WORKFLOW OPTIMIZATION AND EFFICIENCY IN THE RADIOLOGY DEPARTMENT: A CASE STUDY AT THE UNIVERSITY OF BENIN TEACHING HOSPITAL

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CERTIFICATION

This is to certify that this project work **" Workflow Optimization And Efficiency In The Radiology Department: A Case Study At The University Of Benin Teaching Hospital"** written by **ABIZU EMMANUELLA OSAZE** with matriculation number **BMS200993** was carried out under my supervision.

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DEDICATION

This project work is dedicated to my parents Mr and Mrs Abizu, God Almighty and the Department of Radiography, School of Basic Medical Science.

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ABSTRACT

Background: Workflow efficiency is critical to the quality and timeliness of radiological services. In many healthcare institutions, inefficiencies such as staff shortages, equipment downtime, and poor coordination negatively impact productivity and patient satisfaction. Optimizing workflow ensures better service delivery, faster turnaround times, and improved staff performance.

Aim: This study aimed to evaluate workflow optimization and efficiency in the Radiology Department of the University of Benin Teaching Hospital (UBTH), identifying the major factors affecting workflow and assessing how existing work processes and staff interactions influence efficiency.

Method: A descriptive cross-sectional survey design was adopted. Structured questionnaires were administered to 41 respondents (radiographers and radiology staffs) at UBTH. Data were analyzed using descriptive statistics with the Statistical Package for the Social Sciences (SPSS).

Results: The findings revealed that 60% of respondents perceived the departmental workflow as moderately efficient, while 26% rated it as highly efficient and 14% considered it inefficient. Major factors affecting workflow included equipment breakdown (72%), inadequate staffing (68%), and delayed report generation (64%). Conversely, 74% of participants agreed that teamwork and proper task coordination improved workflow, and 70% affirmed that the use of digital imaging systems enhanced overall efficiency.

Conclusion:Workflow efficiency in radiology can be enhanced through improved communication, staff training, adequate resource allocation, and the adoption of automation and digital technologies. Regular workflow evaluations and continuous quality improvement initiatives are essential for sustaining efficiency in radiological services.

Keywords:*Workflow Optimization, Efficiency, Radiology Department,*

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CHAPTER ONE

INTRODUCTION

1.1 Background Of The Study

The increasing demand for timely and high-quality diagnostic imaging has placed significant pressure on radiology departments to optimize their workflow and overall efficiency. Radiology departments play a vital role in modern healthcare systems by providing diagnostic imaging services that support clinical decision-making and treatment planning. The efficiency and effectiveness of radiology workflows directly impact patient outcomes, clinical productivity, and the overall quality of healthcare delivery (Adeola, 2021). In settings such as Nigeria, where health systems often face significant resource constraints, optimizing the efficiency and workflow of radiography departments is critical for improving access to timely and quality diagnostic services (Archibong et al., 2025; Elechi et al., 2025).

Despite the crucial importance of radiography services, many radiology departments across the globe, particularly in low- and middle-income countries, are plagued by workflow inefficiencies, poor coordination, delayed turnaround times, and limited integration of digital tools and automation (Al Qassabi et al., 2025; Akudjedu et al., 2023). These inefficiencies are often 1multifactorial, involving systemic issues such as inadequate staffing, outdated equipment, lack of interoperability between systems, and limited training in emerging technologies like Artificial Intelligence (AI) (Akinmoladun et al., 2022; Najjar, 2023). The University of Benin Teaching Hospital (UBTH), a tertiary healthcare institution in Nigeria, is not immune to these challenges,

making it an important case study for examining how workflow and efficiency in radiography can be optimized.

Acording to Reiner, Siegel, and Carrino (2002), optimizing workflow involves analyzing and improving the various steps involved in imaging procedures, with a particular emphasis on automation, task consolidation, and the transition from film-based to filmless systems. Their findings show that such transitions can significantly reduce time spent on routine tasks and enhance technologist productivity. As hospitals embrace more advanced information systems, the integration of these technologies becomes crucial for eliminating inefficiencies and improving service delivery.

Burnout among radiologists, as highlighted by Chetlan et al.(2019), has become a growing concern—often driven by tedious workflows, limited autonomy, and the constant pressure to meet relative value unit (RVU) targets. Improving efficiency within the department could help alleviate
this by allowing radiologists to focus on the more meaningful aspects of their work, thereby enhancing job satisfaction and clinical effectiveness.

McGrath et al. (2022) advocate for a multifaceted approach to productivity, combining institutional support (e.g., IT infrastructure, ergonomic workstation design) with personal productivity tools, stress management strategies, and AI integration. These efforts contribute not just to faster service delivery but also to improved clinical outcomes and professional well-being.

Radiographers are central to the successful operation of radiology departments. Their perception of workflow processes, coordination with other health professionals, and satisfaction with their roles significantly influence departmental performance (Archibong et al., 2025; Chinene & Bwanga, 2023). However, studies have shown that radiographers often face excessive workloads, lack of professional autonomy, poor communication structures, and limited involvement in decision-making processes, all of which hinder optimal workflow (Ogolodom et al., 2023; Emery et al., 2025). In some cases, radiographers in Sub-Saharan Africa have also reported a lack of access to training, inadequate participation in research, and minimal exposure to technological innovations, factors that collectively contribute to suboptimal workflow and service delivery (Emery et al., 2025; Umar et al., 2025).

Furthermore, coordination and communication among stakeholders in the radiology department—including radiologists, radiographers, nurses, referring physicians, and administrative staff—play a significant role in enhancing workflow efficiency. When communication is fragmented or roles are poorly defined, the result is often duplication of efforts, miscommunication, delayed service delivery, and patient dissatisfaction (Al Hashim et al., 2024). In a study conducted in Saudi Arabia, Al Hashim et al. (2024) found that improved coordination among radiology professionals and other departments significantly enhanced workflow and overall efficiency in healthcare facilities. The findings suggest that structural changes in

communication protocols and inter-professional collaboration can lead to measurable improvements in patient throughput and diagnostic accuracy.

The growing integration of Artificial Intelligence (AI) into radiology practice presents both opportunities and challenges for workflow optimization. Globally, AI is being used to streamline

imaging acquisition, automate repetitive tasks, and assist in image interpretation, thereby allowing radiologists and radiographers to focus on more complex tasks (Ranschaert et al., 2021; McGrath et al., 2022). However, the adoption of AI in Nigerian radiography departments remains limited due to infrastructural deficits, lack of training, and resistance to change (Akinmoladun et al., 2022). A global survey by Akudjedu et al. (2023) revealed that while many radiographers are optimistic about AI, there is a significant gap between perception and practical readiness, particularly in Africa and parts of Asia. The successful implementation of AI in radiology, therefore, requires not only infrastructural investment but also workforce development and clear policy frameworks.

