região do Algarve.
A tese de doutoramento que me encontro a desenvolver é no âmbito do curso de Doutoramento em Ciências da Saúde da Universidade de Múrcia, subordinada ao estudo da qualidade assistencial nos serviços
de Imagiologia da região do Algarve, pelo que a sua ajuda e colaboração é da máxima importância.

Grato pela atenção.

Atentamente,

Rui Pedro Pereira de Almeida

Authorization:



Re: Pedido de autorização para uso de instrumento no âmbito de tese de doutoramento - Caixa de...

Mensagem

Eliminar | Arquivar | Responder | Responder a Todos | Reencaminhar | Mover | Lixo | Regras | Mover Para Outro | Lido/Não Lido | Categorizar | Dar Seguimento

Re: Pedido de autorização para uso de instrumento no âmbito de tese de doutoramento

JP

João Paulo Costa <jpsilvacosta@gmail.com>

segunda-feira, 24 de julho de 2017, 23:30

Rui Pedro Pereira de Almeida

Mostrar Detalhes

Reencaminhou esta mensagem a 26/07/17, 14:47.

Boa noite,

Pode utilizar sem problema.
Obrigado e bom trabalho

João Paulo

2017-07-16 15:30 GMT+01:00 Rui Pedro Pereira de Almeida <rpalmeida@ualg.pt>:

Exmo. Sr. Prof. Doutor
João Paulo Costa

Venho por este meio solicitar autorização para poder utilizar o instrumento originalmente desenvolvido por Wagner, Bakker e Gronewegen (1999), que V. Ex. utilizou de forma adaptada ao contexto português e ao serviço de radiologia no âmbito da sua tese de Mestrado em 2006.
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A tese de doutoramento que me encontro a desenvolver é no âmbito do curso de Doutoramento em Ciências da Saúde da Universidade de Múrcia, subordinada ao estudo da qualidade assistencial nos serviços
de Imagiologia da região do Algarve, pelo que a sua ajuda e colaboração é da máxima importância.

Grato pela atenção.

Appendix E - Comparison between original, translated (Beaton et al. 2000) and Costa (2006) instrument.

Método de Beaton et al. (2000)	**Costa (2006)**
Área focal 1: Politica de qualidade	Dimensão A: Politica de qualidade
1. O seu departamento de radiologia tem um ou mais dos documentos mencionados (Assinale "Não", "Em desenvolvimento" ou "Sim")?	I - No âmbito da Política da Qualidade pretende-se avaliar se o Departamento de Radiologia tem os Documentos expostos no quadro e o seu grau de adequação. Assinale com um X nas opções Não, Sim, Em desenvolvimento ou Não sei.
Instruções: "Em desenvolvimento", uma ou mais pessoas do departamento estão a trabalhar no desenvolvimento desse documento.	Notas: Em desenvolvimento significa que um ou mais profissionais do departamento estão a construir o documento No caso de ter respondido Sim a qualquer das perguntas, avalie o grau de Adequação do conteúdo dos respetivos Documentos de acordo com a seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado, assinalando com um X ou um círculo na sua opção. Adequação: Em que medida o conteúdo do documento se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).
Documentos: 1.10- Informação escrita da missão: a visão e a prioridade do departamento de radiologia	Documentos de Garantia da Qualidade: 1. Informação escrita com a descrição da Missão do Departamento de Radiologia
1.11 – Descrição dos procedimentos: descrição detalhada do cuidado a prestar a diferentes grupos de pacientes	2. Descrição dos procedimentos, relativamente aos utentes com necessidades especiais (Crianças; Idosos; Deficientes físicos; Acamados; Doenças infecto-contagiosas; Politraumatizados; ...)
1.12- Perfis da Qualidade: descrição concreta das características da qualidade e dos padrões de qualidade dos serviços de saúde prestados	(sem correspondência)
1.13 – Documentos da politica de qualidade: Descrição dos objectivos da garantia da qualidade, o nível desejado de prestação de cuidados e as estratégias para o departamento atingir esses objectivos	3. Descrição do nível desejado da qualidade relativamente aos serviços prestados e a forma como o Departamento se organiza para atingir os objectivos estabelecidos
1.14- Plano de acção da qualidade para todo o departamento: documento escrito com as medidas para	4. Documento escrito com as medidas consideradas necessárias, tendo em vista a implementação das acções, que

Método de Beaton et al. (2000)	**Costa (2006)**
1.15- Plano de acção da qualidade para algumas valências radiológicas	(sem correspondência)
1.16- Plano de acção da qualidade para todas as valências radiológicas	(sem correspondência)
1.17- Relatorio anual da qualidade: um relatorio sobre todas as actividades realizadas para garantir a qualidade dos cuidados e os resultados das actividades previstas	5. Relatório com todas as actividades executadas no ano transacto, tendo em vista assegurar a qualidade no departamento (Relatório Anual da Qualidade do Departamento)
1.18- Manual da qualidade: Uma descrição de todos os procedimentos que o departamento usa para garantir a qualidade e os profissionais que são responsáveis para assegurar a conformidade com os procedimentos	6. Descrição de todos os procedimentos que o departamento usa para a garantia da qualidade com a identificação dos profissionais que são responsáveis pela conformidade dos serviços (Manual da Qualidade)
Area focal 2: Condições e gestao de recursos humanos	Dimensão D: Gestão de Recursos Humanos
2 O seu departamento tem/faz normas especiais para a implementação de actividades de garantia/melhoria da qualidade? (é permitida mais do que uma resposta) - Sem normas especiais - Treino/formação do staff/gestão - Treino/formação dos profissionais - É permitido aos profissionais participarem em atividades da garantia de qualidade (QA´s) durante as horas de trabalho - Nomeação de um coordenador da qualidade - Criar um comité de direcção -Criar grupos de trabalho da qualidade - Orçamento para a gestão de qualidade - Suporte pelos consultores	Relativamente à Gestão de Recursos Humanos pretende-se Avaliar a existência de Programas específicos para a implementação das Actividades de Garantia e Melhoria da Qualidade, face aos expostos no quadro. Assinale com um X nas opções Não, Sim, Em desenvolvimento ou Não sei. - Existe formação dirigida ao Técnico de Radiologia - Existe formação dirigida aos outros profissionais do departamento - O Técnico de Radiologia no desempenho das suas actividades tem apoio de especialistas na área da qualidade - Existe um Técnico de Radiologia responsável pela coordenação das actividades para a melhoria da qualidade - Existem equipas de trabalho em qualidade - Existe arquivo de imagens de diagnóstico para fins de formação e ensino - Existe um orçamento específico para a gestão da qualidade do departamento

Método de Beaton et al. (2000)	**Costa (2006)**
3 Existe alguma relaçao entre a gestao dos recursos humanos e a politica de qualidade no seu departamento? (é permitida mais do que uma resposta) - Não aplicável - Selecção de novos profissionais com uma atitude positiva acerca da garantia da qualidade - Treino de novos profissionais em métodos de melhoria da qualidade - A educação contínua é feita com base em prioridades na política da qualidade - Os profissionais são encorajados a auto-desenvolverem-se na sua profissão - É exigida a participação nos projectos de melhoria de qualidade	Relativamente à Gestão de Recursos Humanos pretende-se Avaliar a relação entre a Gestão de Recursos Humanos e a Política da Qualidade do Departamento de Radiologia, face aos expostos no quadro. Assinale com um X nas opções Não, Sim, Em desenvolvimento ou Não sei. - Verifica-se preocupação na selecção de novos profissionais para uma atitude positiva face à garantia da qualidade - Existe um programa de desenvolvimento e formação que facilita a integração dos novos profissionais em métodos de melhoria contínua da qualidade - Existe um programa de formação do Técnico de Radiologia com base em prioridades de política da qualidade - O Técnico de Radiologia é motivado a evoluir nos conhecimentos inerentes à relação entre a profissão e a política da qualidade - A participação do Técnico de Radiologia em projectos de melhoria da qualidade é requerida
4. Como é que a gestão estimula o envolvimento dos profissionais na garantia/melhoria da qualidade? (é permitida mais do que uma resposta) - Não aplicável - A estimulação não é necessária, os professionais prestam atenção suficiente à garantia /melhoria da qualidade. - A gestão indica o que é esperado dos profissionais no que respeita à garantia da qualidade - A gestão verifica se os profissionais respeitam os compromissos - É dado um "*feedback*" sistemático aos profissionais acerca dos resultados obtidos. - A gestão dá incentivos - Monitorização dos planos de acção do departamento - Sanções, nomeadamente…	Pretende-se Avaliar a forma como a Gestão estimula a participação do Técnico de Radiologia nos processos de Garantia e Melhoria da Qualidade, relativamente aos itens expostos no quadro. Assinale com um X nas opções Não, Sim, Em desenvolvimento ou Não sei. - O Técnico de Radiologia presta suficiente atenção à garantia e melhoria da qualidade, não sendo necessários outros incentivos - A gestão indica o que se espera do Técnico de Radiologia no que respeita à garantia da qualidade - A gestão supervisiona e regista o envolvimento e responsabilidade do Técnico de Radiologia - A gestão dá feedback ao Técnico de Radiologia sobre os resultados alcançados - A gestão incentiva o envolvimento do Técnico de

Método de Beaton et al. (2000)	**Costa (2006)**
Área focal 3: Padrões	Dimensão C: Controlo de Processos Baseado em Normas
5. Que tipo de padrões os profissionais usam no seu departamento? (é permitida mais do que uma resposta) - Padrões para tratamentos/intervenções específicos - padrões para a educação do paciente - Padrões para acções médicas restritas - Padrões para a utilização de equipamento médico -Padrões para momentos críticos na prestação de serviços - Normas para grupos alvos específicos e diagnósticos - Normas para encaminhamento dos pacientes da chegada até à alta médica. -Normas para cooperação com outras organizações	Pretende-se avaliar a existência de Procedimentos escritos (Normas) que são utilizados na prática clínica no Departamento de Radiologia, relativamente aos expostos no quadro. Assinale com um X nas opções Não, Sim, Em desenvolvimento ou Não sei. - Normas de realização de exames radiológicos invasivos (Angiografia; Biopsia guiada por Tomografia Computorizada, Biopsia guiada por eco; …) - Normas de comunicação e informação ao utente - Normas de protecção e segurança contra radiações ionizantes - Normas de utilização dos equipamentos de diagnóstico por imagem - Normas de actuação e de meios aconselhados, em particular no que se refere à identificação de eventuais reacções adversas pela administração intravenosa do produto de contraste - Normas de realização de exames radiológicos nas diversas valências (Radiologia Convencional; Tomografia Computorizada; Mamografia; Ressonância Magnética; ...) - Normas de orientação e encaminhamento do utente - Normas de cooperação com outros Departamentos do Hospital (Medicina, Cirurgia, Pediatria; ...)
Area focal 4: Envolvimento do paciente	Dimensão B: Envolvimento dos Utentes
6. De que maneira os pacientes (ou a organização dos pacientes) estão envolvidos na garantia da qualidade ou nas actividades de melhoria no seu departamento? (Marque “Não/não se aplica”, “depende da pessoa” ou “sempre”)?	Relativamente ao envolvimento dos utentes pretende-se avaliar o seu envolvimento em Actividades de Garantia e Melhoria da Qualidade no Departamento de Radiologia, relativamente às actividades expostas no quadro. Assinale com um X nas opções Nunca, Poucas vezes, Muitas vezes, Não sei.
Documentos: 6.1 Desenvolver critérios de qualidade	Os utentes colaboram no desenvolvimento de critérios da qualidade
6.2 Desenvolver protocolos//padrões	Os utentes colaboram no desenvolvimento de protocolos e normas

