

# Quality Managing Medical Imaging Facility Transitioning into and Out of a Structural and Organisational Temporal Space



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## Abstract

The advances in medical imaging technology with enhanced image quality is inherently temporal. Due to the temporary nature opens the door for remodelling and restructuring to upkeep the high-quality services within the ever-evolving health care system. Management of quality entails many aspects depending on the size and complexity of the imaging facility as a single entity or within healthcare organisation. Irrespective of the services medical imaging forms a cornerstone in integrated healthcare. A gap in the literature is a framework for managing quality and its dimensions when a health system complex structurally or organisationally shifts into a temporal transient phase. The purpose of this paper by means of developing a framework illustrates the importance of aligning and integrating the organisational quality management processes and procedures integrated with medical imaging quality and its dimensions. Central to this is the sustaining of the project at hand. The importance of developing a realistic but achievable goal in terms of quality without compromising the project goals.

**Keywords:** Quality management; Transient phase; Diagnostic medical imaging; Framework, Health system complex

## Introduction

Managing quality in the diagnostic medical imaging context entails many different aspects and may be defined in many ways and from various angles. Managing quality is most likely include processes related to quality assuring (QA). A means to ascertain minimum quality standards, set by regulatory professional bodies are abided through accreditation by certification with inspections [1]. Quality control (QC) in medical imaging services deals with acceptance testing of equipment and its accessories includes calibration tests on imaging parameter amongst other tests [2]. To ensure safe, effective, efficient and timely provision of quality of professional services and patient care.

The rapid technological and networking advances capabilities in medical imaging services whether diagnostic, interventional or therapeutic impacts on the quality of service delivery. Virtual Private Networks are driving new service delivery models by applying clinical teleradiology. Contained within the area of diagnostic imaging is the process of care, defined as a set of activities that occur within and between the medical services available across the different levels of the healthcare institution [3,4]. The "dimensions of care" in medical imaging is divided into 2 principal components: the laboratory structure and

the imaging process. The structure can be subdivided into a minimum of 4 elements: the physical laboratory, the equipment, the technical staff, and the physician(s).

The imaging process can be separated into 5 core areas: patient selection, image acquisition, image interpretation, results communication, and the incorporation of results into care [5]. Additionally, these activities require interactions with a diverse set of healthcare practitioners and providers [3,4]. Delivering improvements in the quality and safety of healthcare remains a challenge when altering processes within an already complex social systems in predictable and unpredictable ways [6]. Irrespective central to the value structure of any organisation is the delivery of quality services [7].

Currently, there is very little research and literature evidence on the temporary transition temporal spaces that medical imaging facilities find themselves as part of an organisation undertaking a remodelling project to a quality improved service status. Often literature addresses an aspect of a transient process to a quality improved status. The purpose of this paper is to propose a framework to include both the organisational and medical imaging quality framework processes integrated into the

project goals and objects which also needs to be quality assured, controlled and managed. The focus is on the intermediary, in other words during the actual remodelling of a health system complex where the shift occurs into a “temporal transitional organisation space” and transitioning out to into a QI status. This paper argues that one cannot achieve this without the reality of out of ordinary disruptions of the unstable and uncertain new ‘temporal space’. Therefore, realistic in alignment be means of a review of the existing quality management framework process is necessary in order to sustain the quality in all aspects. At the same time considering the vulnerable status of organisation which includes the people at the ground level performing their day to day tasks in ensuring that the quality of healthcare is compromised.

### Importance of Research

For example, the South African government took a proactive approach to rectify the past inequitable access to healthcare service by its citizens by restructuring and upgrading health care institutions. Two case studies were reported. In the North West Province, a district hospital where imaging services were shut down and outsourced to private and neighbouring facilities and a makeshift hospital was created [8]. Due to poor triaging and gatekeeping experienced major disruptions in service delivery including medical imaging service accessibility. Resulting in excessive cost implications during temporal transitional space.

In another province, a decision taken to build a new hospital was found not feasible. Instead two public tertiary institutes underwent upgrades and renovations included the medical imaging department and its equipment. The private sector not only funded the project but also merged with the two hospitals. This merger or integration also resulted in a cost saving and QI services. However, data regarding how the quality was managed during the transient period is absent. Research on quality and safety has been encouraged in more recent medical imaging literature due to reimbursements to healthcare organisations being increasingly tied to measures of overall quality, patient safety, the efficiency and appropriateness of imaging provided [7]. QI is the science of process management.

