Chapter

Diagnostic Imaging Safety and Protection: A Collective Interaction and Decision-Making Processes and Procedures toward an Effective Health Outcome

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Abstract

This chapter will focus on the safety and protection in utilization of radiation and nonradiation imaging modalities within a medical encounter in health institutional context. The challenges of ease of access on the one hand regarding a referral versus accessing of these imaging services. The roles and responsibilities of the diverse range of professionals in the medical encounter are in ensuring that an effective decision-making is made at each point in time. The importance of communication, coordination, collaboration, and alignment is in ensuring that the care and safety of the patient is not compromised. Thus, the chore essence of provider is patient-centered care, that is, from the point of the initiation of the referral to the outcomes of an effective medical treatment and management plan. The role of the imaging investigation and its value is outweighing the risks versus harm through these chains of events and beyond.

Keywords: safety, interrelated, interdependent, distributed roles and responsibilities, collective decision-making

1. Introduction

Modern medicine is highly dependent upon high technological scientific equipment and practices [1] of which medical imaging, often referred to as a diagnostic test, is part of. The advances in medical imaging technology with enhanced image quality open the door for detecting previously unseen abnormalities of unknown relevance. According to Webster [2], imaging from surface anatomy to intrabody physiology enables the "medical gaze" to move deeper and deeper into body structures. Digitally acquired images also promote ease of access for the referrer [3]. However, technology has professional, social, and individual implications, as the availability of the latest diagnostic equipment is like a diagnostic invitation that could lead to the belief in the "gift" of knowing that would enable health-care professionals to make an informed decision [4]. Unfortunately, according to modern medicine and Smith [1], at times, the patient as a person can be lost from the clinician's gaze and advancement in patient care is not necessarily guaranteed [5].

Globally, an ongoing concern is about the effectiveness of radiation and nonradiation control measures. Increasing budgetary and financial constraints in health-care sectors and the growing consumerist movement demanding greater patient-initiated access to medical services are of special concern [6]. The justification for an imaging investigation referral or a nonreferral within in the chain of events leading to the ultimate diagnosis in managing the health outcomes lies beyond the traditional medical encounter. Whether the procedures involve exposure to ionizing radiation or nonionizing radiation, of importance is the benefit versus risks in conjunction with the clinical value of the referral, the justification of the imaging investigation requested and the actual conducting of the investigation and outcomes thereof in devising an effective management and treatment strategy that would benefit not only the health outcomes within a medical encounter but also the person.

The purpose of this chapter is to discuss the complexities of decision-making processes and procedures in imaging investigation utilization within the continuum of care processes and procedures to achieve a quality of health outcomes for the patient as a person. Where communication and interactions shaping the decisions are inherently distributed in nature. Apart from the temporary nature of the encounter, it is also integrated and intertwined within the biomedical, technological, and psychosocial dimensions. The assumption is to ensure the safety of the patient within the medical imaging context requiring a collective of decisions which are interrelated rather than isolated events that lead to a quality health outcome.

2. The health system and the timely access

Within the health system, diagnostic imaging services form an important component in terms of delivering quality professional service to health-care professionals and patients as the direct or indirect beneficiaries from the referral. The use of diagnostic medical imaging can be defined as "timely access to and delivery of integrated and appropriate radiological studies and interventions in a safe and responsive facility and a prompt delivery of accurately interpreted reports by capable personnel in an efficient, effective, and sustainable manner" ([7], p. 457).