Método de Beaton et al. (2000)	**Costa (2006)**
6.3 Reuniões onde se fala acerca dos resultados dos inquéritos de satisfação, reclamações	Os utentes colaboram em reuniões com os Técnicos de Radiologia para análise dos resultados das avaliações da satisfação e reclamações dos utentes
6.4 Comités de qualidade	Os utentes colaboram em reuniões com a Comissão da Qualidade
6.5 Projetos de melhoria da qualidade	Os utentes colaboram no desenvolvimento de projectos de melhoria da qualidade
6.6 Avaliação da melhoria dos objetivos da qualidade	Os utentes colaboram na avaliação do processo de melhoria da qualidade
Area focal 5: Garantia da qualidade e actividades de melhoria	Dimensão E: Actividades de Garantia e Melhoria da Qualidade
7. O seu departamento aplica as seguintes actividades de forma regular e sistemática (p.e. Ciclo de Deming: planear, efectuar, verificar, agir). (Marque "Não", "Sim", "Ciclica", "sistemática)?	Refira se em relação à Avaliação das Actividades de Garantia e Melhoria da Qualidade, se no Departamento de Radiologia existem as actividades expostas no quadro. Assinale com um X nas opções Não, Sim, Em desenvolvimento ou Não sei.
Explicação Não = Não/não se aplica Sim = A actividade não é aplicada de forma regular Ciclica = a actividade é aplicada baseada num ciclo de melhoria da qualidade Sistematica = A actividade é aplicada baseada no ciclo de melhoria da qualidade e a actividade é ntegrada nas rotinas diárias de trabalho	Nota: No caso de ter respondido Sim a qualquer das perguntas, avalie o grau de Adequação das respectivas actividades de acordo com a seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado, assinalando com um X ou um círculo na sua opção. Adequação: Em que medida o conteúdo do documento se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).
Actividades: 7.1 avaliação por pares monodisciplinares	Avaliação do desempenho feita pelos pares
7.2 avaliação por pares multidisciplinares	Avaliação do desempenho feita por outros profissionais
7.3 utilização de planos de cuidados individuais	(sem correspondência)
7.4 Comités p.e. indidentes, infecção ou comités de fármacos	(sem correspondência)
7.5 Entrevistas de avaliação de trabalho	Avaliação do desempenho com a participação do próprio
7.6 Auditoria interna	Avaliação do sistema da qualidade do departamento de Radiologia, realizada pela própria organização (Auditoria interna)
7.7 Visitação/Acreditação	(sem correspondência)
7.8 – Sistemas de informação de gestão	(sem correspondência)

Método de Beaton et al. (2000)	**Costa (2006)**
7.9 – Questionários de satisfação dos pacientes	Avaliação da satisfação dos utentes
7.10 – questionários de satisfação dos prescritores	Avaliação da satisfação dos médicos prescritores
7.11 – Questionarios de satisfação dos colaboradores	Avaliação da satisfação dos profissionais do departamento de Radiologia
7.12 – Questionarios sobre as necessidades dos pacientes	Análise das necessidades e expectativas junto dos utentes
7.13 – Questionários sobre as necessidades prescritores ou de outros colaboradores	Análise das necessidades e expectativas junto de outras especialidades médicas
7.14 – Registo das reclamações	Utilização das diferentes sugestões/reclamações para a melhoria da qualidade
7.15- Gabinete do paciente	(sem correspondência)
7.16- outras actividades, por nomeadamente……..	(sem correspondência)

Appendix F - Instrument/questionnaire number 1

The questionnaire presented below consists of an adapted version to evaluate the development of Quality Systems in imaging departments, based on the original instrument developed by Wagner et al. (1999) and their Portuguese version adapted by Costa (2006).

Questionário 1 (AvD_SisQualRAD) Nº|_|_|

Avaliação do Desenvolvimento do Sistema da Qualidade do Serviço / Departamento de Radiologia

No âmbito dum projeto de doutoramento em Ciências da Saúde sobre a temática da Gestão da Qualidade Assistencial dos Serviços de Imagiologia, sob coordenação da Universidade de Murcia, solicita-se a sua participação no preenchimento deste questionário.

O questionário é **anónimo** e pretende, junto dos Técnicos Superiores de Radiologia, contribuir para **avaliar o Sistema da Qualidade do Departamento de Radiologia implementado (formal ou informal), do nível de desenvolvimento e das respetivas atividades de melhoria.**
Trata-se de um instrumento de avaliação do desenvolvimento de Sistemas da Qualidade das organizações de saúde efectuado por Wagner et al. (1999) e validado para o contexto português por Costa (2006) numa versão adaptada para avaliação dos Departamentos de Radiologia.

No preenchimento do **questionário,** as **respostas** são **assinaladas** com uma **cruz.**
O tempo esperado de preenchimento do questionário é de cerca de **20 minutos.**

Muito obrigado pelo tempo dispensado ao preencher o questionário

A - Política da Qualidade

I - No âmbito da **Política da Qualidade** pretende-se **avaliar** se o **Departamento de Radiologia** tem os **Documentos** expostos no quadro abaixo e o seu grau de adequação**.** Assinale com um X nas opções "Não", "Sim", "Em desenvolvimento" ou "Não sei".

Notas:
Em **desenvolvimento** significa que um ou mais profissionais do departamento estão a construir o documento

No caso de ter respondido **Sim** a qualquer das perguntas**, avalie** o **grau** de **Adequação** do **conteúdo** dos respetivos **Documentos** de acordo com a **seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado**, assinalando com um X ou um círculo na sua opção.

Adequação: Em que medida o **conteúdo** do **documento** se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).

Documentos de Garantia da Qualidade	Não	Sim	Em desenvolvimento	Não sei	Menor Adequação				Maior Adequação			
1. Informação escrita com a descrição da **Missão** do Departamento de Radiologia					1	2	3	4	5	6	7	8
2. Descrição dos procedimentos, relativamente aos utentes com **necessidades especiais** (Crianças; Idosos; Deficientes físicos; Acamados; Doenças infecto-contagiosas; Politraumatizados; ...)					1	2	3	4	5	6	7	8
3. Descrição do **nível desejado da qualidade** relativamente aos serviços prestados e a forma como o Departamento se organiza para atingir os objectivos estabelecidos					1	2	3	4	5	6	7	8
4. Documento escrito com as medidas consideradas necessárias, tendo em vista a implementação das acções, que permitam atingir os objectivos pretendidos (**Plano de Acção da Qualidade para o Departamento**)					1	2	3	4	5	6	7	8
5. Relatório com todas as actividades executadas no ano transacto, tendo em vista assegurar a qualidade no departamento (**Relatório Anual da Qualidade do Departamento**)					1	2	3	4	5	6	7	8
6. Descrição de todos os procedimentos que o departamento usa para a garantia da qualidade com a identificação dos profissionais que são responsáveis pela conformidade dos serviços					1	2	3	4	5	6	7	8
7. Descrição dos procedimentos a ter aquando da **realização** de exames radiológicos **no** Departamento de Radiologia					1	2	3	4	5	6	7	8
8. Descrição dos procedimentos a ter aquando da **realização de exames radiológicos em locais exteriores** ao Departamento de Radiologia (Bloco operatório; Unidade de Cuidados Intensivos; Medicina; Pediatria; ...)					1	2	3	4	5	6	7	8

B- Envolvimento dos utentes

I - Relativamente ao **envolvimento dos utentes** pretende-se **avaliar** o seu **envolvimento** em **Actividades** de **Garantia** e **Melhoria** da **Qualidade** no **Departamento** de **Radiologia,** relativamente às **actividades** expostas no quadro abaixo. Assinale com um X nas opções "Nunca", "Poucas vezes", "Muitas vezes", "Sempre".
Nota: No caso de ter respondido **poucas vezes**, **muitas vezes** ou **sempre** a qualquer das perguntas**, avalie** o **grau** de **Adequação** dessa **colaboração** de acordo com a **seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado**, assinalando com um X ou um círculo na sua opção.

Adequação: Em que medida o **conteúdo** do **documento** se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).

Actividades	Nunca	Poucas vezes	Muitas vezes	Sempre	Menor Adequação				Maior Adequação			
1. Os utentes colaboram no **desenvolvimento de critérios da qualidade**					1	2	3	4	5	6	7	8
2. Os utentes colaboram no **desenvolvimento de protocolos e normas**					1	2	3	4	5	6	7	8
3. Os utentes colaboram em **reuniões** com os Técnicos de Radiologia para análise dos **resultados das avaliações da satisfação e reclamações** dos utentes					1	2	3	4	5	6	7	8
4. Os utentes colaboram em **reuniões com a Comissão da Qualidade**					1	2	3	4	5	6	7	8
5. Os utentes colaboram no desenvolvimento de **projectos de melhoria da qualidade**					1	2	3	4	5	6	7	8
6. Os utentes colaboram na **avaliação do processo de melhoria**					1	2	3	4	5	6	7	8

C – Controlo dos Processos baseado em Normas

I – Pretende-se **avaliar** a existência de **Procedimentos escritos (Normas)** que são **utilizados** na **prática clínica** no **Departamento** de **Radiologia,** relativamente aos expostos no quadro abaixo. Assinale com um X nas opções "Não", "Sim", "Em desenvolvimento" ou "Não sei".

Nota: No caso de ter respondido **Sim** a qualquer das perguntas**, avalie** o **grau** de **Adequação** do **conteúdo** das respectivas **normas** de acordo com a **seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado,** assinalando com um X ou um círculo na sua opção.

Adequação: Em que medida o **conteúdo** do **documento** se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).

Procedimentos escritos (Normas)	Não	Não sei	Sim	Menor Adequação				Maior Adequação			
1. Normas de **realização de exames radiológicos invasivos** (Angiografia; Biopsia guiada por Tomografia Computorizada, Biopsia guiada por eco; …)				1	2	3	4	5	6	7	8
2. Normas de **comunicação e informação** ao utente				1	2	3	4	5	6	7	8
3. Normas de **PSR**				1	2	3	4	5	6	7	8
4. Normas de **utilização dos equipamentos**				1	2	3	4	5	6	7	8
5. Normas de **actuação e de meios aconselhados**, em particular no que se refere à identificação de **eventuais reacções adversas** pela administração intravenosa do produto de contraste				1	2	3	4	5	6	7	8
6. Normas de **realização de exames** radiológicos nas diversas **valências** (Radiologia Convencional; Tomografia Computorizada; Mamografia; RM; ...)				1	2	3	4	5	6	7	8
7. Normas de **orientação e encaminhamento do utente**				1	2	3	4	5	6	7	8
8. Normas de **cooperação com outros Departamentos** do Hospital (Bloco Operatório, Medicina, Cirurgia, Pediatria; ...)				1	2	3	4	5	6	7	8

D1 – GRH I (**existência** de **Programas** específicos)

I – Relativamente à **GRH** pretende-se **Avaliar** a **existência** de **Programas** específicos para a implementação das **Actividades** de **Garantia** e **Melhoria** da **Qualidade,** face aos expostos no quadro abaxio. Assinale com um X nas opções "Não", "Não Sei" ou "Sim".

Nota: No caso de ter respondido **Sim** a qualquer das perguntas**, avalie** o **grau** de **Adequação** dos respectivos **Programas** de acordo com a **seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado,** assinalando com um X ou um círculo na sua opção.

Adequação: Em que medida o **conteúdo** do **documento** se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).

Programas	Não	Não sei	Sim	Menor Adequação				Maior Adequação			
1. Existe **formação** dirigida ao **Técnico de Radiologia**				1	2	3	4	5	6	7	8
2. Existe **formação** dirigida aos **outros profissionais** do departamento				1	2	3	4	5	6	7	8
3. O Técnico de Radiologia no desempenho das suas actividades tem **apoio de especialistas na área da qualidade**				1	2	3	4	5	6	7	8
4. Existe um Técnico de Radiologia **responsável pela coordenação das actividades** de melhoria				1	2	3	4	5	6	7	8
5. Existem **equipas de trabalho em qualidade**				1	2	3	4	5	6	7	8
6. Existe **arquivo de imagens** de diagnóstico para **fins de formação e ensino**				1	2	3	4	5	6	7	8
7. Existe um **orçamento específico para a da qualidade** do departamento				1	2	3	4	5	6	7	8

D2 – GRH II (relação com a Política da Qualidade do Departamento de Radiologia)

II – Pretende-se **Avaliar** a **relação** entre a **Gestão** de **Recursos Humanos** e a **Política** da **Qualidade** do **Departamento** de **Radiologia**, relativamente aos itens expostos no quadro abaixo. Assinale com um X nas opções "Não", "Não Sei" ou "Sim".