Data driven QI data is critical for a meaningful impact in healthcare. Managed care means managing the processes of care. Donabedian’s definition of quality of care represents the entire continuum from structure to process and to outcome. Structures, processes and outcomes are interdependent [9]. Where specific attributes of one influence another according to the strength of the relationship. The organizational factors influence care processes, teamwork and staff satisfaction and patients in order to receive quality care outcomes [10,11]. Literature in medical imaging implementation of a QI projects, its relevant quality dimensions and the relevant key performance indicators addresses aspects such as safety, effective, timely, efficient and equitable patient access, patient centred approach, shared

decision making and the relevance of current knowledge by evidence-based approaches.

Including the quality of referral, to the actual investigation to incorporating the results into the care plan. It is recommended that for medical imaging the Deming cycle for achieving QI goals is fit [12]. Special considerations include dust, noise, reduced light and vibration which has consequences for the affected persons [13,14]. For e.g., dust produced from renovation activities may contain significant quantities of fungal spores and organic matter can remain airborne and cause a wide range of potentially fatal complications, particularly among immunocompromised populations [15,16]. Then another challenge is the already inefficient services due to aged imaging equipment, absence of maintenance plans and human resource constraints, proper referral guidelines and a professional skilled expert in QC or QA. QA administration entails cost [17]. According to Grumbach, the traditional approach to health care delivery redesign is to view ‘the extravagantly rococo structure’ of the existing health care system and propose additions or minor alterations to this dysfunctional structure [18].

The first failure could be input-outcome discordance, the organisation, structural processes are failing to interrogate and important determinant of quality. The structure and processes problem cannot be detected upfront. A fundamental misalignment between management’s quality vision and the needs of the actual needs of the patient and referrer. Limited interaction and communication before and after the project [19]. Azpiroz-Leehan and others encourage the constructing team to use an evidenced based approach by undertaking some research to get insights on for instance designing medical imaging facilities and the realities associated with it [20]. Especially accessibility to medical imaging services based on pyramid health structures in need of horizontal expansion. From their experience primary sources of information on the state of the infrastructure and equipment in medical facilities could be unreliable [21]. The knowledge gap to be bridged is aligning the managing of medical imaging quality imaging facility as part of an organisation and project QM processes transitioning into and out of a temporal space whilst shifting to a QI status. To bridge this gap a framework is proposed.

### Towards a Framework in Managing QM Dimensions within a Temporary Transitional Space Towards QI Status

The inherent nature of healthcare systems and its institutes are in continuous cycle of remodelling and/or expanding their facilities from time to time to keep up with quality and safety improvements in delivery of services [6]. As already mentioned, medical imaging is no exception due to the ever-evolving technological expansions, remodelling, redesigning, renovation and/or restructuring with-in and/ or out -of a healthcare system complex is inevitable.

### Conceptualising the Temporal Transient Organisational Structural Space

QI is the science of process management. Changes are part of the complex social systems, i.e., predictable and unpredictable ways [21,22]. To facilitate this change inherently entails project, program and teams to achieve goals that are new, innovative and unique [23]. The project is temporary, with a defined beginning and end, uses limited organisational resources [24]. The execution and completion of these tasks depends on measurement, research and testing, communications and change management as outlined in the figure below. The uniqueness lies in that though not part of the ongoing operations of an organisation there are specific goals to be accomplished. The emphasis shifts to the adaption in adopting a strategy as doing things in a different way from the normal routine.

This process entails some degree of disruptions whether it be structural and/ or organisational. A shift from the permanent fixed, into a temporal transient structural organisational space [23]. According to literature the reality is that project teams are integrated and convene individuals (e.g., architect, project manager and healthcare professionals of various disciplines hospital wide) who seldom work together, and the context of their interaction vary from their routine [24]. However, they must be knowledgeable with the QI processes, and committed to its success [21]. As well dealing with data and issues that involve multiple departments or clinical services and processes for cross organisational boundaries rather than a single facility. Although complex includes opportunities for collective way of learning and acquiring new knowledge [21,24,25].