Accessibility to these medical imaging services depends highly on the level of services provided at the various institutions. The effectiveness of these services is shaped through interactions between skilled health-care professionals and the patient and between multiple skilled health-care professionals who either work as individuals or as a group to make decisions regarding intra- and interinstitutional pathways of the referral and treatment to be followed for each individual patient. Accessing a timely service to certain imaging modalities is not always a linear pathway. In some instances, it may entail building up evidence through a graded referral from the most basic to the most sophisticated modalities based on clinical decisions. It could entail moving from one level of care to the next, depending on the availability of medical specialists, technologies [8]. A common experience of all professionals and patients is the financial boundaries and constraints. This correspond with Gibson's [9] description of "first layered approach of access to health services" aimed at cost-effectiveness and rational usage of available resources. Khan et al.'s [10] view is that the more expensive imaging services are not necessarily the most appropriate for a given clinical situation. Often, a patient's condition necessitates referral to a better resourced health-care institution for further management [11]. Then, in the absence of a central record, keeping system which includes imaging investigations may result in a re-referral for duplication of a diagnostic imaging investigation at the receiving health-care institution [12]. Regarding quality of care, it is important that the continuum of care is maintained.

The principles of justification and optimization that underpin medical practice also form the cornerstones of radiation protection [6]. On the one hand, according to Bernardy et al. [13], the quality of medical care brings value to both patient and provider when medical imaging investigation is justified and performed correctly. This investigation can be used for triaging to determine whether to refer a patient for further diagnostic tests [14]. If initial tests suggest the possibility of a condition, more costly or invasive tests may be ordered for confirmation on the basis of the possible differential diagnoses.

On the other hand, a failure of timely, appropriate clinical action following the test result can render the value of the entire process useless [7]. Medical practitioners are expected to employ the most efficient diagnostic strategies to prevent unnecessary referrals for diagnostic tests that could impact on time and resources [15]. A definitive diagnosis of a patient's condition is sometimes challenging and may require additional, unrewarding imaging examinations to improve the certainty of the diagnosis [16]. The use of radiological referral guidelines, an effective handoffs, and continuous professional development programs are essential to bridge this gap [17, 18].

Despite the acknowledgement in the current literature that health professional-patient interactions and decision-making processes regarding referral, diagnostic imaging investigations, interpretation, and communication of outcomes are complex phenomena, research in diagnostic investigations in general is distributed [8]. Effective control of ionizing or nonradiation exposure, inter alia by means of appropriate justification for every exposure, is a basic principle to be followed by all diagnostic imaging services. Each set of role players and each individual bring with them individual characteristics, skills, competencies, roles, and responsibilities. According to Webster [2], the medical gaze transcends not only at an individual level but also at a public, collective level of the regulation bodies. For instance, most health-care professionals belong to a central professional statutory regulatory body but are also governed by their institutional code of conduct and practice. An influencing or confounding factor is about financial incentives for the provider via payments by medical aids providing access to these services [9]. One way of overcoming these challenges is developing of practice-based case management. This is achieved by coordinated care management across the continuum of care by workflow mapping techniques and standardizing protocols and clinical pathways. And is followed by network interfaces between different subsystems (i.e., points of care). That is, an integrated case management platform is coordinated by clinicians as the patient navigates through the health-care delivery network [19].

3. The interrelated interdependent medical imaging encounter: decisions within a biotechnopsychosocial context

Decision-making in the health-care system—specifically with regard to diagnostic imaging investigations—occurs at multiple levels. Decision-making involves choosing a course of action to achieve specific outcomes and can occur at departmental and individual levels [17]. Within the ambit of diagnostic imaging, van Baalen et al. [20], in their study on the diagnosis and treatment of patients with pulmonary hypertension, refer to this kind of decision-making as being based on "distributed knowing." Distributed knowing implies a socially distributed process of shared meaning making among different health-care providers. Information is exchanged, collectively explored, and adjusted at the patient's different points of contact in a medical encounter. Within the health-care context, the ultimate predictor of the efficiency and effectiveness of the decision is measured by the well-being of the patient, hence the prominence given to patient-centered care.