Nota: No caso de ter respondido **Sim** a qualquer das perguntas**, avalie** o **grau** de **Adequação** dos respectivos **indicadores** de acordo com a **seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado,** assinalando com um X ou um círculo na sua opção.

Adequação: Em que medida o **conteúdo** do **documento** se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).

Indicadores	Não	Não sei	Sim	Menor Adequação				Maior Adequação			
1. Verifica-se preocupação na **selecção de novos profissionais** para uma atitude positiva face à garantia da qualidade				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2. Existe um **programa de desenvolvimento e formação** que facilita a **integração dos novos profissionais** em métodos de melhoria contínua da qualidade				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
3. Existe um programa de **formação** do Técnico de Radiologia com base em prioridades de **política da qualidade**				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
4. O Técnico de Radiologia é **motivado a evoluir** nos conhecimentos inerentes à relação entre a profissão e a política da qualidade				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5. A **participação** do Técnico de Radiologia em **projectos de melhoria** da qualidade é requerida/exigida				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

D3 – GRH III (participação do Técnico de Radiologia)

III – Pretende-se **Avaliar** a forma como a **Gestão estimula** a **participação** do **Técnico** de **Radiologia** nos processos de **Garantia** e **Melhoria** da **Qualidade,** relativamente aos itens expostos no quadro. Assinale com um X nas opções "Não", "Sim", ou "Não sei".

Nota: No caso de ter respondido **Sim** a qualquer das perguntas**, avalie** o **grau** de **Adequação** dos respectivos **indicadores** de acordo com a **seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado,** assinalando com um X ou um círculo na sua opção.

Adequação: Em que medida o **conteúdo** do **documento** se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).

Indicadores	Não	Sim	Não sei	Menor Adequação				Maior Adequação			
1. O Técnico de Radiologia **presta suficiente atenção** à garantia e melhoria da qualidade, não sendo necessários outros incentivos				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2. A gestão **indica o que se espera** do Técnico de Radiologia no que respeita à garantia da qualidade				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
3. A gestão **supervisiona e regista** o envolvimento e responsabilidade do Técnico de Radiologia				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
4. A gestão dá **feedback** ao Técnico de Radiologia dos resultados alcançados				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5. A gestão **incentiva** o envolvimento do Técnico de Radiologia no Sistema da Qualidade				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
6. A gestão **avalia** os planos de acção do Departamento				**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

E – Actividades de Garantia e Melhoria da Qualidade

I – Refira se em relação à **Avaliação** das **Actividades** de **Garantia e Melhoria da Qualidade,** se no **Departamento** de **Radiologia** existem as **actividades** expostas no quadro abaixo. Assinale com um X nas opções "Não", "Sim", ou "Não sei".

Nota: No caso de ter respondido **Sim** a qualquer das perguntas**, avalie** o **grau** de **Adequação** das respectivas **actividades** de acordo com a **seguinte escala: 1= Nada Adequado a 8= Totalmente Adequado,** assinalando com um X ou um círculo na sua opção.

Adequação: Em que medida o **conteúdo** do **documento** se adequa ao contexto da situação sobre o qual se pretende intervir e às necessidades da população alvo (profissionais / utentes).

Actividades de Garantia e Melhoria da Qualidade	Não	Sim	Não sei	Menor Adequação				Maior Adequação			
1. Avaliação do **desempenho feita pelos pares**				1	2	3	4	5	6	7	8
2. Avaliação do **desempenho feita por outros** profissionais				1	2	3	4	5	6	7	8
3. Avaliação do **desempenho com a participação** do próprio				1	2	3	4	5	6	7	8
4. Avaliação do sistema da qualidade do departamento de Radiologia, realizada pela própria organização (**Auditoria interna**)				1	2	3	4	5	6	7	8
5. Avaliação da **satisfação dos utentes**				1	2	3	4	5	6	7	8
6. Avaliação da **satisfação dos profissionais** do departamento de Radiologia				1	2	3	4	5	6	7	8
7. Avaliação da **satisfação dos médicos prescritores**				1	2	3	4	5	6	7	8
8. Análise das **necessidades e expectativas junto dos utentes**				1	2	3	4	5	6	7	8
9. Análise das **necessidades e expectativas** junto de outras **especialidades médicas**				1	2	3	4	5	6	7	8
10. Utilização das diferentes sugestões para a melhoria da qualidade				1	2	3	4	5	6	7	8
11. **Registo informatizado** de marcação de exames radiológicos, efectuado com base num sistema de gestão e informação				1	2	3	4	5	6	7	8
12. **Sistema de digitalização** dos exames Radiológicos				1	2	3	4	5	6	7	8
13. **Revisão estruturada das práticas**, dos procedimentos e dos resultados radiológicos em função de normas de boas práticas de Radiologia				1	2	3	4	5	6	7	8
14. Todos os procedimentos radiológicos são realizados por **pessoal qualificado** com conhecimentos e formação em qualidade				1	2	3	4	5	6	7	8
15. Quando se detectam **achados críticos**, o Médico radiologista, ou na sua ausência, o Técnico de Radiologia, informa imediatamente o Médico prescritor				1	2	3	4	5	6	7	8
16. Existe **sinalética destacada** alertando as grávidas para o risco das radiações				1	2	3	4	5	6	7	8
17. Avaliação das **condições de segurança** de todas as salas e equipamentos, em intervalos aceitáveis, por peritos de radiação adequadamente qualificados				1	2	3	4	5	6	7	8
18. Um **programa implementado** de garantia e controlo da qualidade dos equipamentos				1	2	3	4	5	6	7	8
19. Análise do **tempo de espera** entre a prescrição e a realização de exames radiológicos para introduzir melhorias				1	2	3	4	5	6	7	8
20. Medição do **tempo de permanência** do utente no departamento aquando da realização de exames radiológicos de forma a ajustá-lo ao ideal				1	2	3	4	5	6	7	8
21. Análise do **tempo de entrega** dos exames radiológicos com relatório aos utentes para introduzir melhorias				1	2	3	4	5	6	7	8
22. **Pedido/Prescrição médica** para todos os exames radiológicos				1	2	3	4	5	6	7	8
23. **Rejeição de realização** de exames radiológicos cujo pedido médico não venha devidamente instruído e justificado (ex: sem Informação clínica; Assinatura do médico prescritor ilegível,...)				1	2	3	4	5	6	7	8
24. Avaliação da **dose absorvida** nos exames radiológicos no sentido de a manter a um nível tão baixo quanto praticável, considerando as informações de diagnóstico pretendidas				1	2	3	4	5	6	7	8
25. **Níveis de referência** de dose absorvida nos exames radiológicos padrão estão definidos				1	2	3	4	5	6	7	8

F – Aspetos Globais

I – Refira ainda em relação ao impacto e **satisfação**, em geral, em relação ao sistema de qualidade e as **Actividades** de **Garantia e Melhoria da Qualidade** no **Departamento** de **Radiologia**. Assinale com um X nas opções "Nunca", "Pouco Satisfeito", "Muito Satisfeito", "Não sei".

Nota: No caso de ter respondido **Pouco ou Muito Satisfeito** a qualquer das perguntas**, avalie** o **grau** de **satisfação**, em geral, de acordo com a **seguinte escala: 1= Nada Satisfeito a 8= Totalmente Satisfeito,** assinalando com um X ou um círculo na sua opção.

Percepção Global	Nenhum	Pouco Satisfeito	Muito Satisfeito	Não sei	Menor Satisfação				Maior Satisfação			
1. Qualidade, em geral, que o Departamento de Radiologia proporciona					1	2	3	4	5	6	7	8
2. Imagem, em geral, que o Departamento de Radiologia proporciona					1	2	3	4	5	6	7	8
3. Organização e gestão, em geral, do Departamento de Radiologia					1	2	3	4	5	6	7	8
4. Serviços prestados (exames radiológicos), em geral, que o Departamento de Radiologia proporciona					1	2	3	4	5	6	7	8

Caraterização do Inquirido

1. Local: Hospital ☐ ……. Especifique qual?_____
Centro de Saúde ☐ ….. Especifique qual?_____

1. Sexo: Fem. ☐ Masc. ☐

2. Idade:_____

3. Habilitações Literárias: Bacharelato ☐ Licenciatura ☐ Mestrado ☐ Doutoramento ☐
Outra ☐ Qual?_____

4. Profissão: Técnico de Radiologia ☐

5. Categoria profissional (em que nível da carreira se encontra?) :_____

6. Regime Contratual: CIT ☐ CTFP ☐ Se outro, indique qual: _____

7. Cargo de chefia: Não ☐ Sim ☐ Qual ? _____

8. Faz parte da Comissão de Qualidade? Sim ☐ Não ☐

9. Há quanto tempo trabalha neste Departamento de Radiologia:_____ **(anos)**

10. Horário: Completo ☐ Parcial ☐

11. Tipo de horário: Fixo ☐ Rotativo ☐

Muito obrigado pela colaboração no preenchimento do questionário

Appendix G - Instrument/questionnaire number 2

The questionnaire presented below consists of an adapted version by Dias et al. (2013), based on the original instrument developed by Ahonen and Liikanen (2010) to study Evidence-Based Practice in Radiology.

Questionário 2 (PBE_TRAD) Nº|_|_|

Estudo sobre a Prática Baseada em Evidências dos Técnicos Superiores de Radiologia

No âmbito dum projeto de doutoramento em Ciências da Saúde sobre a temática da Gestão da Qualidade Assistencial dos Serviços de Imagiologia, sob coordenação da Universidade de Murcia, solicita-se a sua participação no preenchimento deste questionário.

O questionário é **anónimo** e pretende, junto dos Técnicos Superiores de Radiologia, contribuir para **o estudo do Prática Baseada em Evidências destes profissionais.**
Trata-se de um instrumento desenvolvido por Ahonen e Liikanen (2010) e validado para o contexto português por Dias *et al*. (2013), numa versão adaptada aos Técnicos Superiores de Radiologia.

No preenchimento do **questionário,** as **respostas** são **assinaladas** com uma **cruz.**
O tempo esperado de preenchimento do questionário é de cerca de **15 minutos.**

Muito obrigado pelo tempo dispensado ao preencher o questionário

P1. Onde recebeu formação sobre atividades de investigação?

☐Estudos de formação base numa Universidade

☐Estudos de especialização numa Universidade

☐Estudos de pós-graduação numa Universidade

☐Formação organizada pelo empregador

☐Outra (especifique qual):_____

☐Não recebeu nenhuma formação

P2. De que forma participou num projeto de investigação científica investigação? (escolha uma ou mais respostas)

☐Como estudante (formação obrigatória no âmbito do plano de estudos)

☐Como professor / orientador / monitor / tutor de um estudante

☐Como parte de uma equipa num projeto de investigação do serviço/departamento onde trabalho

☐Como parte de uma equipa num projeto de investigação do hospital onde trabalho

☐Como responsável princial num projeto de investigação

☐Outra (especifique qual):_____

☐Nunca participou num projeto de investigação científica

P3. Em cada um dos seguintes pontos, avalie as afirmações com uma escala de 1 a 5, assinalando com um X o número que melhor corresponde à sua opinião, em que 5 significa "Concordo totalmente", 4 "Concordo parcialmente", 3 "não concordo nem discordo", 2 "discordo parcialmente", 1 "discordo totalmente". (Por "Ação baseada em evidências" refere-se à utilização de dados científicos na sua atividade profissional. Os dados científicos são dados resultantes de trabalhos e/ou estudos científicos).