### Managing Quality Improvement (QI)

Quality improvement (QI) processes and procedures are developed in response to the needs of an organisation [1]. Diverse aspect needs to be taken into consideration in the implementation of and managing quality of services. A referral for imaging investigations forms an integral part of the chain of events of the continuum of care processes and procedures [26,27]. of the patient's journey through the healthcare system. A core aspect is the permanent stability of an organizational and physical structure that facilitates the timely delivery of the imaging procedure for both medical practitioners and patients. The diagnostic medical imaging could be a discrete facility.

Depending on the level of care service may include interventional imaging services and may incorporate nuclear medicine and radiation therapy units, i.e., a fully integrated medical imaging service or most times co-located. The model of imaging services delivery could provide as a single department managed and operated by the health institution, or a main facility with sub-units located for ease of patient access within the hospital. Private imaging facility could provide a service to several hospital units on-site and off-site where full imaging services is not justified. Of importance, is a timely access to and delivery of integrated and appropriate imaging procedure in a

safe and responsive facility and prompt delivery of accurately interpreted radiological reports by capable professionals in an efficient, effective and sustainable manner [28].

An imaging procedure is an integral service that happens within the contexts of the wider patient care component of a health system complex. As a structural characteristic, the presence of imaging technology, although necessary, is not enough to provide quality health services [29,30]. The imaging procedure and process requires both the time and the space to occur within the larger operations of a working health system complex. In this context of quality of integrated healthcare, access depends on the availability of imaging technology. Which can be considered a structural, stable element that facilitates the provision and delivery of medical care but uses a structure-process-outcome approach.

### Quality Assuring Process

The question of where to focus QA efforts. Harvey et al. like Zygmunt et al. suggests that ideally provision of "quality" for the patient is to receive the correct imaging investigations, in the right sequence, performed using best practice principles, quality report that leads ultimately to the right clinical action irrespective of income, physical location and cultural background [4,19]. This achieved in creating safe environment of care walkabouts are effective when performed by in identifying hazards, safety equipment -quality of patient radiation dose, and physical areas that do not meet the guidelines and may requires intervention. These walkabouts are effective when performed by trained observers [21,25]. This includes QC and safe use of equipment. Daily checks are essential in monitoring the endurance of handling unusual high workloads.

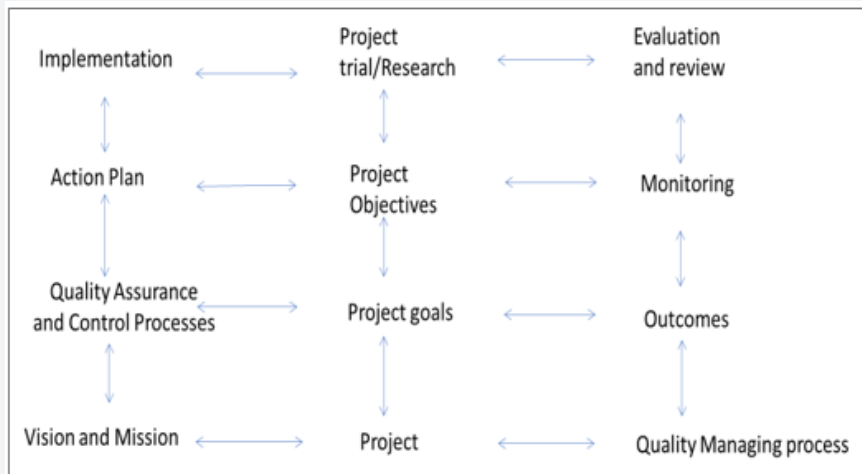
Monitoring compliance with safety regulations includes infection control, resuscitation equipment and visible signs. Equipment mobility to handle complex radiographic investigations. Monitoring charts daily whilst managing resources adequately with an add on to sustaining the project goals and objectives see (Figure 1) [21]. However, an essential would be to make the transition from these ideals of patient-focused "quality" through implementation of realistic QA frameworks and necessary processes embedded in the QM process whilst in transit. Lagrosen and authors [31] proposes the contextualising the meaning of QA within a specific situation it is being applied to at a point in time. In other words, in the temporal transitional space, is the sustaining of quality which requires a carefully co-ordinated and aligned framework which incorporates organisational, structural, operational process and procedural outcomes. From a medical imaging context is the access to equitable timely access to imaging services without compromising safety [19,32].

