



Personalizing Radiation Protection in Medical Imaging: An Islamic Approach

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Abstract

This paper aligns the Islamic worldview and other Islamic essences to radiation protection. Current guidelines on radiation protection lack in terms of punitive measures as well as the existence of differences in addressing non-compliances to radiation protection practices. The Islamic stance is non-separation of religious matters from one's daily life, including in the professional environment. In this paper Medical imaging practitioners are introduced to three elements of the Islamic worldview and the other essences that emerge from their discussions. Spirituality, religiosity, the concept of retribution, *Maqasid* and *Qawaid Al-Shariah* and guiding principles of *Ihsan, Itqan, Fitrah and Istiqomah* can help shape the Muslim practitioner to accept radiation protection as more than a professional obligation. The onus upon the Medical imaging practitioner to consolidate his practice should be seen within the context of motivation and deterrence that those essences carry. Personalizing radiation protection thus becomes a personal Muslim professional virtue.

Keyword: Radiation protection, Islamic perspective, Professionalism, Medical imaging

Abstrak

Kajian ini menyelaraskan pandangan dunia Islam dan esens Islam yang lain bagi membangunkan perlindungan radiasi. Garis panduan semasa yang berkaitan dengan perlindungan radiasi mempunyai kekurangan dari segi ukuran punitif serta adanya perbezaan dalam menangani ketidakpatuhan kepada pelaksanaan membangunkan perlindungan radiasi. Pendirian Islam mempraktikkan agar tidak memisahkan perkara agama dari kehidupan harian seseorang, termasuk dalam lingkungan profesional. Kajian ini, pengamal perubatan pengimejan diperkenalkan kepada tiga elemen berasaskan pandangan dunia Islam dan esens lain yang didapati hasil daripada perbincangan mereka. Kerohanian, keagamaan, konsep pembalasan, *Maqasid* dan *Qawaid Al-Shariah* dan prinsip-prinsip panduan *Ihsan, Itqan, Fitrah dan Istiqomah* dapat membantu membentuk pengamal Islam untuk menerima perlindungan radiasi melebihi daripada tanggungjawab profesional. Tanggungjawab terhadap pengimejan perubatan bagi menyempurnakan praktiknya harus dilihat dalam konteks motivasi dan pencegahan yang dibawa oleh esens tersebut. Memperibadikan perlindungan radiasi itu menjadi kebajikan bagi seorang profesional Islam.

Kata kunci: Perlindungan radiasi, perspektif Islam, Profesionalisme, Pengimejan perubatan

Introduction

Amidst the technological advancements in ionizing radiation-based imaging modalities, Medical imaging has yet to free itself from its conflicting natures; as a diagnostic tool and a source of radiation risks. An unpublished study by the present author in September

2017 shows that discussions to matters related to radiation protection is still being actively undertaken. The study examined articles indexed in the online database Scopus that have the keyword "Radiation protection" in the article titles. The findings showed that there were 348 articles under "Medical and Health" category, published from 2014 till 2017. The discussions can be broadly be classified into Dosimetry, Dose effects, radiation protection management, education, training, awareness, innovations, models for radiation protection, studies of radiological practices and ethical issues in radiation protection. These publications highlight the prevailing concerns among practitioners in an area of

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specialization that has its contributions in the detection, localization, characterization as well as monitoring of medical abnormalities.

The wider use of radiation in medicine (Rehani, 2015) and the associated risks they pose requires the Medical imaging fraternity to be in a continuous state of updating knowledge that serves to limit the social, biological and economic effects of those risks. Medical imaging professional bodies have come up with various ethical guidelines or standards of professional practice that were aimed to ensure the promotion, implementation and monitoring of radiation protection measures are appropriately undertaken. One such document, the Bonn Call for Action Joint IAEA WHO Position Statement on the Bonn Call-for-Action (World Health Organisation, 2012), recognizes the need to identify gaps in current approaches and tools in radiation protection. This in turn leads to a review to improve this particular aspect of safety in medicine. This specific document among others highlights initiatives that could enhance the practice of radiation protection. They include the implementation of principles of justification and optimization, strengthening radiation protection education and training, enhancement of safety culture in healthcare, reinforcing safety requirements, fostering radiation benefit-risk-dialogues and promote strategic research agenda for radiation protection in medicine. It can thus be appreciated that holistic radiation protection will require the involvement of a multitude of approaches and the different levels of humanistic participation; individuals, administration and organisations.

However, these ethical guidelines could not guarantee adherence on the part of the practitioners. Taken as “soft law”, these guidelines have limited legal standings (Campbell & Glass, 2001). Various “Standards of practice”, “Code of practice” and “Code of ethics” remains as guidelines that somehow lack in terms of the punitive measures against non-adherence to the recommended safe practices. Differences in administrative measures towards the intensity and seriousness of non-compliance, as well as the degree of reprimand, could exist between the authorizing bodies. Cultural influences, political dominance and administrative biases could have also contributed to those different interpretations. Without a strong administrative stance, the adherence to the application of radiation protection measures during the conduct of radiological examinations could be left to personal choices. Any failure of Medical imaging practitioners to observe and uphold safety standards could be interpreted as a loss of personal ethical attribute.