3.1 The medical encounter

An illustration at an individual level during a medical encounter entails clinical decisions that are mostly governed by; either you have the disease or not, align with yes/no decisions. Often, these processes entail a series of interim decisions, guided at each stage to a diagnosis being present or not by minimizing uncertainty. This process still assumes there is an underlying dichotomous disease state (yes or no); this assumption could be inconclusive [21]. These interim decisions depending on the context of the encounter may be paternalistic, informed, shared, negotiated, and or a partnership process. However, these interactions should address the benefit versus risks in conjunction with the clinical value of the referral, aligning with the justification of the imaging investigation requested and the aligning of actual conducting of the investigation achieved through coordination by the medical imaging professional (competency) and cooperation by the patient mediated through text (patient records, quality of the order, and radiological report) and technology (optimally functioning equipment) to achieve an effective outcomes thereof in informing in the decision of devising an effective management and treatment strategy benefitting not only the health outcomes from a medical provider perspective but also the patient as a person.

Within the medical encounter regarding the diagnostic interaction revolves around how medical practitioners involve patients when collecting information. For example, according to Langalibalele et al., patients rely on referring doctors to provide information on the management aspect prior to the referral [12]. Not having records in this regard could lead to a decision of re-referral for duplication of investigation(s) at the receiving health-care institution. Physicians should encourage patients to describe their previous imaging examinations to help eliminate the duplication of imaging studies [16]. The dilemma is that the continuum of care is not disrupted. Often, a patient's condition necessitates referral to a better resourced health-care institution for further management [11]. If records are not centrally linked, it could lead to a re-referral for duplication of diagnostic imaging investigation at the receiving health-care institution [12, 22]. The electronic sharing of medical imaging data is an important element of modern health-care systems, but current infrastructure for cross-site image transfer depends on trust in third-party intermediaries [22, 23].

The referring doctor has the responsibility for the collection of all diagnostic information that justifies the requested radiological (radiography) examination, including information about previous exposures. Khan et al. [10] and others [24] state that in order to select imaging tests judiciously, the clinician must understand what each test can do and be fully knowledgeable about the limitations, also with regard to the available techniques. Malone et al. [6] and others [25] also refer to the use of referral guidelines or appropriateness criteria as a good practice in the process of justification. In the absence of written formal system, protocols related to the way in which diagnostic imaging investigation referrals intertwined with clinical pathways often result in what Croft et al. [21] like Croskerry [26] refers to the "gradient" of decision-making that parallels the degree of uncertainty associated with the wide variety of patient conditions, as well as to the challenge of the uncertainty about the diagnosis and the inability to stage the disease and make a choice on treatment and management.

Reasons for referrals vary, that is, to rule out a condition or to help the attending practitioner's referral decision-making. Primary care doctors commonly face the decision between ordering a test or adopting a period of "watchful waiting," requesting the patient to return later to follow the development of his or her symptoms [14, 21, 27]. To provide information to the secondary care specialist, or

instance, refers to the use of radiographic investigation in triaging the referral to a secondary care specialist, whereas Gibson [9] refers to it as the medical legitimization of the institutionalization of the patient. Langalibalele et al. [12], highlight that the receiving doctor has to be well informed, otherwise there may be a need to "re-invent the wheel" through trial and error, which has an effect on cost and time. Confirmation of normality is often important in general practice to exclude or confirm a diagnosis. In this situation, a negative result may be as important as a positive one [28].

The quick-fix approaches and head-to-toe investigations were an easy way to diagnose and served as a form of reassurance that it was the right thing to do, a phenomenon that has also been reported in the international literature [29]. Then, the old paradigm of history taking, physical examination, and provisional clinical diagnosis is being replaced by imaging investigations [30]. Geneau et al. [8] refer to time management and patient overflow associated with less communication between patient and physician, which leads to medical uncertainty, and ultimately more referrals for investigations.

Health-care professionals are also of the opinion that patients see the referral as a curative measure to the extent of a total healing of their illnesses. Perceptions like these could lead to the use of technology as a placebo for the so-called demanding patients to pacify the desire for a referral and at the same time as an incentive to prevent comebacks, instead of trying to convince patients on clinical grounds why a referral for a diagnostic imaging investigation was not necessary [31]. Murphy [32] states that myths that confuse patients and "blur the boundaries between facts and fiction" are widely disseminated because of patients' previous encounters with imaging examinations. Then, some practitioners feel they deserved an investigation, because an expectation had been created and it could affect the relationship if the patient was denied of a referral for the investigation. Therefore, it is important that when decisions are made for referral are the benefits versus harm and risks are carefully weighed against each other and in situations. It is beneficial by both the medical practitioner and the patient work together to determine how to best address the situation. The patient gets an opportunity to deliberate, clarify what is most important to them and be guided [33].