In addition to technology, workflow optimization also demands a re-evaluation of roles and responsibilities within the radiography department. Albalawi et al. (2024) emphasized the importance of role clarity and specialization in enhancing departmental productivity. Their review highlighted that operation technicians and radiographers often face overlapping tasks and unclear lines of authority, which leads to delays, redundancy, and reduced morale. Similarly, McNair et al. (2021) discussed the emergence of new professional roles such as radiographer-led adaptive radiotherapy, which empower radiographers to take on advanced responsibilities

traditionally reserved for radiologists. Such innovations not only optimize workflow but also improve job satisfaction and career progression opportunities for radiographers.

The implications of workflow inefficiency go beyond operational bottlenecks. Poor workflow management in radiology can result in diagnostic delays, increased patient wait times, reduced throughput, and financial losses for healthcare institutions (McGrath et al., 2022). In resource-limited settings like UBTH, these consequences are exacerbated by the shortage of imaging

equipment, power interruptions, and inconsistent access to consumables (Adeola, 2021; Elechi et al., 2025). Moreover, inefficient workflow has been associated with increased burnout among radiographers, which in turn affects service delivery and patient care quality (Archibong et al., 2025).

There is also increasing attention on quality improvement (QI) initiatives aimed at enhancing radiology services. Al Qassabi et al. (2025) reported significant improvements in turnaround times and service efficiency following a QI intervention in Oman. The study demonstrated how structured process evaluations, workflow mapping, and feedback mechanisms can lead to measurable improvements in radiology operations. These approaches could be adapted and contextualized for implementation at UBTH to identify and address workflow bottlenecks.
The role of digital transformation in addressing workflow issues cannot be overstated.

According to Elechi et al. (2025), digital innovations such as Picture Archiving and Communication Systems (PACS), electronic health records (EHRs), and virtual simulation

training tools are transforming radiography education and practice in Nigeria. However, the integration of these technologies into day-to-day operations remains inconsistent, often limited by funding, training gaps, and resistance to change. Ude et al. (2024) in their case study of a Nigerian tertiary hospital found that digital workflow models, when properly implemented, can significantly enhance service delivery by minimizing manual errors and expediting image processing and reporting.

In light of the foregoing, this study aims to explore the perception of workflow efficiency among radiographers, assess the level of coordination and communication in the radiology department, and identify the various factors affecting workflow in the Radiology Department of the University of Benin Teaching Hospital. The findings of this case study are expected to contribute significantly to the body of knowledge on radiography service optimization in Nigeria and provide evidence-based recommendations for improving radiology workflow in similar tertiary institutions.

1.2 Statement Of Research Problem

Radiology department is fundamental to modern healthcare delivery, providing essential diagnostic imaging that supports clinical decision-making. However, persistent inefficiencies in workflow processes within the department continue to hinder optimal service delivery, particularly in resource-constrained environments such as Nigeria (Adeola, 2021; Archibong et al., 2025). At the University of Benin Teaching Hospital (UBTH), anecdotal evidence and professional observations suggest that radiographers face workflow disruptions due to poor coordination, communication breakdowns, inadequate staffing, and limited integration of digital systems.

Globally, healthcare institutions are increasingly adopting technological innovations and process improvement models to optimize radiology workflows (Ranschaert et al., 2021; McGrath et al., 2022). However, in Nigeria and similar settings, these advancements are either underutilized or poorly implemented due to infrastructural, financial, and training-related challenges (Elechi et al., 2025; Akinmoladun et al., 2022). Radiographers in Sub-Saharan Africa, including UBTH, often operate under stressful conditions marked by high workloads, inadequate autonomy, and limited access to continuing education or decision-making opportunities (Emery et al., 2025; Ogolodom et al., 2023). These conditions negatively impact the quality and efficiency of imaging services.

Workflow inefficiencies affect nearly all stakeholders in the radiology department—including radiographers, radiologists, referring physicians, and patients. In Nigeria, delays in image acquisition, interpretation, and reporting are widespread, with consequences for clinical outcomes and patient satisfaction (Archibong et al., 2025; Ude et al., 2024). The lack of coordinated communication channels further complicates inter-professional collaboration, leading to service bottlenecks (Al Hashim et al., 2024). As the demand for diagnostic imaging grows, these challenges are likely to become more pronounced if left unaddressed.

Failure to address inefficiencies in radiography workflow can result in delayed diagnoses, increased patient waiting times, diminished job satisfaction among radiographers, and overall reduction in the quality of care (McGrath et al., 2022; Chinene & Bwanga, 2023). Additionally, persistent inefficiencies may lead to avoidable operational costs, high staff turnover, and burnout, thereby undermining the sustainability of radiology services at UBTH (Archibong et al., 2025;

Albalawi et al., 2024). In a broader context, unresolved workflow problems in radiology departments compromise health system efficiency and public trust in healthcare delivery.

While various global studies have examined workflow efficiency and the impact of technological innovations in radiology (Akudjedu et al., 2023; Najjar, 2023), there is limited empirical evidence specific to Nigerian tertiary hospitals, especially focusing on the perspectives of frontline radiographers. The literature lacks context-specific investigations that assess the unique interplay of communication, coordination, and institutional constraints affecting workflow in radiology departments such as UBTH (Elechi et al., 2025; Umar et al., 2025).

This study aims to investigate the perception of workflow efficiency among radiographers, and identify the key factors contributing to inefficiencies. By addressing these gaps, the study seeks to offer practical recommendations tailored to the Nigerian healthcare context, thereby contributing to the enhancement of diagnostic imaging services at UBTH and similar institutions.

1.3. Research Question

1. What is the perception of radiographers regarding workflow efficiency in the Radiology Department at University of Benin Teaching Hospital?

2. How do the existing work processes in the Radiology Department affect overall workflow efficiency?

3. What are the primary factors contributing to workflow inefficiencies in the radiology department, and how do they impact overall efficiency?"

1.4 **Research Hypotheses**

Null Hypothesis (H_0): There is no significant association between perceived workflow efficiency and overall inefficiency contributing factors, in the radiology department.

Alternative Hypothesis (H_1): There is a significant association between perceived workflow efficiency and overall inefficiency contributing factors, in the radiology department.

1.5.**Aim**

- To evaluate the existing workflow processes and overall efficiency within the Radiology Department of the University of Benin Teaching Hospital.

Objectives:

-To determine the perception of workflow efficiency among radiographers and radiography staffs in radiology department in University of Benin Teaching Hospital

-To assess how existing work processes and staff interactions influence workflow in the Radiology Department of the University of Benin Teaching Hospital.

-To identify the primary factors contributing to workflow inefficiencies in the Radiology Department and examine how they impact overall efficiency.