An important feature of professional guidelines is their emphasis on professional values and morals that are recognized as crucial factors in ensuring safe

practices. Ideally a practitioner’s professional and personal values should be seen as one or the same. Dichotomy between them could result in differing standards in conduct. An undesirable consequence could give rise to conflicting approaches towards safety between practitioners. Personal biases towards radiation safety will be a highly undesirable attribute if those biases occur within the individual practitioner.

This work is an extension of the work by the author on Islamic perspectives in Medical imaging (Zainul, 2015). The work concluded that there is a dearth of Islamic perspectives being addressed in this sub-specialization in medicine. The findings from the said work prompted the author to present a dimension of safety which is unique to medical imaging. The author had searched for works on radiation protection and Islamic perspectives by other researchers, taking into consideration a lapse of two years since his last publication. No such publications can be found. Thus this work attempts to fill the void.

The organization of this paper presents an overview of radiation protection, followed by discussions that relate radiation protection to Islamic essences. This is done to re-align the mind of the Muslim Medical imaging practitioner to value radiation protection as a religious obligation vis-à-vis professional obligation. This paper contents that the individual practitioner needs to constantly reinforce his obligations and responsibilities towards providing a practice that is safe and up to date. The right of the patients to receive Medical imaging service that is safe and current is to be honoured by practitioners.

Decisions on radiation protection practices by practitioners are bioethical decisions. In this respect, Hogan (2009) feels that it is crucial for practitioners to be sensitive to ethical questions, viewing those questions from the perspective of social justice. The author reiterates that those questions should not be left to the philosophical or theological experts. A distancing stance by practitioners to align the philosophical, theological and religious dimensions to the bioethical decisions could merely mean an extension of the secularization agenda.

While Hogan (2009) presented the Christian approach of non-separation of issues in bioethics from social justice, this paper guides Medical imaging practitioners to the non-separation of clinical decisions, involving radiation protection to the Islamic religious dimension. Islam pays special emphasis on the roles of individuals towards themselves and the community. The religious approach highlights the elements of safety in the practice from predominantly the Islamic worldview. From this perspective, other Islamic essences emerge, complementing the discussions that could pave for the appreciation of

safety that aligns one's spirituality or connectedness to God (Allah). This is followed by reinforcing the safety initiatives through the appreciation of the Islamic worldview, the application of the *Maqasid Al-Shariah* (مقاصد الشريعة) and *Qawaid Al-Shariah* (قواعد الشريعة), depiction of Islamic values and morals as well as accepting the concept of retribution. To accept radiation protection in line with the concept of *Ibadah* (عبادة) or worship would also be instrumental in shaping the Muslim practitioner to accept the concept of radiation protection as a Muslim personal attribute. The onus is upon the Muslim practitioner to preserve safe practice in the field of Medical imaging that deals with saving lives and quality of life.

Overview of Radiation protection

Concerns over the health effects of radiation on humans can be traced back to as early as 12 months after the discovery of X-rays in 1895 (Clarke and Valentin, 2008). The Mackenzie Lecture (Rollerstone, 1927) presented concerns of the effect of radiation on patients and staff. Conjunctivitis associated to radiation exposure was reported in 1896. Fifty four cases of cancer that were attributed to radiation were reported in 1911. The lecture also highlighted several symptoms of radiation effects. They include malaise, lassitude, nausea and loss of appetite. Other recognizable effects then were diarrhoea, abdominal distension, cardiac failure and fatality. In the same publication, the pioneering efforts towards establishing safety standards was undertaken by a concerned group of scientists in 1915, followed by an International X-ray Unit committee in 1925. This eventually led to the setting up of the International Commission on Radiation Protection (ICRP) in 1928 (Clarke and Valentin, 2008) which functions to this day. This organization is responsible to make recommendations on how to effectively manage radiation and the risks it poses.

The general objective of radiation protection is to protect man and the environment against the risks of ionizing radiation. While the specific objective of radiation protection in Medical imaging is to limit radiation risks to patients, staff and the general public; taking into consideration the social and economic factors. These objectives were derived in view of the risks of radiation to humans. As reported by Rollerstone (1927) the effects of radiation are multifaceted. The term "radio-sensitiveness" appeared in this publication. This suggest the apparent different intensities in the effects of radiation, as well as susceptibilities to those effects based on metabolic rate, types of cells, production of aplasia in bone marrow, gastro-intestinal lesions and even the colour of the hair and skin! A prominent work "Law of Bergonie and

Tribondeau" in 1906 outlined that radio sensitivity is more prominent in stem or immature cells, younger tissues or organs, cells with higher metabolic activity and tissues that exhibit greater proliferation and growth rate (Forshier, 2012). Radiation effects are further divided into somatic and genetic effects. While somatic effects appear in the person exposed to the radiation, genetic effects appear in the offspring. A further classification divides the effects into deterministic and stochastic effects. A certain threshold level in the radiation exposure is required before the deterministic effect is visible. For example, radiation burns. There are concerns with stochastic effects. These effects do not have a threshold value for them to occur, and their probability to occur, but not the severity, increases with amount of radiation exposure. The uncertainties presented in this paragraph could present a challenge to the practitioner in accepting radiation protection holistically, or otherwise.