3.1	A ação baseada em evidências tem **relevância** quanto ao trabalho do técnico de radiologia	**5**	**4**	**3**	**2**	**1**
3.2	A ação baseada em evidências **faz parte** da minha função	**5**	**4**	**3**	**2**	**1**
3.3	Para mim, na minha atividade profissional, é **util utilizar** dados baseados em evidências **como apoio** às minhas funções	**5**	**4**	**3**	**2**	**1**
3.4	A ação baseada em evidências **é util para desenvolver / melhorar as práticas** no meu posto de trabalho	**5**	**4**	**3**	**2**	**1**
3.5	As atividades de investigação **proporcionam informações sobre o trabalho** de técnico de radiologia	**5**	**4**	**3**	**2**	**1**
3.6	Participar nas atividades de investigação **faz parte das atividades** profissionais	**5**	**4**	**3**	**2**	**1**
3.7	Participar nas atividades de investigação melhora as minhas **possibilidades de promoção / progressão** na carreira	**5**	**4**	**3**	**2**	**1**
3.8	Participar nas atividades de investigação **faz parte** do papel de **docente / monitor** na formação dos estudantes	**5**	**4**	**3**	**2**	**1**
3.9	Participar nas atividades de investigação **ajuda** o meu **desenvolvimento** profissional e pessoal no meu emprego	**5**	**4**	**3**	**2**	**1**
3.10	Estou **disponível para participar** nas atividades de investigação	**5**	**4**	**3**	**2**	**1**
3.11	O meu **serviço / departamento** deveria **desenvolver projetos** de investigação	**5**	**4**	**3**	**2**	**1**
3.12	O **conhecimento tácito é uma base suficiente** de conhecimento no trabalho de técnico de radiologia	**5**	**4**	**3**	**2**	**1**
3.13	O trabalho do técnico de radiologia é trabalho baseado na prática pelo que **não é necessário o contributo da investigação científica**	**5**	**4**	**3**	**2**	**1**
3.14	A pesquisa de dados científicos **retira tempo ao trabalho** principal do técnico de radiologia	**5**	**4**	**3**	**2**	**1**

P4. Se considerar que a participação nas atividades de investigação não faz parte das funções do técnico de radiologia, justifique de forma sucinta o porquê da sua opinião.

_____

_____

P5. Na sua opinião, quem deveria realizar projetos de investigação científica? (escolha uma e só uma resposta)

☐Técnicos de radiologia (participação individual)

☐Equipas de técnicos de radiologia

☐Profissionais da área clínica e/ou médicos (p. ex. Especialistas em radiodignóstico)

☐Técnicos de radiologia, profissionais da área clínica e/ou médicos especialistas em conjunto

☐Em colaboração com organismos externos (p. ex. Universidades, Unidades de Proteção e Segurança Radiológica, Centros de Investigação, Empresas, etc).

☐Outros (especifique quem):_____

P6. Na sua opinião, quais são os factores que podem fomentar a sua participação nas atividades de investigação? (escolha uma ou mais respostas)

☐Apoio dos colegas

☐Apoio das chefias diretas do serviço / departamento (p. ex. superior hierarquico imediato)

☐Apoio da direção do serviço / departamento

☐Apoio dos médicos e/ou outros profissionais da área clínica

☐O facto de reservar tempo para as atividades de investigação

☐Informação suficiente sobre as atividades de investigação

☐O interesse pelas atividades de investigação

☐Outra (especifique qual):_____

P7. E, quais os fatores que podem, eventualmente, impedir a sua participação nas atividades de investigação? (escolha uma e só uma resposta)

☐Falta de tempo

☐Falta de financiamento

☐Falta de motivação

☐Falta de informação sobre os assuntos relacionados com as atividades de investigação

☐Falta de apoio (p. ex. apoio dos colegas, do superior hierarquico imediato, da direção)

☐Outros (especifique quem):_____

☐Não há impedimentos

P8. Que vantagens espera obter com a participação em atividades de investigação? (Indique pelo menos duas)

1- _____

2- _____

P9. Quais são os fatores que o podem levar a ler publicações científicas? (escolha uma ou mais respostas)

☐O facto de reservar tempo para ler publicações científicas

☐Interesse em ler publicações científicas

☐Ter conhecimentos suficientes para ler publicações científicas

☐O fácil acesso às publicações (p. ex. acesso a bases de dados, revista disponível no local de trabalho…)

☐Ter conhecimentos linguísticos suficientes

☐O facto de conversar com colegas no local de trabalho sobre as publicações científicas

☐Outros (especifique quais):_____

P10. E, quais os factores impeditivos da leitura de publicações científicas? (escolha uma ou mais respostas)

☐Falta de tempo

☐Falta de motivação

☐Falta de informação sobre os assuntos relacionados com as atividades de investigação

☐Conhecimentos linguísticos insuficientes

☐Dificuldade em obter as publicações

☐Outros (especifique quais):_____

☐Não há impedimentos

Se não participa / não participou em atividades de investigação, por favor passe para a pregunta 14.

P11. Se participa / participou de algum modo em atividades de investigação, responda às afirmações que se seguem escolhendo a alternativa mais adequada, em que 5 significa "Concordo totalmente", 4 "Concordo parcialmente", 3 "não concordo nem discordo", 2 "discordo parcialmente", 1 "discordo totalmente".

11.1	Recebo / recebi apoio e incentivo suficiente **dos meus colegas** (outros técnicos de radiologia) para participar em atividades de investigação	**5**	**4**	**3**	**2**	**1**
11.2	Recebo / recebi apoio e incentivo suficiente **de outros profissionais da área** (p. ex. médicos especialistas) para participar em atividades de investigação	**5**	**4**	**3**	**2**	**1**
11.3	Recebo / recebi apoio e incentivo suficiente **da coordenação técnica** do meu serviço / departamento para participar em atividades de investigação	**5**	**4**	**3**	**2**	**1**
11.4	Recebo / recebi apoio e incentivo suficiente **da direção** do meu serviço / departamento para participar em atividades de investigação	**5**	**4**	**3**	**2**	**1**

P12. Indique outras fontes de onde recebe/recebeu apoio e incentivo para participar em atividades de investigação?

_____

_____

P13. Assinale com um "X" a afirmação que melhor corresponde à sua opinião, em que 5 significa "Concordo totalmente", 4 "Concordo parcialmente", 3 "não concordo nem discordo", 2 "discordo parcialmente", 1 "discordo totalmente".

13.1	Falo sobre os dados científicos com os meus **colegas**	**5**	**4**	**3**	**2**	**1**
13.2	Falo sobre os dados científicos com o meu **superior hierárquico**	**5**	**4**	**3**	**2**	**1**
13.3	As minhas ações são baseadas em dados investigados cientificamente	**5**	**4**	**3**	**2**	**1**
13.4	Questiono as práticas baseando-me nos dados científicos	**5**	**4**	**3**	**2**	**1**
13.5	Tento mudar/adaptar práticas baseando-me nos dados científicos	**5**	**4**	**3**	**2**	**1**
13.6	Falo sobre os dados científicos com os estudantes que eu ensino (caso se aplique)	**5**	**4**	**3**	**2**	**1**
13.7	Falo sobre os dados científicos com os professores que orientam trabalhos de investigação (caso se aplique)	**5**	**4**	**3**	**2**	**1**
13.8	Ensino estudantes a pesquisarem dados científicos durante os períodos de prática / estágio clínico (caso se aplique)	**5**	**4**	**3**	**2**	**1**

P14. Se já participou na investigação através de um projeto de investigação científica, quais as tarefas que efetuou? (escolha uma ou mais respostas)

☐Identifiquei o problema de investigação

☐Fiz pesquisas bibliográficas

☐Defini questões / problemas de investigação

☐Planeei os métodos de investigação a serem usados

☐Recolhi informação (p. ex. aplicação dos questionários, entrevistas…)

☐Efetuei o tratamento de dados (p. ex. testes estatísticos)

☐Participei na elaboração do relatório de investigação

☐Apresentei o projeto de investigação (p. ex. com um poster, comunicação oral …)

☐Outras (especifique quais):_____

☐Não participei num projeto de investigação científica

P15. Avalie também a importância das seguintes fontes de informação no seu trabalho, assinalando com um "X" a afirmação que melhor corresponde à sua opinião/situação, em que 5 significa "Muito importante", 4 "Importante", 3 "Não sei dizer", 2 "Pouco importante", 1 "Nada importante".

		Muito importante	Importante	Não sei dizer	Pouco importante	Nada importante
15.1	Conhecimentos adquiridos durante a formação académica base	5	4	3	2	1
15.2	Investigações científicas	5	4	3	2	1
15.3	Manuais de referência da própria área do saber	5	4	3	2	1
15.4	Literatura médica	5	4	3	2	1
15.5	Prática não registada no serviço / departamento	5	4	3	2	1
15.6	Prática registada no serviço / departamento (p. ex. manuais de qualidade e instruções de procedimentos)	5	4	3	2	1
15.7	O próprio conhecimento tácito	5	4	3	2	1
15.8	Colegas	5	4	3	2	1
15.9	Instruções e ordens dos profissionais da área clínica / médicos	5	4	3	2	1
15.10	Dias de formação (p. ex. sobre a segurança radiológica para os técnicos de radiologia…)	5	4	3	2	1

P16. Com que frequência lê revistas profissionais NACIONAIS (p. ex. Acta Radiológica)? (escolha uma e só uma resposta)

☐Todas as semanas

☐Uma vez por mês

☐Algumas vezes por ano

☐Uma vez por ano

☐Não leio revistas profissionais nacionais

P17. Com que frequência lê revistas profissionais INTERNACIONAIS? (escolha uma e só uma resposta)

☐Todas as semanas

☐Uma vez por mês

☐Algumas vezes por ano

☐Uma vez por ano

☐Não leio revistas profissionais internacionais

P18. Porque razão lê revistas profissionais? (escolha uma e só uma resposta)

☐Os colegas também o fazem

☐Para me manter atualizado(a) sobre as novas práticas

☐Por causa do incentivo da coordenação / direção do serviço / departamento

☐Para o meu desenvolvimento pessoal

☐Faz parte de ser profissional

☐Outra razão (especifique):_____

☐Não leio revistas profissionais

P19. Com que frequência lê revistas científicas? (p. ex. Academic Radiology, Radiography, European Radiology, etc). (escolha uma e só uma resposta)

☐Todas as semanas

☐Uma vez por mês

☐Algumas vezes por ano

☐Uma vez por ano

☐Não leio revistas científicas

P20. Que outras revistas científicas ou publicações lê? (indique pelo menos uma)

_____

_____

P21. Porque razão lê revistas científicas? (escolha uma e só uma resposta)

☐Os colegas também o fazem

☐Para me manter atualizado(a) sobre as novas práticas

☐Por causa do incentivo da coordenação / direção do serviço / departamento

☐Para o meu desenvolvimento pessoal

☐Faz parte de ser profissional

☐Outra razão (especifique):_____

☐Não leio revistas científicas

P22. Em relação às questões científicas, assinale com um "X" a afirmação que melhor corresponde à sua opinião, em que 5 significa "Concordo totalmente", 4 "Concordo parcialmente", 3 "não concordo nem discordo", 2 "discordo parcialmente", 1 "discordo totalmente".

22.1	Considero que tenho capacidade para participar nas atividades de investigação	**5**	**4**	**3**	**2**	**1**
22.2	Considero que tenho conhecimentos básicos sobre o processo de investigação	**5**	**4**	**3**	**2**	**1**
22.3	Considero que compreendo as fases do processo de investigação	**5**	**4**	**3**	**2**	**1**
22.4	Conheço bem os estudos científicos da minha área	**5**	**4**	**3**	**2**	**1**
22.5	As minhas capacidades de pesquisa são suficientes para pesquisar factos científicos	**5**	**4**	**3**	**2**	**1**
22.6	Sei utilizar os resultados dos estudos científicos na minha atividade profissional	**5**	**4**	**3**	**2**	**1**
22.7	Conheço bem os resultados dos estudos científicos atuais da minha área	**5**	**4**	**3**	**2**	**1**
22.8	Os meus conhecimentos linguísticos são suficientes para ler e compreender os relatórios científicos estrangeiros (inglês)	**5**	**4**	**3**	**2**	**1**
22.9	Os meus conhecimentos sobre os métodos de investigação são suficientes para compreender os estudos científicos	**5**	**4**	**3**	**2**	**1**
22.10	Os meus conhecimentos sobre os métodos estatísticos são suficientes para compreender os resultados dos estudos científicos	**5**	**4**	**3**	**2**	**1**
22.11	Considero que consigo avaliar os estudos científicos de uma forma critica	**5**	**4**	**3**	**2**	**1**

P23. Que mais gostaria de acrescentar? Se preferir pode indicar sugestões de melhoria do ambiente e das condições da organização do trabalho no seu serviço / departamento.