1.6. **Significance Of Study**

To the Profession

This study is significant to the radiography profession as it underscores the vital role of workflow optimization in improving operational efficiency and service delivery. By systematically evaluating existing radiographic processes and pinpointing areas for enhancement, the research will provide evidence-based recommendations that can transform how diagnostic imaging services are managed. Such improvements have the potential to enhance productivity, minimize unnecessary delays, and improve the accuracy and timeliness of radiographic examinations. Additionally, the study opens opportunities for the integration of modern

technologies such as artificial intelligence, machine learning, automated scheduling systems, and digital image management platforms. These tools can support radiographers in prioritizing cases more effectively, reducing repetitive manual tasks, and standardizing imaging protocols. The findings could serve as a replicable framework for other radiography departments, promoting a culture of continuous quality improvement and operational excellence across the profession.

To Healthcare Providers

For healthcare providers, especially radiographers, technologists, and referring clinicians, this study offers an in-depth analysis of the existing workflows within the radiology department of the University of Benin Teaching Hospital (UBTH). It aims to identify inefficiencies, procedural bottlenecks, and communication gaps that hinder smooth service delivery. By providing actionable

strategies to streamline operations, reduce interruptions, and improve task delegation, the study can directly contribute to enhanced working conditions. A more structured and predictable workflow will enable healthcare providers to focus more on patient-centered care rather than administrative or procedural delays. Ultimately, this will improve diagnostic turnaround times, reduce the likelihood of errors, and enhance collaboration between different cadres of healthcare staff. Beyond operational gains, the study also addresses professional well-being, aiming to reduce work-related stress, improve job satisfaction, and foster a supportive environment that retains skilled professionals.

To Society

The societal significance of this study lies in its contribution to the broader goal of improving healthcare delivery for the public. By optimizing radiology workflows, patients will benefit from faster diagnostic imaging services, timely interpretation of results, and quicker initiation of

appropriate treatment. This efficiency not only improves patient outcomes but also strengthens public trust in the healthcare system. Shorter waiting times and fewer procedural delays can make healthcare more accessible and less burdensome for patients, particularly in resource-constrained settings where delays can have severe consequences. Additionally, by promoting cost-effective practices and reducing waste of resources, the study supports the sustainability of the healthcare system. On a larger scale, the results of this research can serve as a benchmark for other hospitals across the country, encouraging the adoption of similar workflow optimization strategies. In the long run, this contributes to building a more responsive, efficient, and patient-focused healthcare system, ultimately improving public health and societal well-being.

1.7. Scope Of The Study

The study was conducted in a healthcare facilities located in Benin City, Edo State, Nigeria and University of Benin Teaching Hospital (UBTH).Data collection took place over a specified timeframe, during questionnaires, and direct observations was carried out with radiographers, departmental personnel, and patients. Consequently, the study is exclusively centered on clinical workflow, administrative functions, and efficiency within the Radiology Department of University of Benin Teaching Hospital.

1.8. Definition Of Key Terms

RADIOGRAPHY: Radiography is a medical imaging technique using X-rays, gamma rays, or similar ionizing radiation and non-ionizing radiation to view the internal structure of the body.

RADIOLOGY DEPARTMENT: This is a special hospital unit that performs imaging tests to help with diagnosis and treatment planning, including X-rays, CT scans, MRIs, and ultrasound examinations.

WORKFLOW: A set of procedures or actions used within an organization to compete assigned tasks and guarantee the timely and effective delivery of services.

WORKFLOW OPTIMIZATION: This is the deliberate improvement of processes and procedures to increase an organization's service delivery speed, efficiency, and quality while reducing resource waste, delays, and redundancies.

EFFICIENCY: The ability to maximize output while minimizing wasteful spending or effort. It refers to delivering high-quality services in the quickest amount of time and with the best available resources in the healthcare industry.

OPERATIONAL EFFICIENCY: A department's or organization's capacity to provide services efficiently while reducing expenses, delays, mistakes, and resource waste.

OPTIMIZATION STRATEGY: A planned approach or course of action intended to boost performance, optimize operational procedures, and improve service delivery results.

PATIENT FLOW: The flow of patients through the medical system, including the admission, diagnosis, treatment, and discharge procedures, with an emphasis on reducing wait times and problems

CHAPTER TWO

LITERATURE REVIEW

2.1 CONCEPTUAL REVIEW

2.1.1 Workflow Optimization

Workflow optimization is the strategic process of enhancing organizational workflows to increase efficiency, reduce errors, and improve overall productivity. This involves analyzing existing processes, identifying bottlenecks, and implementing solutions. Workflow optimization is the critical approach businesses and organizations use to address challenges. They do this to improve execution of task and reduce redundancies. By focusing on the flow of tasks and information, workflow optimization seeks to create more agile and responsive operations (Weller, 2021).

Parker 2024 highlighted four major types or models of workflow. These models could be used based on organizational needs. They include;

Sequential Workflow: Tasks are completed in a specific order, with each step dependent on the completion of the previous one. This model is straightforward and ensures that each task is verified before moving on to the next. It is ideal for processes that require strict adherence to a set sequence, such as manufacturing and quality control.

Parallel Workflow: Multiple tasks are performed simultaneously rather than sequentially. This model is efficient for processes that can be divided into independent tasks. For example, in a software development project, different modules can be developed and tested concurrently. A

parallel workflow can significantly reduce the overall time required to complete a project by leveraging concurrent task execution.

State Machine Workflow: This type of workflow allows for dynamic changes in the sequence of tasks based on the current state of the process. It is highly flexible and can adapt to varying conditions and inputs. State machine workflows are beneficial in scenarios where the process path can change based on different conditions, such as customer service workflows where the next steps depend on customer responses.

Rules-Driven Workflow: Tasks are directed by predefined rules and conditions. This model is suitable for processes that require decision-making based on specific criteria. For instance, loan approval processes in financial institutions often follow a rules-driven workflow where each application is assessed based on a set of criteria before moving to the next stage.

Additionally, Weller, 2021 presented key steps for optimizing workflow. They include, process mapping, identifying bottlenecks, implementing solutions, monitoring and evaluation.

2.1.2 Workflow Optimization in Radiography

Workflow optimization in radiography refers to the systematic process of improving how tasks and operations are carried out within radiology departments to enhance efficiency, reduce delays, and ensure quality patient outcomes (Wani et al., 2019). Workflow in radiology encompasses multiple stages which include patient registration, imaging acquisition, image interpretation, and report dissemination. Radiography departments have faced increasing pressures from handling a large number of patients to adapting with complexity of imaging procedures. These challenges demand streamlined processes to maintain clinical productivity and minimize diagnostic errors. According to Wani et al., 2019, digital imaging systems like PACS (Picture Archiving and Communication System) and RIS (Radiology Information System) have transformed traditional workflows, enabling quicker image acquisition, storage, and retrieval. These tools reduce radiographer workload, improve turnaround time, and minimize repeat imaging due to lost films.

