

Human Rights Design of Diagnostic Medical Imaging Technology Instrumentation

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1. Abstract

Signal to noise ratio should necessarily be enhanced at the design stage and not as a compensation by software. Effective design demands that the tissue spectral absorbance be known and also reflective properties of adjacent structures at the biological site under requirement to be tested. Detection and discrimination are not the same, and so also quantification. All of these are better understood as figure-ground segregation concepts, for closed contours filled uniformly with homogeneously textured biological substance. Imaging technology for medical diagnostics is today at a crossroads and just mere innovation by technically qualified scientific engineers is not enough. We must be aware of the clinical setting and patient requirements. But how does a major corporation conduct design engineering process protocols so as to make biology accessible for a medical doctor who committed upon issuance of a practice license, to the Oath of Hippocrates? We can only present very few pointers in this brief technical note.

2. Introduction

Because we are diagnostic systems design engineering consultants, we know that electronic sensor inputs receive information upon interaction with membranes and soft tissue cellular aggregates. Radiation wavelength must be chosen carefully so that bodily tissue makes a measurable alteration. Incident array: optical, ultraviolet, infrared, ultrasound, radio, or microwave; and the biologically altered array must be adequately different and that difference must be quantifiable and should elucidate what the doctor needs to know. Every animal species and every plant species of every phylum on planet Earth-- our third planet from the bright

sun Solaris, can be shown to communicate external to its bodily soma by receipt of information that is processed and made useful to species member organism. We are familiar with our own sensory apparatus, such as visual functions mediated by two eyes pointing forward. On a cold winter day morning, when a dense fog blurs the landscape, do you even TRY to drive your 4-door steel belted sedan at the highway speed of 60 miles an hour? It would be potentially suicidal to do, and far beyond just foolishness. But the city council and state highway authority did not tell you so. Neither your automotive company board of executive directors. So importantly we must address the topic of informed consent in a clinical setting, because ultimately, diagnostic imaging is meant for patients, and the 1964 Helsinki Declaration has defined human rights in a professional environment, wherever there is even a slight element of uncertainty.

3. Historically Speaking

It was many years ago that we humans began to question... what is this world in which we live? "Does it end at the visible horizon interface where the frothing watery seaside meets our sunlit cloudy sky?" So far as archeology can address origins, our oldest invention is the hunter's boomerang perhaps 20,000 years back in time from today, and we are today, two thousand years and two decades after the crucified Jesus, who was reviled by his own kinsmen. Jesus in fact was not just what we regard today, but during his daily works he observed and absorbed and attempted to gather supporters in the hope for making amends. Michelangelo made a fabulous painting upon the concave surface up above inside the dome, what we call the Sistine Chapel, revered by so many, not just of those with Christian upbringing or religious historicity. He

consented to paint that mural, yes indeed. Do we know anything about his family and finances, health, wellness, and professional satisfaction? We know much more about the life of Leonardo Da Vinci, comparatively. But why are we mentioning such esoteric facts here in a technical journal for engineering professions?

Because how things are done matters, not just what we do, but how we make attempts to do what we are contracted as professionals to execute with responsibility to any of those who are impacted by our technical innovations. This includes patients who consented to be “managed” and taxpayers who gave to the government their precious earned dollar income, without knowing where that money might be spent by county clerks. Design engineers must be aware of and try to reduce the national burden from economic allocations to healthcare.

4. Sensor Instrumentation and Software

A simple sensor example is a photocell but even more easy the stylus of a vinyl record playing turntable. In the first example, the work done is light energy upon semiconductor substrate and in the second example it is physical crystalline solid matter deformation energy, time-dependent pressure changes that make electrical voltage potential energy charge in Coulombs.

What is the role of software?

- 1) To manage the sensor instrumentation and to create retrievable patient visitation records.
- 2) Upgrade so the doctor remains satisfied with the invested instrumentation dollars.
- 3) Perform additional tasks not offered by the corporation when device was purchased.
- 4) To address image quality problems, a cause for complaint and potential censure.

5. Consenting Patients

It is nearly universal that when a human person walks into a doctor’s office, many unknown diagnostic procedures and therapeutic care interventions are consented by the simple act of walking in. Unlike legal practice where the lawyer decides to accept a client, it is the care-seeking “human person” who in the act of selecting a medical practitioner has already accepted (sometimes without knowing) the transition of role and responsibility, to now be regarded by the medical office managers as a “billable patient required to be committed to compliance.”

But consent is most widely accepted as needed BEFORE intimacy, for instance sexual acts between consenting adults do require each of the two being agreeably compatible and most certain that they want to go forward. When was the last time you wanted to meet your doctor by phone to ask a few simple questions BEFORE consenting to be billed for an examination?

6. Patient Safety and Informed Consent Legality

Many approved imaging tests are problematic today for many people. Several tests can require the patient to remain physically confined and the person under test must refrain from budging an inch body and limb. A diagnostic chamber can be very intimidating for persons with tendency to claustrophobia. Though radiation can be safe, it can also be damaging. Most diagnostic instruments on the medical device market for sale to physicians and surgeons and hospital administration, cannot be labeled as harmful else the company that made them would be financially responsible if legal class action suit came to be filed in a court of law of either Federal or State level jurisprudence. So, moral of the story here is that engineers that make medical device technology could find it useful to study the clinical setting at which patient consents to be diagnosed by the medical man or woman who is authorized to bill insurance, but often the patient’s pocketbook is required as supplementing in accordance with diagnostic coding regulations. Legality for informed consent is not universal and informed consent is not properly executed many times at many medical locations in the USA and across the world. We can each make a difference as educated patients and as informed citizens and vocal advocates. First Lady of the United States, Mrs. Eleanor Roosevelt was not a lawyer. But the 1964 Helsinki Declaration is in fact a legal document for human rights in a professional setting.

7. Closing Remarks

Image after image, the National Geographic magazine and Life magazine; Time magazine, and Newsweek, have painted for us viewers, what is otherwise inaccessible, because we were not witness to the crime scene and neither invited to the banquet dinner reception for that recent wedding between Royals. But then we also have young men today who wish to express through images painted on city structures, such painters liable to be incarcerated, despite their artistry being an appeal for justice, requesting to address a financially dire situation, many such matters funded already from Federal allocations, but not made available to those needy boys and young women of artistic faith and fervor. Notwithstanding photo-journalists and artisanal painters of graffiti, any corporation that enters the domain of diagnostic image sensing technology, must act with responsible religious fervor, and should aim to exert similar devotional perseverance as the human person responsible for making-famous the Sistine chapel.

8. Acknowledgements

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