_____

_____

Muito obrigado pela colaboração no preenchimento do questionário

Appendix H - Instrument/questionnaire number 3

The questionnaire presented below consists of an adapted version by Sancho et al. (2013), based on the original instrument developed by Martínez-Silveira and Oddone (2008) to study of the informational behavior of radiographers.

Questionário 3 (CI_TRAD) Nº|_|_|

Estudo sobre o Comportamento Informacional do Técnico de Radiologia

No âmbito dum projeto de doutoramento em Ciências da Saúde sobre a temática da Gestão da Qualidade Assistencial dos Serviços de Imagiologia, sob coordenação da Universidade de Murcia, solicita-se a sua participação no preenchimento deste questionário.

O questionário é **anónimo** e pretende, junto dos Técnicos Superiores de Radiologia, contribuir para **o estudo do comportamento informacional destes profissionais.**
Trata-se de um instrumento desenvolvido por Martínez-Silveira e Oddone (2008) e validado para o contexto português por Sancho *et al*. (2013), numa versão adaptada aos Técnicos Superiores de Radiologia.

No preenchimento do **questionário,** as **respostas** são **assinaladas** com uma **cruz.**
O tempo esperado de preenchimento do questionário é de cerca de **15 minutos.**

Muito obrigado pelo tempo dispensado ao preencher o questionário

Estudo sobre o Comportamento Informacional do Técnico de Radiologia

Instruções de preenchimento:

- Responda às perguntas reportando-se apenas à sua actuação na prática profissional
- Pode assinalar mais de uma opção em todas as respostas (excepto nas especificamente indicadas)

1. Quantas horas por dia dedica à realização de exames radiológicos?

_____ horas por dia (média)

2. Quais as suas áreas de actuação no serviço/departamento de Radiologia?

☐Radiologia Convencional
☐Tomografia Computorizada
☐Ressonância Magnética
☐Mamografia
☐Ultrassonografia
☐Densitómetria Óssea

3. Qual o número de exames que realiza num dia típico consignado a uma dessas áreas?

Radiologia Convencional: _____ exames por dia (média)
Tomografia Computorizada: _____ exames por dia (média)
Ressonância Magnética: _____ exames por dia (média)
Mamografia: _____ exames por dia (média)
Ultrassonografia: _____ exames por dia (média)
Densitómetria Óssea: _____ exames por dia (média)

4. Nos últimos 30 dias, utilizou algum dos recursos abaixo mencionados para procurar informações relacionadas com a sua prática profissional (por exemplo durante a realização de exames)?

☐Biblioteca (geral ou do departamento)
☐Técnico Coordenador ou Colega mais experiente
☐Outro profissional de saúde
☐Bases de Dados bibliográficas (ex. PubMed, Web of Science, Lilacs, …)
☐ Outros *websites* de informação médica ou ferramentas de pesquisa médica (ex. Scielo, Bibliomed, …)
☐Fontes da sua coleção particular
☐Outras ferramentas de pesquisa (ex. Google, Yahoo, …)
☐Outros (Especifique):_____
☐Não utilizou

5. São muitos os factores que podem dificultar a procura/pesquisa de informação. Tendo em conta esses factores, qual ou quais as situações abaixo mencionadas, que mais o(a) motiva a procurar informação, em caso de questões decorrentes da prática profissional? (Se durante a prática profissional <u>nunca</u> surgem questões que o(a) levem a pesquisar informação, passe para a pergunta 8).

☐Perguntas de utentes/pacientes que aguardam por uma resposta
☐Interesse especial pelo paciente/utente
☐Evidências de caso raro ou pouco conhecido
☐Curiosidade
☐Dúvidas ou Insegurança
☐Receio de cometer um erro
☐Interesse em pesquisar ou publicar sobre o caso
☐Apresentação do caso ao superior hierárquico ou em aulas, etc.
☐Outros (Especifique):_____

6. Decidido(a) a consultar literatura, o que poderia impedi-lo(a) de concluir essa consulta?
(Se <u>nenhum</u> obstáculo ou dificuldade costuma impedi-lo(a) de concluir uma consulta informacional, passe para a pergunta seguinte).

☐Inexistência de uma biblioteca de fácil acesso ou com serviços adequados
☐Dificuldade em localizar documentos pertinentes
☐Não dispor de computador
☐Não dispor de coleção particular
☐Barreiras linguísticas
☐Não saber manusear os diferentes recursos informacionais eletrónicos (Internet, bases de dados, etc)
☐Falta de tempo
☐Custo financeiro dos documentos
☐Outros obstáculos (Especifique):
_____

7. Faz parte da sua rotina profissional frequentar biblioteca(s) especializada(s) na área da saúde?

☐ SIM Qual ou quais?_____

☐ NÃO ☐ RARAMENTE

Se respondeu "NÃO" ou "Raramente" indique porquê (Considere apenas a opção que melhor se aplica ao seu caso)

☐Por não conhecer ou não ter acesso a uma biblioteca com um bom conteúdo

☐Porque os conteúdos das bibliotecas não estão atualizados

☐Porque as bibliotecas não possuem o material bibliográfico de que necessita

☐Por não encontrar nas bibliotecas um profissional da informação disponível para atende-lo(a)

☐Por considerar que os bibliotecários não estão preparados para o atendimento

☐Por encontrar dificuldades para procurar nos catálogos ou nas estantes da biblioteca

☐Porque os horários de atendimento das bibliotecas não são adequados

☐Porque as bibliotecas não possuem espaços adequados para o estudo e a pesquisa

☐Porque as bibliotecas não disponibilizam serviços personalizados de pesquisa bibliográfica

☐Porque as bibliotecas não possuem computadores suficientes para a pesquisa

☐Porque não preciso de biblioteca, faço tudo pela Internet

☐Outro motivo (especifique):_____

8 Quando procura informação, que meio prefere utilizar?

☐Eletrónico ☐Impresso

9. Indique por ordem (1º, 2º, 3º …) qual dos recursos mencionados abaixo prefere utilizar quando procura informação:

☐Biblioteca

☐Técnico supervisor ou mais experiente

☐Outro profissional da área da saúde

☐Bases de dados bibliográficos (ex. PubMed, Web of Science, Lilacs, etc)

☐Fontes da sua coleção particular

☐Outros *sites* de informação médica

☐Outras ferramentas de pesquisa (ex. Google, Yahoo, etc)

☐Outros (Específique):_____

10. Quais os recursos bibliográficos abaixo enumerados que fazem parte da sua coleção particular? Indique as quantidades aproximadamente. (Se não possui coleção particular, passe para a pregunta seguinte).

Livros	☐Sim	☐Não	Quantos?	☐1 a 10	☐11 a 20	☐Mais de 20
Subscrição de periódicos impressos	☐Sim	☐Não	Quantos Nacionais?	☐1 a 10	☐11 a 20	☐Mais de 20
			Quantos Estrangeiros?	☐1 a 10	☐11 a 20	☐Mais de 20
Subscrição de periódicos eletrónicos	☐Sim	☐Não	Quantos Nacionais?	☐1 a 10	☐11 a 20	☐Mais de 20
			Quantos Estrangeiros?	☐1 a 10	☐11 a 20	☐Mais de 20
CD-ROMs científicos	☐Sim	☐Não	Quantos?	☐1 a 10	☐11 a 20	☐Mais de 20
Videos científicos	☐Sim	☐Não	Quantos?	☐1 a 10	☐11 a 20	☐Mais de 20
Atas de congressos ou de outros eventos	☐Sim	☐Não	Quantos?	☐1 a 10	☐11 a 20	☐Mais de 20
Outros recursos (especifique):						
Possui computador com acesso à Internet na sua residência?				☐Sim	☐Não	

11. Indique por ordem (1º, 2º, 3º …) quais os recursos bibliográficos abaixo mencionados que mais utiliza.

☐Livros
☐Artigos de periódicos impressos
☐Artigos de periódicos eletrónicos
☐Trabalhos em formato eletrónico de congressos ou outros eventos científicos
☐CD-ROMs científicos
☐Vídeos científicos
☐Outros recursos eletrónicos *on-line* (documentos de *sites*, imagens, etc)
☐Outros (Específique):_____

12. Atualmente, as informações científicas podem ser encontradas em formatos diversos. Indique por ordem (1º, 2º, 3º …) quais as modalidades abaixo indicadas que prefere utilizar nas suas leituras.

☐Artigos originais
☐Artigos de revisão
☐Revisões sistemáticas e/ou metanálises
☐Comunicações de eventos científicos
☐Relatórios de pesquisa/investigação
☐Protocolos ou *guidelines*
☐Outros (Específique):_____

13. Através de que recursos abaixo indicados é mais frequente receber informações relativas a novidades ou descobertas recentes na sua área profissional?

☐Bibliotecas
☐Colegas, professores ou outros profissionais de saúde
☐Periódicos impressos ou eletrónicos
☐Listas de discussão/e-mail
☐*Sites* de informação médica
☐Eventos informais (reuniões, etc)
☐Eventos formais (congressos, etc)
☐Outros (Específique):_____

14. Dos recursos abaixo indicados, quais acredita serem imprescindiveis para uma boa prática profissional?

☐Biblioteca especializada com informação atualizada
☐Computador com acesso livre à Internet em ambiente profissional
☐Trabalhos de congressos ou eventos disponíveis em ambiente profissional
☐Periódicos eletrónicos e impressos disponíveis em ambiente profissional
☐Livros de consulta disponíveis em ambiente profissional
☐Subscrição de bases de dados especializadas
☐Outros (Específique):_____

15. Realiza pessoalmente as suas pesquisas bibliográficas em bases de dados da área ou manda fazer?

☐Realiza
☐Manda fazer (passe para a pregunta 24)
☐Ambas as situações
☐Não faz (passe para a pregunta 24)

16. Como aprendeu as técnicas de pesquisa bibliográfica?

☐Recebeu orientação ou formação de um bibliotecário
☐Recebeu orientação ou formação de um professor durante a formação académica
☐Foi um tema abordado na formação académica como parte de uma disciplina
☐Aprendeu com tutoriais ou na "Ajuda" das próprias bases de dados
☐Aprendeu com a prática
☐Aprendeu através da leitura de livros, artigos ou outros textos sobre o assunto
☐Aprendeu através de cursos à distância, oferecidos por *sites* da área da saúde
☐Não tem a certeza se usa as técnicas de pesquisa corretamente
☐De outro modo (Específique):_____

17. As frases abaixo indicadas descrevem diferentes estágios na utilização de bases de dados eletrónicas. Escolha a que melhor representa o seu desempenho atual (selecione apenas uma resposta).

☐ Escreve palavras-chave na primeira caixa de diálogo que aparece

☐ Seleciona a opção "pesquisa avançada"

☐ Combina diversas palavras-chave com operadores boleanos (AND, OR, NOT)

☐ Combina diversos resultados utilizando o recurso "histórico da pesquisa"

☐ Utiliza outros recursos como "limites", "campos" ou "índice"

☐ Utiliza estratégias com descritores (MeSH ou DeCS) e qualificadores e combina diversos temas

☐ Utiliza estratégias com termos específicos, recuperando apenas trabalhos com alto valor científico

18. Como avalia o resultado mais frequentemente obtido neste tipo de pesquisa?

☐Encontra sempre e de forma rápida o que precisa

☐Guarda um número suficiente e acessível de referências (menos de 100)

☐Apesar da grande quantidade de resultados, consegue encontrar o que precisa

☐Obtém resultados muito amplos, cuja maioria não se aplica ao tema

☐Não sabe se a pesquisa foi exaustiva e, em geral, não tem tempo para aprofundar os resultados

☐Percebe que necessita de aprender a manusear melhor as estratégias de pesquisa

☐Nunca encontra o que necessita

☐Outra avaliação (Específique):_____

19. Com que frequência utiliza as bases de dados indicadas a seguir?

Assinale com uma cruz ("X")

Bases de Dados	Frequentemente (mais de 2 vezes por mês)	Raramente (menos de 4 vezes por ano)	Nunca	Não
MEDLINE				
LILACS				
PSYCINFO				
WEB OF SCIENCE				
EMBASE				
THE COCHRANE LIBRARY				
Outra: _____				

20. Em relação à pesquisa de literatura científica nas fontes eletrónicas (bases de dados e Internet), quais são os problemas que encontra com maior frequência?