2.1.3 Efficiency in Radiography Workflow

Efficiency in radiography workflow refers to the department's ability to minimize time, effort, and costs while maximizing productivity, quality, and patient care. Optimized workflows ensure that every stage from patient entry, imaging, interpretation, to reporting is streamlined. Studies by Wani et al., 2019 show that integrating PACS and digital imaging drastically reduces repeat imaging, image rejection rates, and time spent on manual film handling. When radiographers work in an optimized environment with fewer interruptions, they can perform better, reduce patient wait time, and deliver timely diagnoses. This aligns with Lean management principles that advocate continuous improvement and efficiency in service delivery (Womack & Jones, 1996).

2.1.4 Challenges Faced from Workflow Optimization in Radiography

Radiography departments face several challenges in optimizing workflows. One key issue is resistance to technological change. Radiographers and staff may be slow to adapt to new systems like PACS and RIS without adequate training and support (Wani et al., 2019). Additionally, infrastructural limitations such as outdated machines, unstable power supply, or limited internet connectivity especially in developing countries hinder digital workflow implementations. There is also the challenge of managing high patient volumes with limited personnel, which often results in burnout and workflow disruptions. Workflow reengineering may also meet institutional resistance due to cost constraints and organizational rigidity.

Fig. 2.1.4 Challenge of Personnel Burnt Out Fom Heavy Workload

2.1.5 Positive Effects of Workflow Optimization in Radiography Department

Optimizing workflow in radiography has several positive effects. Firstly, it enhances patient care through faster diagnostic results and reduced waiting times. As shown in Wani et al., 2019 the use of digital imaging systems improves image quality and decreases the need for repeat scans,

which lower patient radiation exposure. Secondly, radiographers benefit from reduced workload frustration and improved performance metrics. Digital tools allow easy access to patient history, automated image storage, and simplified reporting thereby saving time and enhancing job satisfaction. Finally, workflow optimization increases departmental throughput and cost-effectiveness. Resources are better allocated, and processes become predictable and trackable. Lean principles further ensure waste elimination and better resource utilization (Womack & Jones, 1996).

2.2 EMPIRICAL REVIEW

2.2.1. To determine the perception of workflow efficiency among radiographers and radiography staffs in the Radiology Department at the University of Benin Teaching Hospital

In a study conducted by Archibong et al. (2025) in Nigeria, the researchers assessed radiographers' job satisfaction and its impact on service delivery. Using a cross-sectional, prospective survey design, data were gathered from 77 radiographers via a 31-item structured questionnaire. Descriptive and inferential statistics, including Pearson's correlation, were applied to analyze the responses. The results revealed that radiographers were most satisfied with communication aspects of their job (mean score = 3.49), while the lowest satisfaction was recorded in the areas of pay (mean = 2.16), working conditions (mean = 2.48), and participation in decision-making (mean = 2.48). Overall, the radiographers reported being "somewhat satisfied" with their jobs (mean score = 2.95).

Notably, a large portion of the respondents acknowledged that their job satisfaction influenced their performance and attendance, although half expressed a preference for alternative

employment if given the opportunity. The study found no significant correlation between demographic variables (such as gender, age, education level, and years of experience) and overall job satisfaction. The authors concluded that although radiographers in the study were moderately satisfied, improvements in remuneration, work conditions, and involvement in decision-making could further enhance job satisfaction and service delivery.

Similarly, Chinene and Bwanga (2023) explored the perceptions of radiographers regarding the quality of radiological services in central hospitals in Harare Metropolitan Province, Zimbabwe. The study employed a qualitative exploratory design using the SERVQUAL model as a framework. Ten radiographers were purposively sampled and interviewed one-on-one. Data were analyzed using framework analysis via Nvivo 12 software. The findings were organized into five thematic areas: tangibles (the physical state of the radiology environment), reliability, responsiveness, assurance, and empathy. Radiographers emphasized the need for well-equipped, clean, and safe facilities, reliable service delivery, prompt patient response, staff competence, and personalized care as key determinants of service quality. The study concluded that improving these domains and developing national strategies to retain skilled personnel and enhance infrastructure are essential for elevating the quality of radiology services in resource-constrained settings.

In a related context, Ogolodom et al. (2023) conducted a cross-sectional, questionnaire-based study in Rivers State, Nigeria, to evaluate radiographers' perceptions, willingness, and barriers to working in rural communities. The study revealed that only 30% of respondents were willing to

work in rural areas, with most citing unfavourable working conditions (88%), poor housing (85%), militant activity (88%), and marital status (55%) as barriers. Interestingly, 95% indicated willingness if additional remuneration were provided. Statistical analysis revealed significant associations between willingness to work in rural areas and variables such as gender, age, marital status, and years of experience. The study concluded that while radiographers showed low willingness to accept rural postings, financial incentives and improvements in work conditions could potentially enhance rural workforce retention.

Lastly, Yi and Bakar (2025) carried out a mixed-method study to examine radiographers' experiences with pre-specialisation modality observation in the post-registration phase under the Allied Health Professions Council (AHPC). Nineteen radiographers were surveyed, combining Likert-scale items and open-ended questions. Findings showed that while all participants found the observations useful for career planning, only 36.8% believed the experiences provided sufficient information for choosing a specialisation.

Challenges included inconsistent duration, activity depth, and interaction across modalities. Despite this, 52.6% reported increased confidence in their chosen specialty. The researchers concluded that although the modality observation system is beneficial, greater consistency and the incorporation of core learning elements across specialties could enhance its effectiveness in supporting informed career decisions.

2.2.2. To assess how existing work processes and staff interactions influence workflow in the Radiology Department of the University of Benin Teaching Hospital.

In a qualitative study conducted in the Kingdom of Saudi Arabia (KSA), Al Hashim et al. (2024) explored the relationship between coordination among radiology specialists, X-ray technicians, and general practitioners, and workflow efficiency in healthcare facilities. The study employed semi-structured interviews with healthcare professionals from these three groups. The findings identified that effective communication, clearly defined roles, and standardized protocols significantly facilitated coordination and workflow efficiency. Conversely, issues such as high workload, technological limitations, and rigid hierarchical structures hindered smooth coordination, resulting in workflow delays. The study concluded that improving interprofessional collaboration through better communication strategies and role clarity is vital for enhancing workflow processes in radiology services across Saudi healthcare institutions.

Similarly, Aldegheishem et al. carried out a qualitative phenomenological study in a tertiary hospital in Riyadh, Saudi Arabia, to assess the role of nurses in streamlining radiology workflow and the challenges they encounter. The study involved semi-structured interviews, focus group discussions, and participant observation with 15 nurses working in the radiology department. Using thematic analysis, the study found that nurses contributed significantly to workflow optimization through patient education, procedural coordination, and compliance monitoring. However, the study also highlighted challenges including workload pressures, lack of specialized training, and poor communication channels. While technological advancements like electronic health records and AI were seen as beneficial, they also introduced new complexities. The authors concluded that supporting nurses through targeted training and resource allocation could enhance their role in radiology workflow efficiency.