Rationale for radiation protection

The presence of radiation cannot be appreciated by the 5 senses: sight, hear, smell, taste and touch. This fact is presented in the light of the discussions presented by Isham (2017) where the scientific fraternity insisted that all theories must be proven through these physical sense observations. This led to the conflict in attempts to align the non-physical to the physical dimensions, the spiritual to the so-called science and the men of religion to the men of science. To scientists, the failure to relate the existence of any physical dimension to the 5 senses and to speak of the nonphysical world is deemed as gibberish, nonsense or absurd. To the author, this stance in limiting human knowledge only to the physical world, devoid of ethics and spiritual will pave the way to disaster.

The theory with radiation will prove that the above insistence by scientists is flawed as radiation does not meet those scientific criteria; the use of radiation in the medical field does not satisfy the five observational senses. The theory behind the existence of radiation and the risks it poses, though not supported by those criteria, is supported by the manifestations of their existence. The ability to view images of the internal organs of the body is a manifestation of the existence of this imaging media. The strong association of the effects of radiation to humans, for example cancer and cataracts, is strong evidence to dispel the need for physical sense observation held by the scientific fraternity. On this note, the application of the concept of the Unseen in Islam (the presence of the unseen God, the angels and the Hereafter) could be re-examined by relating to the discussion on radiation. The presence of radiation is real, the images are real and the risks, within a certain level of acceptance are real. The phrase

“within a certain level of acceptance” refers to the probabilistic nature of manifestations of effects of radiation in certain individuals who were exposed to the radiation as elaborated earlier.

The rationale for radiation protection is enhanced considerably with information technology. Accessibility to information, especially via the internet, has given the avenue for the general public to gain information about the possible effects of radiation. The concerns to the use of the Atomic bomb on two Japanese cities in 1945 may not have created enough anxiety to the masses then. This is simply due to the fact that the general public may have not followed the discussions due to lack of accessibility to the discussions. The Three Mile Island nuclear accident in 1979 did not raise health concerns (World Nuclear Association 2012). However, the Chernobyl nuclear reactor disaster in 1986 that killed 28 workers on site (United States Nuclear Regulatory Commission, 2013) and the Fukushima incident in 2013 may have increased the public perception towards risks of radiation since the population of these two sites had been evacuated and prevented from returning to this day. The general public may not know the differences in the characteristics of the radiations involved in these episodes compared to those used in Medical imaging, nevertheless their anxiety levels could have increased. Further researching on the internet may provide the general public with the knowledge of those effects, ways to limit those effects and the professional obligations upon the practitioners to limit those risks. The general public is now equipped with the knowledge of their rights with respect to protecting themselves from the effects of radiation.

Observing the rights of the patients and meeting patients' expectations are two concepts in the healthcare scenario. Among others the rights of the patients include preservation of their privacy, confidentiality and informed consent. It is also their right not to be involved in research. Their right to expect from the practitioner a practice that is safe and up to date will constitute the application of radiation safety measures that are evidence based. In Medical imaging, differences exist in the conduct of radiological examinations. These are attributed to differences in patient's physical, physiological and psychological characteristics, differences in system specifications within the same type of imaging modality and differences in the physics of image generation between different imaging modalities. These differences require the practitioner to individually tailor the examinations, and the associated radiation protection approaches to the given patient. Elements involving critical mindedness are expected

and steps to apply individual tailoring must be based on evidences obtained through research.

Radiation protection principles

Radiation protection practices in Medical imaging begin with the justification of radiological examinations. This refers to the request for a particular radiological examination on a patient is made on informed clinical decisions by the Clinician. Closely related to this is the concept of “benefits against the risks”, whereby the benefits of reaching a diagnosis outweighs the risks associated with the radiation used. The Medical imaging practitioner is expected to support these considerations through the application of the concept of ALARA (As low as reasonably achievable). He exercises this concept by manipulating the imaging parameters through the application of optimization. Within the Medical imaging scenario the concept of optimization deals with the balancing act involving the technicalities, image quality, radiation dose (safety) and economics. Good image quality is interpreted alongside the concept of adequate imaging, focusing the quality to that of diagnostic quality. The radiation protection initiatives will also require the practitioner to apply the 10 or 28 day rule on women of child bearing age. The conduct of the examination will also adhere to the protection principles of Shielding, Time and Distance. Radiation dose reference levels (DRLs) in the various radiological examinations have been documented to assist positively to ensure radiation dose to patients are within acceptable levels.