☐Dificuldade em utilizar os recursos

☐Seleccionar entre a grande quantidade de documentos guardados nas pesquisas

☐Custo financeiro dos documentos

☐Falta de tempo para a pesquisa

☐Descobrir *sites* específicos na sua área de interesse e/ou especialização

☐Encontrar palavras-chave adequadas para uma boa estratégia de pesquisa

☐Outro (Específique):_____

21. Que fatores prioriza para selecionar os documentos que gostaria de ler para tentar responder às perguntas que surgem no decurso da sua prática profissional?

☐O texto estar em português

☐O texto ser pouco extenso

☐O texto completo ser gratuito

☐O texto completo ser de fácil acesso

☐A atualidade e/ou novidade da informação

☐O formato do texto completo ser PDF

☐Outros fatores (Específique):_____

22. De que forma procede para obter o texto completo dos documentos selecionados nas bases de dados?

☐Vai a uma biblioteca e procura saber se os documentos estão disponíveis

☐Paga os direitos de utilização do documento

☐Apenas obtém os documentos gratuitos das bases de dados

☐Procura em outros *sites* na Internet (Scielo, Free Medical Journals, etc).

☐Outras formas (Especifique):_____

23. Para a leitura dos documentos selecionados em formato eletrónico, como prefere proceder?

☐Ler no ecrã do computador

☐Imprimir o documento

24. Considerando a sua prática profissional, poderia especificar a que tipo de assuntos, decorrentes dessa prática, se referem as perguntas que surgem <u>com maior frequência</u>?
(Nesta pergunta selecione apenas UMA opção)

☐Posicionamento do paciente

☐Parâmetros de aquisição de imagem

☐Proteção e segurança radiológica

☐Justificação do exame prescrito

☐Otimização do exame a realizar

☐Protocolos de administração de contraste endovenoso

☐Atuação face a reações adversas ao contraste endovenoso

☐Outras formas (Especifique):_____

☐Não têm surgido perguntas de nenhum tipo

25. Na sequência da pergunta anterior (nº24), e ainda referente ás questões que surgem durante a prática profissional, seria possível identificar nas opções abaixo a <u>SEGUNDA mais frequente</u>?
(Nesta pergunta selecione apenas UMA opção)

☐Posicionamento do paciente

☐Parâmetros de aquisição de imagem

☐Proteção e segurança radiológica

☐Justificação do exame prescrito

☐Otimização do exame a realizar

☐Protocolos de administração de contraste endovenoso

☐Atuação face a reações adversas ao contraste endovenoso

☐Outras formas (Especifique):_____

☐Não têm surgido perguntas de nenhum tipo

Para responder às questões que se seguem, pense agora em qualquer **<u>ocasião específica</u>**, ocorrida **<u>durante o último mês</u>**, na qual necessitou de informação relacionada com um exame efetuado a um utente/paciente (exclua aqui necessidades relacionadas com investigações, cursos, ensino, redação de artigos científicos, dissertações, teses ou outros trabalhos académicos).

26. A informação que necessitou nessa ocasião referia-se a qual assunto específico?
(Nesta pergunta selecione apenas UMA opção)

☐Posicionamento do paciente

☐Parâmetros de aquisição de imagem

☐Não necessitou de nenhuma informação no último mês.

Poderia identificar o motivo:

- o Não há motivo
- o Não exerceu funções no último mês
- o Não se recorda se necessitou de informação
- o Outros motivos (especifique): _____

☐Proteção e segurança radiológica

☐Justificação do exame prescrito

☐Otimização do exame prescrito

☐Protocolos de administração de contraste endovenoso

☐Atuação face a reações adversas ao contraste endovenoso

☐Outros (Específique):_____

27. Onde tentou obter a informação?

☐Biblioteca

☐Técnico supervisor ou mais experiente

☐Outro profissional da área da saúde

☐Bases de dados bibliográficos (ex. PubMed, Web of Science, Lilacs, etc)

☐Outros *sites* de informação médica (ex. Scielo, Bibliomed, etc)

☐Fontes da sua coleção particular

☐Outras ferramentas de pesquisa (ex. Google, Yahoo, etc)

☐Outro local (Específique):_____

☐Não tentou (fim do questionário)

28. Na sequência da pergunta anterior, qual foi o resultado obtido face à informação recolhida?

☐Sucesso em encontrar a informação

☐Sucesso parcial (informação incompleta, falta de tempo ou requer recursos adicionais)

☐Não obteve a informação (fim do questionário)

☐Outros (Específique):_____

29. Na hipótese da informação ter sido encontrada, qual foi o impacto imediato?

☐Relembrou detalhes ou factos

☐Comprovou o que já sabia ou que suspeitava

☐Permitiu utilizar pelo menos alguma informação imediatamente

☐Obteve novas informações

☐Despertou interesse em aprofundar o tema

☐Não teve impacto

☐Outros (Específique):_____

30. A informação encontrada contribuiu para modificar ou para esclarecer alguma tomada de decisão? Qual ou quais?

☐Escolha do posicionamento adequado

☐Escolha dos parâmetros de aquisição adaptados ao paciente

☐Correta proteção radiológica

☐Exame devidamente justificado

☐Procedimento de execução do exame devidamente otimizado

☐Administração adequada de contraste endovenoso

☐Atuação adequada face a reações adversas ao contraste endovenoso

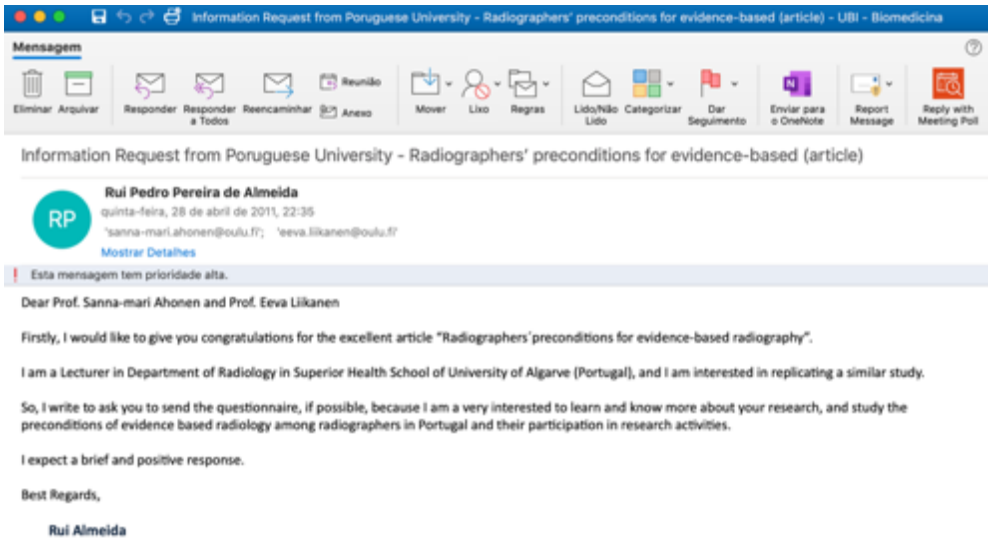
☐Não foi modificado ou esclarecido

☐Outras (Específique):_____

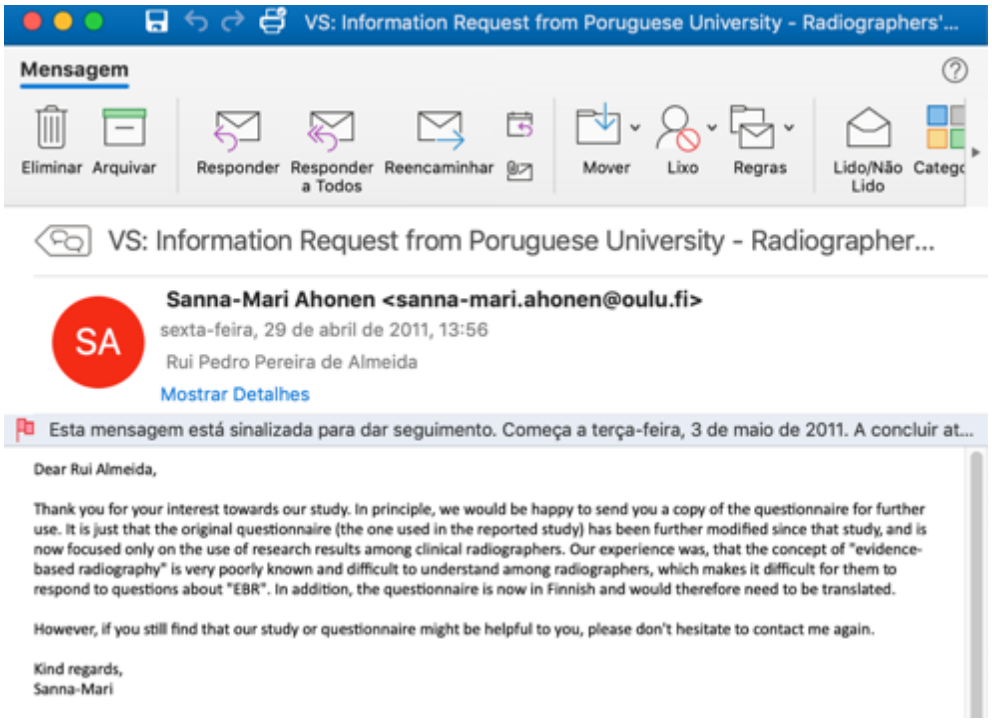
Muito obrigado pela colaboração no preenchimento do questionário

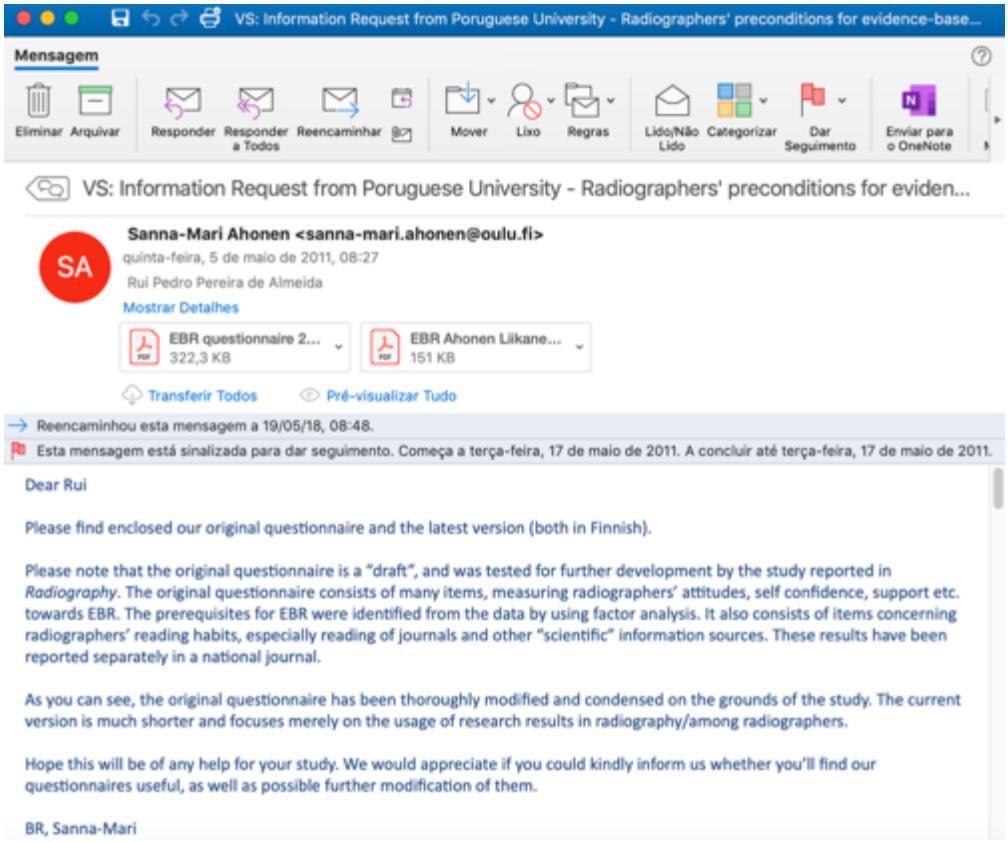
Appendix I - Permission to use the instruments 2 and 3