3.2 The actual medical imaging investigation and outcomes thereof

The diagnostic imaging investigation phase starts with the interpretation of the request order. An investigation can only be justified if sufficient relevant clinical information is provided on the request form [34, 35]. Information gathering is initiated by the medical imaging professional interpretation of the request form. The minimal information radiographers routinely receive about their patients prior to taking a radiographic image has also been a finding in a study by Halkett et al. [36]: the quality of the information on the request form; in the event of a mismatch between the investigation requested and the intended investigation; could result in an incorrect investigation conducted; and in some instances, the correct investigation by getting additional information from the patients themselves or by contacting the general practitioner [34]. The medical imaging professional makes the choice to accept or reject the request if needed or to modify it and continue with the investigation. The quality of the task to be performed is assessed against the quality of the request and whether the referring medical officer's question is answered [37]. The value of medical records in planning the task at hand is access to patients' previous records and guides on what you could do.

Prior to commencing this subsection, it is important to provide a brief overview on the image formation and production and the importance thereof in terms of the

inherent risks or harm versus benefits. To produce images depends on the type of modality used to acquire an image. A suitable source is required to produce the different forms of energy, such as X-rays (high-energy radiation), ultrasound (high-energy sound waves), magnetic resonance imaging (strong magnetic fields, electric field gradients, and radio waves), and radioactive substances. Within planar imaging, it would be, for instance, the voltage, current, and time which is depended on the distance and type of receptor used. For ultrasound, it would be the type of transducer used which generates the sound pulses and detects the echoes. Whereas, with MRI, it entails selecting appropriate imaging parameters like T1 and T2 and the various software available to characterize the image. To produce an image requires a suitable medium to capture these attenuated energies and convert to an analogue or digital form of a visible image on a screen to make a diagnosis. All of these depend on the ability and the capability of the imaging equipment, the competency of the operator to make a sound decision on the completeness of the investigation using sound scientific knowledge-based approach without compromising the integrity of the quality of the examination.

For example, in the case of follow-up imaging investigation, it may be modified, so with establishing the exposure technique, some factors determine the quality of the image. In the case of pathology, sometimes, the exposure technique needs to be adapted is to be consistent of the quality standard of the image produced to compare with previous images. This is governed, among other factors (e.g., the focus to film distance and positioning of the patient), by the exposure technique over which the radiographer has most control [38–40]. Precautionary measures have a positive outcome on the possible risk of exposing the patient unnecessarily to radiation. Part of obtaining an optimal quality image is the investigation protocol and procedures including the imaging parameters [41]. Established departmental quality control and assurance guidelines are essential to avoid inconsistencies in practice which may result in suboptimal imaging investigation. The patient's physical condition and capacity to cooperate in the examination must be assessed and any shortcomings must be communicated to others in the health-care team [39, 42]. Radiographers often have trouble in acquiring the desired projection if the patient is either uncooperative or immobile. The investigation is measured against the time consumed and the worth in terms of anticipated normal versus abnormal findings.

The completeness of the information required to generate a radiological diagnostic report is depended on the quality of the completeness of the request, the patient, and the accuracy of investigation performed. According to Khan et al. [10], detailed case notes and a well-conceived, ordered list of differential diagnoses are the absolute minimum to include in any imaging request to ensure that the selected imaging is warranted and to improve the accuracy of reporting. Then, clinicians should not just read the radiological report, but ought to be able to interpret the image. Misreading of images has been shown to be the most common type of clinical error [28]. According to Hardy and Barrett [43], a referral for a diagnostic investigation stems from a clinical examination, based on the clinical signs and symptoms. The provisional diagnosis can be confirmed or refuted depending on the clinician's ability to interpret the images. Therefore, in all circumstances, the decision to do a radiographic investigation should be influenced by the ability to interpret the resultant image [27]. It is the responsibility of the treating clinician to determine whether the anatomic anomaly revealed by an imaging study is related to the patient's symptoms [10]. This could be since in clinical practice "to recognize pathology in a 'sea of normals'" is quite difficult and "[t]he prevalence of pathology can contribute to a 'context or prevalence bias' in decision making" [44]. It is recommended that collaborative radiologist-medical practitioner educational efforts to help enhancing medical practitioners' knowledge could be useful. Another option could be use of decision aids [45].