While the prevailing discussions are concerned with the safety of the patient, an important aspect that should not be overlooked is the need to reduce the radiation to the staff, in particular the Medical imaging practitioner. Practice guidelines are available to guide the practitioners on standards of good practice. The concept of Maximum Permissible Dose (MPD) has been used to ensure that the radiation doses received by the practitioners and the public are within acceptable levels. For radiation practitioners, the occupational exposure is taken at 20 millisieverts (mSv) per year in any period of 5 years. While this amount is generally accepted worldwide, questions had been raised as to whether genetics and body sizes, as evident between the different geographical demographics, had been taken into account in the determination of the MPD.

To summarise the above discussions concerning radiation protection, it can be concluded that the importance of the concept to the Medical imaging services and the practitioner cannot be denied. The differences in administrative measures to penalize non-adherence, the state of radio sensitivities of organs, the probabilistic nature of occurrence of stochastic effects, the critical mindedness in optimization initiatives, the

anxieties of the patient and general public concerning radiation risks and the uncertainties from within the Medical imaging fraternity to the concept of MPD could be burdensome to the practitioner. Thus the rationale for radiation protection is greatly intensified since its importance or relevance is not only confined within the medical imaging departments. This could de-motivate the practitioner in addressing radiation protection holistically. The ensuing discussions will be directed towards accepting radiation protection from the realms of Islamic teachings and practice.

The Muslim Medical imaging practitioner

A Medical imaging practitioner is a member of the healthcare fraternity. He is recognised as one with the specialised body of core knowledge in Medical imaging. With the acquired knowledge, skills and competencies, he is expected to practice within his capabilities based on accepted practice and guidelines. He promotes, integrates, disseminates existing knowledge while continuously acquires new knowledge through the various educational platforms. Exemplary traits include the various capacities as facilitator, mentor and role model to students and colleagues. He remains conducive to establish and sustain teamworking for the common good in patient outcomes while maintaining a sense of autonomy in the conduct of most examinations. He possess a strong commitment towards good patient / client centred care and ensures his practice is current with an affinity to recognise, respond and act decisively to any types of clinical emergencies. This consolidates one's understanding of the overall role of the practitioner within the health and social care services as well as in health promotion and education.

A tradition from the Muslim educational background is the concept of '*Ijazah*' (إجازة). The use of this term is rather common in Malaysia, especially to denote those who have completed their undergraduate studies. Though it is originally directed to the doctorate, the Arabic term '*ijazat attadris*' (إجازة التدريس) carries the important meaning "license to teach" and later to include "license to issue legal opinions" (Makdisi, 1989). The significance of this "license to teach" in Islamic pedagogy is closely related to a recognition placed upon a graduate as qualified to transmit a given subject to his own students (Idriz, 2007). In other words, the term '*Ijazah*' is seen within the context of a permission or indication that one has been authorised by an authority to teach a certain subject. The spirit that it conveys in the term "authorised" is synonymous with certified, sanctioned or approved to practice. Perhaps the term recognition will be more appropriate to describe the overall burden of trust that follows with the authorisation to practice. To teach may invoke one

to contemplate on the following synonyms, among others, impart, explain, demonstrate, communicate and show. These expectations can somehow dilute the selfishness that one might harbour with the personal glory that could be influenced by the personal glory behind the recognition bestowed earlier. To be able to practice radiation protection holistically will be a testament to the recognition mentioned earlier.

The Muslim practitioner is now drawn to the concept of the original agreement. Upon his employment he agreed to undertake the responsibility as a Medical imaging practitioner under the terms and regulations specified in the offer letter. Upon accepting the offer to be employed he has come into contract or agreement to the stipulated terms and conditions. Islam honours agreement, thus a Muslim must honour the agreement. He should be cautioned to the Qur'anic verses 61:2:

"O ye who believe! Why say ye that which ye do not?" and 8:56, *"They are those with whom thou didst make a covenant, but they break their covenant every time, and they have not the fear (of Allah)* (Abdullah, 2009).

Some Islamic perspectives in Islam can be applied to the Muslim practitioner. Firstly, he should be aware of the concept of Vicegerency and the purpose of his existence on Earth. Among the purposes include using the resources that Allah has provided on earth to benefit mankind as well as to ensure justice is served as indicated in the Holy Qur'an 2: 30 and 38: 26. Next, he needs to align himself to the concept of the Islamic worldview, the *Maqasid* (Objectives) and *Qawa'id* (Principles) *Al-Shariah*. These concepts address the Islamic stance on the sanctity of life, perceptions towards ill-health, prevention of further harm and to provide relief. The *Maqasid* perhaps needs to be given serious considerations in relation to the service that the practitioner gives in relation to the preservation or protection of religion, life, mind, progeny and wealth.