Request for instrument 2:

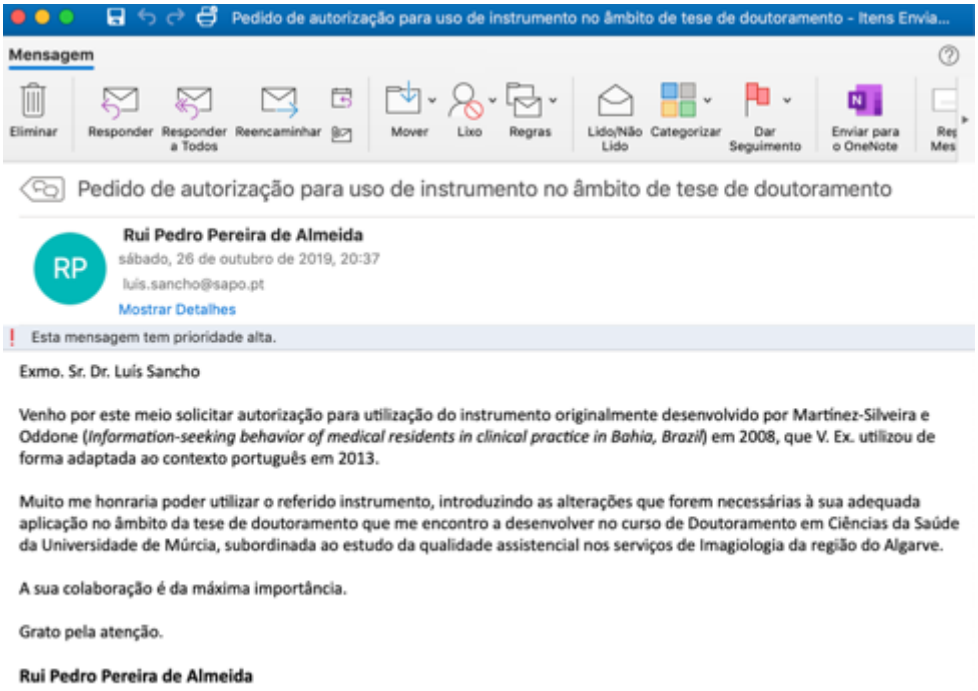


Authorization:





Request for instrument 3:



Authorization:

Appendix J – Participant consent form

Declaração de Consentimento Informado [12]

Título do Estudo: Gestão da Qualidade Assistencial nos Serviços de Radiologia da Região de Saúde do Algarve: Estudo da perceção dos Técnicos Superiores de Radiologia

Enquadramento: Trabalho de investigação para habilitação ao grau de Doutor em Ciências de Saúde pela Universidade de Múrcia, e que tem como objetivo explorar e analisar de forma integrada e multidimensional, as condições necessárias à capacidade organizacional para a prestação de cuidados de qualidade e de práticas baseadas em evidências nos serviços de radiologia.

Explicação do estudo: Administração simultânea de 3 questionários em papel, para auscultação da perspetiva dos técnicos superiores de radiologia relativamente aos sistemas de qualidade, ao uso de práticas baseadas em evidências e do seu comportamento informacional. Os dados recolhidos serão lançados numa base de dados informática juntamente com dados de outros participantes. Estes dados, uma vez trabalhados estatisticamente, permitirão obter um conhecimento melhorado do modelo explicativo da qualidade dos cuidados prestados e do uso de práticas baseadas em evidências, numa perspetiva de implementação de estratégias de melhoria contínua da qualidade e da segurança do paciente. A autorização para participação não implicará qualquer constrangimento ou qualquer modificação à normal prestação do trabalho do Técnico Superior de Radiologia.

Condições e financiamento: O presente estudo não envolve quaisquer contrapartidas ou pagamentos aos investigadores ou aos participantes que voluntariamente aceitem participar.
No caso de não querer participar, daí não resultará qualquer prejuízo assistencial ou outros.

Confidencialidade e anonimato: Dos dados colhidos relativos à perceção dos Técnicos Superiores de Radiologia é garantido o total anonimato porque, uma vez feito o registo, não mais será possível aceder a eles nem identificar a origem dos mesmos, impossibilitando que a sua identificação possa ser tornada pública. Além disso, os dados colhidos para o presente estudo serão única e exclusivamente utilizados para fins de investigação.

Quero agradecer-lhe a autorização que me concede para utilizar os dados atrás descritos, para fins de investigação.

Identificação do investigador:

Nome: Rui Pedro Pereira de Almeida
Local de Trabalho: Universidade de Múrcia – Escola Internacional de Doutoramento
Contacto telefónico: (+351) 926222590
Endereço eletrónico: rpalmeida@ualg.pt
Assinatura/s: ____

… …

[12] Com base nas declarações éticas em vigor: *THE WORLD MEDICAL ASSOCIATION* (2008) e Resolução da Assembleia da República nº 1 (2001)

Aceitação de Participação no estudo:

Nome: … … … … … … … ….... … … … ….... … … … … … … … … … … … … …

Assinatura: … … … … … … … ….... … … … … ... … … … … … … … … … …

Data: …… /…… /……..

Appendix K - *Kolmogorov-Smirnov* and *Shapiro-Wilk* tests

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
(AvD_SisQualRad_A2_P1)	,306	62	,000	,772	62	,000
(AvD_SisQualRad_A2_P2)	,387	62	,000	,643	62	,000
(AvD_SisQualRad_A2_P3)	,419	62	,000	,609	62	,000
(AvD_SisQualRad_A2_P4)	,355	62	,000	,720	62	,000
(AvD_SisQualRad_A2_P5)	,387	62	,000	,688	62	,000
(AvD_SisQualRad_A2_P6)	,355	62	,000	,742	62	,000
(AvD_SisQualRad_A2_P7)	,290	62	,000	,826	62	,000
(AvD_SisQualRad_A2_P8)	,387	62	,000	,675	62	,000
(AvD_SisQualRad_B2_P1)	,403	62	,000	,585	62	,000
(AvD_SisQualRad_B2_P2)	,435	62	,000	,496	62	,000
(AvD_SisQualRad_B2_P5)	,484	62	,000	,211	62	,000
(AvD_SisQualRad_B2_P6)	,468	62	,000	,305	62	,000
(AvD_SisQualRad_C2_P1)	,355	62	,000	,714	62	,000
(AvD_SisQualRad_C2_P2)	,371	62	,000	,710	62	,000
(AvD_SisQualRad_C2_P3)	,226	62	,000	,919	62	,001
(AvD_SisQualRad_C2_P4)	,258	62	,000	,861	62	,000
(AvD_SisQualRad_C2_P5)	,274	62	,000	,834	62	,000
(AvD_SisQualRad_C2_P6)	,305	62	,000	,822	62	,000
(AvD_SisQualRad_C2_P7)	,387	62	,000	,667	62	,000
(AvD_SisQualRad_C2_P8)	,387	62	,000	,701	62	,000
(AvD_SisQualRad_D1.2_P1)	,145	62	,002	,955	62	,024
(AvD_SisQualRad_D1.2_P2)	,210	62	,000	,899	62	,000
(AvD_SisQualRad_D1.2_P3)	,435	62	,000	,518	62	,000
(AvD_SisQualRad_D1.2_P4)	,274	62	,000	,849	62	,000
(AvD_SisQualRad_D1.2_P5)	,403	62	,000	,518	62	,000
(AvD_SisQualRad_D1.2_P6)	,435	62	,000	,449	62	,000
(AvD_SisQualRad_D1.2_P7)	.	62	.	.	62	.
(AvD_SisQualRad_D2.2_P1)	,403	62	,000	,624	62	,000
(AvD_SisQualRad_D2.2_P2)	,419	62	,000	,591	62	,000
(AvD_SisQualRad_D2.2_P3)	,419	62	,000	,473	62	,000
(AvD_SisQualRad_D2.2_P4)	,323	62	,000	,758	62	,000
(AvD_SisQualRad_D2.2_P5)	,371	62	,000	,613	62	,000
(AvD_SisQualRad_D3.2_P1)	,371	62	,000	,637	62	,000
(AvD_SisQualRad_D3.2_P2)	,403	62	,000	,640	62	,000
(AvD_SisQualRad_D3.2_P3)	,403	62	,000	,549	62	,000

(AvD_SisQualRad_D3.2_P4)	,371	62	,000	,618	62	,000
(AvD_SisQualRad_D3.2_P5)	,419	62	,000	,522	62	,000
(AvD_SisQualRad_D3.2_P6)	,403	62	,000	,564	62	,000
(AvD_SisQualRad_E2_P1)	,228	62	,000	,889	62	,000
(AvD_SisQualRad_E2_P2)	,452	62	,000	,500	62	,000
(AvD_SisQualRad_E2_P3)	,177	62	,000	,928	62	,001
(AvD_SisQualRad_E2_P4)	,355	62	,000	,711	62	,000
(AvD_SisQualRad_E2_P5)	,419	62	,000	,582	62	,000
(AvD_SisQualRad_E2_P6)	,452	62	,000	,354	62	,000
(AvD_SisQualRad_E2_P7)	,484	62	,000	,250	62	,000
(AvD_SisQualRad_E2_P8)	,484	62	,000	,261	62	,000
(AvD_SisQualRad_E2_P9)	,468	62	,000	,319	62	,000
(AvD_SisQualRad_E2_P10)	,403	62	,000	,577	62	,000
(AvD_SisQualRad_E2_P11)	,274	62	,000	,892	62	,000
(AvD_SisQualRad_E2_P12)	,130	62	,011	,942	62	,005
(AvD_SisQualRad_E2_P13)	,339	62	,000	,728	62	,000
(AvD_SisQualRad_E2_P14)	,274	62	,000	,812	62	,000
(AvD_SisQualRad_E2_P15)	,157	62	,001	,917	62	,000
(AvD_SisQualRad_E2_P16)	,278	62	,000	,762	62	,000
(AvD_SisQualRad_E2_P17)	,196	62	,000	,801	62	,000
(AvD_SisQualRad_E2_P18)	,194	62	,000	,862	62	,000
(AvD_SisQualRad_E2_P19)	,468	62	,000	,397	62	,000
(AvD_SisQualRad_E2_P20)	,468	62	,000	,362	62	,000
(AvD_SisQualRad_E2_P21)	,468	62	,000	,362	62	,000
(AvD_SisQualRad_E2_P22)	,193	62	,000	,897	62	,000
(AvD_SisQualRad_E2_P23)	,339	62	,000	,806	62	,000
(AvD_SisQualRad_E2_P24)	,355	62	,000	,765	62	,000
(AvD_SisQualRad_E2_P25)	,355	62	,000	,744	62	,000
(PBE_TRAD_P3.1)	,315	62	,000	,756	62	,000
(PBE_TRAD_P3.2)	,270	62	,000	,773	62	,000
(PBE_TRAD_P3.3)	,291	62	,000	,742	62	,000
(PBE_TRAD_P3.4)	,405	62	,000	,657	62	,000
(PBE_TRAD_P3.5)	,307	62	,000	,747	62	,000
(PBE_TRAD_P3.6)	,216	62	,000	,858	62	,000
(PBE_TRAD_P3.7)	,222	62	,000	,863	62	,000
(PBE_TRAD_P3.8)	,291	62	,000	,767	62	,000
(PBE_TRAD_P3.9)	,272	62	,000	,794	62	,000
(PBE_TRAD_P3.10)	,248	62	,000	,809	62	,000
(PBE_TRAD_P3.11)	,279	62	,000	,798	62	,000
(PBE_TRAD_P3.12)	,252	62	,000	,832	62	,000