3.3 Patient autonomy

Patient-centered care puts the patient as partner and collaborator in the diagnosis and management of his or her own health conditions. Patient-centered care is intricately linked with notions of shared decision-making and the patient's active participation in all processes of the medical encounter, ranging from the provisional diagnosis to the choice of diagnostic investigations (including diagnostic imaging), the discussion of provisional findings, and the design of a management plan [46–53]. In the doctor-patient consultation, there has been a steady shift from paternalism toward a focus on the needs and the multiple voices of providers and the autonomy of the patient as being at the center of his or her own care [54]. When information is passed on, an individual's language preferences and level of literacy should be considered [50], including the ability to negotiate and coordinate care [47]. One way of potentially solving language discordance problems and reducing disparities in care is to provide language interpreters [55] for the patient to understand what is going on and could engage effectively [56] to bridge this gap by use of comprehensive language and modify some of the terminology through metaphors [57]. In communicating the events frequently, little or no mention is made of radiation risk [6, 58]. The argument is the complex and specialized nature of the units used to quantify radiation exposure, which is not conducive to effective communication with the public and even with health professionals. Patients have the right to know of the radiation risk and it is the duty of health professionals to inform them [6]. This contributes to empowering patients to make informed decisions especially in the case of high-dose procedures, where open discussion and shared decision-making would facilitate the process. Radiologists and their registrars had an expectation that it was the attending medical officers' responsibility to communicate risks and benefits. This type of consultation is also dependent on the institutional culture which promotes active participation or where patients are expected to behave like "good" patients and passively accept services and attention allocated to them [9].

Another important factor is the potential influence of consumer awareness and demand on the patterns of utilization of diagnostic imaging services. Patients may demand imaging procedures for various reasons: they may have acquired information from the print or electronic media or by word of mouth; or they could believe that they should receive specific imaging services for particular symptoms, based on their past experience. Most patients are not financially liable for imaging services received. If the physician is reluctant to refer them for diagnostic imaging, they may interpret it as insensitivity on the part of the physician who withholds procedures that they are entitled to. Furthermore, many patients have little understanding of indications for or benefits of imaging procedures and the cost involved. Radiation doses and their associated risks, and the protection procedures in place are also poorly understood [6, 8, 16, 59, 60]. One of the gaps in the current knowledge on the functioning of the health system is the extent to which patients are aware of their rights regarding participation in the planning of their treatment and diagnostic processes, including knowledge of radiation risks. According to Geneau et al. [8], patient demands influence physicians' behavior. Espeland and Baerheim [29] found that medical practitioners complied with strong wishes from patients in cases where the clinical indication for radiographic investigation was in doubt, little else could be done, the consultation was difficult, or time was scarce or out of moral obligation. This created a false sense hope that something could and had been done. A choice was made to refer the patient without the knowledge of what the patient's desires were in terms of monetary incentives. The types of misconceptions of passive demands or expectations may have been created as a result of the "quick fix" approach, for instance, like, let us rather do the X-ray, it is easier. Khan et al. [10] blame physicians for contributing to the idea

that an accurate diagnosis is only possible with the aid of an image. The above view corresponds with Balaqué and Cedraschi's [61] contention that "[p]atients tend to consider technological investigations as more trustworthy than the clinical examination." According to Borgen et al. [62], "normal findings will reassure the patient" (p. 197) and treatment, gives patients the feeling of being taken seriously.