The Islamic Worldview

The American Heritage Dictionary of the English Language (2000) describes a worldview as "the overall perspective from which one sees and interprets the world" and "a collection of beliefs about life and the universe held by an individual or a group". Muslim scholars agreed that the principles of the Islamic worldview are predominantly governed by the Holy Qur'an and the *Hadiths*. Several interpretations of what constitutes the Islamic worldview have been discussed by Muslim scholars. Mohamed Aslam (1997) outlines four elements in the Islamic worldview. They are the Concept of Tauhid (التوحيد) (theism), (the Unity and Oneness of God), the concept of *Khilafah* (الخلافة)

(vicegerency), and servant of God, the concept of nature / Universe and the concept of Deen (دِين) (religion). Meanwhile Ragab (Mohd. Yusof 2006) presented the principles in the Islamic/ Tauhidic worldview that include (i) the unity or Oneness of Allah, (ii) the unity of creation, (iii) the unity of truth and knowledge, (iv) the unity of life and (v) the unity of humanity. Irrespective of the minor differences that one would encounter in the principles of the worldview in those various works, the main principles remain relatively the same. It is to be reiterated at this point that the differences that exist in those works are within the context of the discussions that prevailed. Al-Faruqi and Al-Faruqi (n.d) reiterate that an obedient person, who subjects his life to those principles, seeks to have all his acts to conform to the divine purpose. The Islamic worldview is based on three fundamental principles. Abdullah and Nadvi (2011) included *Adalah* (عَدَالَةٌ) (justice) as one of the principles of the worldview. The later authors hold the opinion that collectively, these principles not only frame the Islamic worldview, but they also constitute the fountainhead of the objectives and the strategy of Man's life in this world. The present author argues that it would be justified to align and present the applications of these principles to the concept of radiation protection.

The concept of Tauhid

The first principle in the Islamic worldview lies in the Muslim's submission to the Oneness or Unity of Allah (God). This is manifested in the *Kalimah Shahadah* (كَلِمَةُ الشَّهَادَةِ), the profession of Islamic faith. It is the first article of the pillar of Islam and it acknowledges the Unity of Allah and the Messengership of Prophet Muhammad (Denny 2006). This is further enhanced by the first pillar of *Iman* (faith), Belief in the existence of Allah that tests the Muslim in accepting the existence of Allah within the realms of the concept of the Unseen. This concept has created a lot of debates to those who rely on scientific evidence to establish His existence. The Muslim practitioner accepts the existence of his Creator in the same way science has acknowledged the presence of the unseen characteristics of X-rays, Gamma rays, Ultrasound, magnetic fields and radio waves that are used in Medical imaging. The presence of these scientific, yet unseen elements is appreciated in their contribution towards the generation of medical images that reveal hidden features within the human anatomy. Not forgetting the unseen medical risks that they carry, until they manifest themselves. On the contrary, the presence of Allah can be seen in His creations within the environment. He relates to His creations of the heavens and earth in the Holy *Qur'an* in verses 67:3, 20:4 and 30:22 (Abdullah, 2009).

While acknowledging the existence of his Creator the Muslim practitioner takes steps to maintain his spirituality or connectedness to Allah, the Unseen Being. One's spirituality is associated with the obedience and compliance to His Will. Spirituality is reinforced by the performance of daily deeds and other religious rituals, as outlined by the Islamic primary sources. These actions describe the Muslim individual's religiosity (*Riyad-us-Saliheen, Hadith 1*). The Islamic essence dictates that spirituality and religiosity are inseparable; connectedness or the relationship to Allah is complemented by the religious rituals. The term *Habluminallah* (حَبْلٌ مِنْ اللَّهِ) refers to one's effort in maintaining the vertical relationship with Allah. Acts of *Ibadah* (worship) maintain this relationship.

In Islam, the act of worship is not to be construed only in the five times daily religious ritual of prayer, the yearly ritual of fasting and alms or the once in a lifetime performance of *Haji* (pilgrimage). Worship is also seen in responding to all that Allah has decreed as "doing good and refraining from all that is evil". Extending this to the professional life of the practitioner his professional obligations therefore, must be aligned to the concept of worship. The professional expectations in applying radiation protective measures fit into the above decree. Thus, it is imperative that the Muslim practitioner aligns his mindset towards applying the concept of radiation protection, as a form of *Ibadah*.

The approaches towards radiation protection that are outlined in the various professional guidelines can be taken as acceptable to be practiced by Muslim practitioners. Islam does not readily reject everything that does not originate from Muslim communities; as long as there is no evidence of transgression to the Creator. Current professional guidelines on radiation protection serves to benefit the masses (patients and others) and there is little to suggest anything that goes against the noble principles that Islam champions. Thus, by observing those guidelines will constitute the "right thing to do". The intention to follow those guidelines in the spirit of "doing good as Allah has commanded" is by itself an act of worship.