(PBE_TRAD_P3.13)	,345	62	,000	,699	62	,000
(PBE_TRAD_P3.14)	,172	62	,000	,910	62	,000
(PBE_TRAD_P11.1)	,339	62	,000	,777	62	,000
(PBE_TRAD_P11.2)	,242	62	,000	,865	62	,000
(PBE_TRAD_P11.3)	,258	62	,000	,823	62	,000
(PBE_TRAD_P11.4)	,274	62	,000	,855	62	,000
(PBE_TRAD_P13.1)	,323	62	,000	,793	62	,000
(PBE_TRAD_P13.2)	,290	62	,000	,863	62	,000
(PBE_TRAD_P13.3)	,355	62	,000	,713	62	,000
(PBE_TRAD_P13.4)	,354	62	,000	,726	62	,000
(PBE_TRAD_P13.5)	,331	62	,000	,696	62	,000
(PBE_TRAD_P13.6)	,290	62	,000	,686	62	,000
(PBE_TRAD_P13.7)	,371	62	,000	,716	62	,000
(PBE_TRAD_P13.8)	,355	62	,000	,729	62	,000
(PBE_TRAD_P15.1)	,378	62	,000	,683	62	,000
(PBE_TRAD_P15.2)	,374	62	,000	,720	62	,000
(PBE_TRAD_P15.3)	,371	62	,000	,701	62	,000
(PBE_TRAD_P15.4)	,342	62	,000	,791	62	,000
(PBE_TRAD_P15.5)	,249	62	,000	,870	62	,000
(PBE_TRAD_P15.6)	,277	62	,000	,862	62	,000
(PBE_TRAD_P15.7)	,356	62	,000	,781	62	,000
(PBE_TRAD_P15.8)	,298	62	,000	,834	62	,000
(PBE_TRAD_P15.9)	,261	62	,000	,887	62	,000
(PBE_TRAD_P15.10)	,264	62	,000	,778	62	,000
(PBE_TRAD_P22.1)	,236	62	,000	,831	62	,000
(PBE_TRAD_P22.2)	,321	62	,000	,816	62	,000
(PBE_TRAD_P22.3)	,261	62	,000	,863	62	,000
(PBE_TRAD_P22.4)	,258	62	,000	,791	62	,000
(PBE_TRAD_P22.5)	,281	62	,000	,860	62	,000
(PBE_TRAD_P22.6)	,326	62	,000	,822	62	,000
(PBE_TRAD_P22.7)	,210	62	,000	,870	62	,000
(PBE_TRAD_P22.8)	,292	62	,000	,861	62	,000
(PBE_TRAD_P22.9)	,310	62	,000	,848	62	,000
(PBE_TRAD_P22.10)	,247	62	,000	,879	62	,000
(PBE_TRAD_P22.11)	,291	62	,000	,854	62	,000

a. Lilliefors Significance Correction

Appendix L - Cronbach's alpha if Item deleted

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
(AvD_SisQualRad_A2_P1)	492,0161	1082,232	,310	.	,920
(AvD_SisQualRad_A2_P2)	492,1011	1086,628	,389	.	,920
(AvD_SisQualRad_A2_P3)	492,5152	1081,212	,500	.	,920
(AvD_SisQualRad_A2_P4)	492,0178	1075,459	,489	.	,920
(AvD_SisQualRad_A2_P5)	492,3803	1085,889	,301	.	,921
(AvD_SisQualRad_A2_P6)	492,0678	1076,624	,468	.	,920
(AvD_SisQualRad_A2_P7)	492,0293	1064,232	,613	.	,919
(AvD_SisQualRad_A2_P8)	492,5678	1074,519	,429	.	,920
(AvD_SisQualRad_B2_P1)	493,3803	1091,320	,230	.	,921
(AvD_SisQualRad_B2_P2)	494,2678	1103,797	,018	.	,921
(AvD_SisQualRad_B2_P5)	493,5678	1105,110	-,065	.	,921
(AvD_SisQualRad_B2_P6)	493,9011	1100,457	,119	.	,921
(AvD_SisQualRad_C2_P1)	492,2520	1071,196	,569	.	,919
(AvD_SisQualRad_C2_P2)	492,5678	1070,797	,553	.	,919
(AvD_SisQualRad_C2_P3)	491,7141	1056,878	,542	.	,919
(AvD_SisQualRad_C2_P4)	492,1615	1067,694	,473	.	,919
(AvD_SisQualRad_C2_P5)	491,9816	1054,108	,622	.	,918
(AvD_SisQualRad_C2_P6)	491,4740	1056,326	,651	.	,918
(AvD_SisQualRad_C2_P7)	492,5678	1087,577	,310	.	,920
(AvD_SisQualRad_C2_P8)	493,1233	1063,007	,557	.	,919
(AvD_SisQualRad_D1.2_P1)	492,8370	1052,005	,521	.	,919
(AvD_SisQualRad_D1.2_P2)	492,9780	1081,738	,297	.	,921
(AvD_SisQualRad_D1.2_P3)	492,5678	1084,828	,386	.	,920
(AvD_SisQualRad_D1.2_P4)	491,9549	1071,175	,433	.	,920
(AvD_SisQualRad_D1.2_P5)	491,7821	1098,999	,104	.	,921
(AvD_SisQualRad_D1.2_P6)	492,6587	1091,832	,315	.	,921
(AvD_SisQualRad_D2.2_P1)	492,7553	1069,022	,558	.	,919
(AvD_SisQualRad_D2.2_P2)	493,2106	1079,359	,371	.	,920
(AvD_SisQualRad_D2.2_P3)	493,0678	1086,737	,412	.	,920
(AvD_SisQualRad_D2.2_P4)	493,0223	1069,165	,550	.	,919
(AvD_SisQualRad_D2.2_P5)	492,9796	1086,670	,310	.	,920
(AvD_SisQualRad_D3.2_P1)	492,6731	1097,412	,139	.	,921
(AvD_SisQualRad_D3.2_P2)	492,5678	1093,190	,239	.	,921
(AvD_SisQualRad_D3.2_P3)	492,0678	1083,946	,340	.	,920

(AvD_SisQualRad_D3.2_P4)	492,2553	1081,631	,362	.	,920
(AvD_SisQualRad_D3.2_P5)	492,1132	1101,757	,067	.	,921
(AvD_SisQualRad_D3.2_P6)	492,8755	1088,797	,262	.	,921
(AvD_SisQualRad_E2_P1)	492,4289	1047,595	,448	.	,920
(AvD_SisQualRad_E2_P2)	493,1678	1092,813	,192	.	,921
(AvD_SisQualRad_E2_P3)	492,6122	1036,890	,528	.	,919
(AvD_SisQualRad_E2_P4)	492,1678	1074,037	,483	.	,920
(AvD_SisQualRad_E2_P5)	492,7821	1080,254	,438	.	,920
(AvD_SisQualRad_E2_P6)	493,2821	1099,348	,186	.	,921
(AvD_SisQualRad_E2_P7)	492,5678	1099,375	,235	.	,921
(AvD_SisQualRad_E2_P8)	492,8178	1103,642	,095	.	,921
(AvD_SisQualRad_E2_P9)	492,3678	1100,470	,270	.	,921
(AvD_SisQualRad_E2_P10)	493,1832	1082,702	,346	.	,920
(AvD_SisQualRad_E2_P11)	492,5465	1065,552	,351	.	,920
(AvD_SisQualRad_E2_P12)	491,8478	1056,695	,476	.	,919
(AvD_SisQualRad_E2_P13)	491,9678	1074,186	,471	.	,920
(AvD_SisQualRad_E2_P14)	490,7496	1076,265	,355	.	,920
(AvD_SisQualRad_E2_P15)	491,3939	1060,285	,492	.	,919
(AvD_SisQualRad_E2_P16)	490,6989	1060,469	,434	.	,920
(AvD_SisQualRad_E2_P17)	491,0961	1037,121	,593	.	,918
(AvD_SisQualRad_E2_P18)	491,1492	1063,361	,438	.	,920
(AvD_SisQualRad_E2_P19)	493,1928	1098,506	,240	.	,921
(AvD_SisQualRad_E2_P20)	492,3678	1100,836	,120	.	,921
(AvD_SisQualRad_E2_P21)	492,3678	1103,447	,026	.	,921
(AvD_SisQualRad_E2_P22)	491,4453	1066,028	,368	.	,920
(AvD_SisQualRad_E2_P23)	492,5678	1081,928	,256	.	,921
(AvD_SisQualRad_E2_P24)	491,7159	1074,014	,411	.	,920
(AvD_SisQualRad_E2_P25)	491,8878	1083,399	,254	.	,921
(PBE_TRAD_P3.1)	493,1807	1092,717	,229	.	,921
(PBE_TRAD_P3.2)	493,3742	1079,042	,413	.	,920
(PBE_TRAD_P3.3)	493,1807	1087,881	,367	.	,920
(PBE_TRAD_P3.4)	492,9871	1090,237	,324	.	,921
(PBE_TRAD_P3.5)	493,1646	1093,402	,230	.	,921
(PBE_TRAD_P3.6)	493,7613	1087,733	,216	.	,921
(PBE_TRAD_P3.7)	494,3259	1079,189	,278	.	,921
(PBE_TRAD_P3.8)	493,4871	1094,931	,123	.	,921
(PBE_TRAD_P3.9)	493,4226	1083,268	,357	.	,920
(PBE_TRAD_P3.10)	493,4226	1084,286	,324	.	,920
(PBE_TRAD_P3.11)	493,3259	1097,460	,117	.	,921
(PBE_TRAD_P3.12)	493,5194	1093,718	,170	.	,921
(PBE_TRAD_P3.13)	493,0678	1094,465	,221	.	,921

(PBE_TRAD_P3.14)	494,4388	1096,348	,086	.	,922
(PBE_TRAD_P11.1)	494,5072	1091,416	,244	.	,921
(PBE_TRAD_P11.2)	495,1739	1099,020	,093	.	,921
(PBE_TRAD_P11.3)	494,2865	1078,474	,388	.	,920
(PBE_TRAD_P11.4)	494,9920	1086,341	,325	.	,920
(PBE_TRAD_P13.1)	493,9617	1093,139	,210	.	,921
(PBE_TRAD_P13.2)	494,6284	1088,859	,226	.	,921
(PBE_TRAD_P13.3)	493,7193	1106,733	-,068	.	,922
(PBE_TRAD_P13.4)	493,5375	1095,090	,186	.	,921
(PBE_TRAD_P13.5)	493,4163	1099,675	,093	.	,921
(PBE_TRAD_P13.6)	493,2715	1095,018	,240	.	,921
(PBE_TRAD_P13.7)	493,6447	1098,268	,098	.	,921
(PBE_TRAD_P13.8)	493,8271	1107,113	-,076	.	,922
(PBE_TRAD_P15.1)	493,0033	1102,738	,035	.	,921
(PBE_TRAD_P15.2)	493,4065	1099,274	,131	.	,921
(PBE_TRAD_P15.3)	493,2452	1095,408	,244	.	,921
(PBE_TRAD_P15.4)	493,6807	1101,273	,040	.	,922
(PBE_TRAD_P15.5)	494,1646	1096,394	,131	.	,921
(PBE_TRAD_P15.6)	493,9871	1088,584	,253	.	,921
(PBE_TRAD_P15.7)	493,6968	1108,907	-,099	.	,922
(PBE_TRAD_P15.8)	493,7130	1080,592	,338	.	,920
(PBE_TRAD_P15.9)	494,1807	1094,333	,122	.	,922
(PBE_TRAD_P15.10)	493,4065	1080,484	,344	.	,920
(PBE_TRAD_P22.1)	493,4871	1091,204	,210	.	,921
(PBE_TRAD_P22.2)	493,6646	1096,020	,140	.	,921
(PBE_TRAD_P22.3)	493,7775	1095,841	,142	.	,921
(PBE_TRAD_P22.4)	494,3420	1094,137	,199	.	,921
(PBE_TRAD_P22.5)	493,9065	1093,914	,169	.	,921
(PBE_TRAD_P22.6)	493,7613	1101,968	,036	.	,922
(PBE_TRAD_P22.7)	494,5678	1086,169	,320	.	,920
(PBE_TRAD_P22.8)	494,0033	1099,578	,054	.	,922
(PBE_TRAD_P22.9)	493,9388	1089,883	,238	.	,921
(PBE_TRAD_P22.10)	494,2936	1091,228	,196	.	,921
(PBE_TRAD_P22.11)	494,0760	1088,255	,252	.	,921