### Aligning the Goals and Mission

Regarding equitable access and timely services may mean review to align with the goals and objectives of the project see (Figure 1) and the goals and mission of the healthcare

institute. A clear vision is necessary of the desired outcomes from all angles. Which in turn will help the project team and the organisational leadership, to enlist the acknowledge and support of departments to have clearly defined chain of accountability [21]. Like the safety and quality service to patients and referring physicians, and efficient utilisation of resources [24]. Which may require a review of the standards, i.e., which standards

are applicable, developing new standards whilst restructuring is been undertaken. To be consistent requires strategies to be put in place and monitoring to solve problems effectively [21]. Sustaining and to maintain continuous engagement with all the staff in planning, strategizing, dedication, and management is crucial.



**Figure 1:** Proposed quality management framework incorporating the project plan in sustaining the organisational outcomes.

Assists in identifying a common purpose, reframing values and beliefs, using and adopting an engaging style. Engaging conversations on issues such as regarding noise, visibility of patients to staff, patient falls, infection, minimising patient transfers and handoffs and if relocation of equipment is required, the hazards/risks. During this process it is important to value staff's quality efforts by acknowledgement and enhanced through providing not only timely but tangible support. A culture where everyone feels comfortable disclosing errors, including their own, without fear of punitive action [21]. A proactive rather than a reactive monitoring process is encouraged. So, process for managing relations by talking to and engaging all stakeholders. Including patients and their family members. Requires collaboration of a large but diverse partnership entailing a short-term orientation with changes to the organisational routines. The reality is nature of the project poses inherently complex specific but also unique challenges one is faced with. Access to information and standardisation could be achieved by processes for analysing, introducing, monitoring, and sustaining change [21]. With review of the existing policies, protocols and guidelines and may need realignment in terms of how to best fit the project.

### Monitoring

Aspects such as roles and task delegations, coordination and active monitoring by assessment and evaluation of the project process aligning with the objectives are essential [24]. To develop timelines, assign ownership, monitor and measure consequences and impact, consider contingencies in case not everything goes as expected. Avoidance of failures, that is,

latent conditions and active failures compromises physical and organisational conditions. In a system approach, error reduction is achieved by building defences, barriers, and safeguards into the facility, equipment and processes that make up the system [21,25]. To overcome shortcoming Larson and Mickelson suggest a feasibility impact analysis [24]. Which is highly dependent on, on decisions made by management, architects and equipment designers. A fluid decision could contribute to latent or combined with active failures to produce an error [25]. It is recommended when designing technology planning should begin early in the process. With existing institutions assisting in determining specific technological needs and setting priorities [25].

Peer review and error reporting -can provide improvements for clinical and technical improvements. Ideally this team should be provided with resources, time, instruction, and authority to perform their tasks. A process that supports the anticipation, identification, and avoidance of failures [25]. A well-functioning cohesive team is essential for successful implementation of the project equipped with dealings of resource limitations, personal conflict and lack of communication. Criteria for identifying and processes for investigating serious adverse events [21]. Tools to measure failures by the various users to the project management team and ongoing communication on updates.

### Action Plan by Conducting a Trial

It is important to note that changes are implemented on a trial basis, using temporary measures such as reminders feedback and education is important. If these are training

institutes, how will professional development and training be affected? Are staff geared up in handling and adapting their skills in these types of environments? Was there training by educating staff and its adequacy in preparation for the change [21]. Were consideration given to align performance managing criteria to the current situation at hand. Frequency of meetings needs to be revisited, like every morning 15mins and fortnightly meetings to brainstorm. Incident report writing on reporting mistakes and/or any other observations that pertains safety needs to be put in place [21]. Strategies to resolve the matters and provide timely feedbacks to the project team into the quality management framework of both the project and the institution.

The question is the sustainability and maintaining quality and safety most importantly the project in the long run. Because these changes must be integrated in the daily operations. These complex processes are frustrating for those who are not directly involved. Active failures are by those who provide direct care. Safety barriers act to prevent a healthcare from committing and active failure or by mitigating the effect of an active failure. For medical providers for instance, could include items exploring their awareness of which services are available, scheduling is on time, access to reports, informed on any medical imaging equipment related matters or technical encounters.