4. The professional confined spaces yet inherently multiprofessional

According to Mørk et al. [63], shared practice by its very nature creates boundaries (p. 14), and experiences may be modified and extended in the light of experiences in their discipline fields. For example, boundary blurring between practices of radiologists and surgeons necessarily evokes conflicts and that each group wants to claim ownership to the treatment and to the eligible patients [63]. Powell and Davies [65] describe professional territory as "the differences in professional identities and core beliefs" and the significant impact of professional identities and boundaries on how individual health-care providers from the same or different profession work with each other—something that has implications for the care that patients receive. They also refer to the radiology profession seeking to lay claim to particular fields of knowledge and to assert their jurisdiction over particular tasks. In a study by Johansen and Brodersen [66], the fear of losing demarcations with regard to resources and organizational quality is also a concern between medical specialist professionals and radiographers where tasks were taken over or shared. Similar to Stephens and Carmeli [64], Hilligoss [67] studied that existing personal relationships, differing levels of experience, formal power structures, and hierarchies have numerous effects on quality of care or services. Lack of information and understanding of professional roles and responsibilities, meaningful communication, and relationships are also reported in the literature [1, 47]. The radiographer's role in theater is confined to a task of taking images, but usually there is no direct cooperation between, for example, operation nurses and radiographers [63]. The power of relations in the hierarchies leaves very little space for radiographers to participate in decision-making processes dominated by other professions. Medical practitioners see the completion of the request form as a medium of instruction to perform a job. A radiologist should—before accepting an examination request—be aware of the clinical condition of the patient and the preceding examinations, to be able to make appropriate decisions [35] in the event of not having the full picture of the interactions that had taken place prior to the referral. They were respectful of the doctor-patient relationship and did not want to be the confounders, which could often result in conflict. Lewis et al. refer to unethical situations relating to the justification of radiographic examinations and radiographers' feelings of uncertainty regarding their legal and moral responsibilities [68]. Olivier et al. see radiographers as often being in the forefront where patients want to know from them what is wrong [69]. They emphasize the importance of finding the appropriate words that will keep them within their professional boundary. If the radiographer is not able to disclose results to patients, it does not afford them much professional autonomy in their working environment [50]. Often the patient is at risk of not been communicated too.

The biomedical and psychosocial worlds cannot be treated as isolated components [58]. These authors refer to the different languages and cultures of these worlds—different ways of knowing—that both contribute to the establishment of overall care of the patients, inter alia about efficient use of resources, the quality of services, and provider and patient satisfaction. These authors refer to the predictability existing in the biomedical world with its focus on anatomy and physiology with a view to diagnose and institute effective treatment to bring the human body

back to its "normal state." This is in contrast with the greater unpredictability and complexity inherent in the psychosocial nature where cognition, emotion, and behavior function more at a normative level needed for adaptability and flexibility. **Figure 1** represents an attempt to interpret the biopsychosocial interactions within "a bigger picture" [58] that portray the nonstatic nature of health-care provision with ever-changing and emerging ways of treatment and health management interaction with recent technological evidence [51].

There is also a growing body of knowledge on the interpretation of biotechno interactions in the ambit of medical technoscience; for example, relations between the analog and digital technological worlds of communication and interactive processes, and the fusion between diagnostic and therapeutic work [47, 63, 71].

Figure 2 depicts the role of information and interpretation in diagnostic imaging decision-making. At each point of contact, four interrelating activities with the focus on information take place: information gathering, information verification, information processing, and information exchange. All these activities also play a role in the final transformation of information, that is, integration and interpretation needed for completing the assessment-treatment-expected outcome sequence [70]. This is a continuous cyclical circular process that plays itself out throughout the patient's journey.