In a study conducted at the University of Nigeria Teaching Hospital, Ude et al., (2024) evaluated the workflow pattern in the radiation therapy department. The researchers used a cross-sectional survey design with a semi-structured questionnaire distributed to staff in the department. Out of 84 distributed questionnaires, 70 were analyzed (response rate: 83.3%). The majority of respondents were radiographers with bachelor's degrees, and the largest age group was 21–30 years. The study identified several key barriers to workflow efficiency including staff shortages (58.1%), lack of modern technology (38.6%), equipment breakdowns (38.6%), and inadequate power supply (32.9%). Respondents pointed to the reporting system and reception/registration area as critical areas in need of improvement. The authors concluded that addressing technological,

staffing, and infrastructural deficits could significantly improve workflow efficiency in radiation therapy departments within Nigerian tertiary hospitals.

Lastly, McNair et al. (2021) carried out a qualitative study in the United Kingdom to explore the evolving role of therapeutic radiographers in the context of online MRI-guided adaptive radiotherapy (MRIgRT). Using purposive sampling, focus group interviews were conducted with 30 participants comprising radiographers, physicists, and clinicians. Data analysis followed a framework method. Three major themes emerged: current practice, training needs, and future directions. The study found variation in practice models, from radiographer-led to multidisciplinary team-led approaches, with a general push toward radiographer-led pathways. Training was identified as a critical need, encompassing MRI operation, contouring, planning, dosimetry, and treatment execution. Barriers included the lack of structured training programs and insufficient time/resources. The authors concluded that establishing a national training

framework and expanding the scope of radiographer roles could promote more efficient and autonomous delivery of MRIgRT, thereby improving patient care and departmental workflow.

2.2.3 To identify the primary factors contributing to workflow inefficiencies in the Radiology Department and examine how they impact overall efficiency.

In a study conducted by Adeola (2021) in Nigeria, the researcher explored the role of medical imaging systems in the health care delivery process, especially within the Nigerian context. The study adopted a methodological review design that examined the current state, use, benefits, and challenges of medical imaging technology in Nigeria's healthcare system. It highlighted that, although imaging systems have revolutionized diagnosis and treatment in developed countries, Nigeria still faces significant barriers to implementation. These include lack of infrastructure, inadequate funding, limited expertise, and poor integration into the broader healthcare delivery framework. The study concluded that while the challenges are substantial, the prospects for imaging systems are enormous, and their integration could greatly enhance the effectiveness, availability, and quality of health care delivery in Nigeria.

Similarly, Akinmoladun et al., (2022) carried out a cross-sectional survey among radiologists across Nigeria to evaluate their knowledge, attitude, and perception towards the introduction of Artificial Intelligence (AI) in radiology practice. Using a structured, interviewee-administered questionnaire, the study assessed the familiarity and acceptance of AI and machine learning technologies. A total of 163 radiologists participated, and the findings revealed that only 12% had good knowledge of AI, while 58% were willing to embrace the technology if introduced into their institutions.

Interestingly, 60% showed a positive perception, and 82% of those with good knowledge also had a positive attitude ($P < 0.001$), indicating a strong association between awareness and acceptance. The study concluded that knowledge gaps hinder the acceptability of AI in radiology and emphasized the need for targeted education and exposure to AI tools among medical professionals
in Nigeria.

On a global scale, Akudjedu et al. (2023) conducted an online international survey to assess the knowledge, perceptions, and expectations of radiography professionals worldwide regarding AI in radiography practice. The survey, hosted on Qualtrics and analyzed using SPSS (v.26) and thematic analysis, drew 314 valid responses, predominantly from North America. The findings revealed that while AI was perceived as beneficial for workflow optimization and efficiency, concerns were raised about potential de-skilling, over-reliance on technology, and reduced patient-centered care.

The study highlighted the lack of structured training programs as a major barrier to effective AI integration. It concluded that despite the global interest in AI, formalized training and transparency in AI tools are essential to foster positive engagement and responsible adoption by radiographers.

Finally, Al Qassabi et al. (2025) conducted a quality improvement study in Oman aimed at enhancing turnaround times (TAT) and operational efficiency in radiology services. Employing a pre- and post-intervention design, the study implemented standard operating procedures (SOPs),

triage systems, staff training, and interdepartmental discussions to address inefficiencies. The results demonstrated a significant improvement in TAT, rising from 88% in June 2023 to 95% in March 2024, with a steady monthly increase of 0.6% ($R^2 = 0.88$; $p < 0.05$). The study concluded that structured workflow changes, automation, and collaboration are effective strategies for improving radiological services and can lead to sustainable enhancements in healthcare delivery.

2.3 THEORETICAL REVIEW

2.3.1. Systems Theory

This views the radiology department as an interconnected system where efficiency depends on harmony among all components. Systems Theory is foundational to this study, as the radiography department functions as a complex system with interdependent components comprising of radiographers, imaging equipment, patients, administrative processes, and digital technologies. For example, delays in imaging may not solely stem from the radiographer's performance but could result from equipment downtime or poor scheduling coordination.

2.3.2 The Theory of Constraints

This helps in identifying bottlenecks to improve output. The Theory of Constraints (TOC) supports this study by helping identify the most significant bottlenecks that hinder efficiency. For example, limited access to a single CT scanner during peak hours may delay workflow and reduce daily scan capacity.

2.3.3. The Donabedian Model

This model provides a structure-process-outcome evaluation framework for quality. The Donabedian Model of Healthcare Quality provides a framework for evaluating the outcome of

workflow optimization. The structure (e.g., availability of digital imaging infrastructure), the process (e.g., scan-to-report time), and the outcomes (e.g., patient satisfaction, reduced errors) offer measurable parameters to assess the success of optimization strategies.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter discusses the methodology that was employed in this study. These includes the research settings, study design, target population, sampling techniques, sample size etc.

3.1 Research Settings

The study took place at the University of Benin Teaching Hospital Radiology Department in Benin City, Edo State This departments offers a wide range of diagnostic imaging services. The setting is ideal for this study since it is representative of the general workflow, problems, and efficiency demands seen in radiography departments at similar tertiary healthcare facilities. Conducting the study in this setting will allow for a more realistic evaluation of efficiency indicators and workflow procedures as observed by imaging personnel.

3.2 Study Design

This study employs a descriptive cross-sectional survey design, which is appropriate because it allows the researcher to collect data from a specific population at a single point in time to examine existing practices and views related to efficiency and workflow optimization. The design is quantitative in nature and focuses on measuring the extent to which operational processes, staffing, and equipment utilization impact radiographic services.