The concept of Khilafah (الْخِلَافَةُ) (Vicegerency)

The second principle in the Islamic worldview is the concept of vicegerency. This principle is closely associated with the term *Habluminannas* (حَبْلٌ مِنَ النَّاسِ) a term to describe the horizontal relationship of the practitioner to his fellowman and the environment (Faruqi, 2007). Reflecting upon his professional and personal obligations he ensures the rights of his patients through safe practice. He preserves the rights of his peers by not bringing the profession into

disrepute through his practice. He meets the expectations of his superiors by returning the trust and the recognition to practice that lie behind his appointment or employment as a practitioner.

Man is created with the sole purpose to serve his Creator. Human beings are given the gift of the 'aql (عقل) (intellect), a characteristic not given to other creatures. With the given intellect he is also reminded of the honour that has been bestowed upon him as outlined in the Holy Qur'an 17: 70. This gift facilitates for informed decisions that will derive optimal benefits to mankind and self, refrain from evil, mischief and destruction, uphold justice, acquire and disseminate knowledge as well as inculcating noble values and virtues. The practitioner uses the God given intellect and the high reasoning capability to apply all possible means to reduce or limit the negative effects of radiation upon exposed individuals. Failure to apply radiation protection principles and thus contributing to additional risks to patients constitutes a non-appreciative stance towards a gift from Allah and a non-responsive approach of being one with the intellect.

The concept of *Adalah* (عدالة) (Justice)

To apply justice is the third element that the Islamic worldview outlines. The philosophical definition of the term 'justice' is usually seen from moral righteousness, fairness or upholding what have been deemed or accepted from the point of law. However, from the Islamic point of view, *adalah* (justice) is a concept that has a distinct directive; placing things at the right place. The straightforward Islamic definition of justice simply place that all things have to be accorded the right treatment or response. Returning trust and honoring the rights of the patients are among the professional attributes that are expected in the professional guidelines. Justice to self includes not creating any avenues for others to have doubts in one's competency and commitment towards radiation protection. There are no avenues for trade-offs or double standards. Deviating from these obligations will not only mean the injustice that is implicated upon others and self but also a direct transgression from the religious point of view.

The present author wishes to highlight a particular area of concern pertaining to the non-adherence to radiation protection requirements. It can be argued that administrative and punitive measures against non-compliance are highly subjective among the various authorities. The application of justice within the context of contemporary law is opened to question.

Maqasid and Qa'waid Al-Shariah

The concept of radiation protection is now discussed within the context of the *Maqasid* and *Qawa'id* of the *Shariah*. The *Shariah* is loosely translated into the Islamic way of life. Encompassing all walks and situations of life the Muslim practitioner should view his profession along the *Shariah*. Thus elements involving radiation protection should be aligned to these two concepts.

The *Maqasid* (objectives) of the *Shariah* deals with the preservation or protection of five elements, namely, religion / faith, life, intellect / mind, progeny / lineage and wealth / property. The order of the elements given is based on the thoughts of Al-Ghazali (1058 –1111 A.D). There are contentions to the order, as well as whether there should be more elements to be included in view of contemporary times. Suffice to say that the Muslim practitioner can benefit by aligning his role to those objectives, especially in areas associated with radiation safety. The way in which those risks be appreciated in relation to the preservation or protection of the five elements can be further studied in order for a comprehensive picture be formulated to guide the practitioner. Some applications of the *Maqasid* include:

- (1) Preservation of *Deen*/religion: The practitioner must be aware that fulfilling his obligations preserves his religion / religious obligations.
- (2) Preservation of life: While life and death is not within the jurisdiction of the practitioner, applying radiation protection may prevent possible medical complications in the future. For example, a young patient with scoliosis will have to come for regular X-ray examinations to monitor his condition. Appropriate radiation protection approaches could reduce the accumulative radiation dose. This could preserve his quality of life as the patient grows older.
- (3) Preservation of the intellect / mind; Applying adequate radiation protection practices may reduce the confusion and anxiety to the patient, while different attitudes between practitioners towards radiation protection may raise question about the values or professionalism adopted by the individual professionals. By adhering to accepted practices, the practitioner also preserves his own intellect. Furthermore the use of the intellect can be further enhanced through involvement in research in radiation protection.
- (4) Preservation of progeny: This is addressed through special considerations of radiation protection to women of child bearing age and children. Current human knowledge associate radiation harming the fetus or those of young age.

The genetic effects discussed earlier may manifest themselves as a result of irradiating a pregnant patient. Somatic effects can be attributed to the accumulative dose over the life span of the child right to adulthood. Radiation considerations to these groups of patients must be meticulously done. (5) Preservation of wealth: If a medical condition is introduced as a result of non-adherence to radiation protection guidelines the ensuing medical treatments can drain the economic resources of the sufferer.