The decision-making and diagnosis processes are also characterized by information and knowledge inputs and outputs that contribute to an awareness of the bigger picture and which Wilson [72] considers as a basis for decision-making processes that could lead to improved operational, economic, or clinical benefit

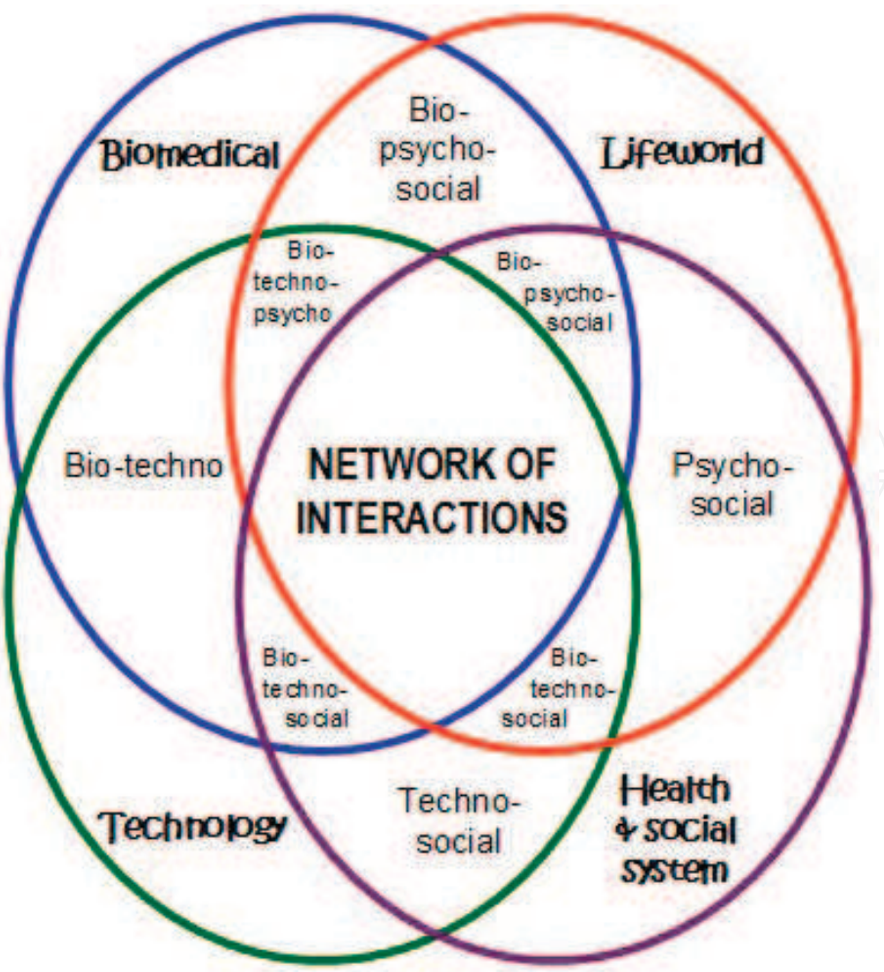

Figure 1.
The biotechnopsychosocial network of interactions.