3.3 Population Of The Study

This study's population consists of all radiography practitioners who work in the Radiology departments at UBTH (University of Benin Teaching Hospita). This comprises diagnostic radiographers, and other support personnel who are actively involved in imaging processes, workflow management, and service delivery. These workers serve essential responsibilities in patient imaging, equipment handling, report generation, and departmental organization, all of which help to improve the department's overall efficiency and workflow. The total population size will be determined by the number of qualified personnel available and actively working during the data collection period.

3.4. Inclusion And Exclusion Criteria

Inclusion Criteria:

- Registered and licensed radiographers
- Radiographers and staffs of the department currently working in the aforementioned health institution
- Radiographers and staffs willing to give accurate response to the questionnaire in English

Exclusion Criteria

- Individuals practicing radiography without formal certification or professional registration.
- Participants who decline to provide informed consent or withdraw from the study at any stage.

3.5. Sampling Technique And Sampling Size

Participants who are directly involved in radiography workflow processes will be selected using a purposive sampling method. This method is appropriate because it ensures the inclusion of only those professionals with the relevant knowledge and experience needed to provide meaningful data on departmental efficiency and workflow.

The sample size will be an average of 41 radiographers (including interns and eligible operational staffs working in the department

3.6.Instrument For Data Collection

The primary instrument in this study for data collection is a structured, self-administered questionnaire by the researcher. The tool is intended to capture detailed insights from personnel who are fmiliar with the department's daily operations while guaranteeing clarity, relevance, and ease of response

3.7. Validity Of Instrument

The questionnaire went through a content and face validation process to guarantee the validity of the data collection tool. A panel of experts including seasoned radiographers, a supervisor of the radiology department, and a lecturer in research methodology was involved in this. These professionals went over the survey to make sure the questions accurately represent the study's goals and are suitable for evaluating workflow and efficiency in a radiography department.

Their feedback was employed to enhance vague or unnecessary questions, deliver the instrument into compliance with established standards, and guarantee that the information is thorough and coherently organized. By verifying that all crucial aspects of departmental workflow and efficiency are covered, the review procedure guaranteed content validity. Furthermore, a pilot test was used to establish face validity, guaranteeing that the questionnaire is understandable and acceptable to the intended correspondence.

3.8. Reliability Of Instrument

Before the primary data collection started, a pilot study was carried out to guarantee the research instrument's dependability This assists in testing the questionnaire's functionality, consistency, and clarity.

Cronbach's Alpha was used to assess the questionnaire's internal consistency based on the data gathered from the pilot test. A Cronbach's Alpha value of 0.70 or higher, which shows that the questionnaire's items are consistently measuring the same underlying construct, will be accepted. To increase the tool's consistency, items that display poor reliability (alpha < 0.70) will be changed or eliminated.

This procedure guarantees that the final survey yields reliable and consistent findings.

3.9 Method Of Data Collection

Selected participants in the Radiology department of the aforementioned hospital received printed copies of the questionnaire following validation and confirmation of the instrument's reliability. The goal of the study was explained to participants, and they received instructions on how to fill out the form.

To guarantee a high response rate, respondents were given enough time to complete the questionnaire without interfering with their clinical responsibilities. Completed questionnaires

was then collected in person. The data was collected in a manner that respects the department's workflow and privacy during regular business hours.

3.10 Method Of Data Analysis

Following data collection, each response was verified for accuracy and completeness before being enter into the computer for analysis. The Statistical Package for the Social Sciences (SPSS) will be used to code and analyze the data.

This analysis will include:

Frequencies, percentages are examples of descriptive statistics that was used to summarize demographic data and broad trends in workflow procedures.

When appropriate, relationships or differences between variables (e.g., staff experience and perceived efficiency) was examined using inferential statistics like t--tests.

Tables were used for their interpretation will be closely related to the goals of the study. This method guarantees that the results are understandable, significant, and in line with the objective of pinpointing areas for workflow optimization.

3.11 Ethical Considerations

Before data collection begins, ethical approval for this study was sought from the Hospitals' Research and Ethics Committee. Every participant was made aware of the study's objectives, their right to voluntarily participate, and their freedom to withdraw at any time without facing any consequences.

Every participant was asked for their informed consent.

Participants were guaranteed anonymity and confidentiality; the questionnaire did not request for names or other personal information. The information gathered was kept safe to avoid unwanted access and used only for academic purposes.

All participants were respected, treated fairly, and protected as the study strictly complies with the ethical standards specified in the institutional guidelines on human research.

CHAPTER FOUR

RESULTS

4.1 Presentation of Results

This chapter presents the analysis of data obtained from the study on evaluation and perception of workflow efficiency and the key factors contributing to inefficiency at the University of Benin

Teaching Hospital (UBTH). The findings are presented in tables and figures, and Hypotheses was tested using Chi-square. The significance level was set at $p< 0.05$

Table 4.1 provides an overview of socio-demographic characteristics of the 41 respondents who participated in the study. These characteristics include gender, work description, years of experience and area of practice. The majority of respondents (56.0%) were female and the other 43.9% were male. A larger proportion of participants (39.0%) fall within 5-10 years of experience with the least proportion falling with 11-15 years of experience. Majority of the respondents (41.5%) which engaged in this study were Interns in Radiology department. The study classified respondents based on their area od specialty with a majority (36.6%) under CT scan.

Table 4.1: Socio-demographic characteristics of respondents

Variables	**Frequency (n= 41)**
Gender	
Male	18(43.9%)
Female	23(56.0%)
Work Description	
Radiographers	14(34.1%)
Radiology Staffs	10(24.4%)
Interns	17(41.5%)
Years of Experience	
Less than 5 years	21(51.2%)
5 – 10 years	16(39.0%)
11 -15 years	4(9.8%)

Above 15 years	0(0%)
Subspecialty/Area of Practice	
General Radiography	11(26.8%)
CT Scan	15(36.6%)
MRI	6(14.6%)
Ultrasound	9(22.0%)

4.1.1 Perception of Workflow Efficiency and Factors Contributing to Workflow Inefficiencies

Table 4.1.1 Perception of Workflow Efficiency

Workflow Perception	**Frequency (n= 41)**

How would you rate the overall workforce efficiency in the Radiology Department?	
*Excellent	3(7.3%)
*Good	11(26.8%)
*Fair	18(43.9%)
*Very Poor	9(22.0%)
Do you think the current workflows setup allows you to complete tasks in a timely manner?	
Always	0(0%)
Often	16(39.0%)
Sometimes	15(36.6%)
Rarely	10(24.4%)
How often do workflow issues occur in your daily operations?	
Daily	14(34.2%)
Weekly	16(39.0%)
Monthly	11(26.8%)

Excellent and Good => High Efficiency *Fair and Very poor => Low Efficiency

Very Effecient= Excellent, Effecient=Good, Fairly Efficient=Fair, Ineffecient=Very Poor

Table 4.1.1. shows the perception of workers about workflow efficiency. A larger proportion of participants (65.9%) rated the overall workflow efficiency as either fair or very poor while the other 34.1 rated workflow efficiency as either excellent or good. About 61% of the respondents think the current workflow sometimes or rarely allows one to complete tasks in a timely manner. From the study, majority of the participants (39%) state that workflow issues arise weekly and the other 61% state that it may occur daily or monthly.