Qawa'id (principles) of the *Shariah* refers to maxims of *Fiqh* (Islamic Jurisprudence) and consists of abstract rules derived from the study of *Fiqh*. Notable maxims and their applications in Medical imaging are given below:

1. Acts are judged by the intention behind them. Medical imaging is not dealing with certainties. Different patients require different imaging parameters which tend to end in different probability of risks. The practitioner has only his knowledge and experience to rely on in the determination of the imaging parameters that would give a diagnostic image quality and the risks associated with it. He contents himself with the prime intention that his act / decision is with the intention of balancing the two entities; quality and risks.
2. Harm may neither be inflicted nor be reciprocated. This has its application whereby the practitioner shall not bring any other harm to the patient. A general application of this maxim can be seen in proper conduct in transferring the patient from the gurney to the examination table. In another procedural situation, the practitioner should not move an injured patient unnecessarily. Prevention of all possible cross-infection episodes must also be carried out. However, this particular maxim is conflicting in its application with respect with Medical imaging with its known radiation risks. However, all efforts must be taken to repel, remove or limit those risks using any acceptable or feasible means.
3. A greater harm is eliminated by means of a lesser harm. The application of this maxim in relation to radiation protection is seen in the justification of radiological procedures. Radiological examinations as a means to determine the cause of illness may constitute the lesser harm over the inability to decide what medical interventions to save lives or improve the quality of life. The risks presented by the radiation should be seen as the lesser harm.

The concept of retribution

The Islamic concept of retribution challenges the human mind in another unseen dimension; heaven and hell. Belief in these two entities is embedded as one of the Islamic pillars of faith. Retribution addresses accountability; the aspect of accountability where all good and undesirable deeds will be rewarded accordingly by Allah. Rewards are in the form of a permanent abode in heaven. While to undesirable deeds Allah will exercise His compassion and forgiving attributes, to either forgive or punish the wrongdoer in hell. This is no different to the practice of various communities in the world that reward for good deeds and penalizes for breaches in conduct. The *Qur'anic* verse 3:4 reiterates Allah being the Lord of retribution while the prominent verse 3:30 relates to man's personal accountability and the full authority of Allah to reward or punish a person based on one's deeds (Abdullah, 2009). Allah's attribute *Al-Hakam* (The Judge, the Arbitrator) eliminates the subjectivity of rewards or punishments that are evident between human communities, professional bodies and administrations.

Islamic values and virtues

The application of the radiation protection is now discussed in relation to four Islamic values and virtues.

The concept of *Ihsan*

The concept of *Tauhid* also highlights some of the ninety-nine attributes of Allah that can cast a profound influence on the practitioner. These attributes are *Al-Basir* (البصير) (All-Seeing), *Al-Alim* (العليم) (All-Knowing), *Al-Khabeer* (الخبير) (All-Aware) and *Ar-Raqib* (الرقيب) (The Watchful). The acknowledgement of His existence and His attributes are fundamentals to the Islamic faith and should shape the practitioner's stance towards radiation protection. To acknowledge the Divine Being in having those attributes can be appreciated in an analogy. Present day technologies have made it possible for one, to track, observe, listen and monitor others without their knowledge. When one is aware of the presence of others, or conscious of being observed, one would naturally act within the accepted norms, behaviors and conduct. The Muslim practitioner is reminded of the term *Ihsan*. This term describes one's conduct in relation to the presence and knowledge of Allah:

"It is to worship Allah as though you could see Him for while you do not see Him, He sees you." (*Riyad-us-Saliheen, Hadith 60*).

In short, to be aware of His presence should deter one from any undesirable conduct.

The concept of *Itqan* (الإتقان)

Islam places high emphasis on efforts to achieve *Itqan* (excellence). The internal drivers to achieve excellence, seen from the psychological perspective, would require realization towards a goal and the necessary willpower to support the undertaking. Viewed from a different perspective, acquiring, generating and enhancing knowledge, seen within the context of intellectual endeavors are championed by Islam. Contemporary Muslim scholars have interpreted various verses in the *Qur'an* within the context of current applications to those intellectual activities. They include verses 96:1-5 (reading as a precursor to knowledge and Allah teaching man on matters he knew not), 39:9 (the differences between those with knowledge and those without it), 58:11 (the elevated ranks of those with knowledge) and 2:269 (benefits to those given the ability to understand) (Abdullah, 2009). These verses consolidate the importance of those instances that involve the use of the intellect. Appraising, adopting and adapting research findings on radiation protection will augment well the reasoning power for which the mind is actually developed. Extending the critical mindedness, the practitioner can initiate or replicate researches as results obtained elsewhere may not be readily applicable at the local front. Differing equipment specifications and subject characteristics would be areas that need to be taken into consideration. To be able to justify radiation protection approaches that addressed those differences should be seen as reaching for excellence.