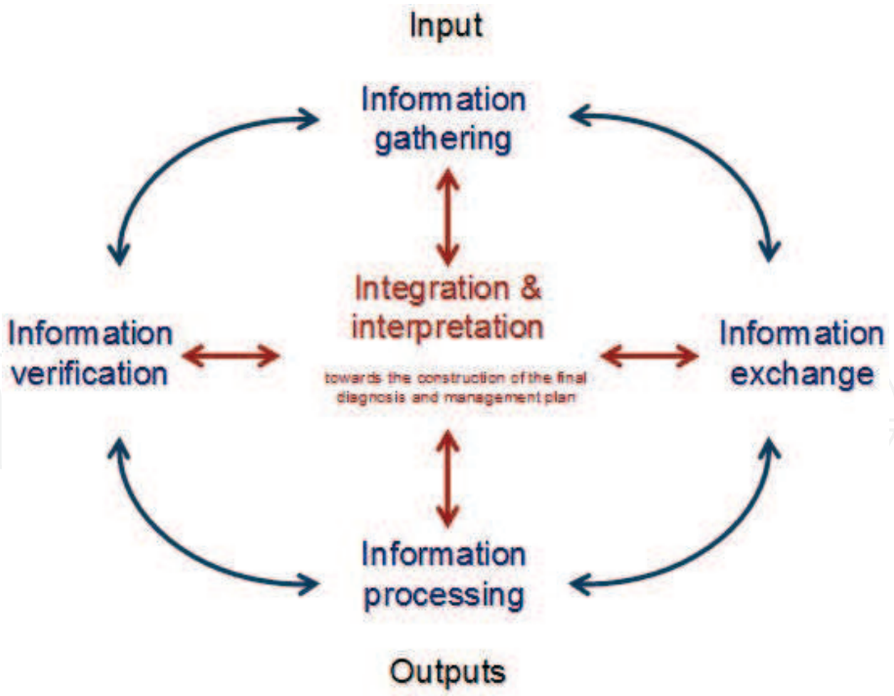

Figure 2.
The role of information and interpretation in diagnostic imaging decision-making.

[73]. According to Paul and Reddy, interpretation draws on mediation tools and embedded contexts such as work practices, cultures, organization structures, and interpersonal relations [74].

To construct and reconstruct a diagnosis and management plan to improve patient outcomes, information in the form of empirical evidence—the "right" piece of information—needs to be gathered during a medical consultation and by means of diagnostic tests [75, 76]. Pivotal questions are "what information to gather?; which diagnostic test to perform?; how to interpret and integrate this information to draw diagnostic conclusions?" ([75], pp. 26–27).

Medical imaging procedures whether diagnostic or interventional, for instance, draw the following together: the system; diverse but interconnected communities of practice; the patient; technology; drugs; clinical interventions; and many other elements [77]. All of them are interconnected and interrelated, "yet each irreducible to the other."

Regarding diagnostic imaging, Murphy [78] distinguishes between "hard technology" (equipment) designed to diagnose and treat disease and "soft technology" that includes the social interactions of radiographers with patients and other health-care professionals. The radiographer acts as an interface between the patient and biomedical health, technology, and humane health care, referred to as "technology-in-practice" [79]. The coordinating power of health technologies is concerned with how technologies can bring together or break apart the pragmatic worlds as social actors navigate in our everyday lives [80]. Reeves and Decker [81] refer to the "technology-human dualism" with which the profession of radiography is faced because of the short encounter and once-off interactions with patients discouraging emotional investment. Within the imaging context entails an acknowledgement of the situation-specific encounter between individual patients and health-care professionals where patient needs and desires do not come to the forefront instead the anatomy and physiology [70].

Some of these combined terminologies referred to above are well described in the literature, whereas others need further exploration in future in terms of the feasibility of their application and their relations to quality of patient care, patient and provider satisfaction, and/or efficient use of resources [70]. The ever-shifting

boundaries between different worlds in which health-care providers and patients are situated and the interconnectedness between role players also has particular implications for the formation of professional boundaries, and identities illustrating the temporariness of encounters within the continuum of the care is the challenge of ensuring the safety of the patient as a person.

5. Conclusions

In conclusion, the building blocks for deciding on the most appropriate investigation of choice with minimal risk and optimal benefit in terms of management and treatment strategies are highly dependent on the organizational structure, its institutional members, the quality of the referral, the investigation itself, and the outcomes thereof. The process evolves as the events unfold, based on the actions that are taken and highly dependent on who is communicating with whom in that institution or with a referral institution and what is communicated with whom. The processes and interactions are also more dependent on what patients present with and how patients present their condition. It calls for a risk-centered approach to many syndromes and chronic conditions [6] and parallels proposals that public health should be organized around achievable outcomes rather than disease categories. Such a framework shifts the focus of clinical practice to improving outcomes for patients in their total biological, psychological, and social environment and away from an exclusive and narrow focus on underlying disease as the determinant of outcome. The underlying "disease" is often a continuous distribution of probability for future health states [21]. This encounter entails the patient together with a diverse range of health-care professionals to collectively align their decisions in ensuring that the safety and care of the patient as a person is not compromised in the delivery of health-care services.

Conflict of interest

None.

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