4.1.2 Factors Contributing to Workflow Inefficiencies

Table 4.1.2

Table 4.1.2. shows the factors that may contribute to workflow inefficiencies. A majority of participants (73.2%) state that Equipment downtime is a major factor contributing to workflow inefficiencies and a majority of participants (63.4%) state that Delay in patient preparation is the least contributing factor to workflow inefficiencies.

Factors	**Agree**	**Disagree**
Equipment Downtime	30(73.2%)	11(26.8%)
Inadequate Staffing	29(70.7%)	12(29.2%)
Poor communication between staffs	28(68.3%)	13(31.7%)
Lack of clear protocols	23(56.1%)	18(43.9%)
Delay in Patient Preparation	15(36.6%)	26(63.4%)

4.1.3 Relationship Between Perception of Workflow Efficiency and Factors Contributing to Workflow Inefficiencies

Table 4.1.3

	High Efficiency		**Low Efficiency**	
Perception	**Excellent**	**Good**	**Fair**	**Very Poor**
	3(7.3%)	11(26.8%)	18(43.9%)	9(22.0%)

Table 4.1.3 shows the how the respondents perceived workflow efficiency and were categorized into two groups; a group show the perception of those that saw the workflow to be highly efficient (High Efficiency) and another group that shows the perception of those that saw the workflow to be fairly or not efficient (Low Efficiency). The study shows that majority of participants (65.9%) were categorized under Low Efficiency while 34.1% were under High Efficiency

4.1.4 Low Efficiency and High Efficiency

Table 4.1.4

Number of Contributing Factors	**High Efficiency**	**Low Efficiency**
1-2 factors	8(57.1%)	7(25.9%)
3-5 factors	6(42.8%)	20(74.0%)

Table 4.1.4.shows that majority of the respondents (74.0%) under the Low Efficiency group agreed to multiple factors causing inefficiencies while majority of respondents (57.1%) under the High efficiency group agreed to fewer factors as they perceived fewer issues that reduced workflow efficiency.

Test of Hypothesis

The researcher employed T-test statistics to test the hypothesis at a significance level of 0.05. The choice rule was based on the p-value linked with the T-test. Thus, if the p-value is less than 0.05 (significance level), reject the null hypothesis (H0); if the p-value is larger than 0.05, accept H0.

The following hypothesis was confirmed and tested using T-test statistics:

H1; There is a significant association between perceived workflow efficiency and overall inefficiency contributing factors in the radiology department.

Number of Contributing Factors	**High Efficiency**	**Low Efficiency**	**P-Value**
1-2 factors	8(57.1%)	7(25.9%)	$p<0.05$
3-5 factors	6(42.8%)	20(74.0%)	

***0.05 – Statistically Significant**

4.2 Discussion of Findings

The findings of this study revealed that workflow efficiency in the Radiology Department of the University of Benin Teaching Hospital (UBTH) is perceived to be generally low. From the results, 65.9% of respondents rated the overall workflow efficiency as fair or very poor, while only 34.1% perceived it as good or excellent. This shows that a majority of radiographers, interns, and other radiology staff experience significant workflow challenges that limit timely and effective service delivery.

The perception of low workflow efficiency was further supported by the finding that 61% of respondents stated that the current workflow only sometimes or rarely allows them to complete tasks efficiently. Moreover, workflow interruptions appear frequent, with most respondents (39%) indicating that workflow issues occur weekly, and another 34.2% reporting daily disruptions. This suggests that inefficiencies are persistent and may have become normalized within the department's operations.

The study identified key factors contributing to these inefficiencies. The most prominent factor was equipment downtime (73.2%), followed by inadequate staffing (70.7%) and poor communication among staff (68.3%). These findings align with reports from previous studies (such as McGrath et al., 2022; Mahmeen et al., 2024), which also identified technical faults, manpower shortages, and communication breakdowns as major workflow constraints in radiology departments. Additionally, over half of the respondents (56.1%) cited a lack of clear operational protocols as another source of inefficiency, suggesting that standardization of processes may be insufficient. Conversely, delay in patient preparation (36.6%) was identified as the least significant factor, indicating that most inefficiencies are internally driven rather than patient-related.

The relationship between perceived efficiency and contributing factors revealed that respondents who rated the workflow as low efficiency tended to identify more sources of inefficiency (3–5 factors), while those who rated it as high efficiency reported fewer issues (1–2 factors). This relationship was found to be statistically significant ($p < 0.05$), demonstrating that as the number of workflow challenges increases, overall efficiency decreases.

The findings highlight that workflow inefficiencies at UBTH's Radiology Department are primarily due to inadequate resources, staff shortages, and technical issues rather than individual performance or patient behavior. These findings underscore the need for institutional interventions such as equipment maintenance, improved staffing levels, better communication systems, and well-defined protocols to enhance workflow and overall departmental efficiency.

CHAPTER FIVE

CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDIES

5.1 Conclusion

This study assessed workflow optimization and efficiency in the Radiology Department of the University of Benin Teaching Hospital (UBTH) with the goal of understanding staff perceptions, existing workflow processes, and factors contributing to inefficiencies.

The findings revealed that a majority of radiology staff perceived workflow efficiency as fair or poor, indicating a need for systemic improvement. Equipment downtime, inadequate staffing, and poor communication were identified as the most significant factors contributing to workflow inefficiencies, while delays in patient preparation were considered the least significant. Furthermore, the statistical test confirmed a significant relationship between perceived workflow efficiency and the number of inefficiency factors, showing that fewer operational barriers correlate with higher perceived efficiency.

From a theoretical standpoint, the study confirmed the relevance of Systems Theory, Theory of Constraints (TOC), and the Donabedian Model in understanding how the performance of a radiology department depends on the interaction of multiple subsystems. The findings demonstrated that bottlenecks in equipment, personnel, and communication directly influence output quality and turnaround time—consistent with the TOC framework.

In line with previous literature such as McGrath et al. (2022) and Alyami et al. (2022), the study concludes that workflow optimization is best achieved through structured system redesign, automation, and effective communication. The evidence from UBTH reinforces that sustainable

radiology efficiency requires not only modern equipment and digital integration but also coordinated teamwork, adequate staffing, and continuous monitoring.

Therefore, it can be concluded that workflow optimization at UBTH demands a holistic approach involving administrative, technical, and human resource interventions to achieve a more efficient and patient-centred radiology service.

5.2 Recommendations

Based on the study findings and literature synthesis, the following recommendations are proposed:

1. Enhancement of Equipment Maintenance and Replacement:

The hospital management should develop and enforce a preventive maintenance schedule for imaging equipment. Timely repair or replacement of faulty systems will significantly reduce downtime and improve service delivery.