Feedback provided on why an examination took longer than required or cancelled. Informed when equipment maintenance is underway. What mechanism are in place should a patient require outsourcing. Are reports received of patients who are outsourced? How image quality and appropriateness of the exam and triaging affected since implementation of project? For instance, patient surveys could include items such as waiting times, should they decide to leave -they complete a form with regards to reason for leaving, will they be returning, see another doctor, medication, if they do see another provider is it just for during this remodelling, etc. what was their experience up to the imaging facility [21].

The reality is the siloing of the care, where health care professionals typically engage patients at only specific 'touch points' or contact points within the system. Whereas, the patient exposure is to the entirety of care process and experiences the gaps in care including the lack of continuity [3,33]. Effective communication between providers like hands off becomes essential to ensure safety across the continuum of care [33]. A principle of collaborative process assessing, planning, implementing and coordinating, monitoring and evaluating options and services are required to meet individual needs [33] Where a pyramid structure of the health system is in existence consideration should be given to the level of services offered. To drop from level 3 to level 1 or 2 by eliminating risking patient whose condition may deteriorate. The question to ask is, does the referring sites have enough resources and willingness to share the workload? Staff distribution and their wellness and the incidence of staff turnover.

Medical imaging is an integral component of the medical encounter. A review of the referral processes and pathways by means of effective triaging [21]. Consider whether episodic and/or continuum based-case management approach will be effective [33]. Temporary partnership or arrangements for an integrated delivery of care should be investigated. If so, then interinstitutional care should be carefully mapped and planned across health conditions, services and care settings over time. Includes, managing both physical transfer of patient across, as well as their information.

The ideal would be a provider system integration, care coordination and coordinated care, and vertical integration with minimal interruptions in the continuum. So, the design of the healthcare subsystems and management of the interfaces between them should be effective in terms cost, safety and quality [25,33, 34]. The emphasis shifts on the functional, financial and structural integration. For instance, integrating the radiological information system and clinical pathways into interinstitutional hospital information system [35]. Not only interinstitutional but also inclusive of imaging room turnover related to optimal functioning of the equipment within that room. Should breakdowns occur what are the alternatives. Policies and procedures in place to deal with such breakdowns.

### Discussion

The equipment that provides diagnostic imaging is a key technology (technology-in-practice) in delivering accurate and reliable information to medical professionals to aid in the delivery of quality healthcare to patients [36,37]. It is essential to recognise medical imaging facility as part of healthcare system organisation shifting in to a temporal transitional organizational space requires carefully coordinated plan to minimise disruptions regarding the standards of quality of services. From the onset according to the proposed framework is a common understanding of the meaning of quality and all stakeholders are clear on the project goals and at same time the importance mapping the quality management processes and its respective dimensions to enable a smooth transition into and out of the transitional transient phase in achieving the desired outcomes. Requires the managing of quality and its strategies narrowed down from intangible ideas about the ideal best practice to a responsible on-the-ground quality assurance strategy [19,32]. This "transitional" strategy requires a carefully coordinated evidence based informed plan to ensure that the quality is sustained in terms of structural integrity and procedural outcomes to the desired goals and objectives see (Figure 1).

### Conclusion

This conceptual paper highlights complexities of "temporal space" situation. A fundamental limitation is to capture the scope of the project and its dimensions. The strength lies to develop a framework to illustrate the alignment and interconnectivities in order to sustain quality and its standards whilst in the

transient phase to a QI improved status. The temporary project with its dimensions highlights the importance of dedicated QM champions roles and responsibilities in mediating and networking to sustain quality of standards the key to achieving common quality outcomes for the organization as well as all its stakeholders. To the best of the author's knowledge this is the first attempt from a radiographer perspective within medical imaging context to create an awareness of the importance of re-contextualizing a QM framework and its processes at the organizational level incorporating the project as part of a quality management process see (Figure 1). As stated earlier that QI is scientific process and could trigger more research on existing models and frameworks available. Could be used as a basis for conducting a longitudinal research case study using a phased approach with mixed methods to capture the transient process.

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