The concept of *Fitrah* (فطرة)

Closely related towards “doing good” is the concept of *fitrah*. Muslim scholars relate *fitrah* to “original disposition”, “inherent goodness” or natural instinct (Zaizul, 2012). This natural instinct towards good, embedded from birth, makes man as essentially “good” or has basic tendencies to develop in the direction of good. The realization of this particular attribute in the Muslim practitioner should guide the practitioner to be on continuous awareness of an integral disposition towards goodness and excellence.

Amidst all efforts to apply radiation protection principles, it can be concluded that it is not possible to achieve the perfect approach to a given patient. Different patient characteristics that include anatomical and genetic considerations, coupled with medical conditions and differing equipment specifications are some of the factors that make clinical decisions in the effort to limit radiation risks

problematic. Though there have been studies on radiation protection, they may not support all intentions to reduce dose based on the above considerations. Thus, the element of certainty or perfection in the practice will be left to chance.

Islam accepts practices by the practitioner involving radiation risks based on his intentions. By a *hadith* narrated by Al-Bukhari and Muslim, one's deed is considered by the intentions and will be rewarded based on those intentions (*Riyad-us-Saliheen, Hadith 1*). The application of the axiom “Benefits outweighs the risks” within the concept of justification of radiological examinations can be aligned to the concept of intention as outlined by the *hadith*. Introducing a lesser harm (an element of radiation risk) to avoid a bigger harm (an undiagnosed medical condition) fulfils the axiom. Having good intentions to limit all risks through optimization of the practice, in spite of the adverse factors that influence radiation protections initiatives above, will be praiseworthy deeds in the eyes of the religion.

The concept of *Istiqomah* (استقامة)

A virtue that can be seen within the context of applying justice is *Istiqomah* (steadfastness or consistency). The application of this virtue will be in a non-bias stance to optimize radiation protection to all, irrespective of the demographics of the patient. This is also seen in the commitment to ensure radiation safety is not only seen but done.

It would be justified to denote the above virtues were evident in the person of Prophet Muhammad (Pbuh). Allah exclaims in the Holy Qur'an verse 68:4:

“And verily, you (O Muhammad) (stand) on an exalted standard of character”. (Abdullah, 2009).

The virtues that the Prophet have shown could relate to the following *hadith* narrated by Muslim; Nawwas bin Sam'an reported: I asked Messenger of Allah (Pbuh) about virtue and sin, and he said, “Virtue is noble behaviour, and sin is that which creates doubt and you do not like people to know about it” (*Riyad-us-Saliheen, Hadith 624*). To emulate the virtues held the prophet would be an extension of one's belief in his Messengership.

Conclusion

The probabilistic nature of the occurrence and effects of radiation on the human body calls for an outmost adherence to radiation protection. However, the same uncertainties coupled with differences in administrative stance to non-compliance to radiation safety standards and the highly demanding critical

mindedness in applying radiation protection initiatives may become de-motivators to some practitioners. This could result in undesirable consequences upon the exposed individual in terms of probable medical complications that result from the radiation exposures, the anxieties and loss of patient's confidence in the Medical imaging service. The personalization of radiation protection within an Islamic dimension creates the avenue for the Muslim practitioner to relate his practice to the spiritual and religious aspect of Islam. Using the Islamic worldview as a foundation in examining his role as a Medical imaging practitioner, he asserts himself to the importance of championing the safety aspect according to what Islam champions. Personalizing radiation protection will require internalizing the various spiritual and religious essences: enhancing one's submission to Allah through good deeds and using the concepts of *Ihsan*, *Itqan* *Fitrah* and *Istiqomah* collectively. These concepts act as Islamic psychological deterrents and motivators towards the professional morality in addressing radiation protection. These psychological deterrents and motivators, from the religious standpoint, should be seen against the inability of current "soft law" guidelines to exercise punitive measures to those who fail to practice the expected obligations in radiation protection. It is encouraged that Muslim practitioners reinforce their minds to personalize radiation protection from these Islamic foundations. Personal enhancement sessions to address present shortfalls in aligning Islamic essences to radiation protection can be addressed through integration of these essences into the curriculum or at other professional avenues. Ultimately, these approaches can enhance further the application of Islamic beliefs and practices into the professional practices in Medical imaging.

Looking from another perspective, this paper has shown that it is possible to align or harmonize present day practices towards applying radiation protection to what has been outlined in Islamic revealed sources. The author wishes to encourage further examination of Islamic essences by Muslim practitioners to reinforce and guide themselves and others within the Islamic teachings, extending the coverage to the other dimensions of Medical imaging. Hopefully, the ideals of Islam could be truly portrayed and these could help to overcome present misunderstandings and misconceptions pertaining to the religion.

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Article History

Received: 06-11-2017

Accepted: 08-05-2018