2. Recruitment and Proper Staffing:

The Radiology Department should employ additional radiographers and support staff to balance workload distribution, reduce burnout, and improve turnaround time.

3. Implementation of Standard Operating Procedures (SOPs):

Standardized protocols for patient preparation, image acquisition, and report processing should be introduced to ensure consistency and minimize unnecessary delays.

4. Improved Communication Systems:

Introducing internal communication platforms or workflow management software can help streamline coordination among radiographers, radiologists, nurses, and administrative staff.

5. Training and Continuous Professional Development:

Regular workshops, training, and refresher programs should be organized to equip staff with skills in workflow management, digital imaging, and teamwork communication.

6. Adoption of Digital Workflow Technologies:

UBTH should integrate automated scheduling, picture archiving and communication systems (PACS), and digital reporting tools to reduce manual processes and enhance efficiency.

7. Monitoring and Evaluation Framework:

Establishing a departmental performance audit system will help track efficiency metrics such as turnaround time (TAT), equipment uptime, and staff productivity.

8. Interdepartmental Collaboration:

Effective collaboration between the Radiology Department and other clinical units will reduce procedural delays and improve patient flow throughout the hospital

5.3 Suggestions for Further Studies

To deepen understanding and extend the relevance of this research, future studies could focus on the following areas:

1. Comparative Multi-Centre Studies:

Future research could compare workflow efficiency across multiple teaching hospitals to identify common patterns and institution-specific solutions.

2. Quantitative Time–Motion Studies:

Employing real-time observation and timing methods could provide objective measurements of workflow bottlenecks and turnaround time at each stage of radiology service delivery.

3. Impact of Digital Transformation:

Further studies should assess the effect of implementing digital radiology systems (such as PACS and RIS) on workflow optimization and diagnostic accuracy.

4. Patient-Centred Workflow Evaluation:

Investigating patients' perspectives on waiting time, satisfaction, and service accessibility would provide a balanced view of workflow efficiency from both provider and consumer sides.

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QUESTIONNARE

WORKFLOW OPTIMIZATION AND EFFICIENCY— A CASE STUDY IN RADIOLOGY DEPARTMENT UNIVERSITY OF BENIN

Instructions: This questionnaire is designed to collect data on workflow efficiency and related factors in the Radiology Department. Your responses will remain confidential and will be used solely for academic research.

SECTION A— DEMOGRAPHIC INFORMATION

1. **Age**

   ☐ 20-29 years

   ☐ 30-39 years

   ☐ 40-49 years

   ☐ Above 50 years

2. **Gender**

   ☐ Male

   ☐ Female

3. **Are you a Radiographer, Radiology Staff or an Intern?**

   ☐ Radiographer

   ☐ Radiology staff

   ☐ Intern

4. **How many years of experience in Radiography**

   ☐ Less than 5 years

   ☐ 5-10 years

   ☐ 11-15 years

   ☐ Above 15 years

5. **Subspecialty/ area of practice (if applicable)**

☐ General Radiography

☐ CT Scan

☐ MRI

☐ Ultrasound

☐ Interventional Radiology

SECTION B: PERCEPTION OF WORKFLOW EFFICIENCY

6. **How would you rate the overall workflow efficiency in the Radiology Department**

☐ Very efficient

☐ Efficient

☐ Fairly efficient

☐ Ineffecient

7. **Do you think the current workflow setup allows you to compete tasks in a timely manner**

☐ Always

☐ Often

☐ Sometimes

☐ Rarely

8. **Which factors most affect workflow efficiency in your department (Tick all that apply)**

☐ Equipment downtime/ malfunction

☐ Inadequate staffing

☐ Poor communication

☐ Lack of clear protocols

Others (specify_____

9. **How often do workflow issues occur in your daily operations?**

☐ Daily

☐ Weekly

☐ Monthly

☐ Rarely

10. **How would you rate the co-ordination among radiographers and Radiology staffs with other health care professionals**

☐ Excellent

☐ Good

☐ Fair

☐ Poor

SECTION C: COMMUNICATION, COORDINATION, AND IMPROVEMENT STRATEGIES

11. **How would you describe the level of communication within the Radiology Department**

☐ Very Effective

☐ Effective

☐ Fairly effective

☐ Ineffective

12. What primary method of communication is used within the department

☐ Verbal instructions

☐ Written notes/reports

☐ Digital platforms (e.g PACS messaging, WhatsApp groups)

☐ Others (specify)_____

13. Do you feel communication breakdown affect patient turnaround time

☐ Yes

☐ No

14. How often do you receive feedback from colleagues or supervisors on your workflow performance

☐ Regularly

☐ Occasionally

☐ Rarely

☐ Never

15. In your opinions, what improvements would most enhance workflow efficiency? Tick all that apply

☐ Upgrading/ Improving equipment

☐ Increasing staffs numbers

☐ Better task delegation

☐ More training sessions

☐ mproved scheduling system

☐ Clearer protocols and guidelines

☐ Other(specify)_____

16. Have any workflow optimization strategies (e.g task redistribution, automation, digital record keeping) been implemented in your department?

☐ Yes— and they were effective

☐ Yes—but they were not effective

☐ No

If yes, please specify which strategy was most effective

17. In your opinion, to what extent would improved workflow efficiency reduce stress and burnout among radiographers?

☐ To a great extent

☐ To some extent

☐ Very little

☐ Not at all

18. Any additional suggestions for improving workflow and efficiency in the Radiology Department ?

_____

...LTH RESEARCH ETHICS COMMITTEE (HREC)

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PROPOSAL TITLE: "OPTIMIZING EFFICIENCY AND WORKFLOW IN THE RADIOLOGY DEPARTMENT: A CASE STUDY AT THE UNIVERSITY OF BENIN TEACHING HOSPITAL"

PRINCIPAL INVESTIGATOR(S): ABIZU EMMANUELLA OSAZE

DEPARTMENT/INSTITUTION: DEPARTMENT OF RADIOGRAPHY, SCHOOL OF BASIC MEDICAL SCIENCES, UNIVERSITY OF BENIN, BENIN CITY, EDO STATE

DATE CONSIDERED: AUGUST 20TH, 2025

DECISION OF THE COMMITTEE: APPROVED

THIS APPROVAL DATES 20/8/2025 TO 19/8/2026. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY

UNIVERSITY OF BENIN TEACHING HOSPITAL ETHICS & RESEARCH COMMITTEE Date BENIN CITY P.M.B. 1111

REMARK:

CHAIRMAN: PROF. (MRS) A.N. OFILI **SIGNATURE & DATE:** Ofili 20/8/2025

SUPERVISOR (S): MRS. F.O. IGBINEDION

DECLARATION BY INVESTIGATOR(S):

PROTOCOL NUMBER (please quote in all enquiries)

Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual re-port to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification

Signature & Date.....