

THE ROLES PHYSICS PLAYS IN THE HEALTH CARE INDUSTRY.

Author: Yash Pal

Assistant Professor

Department of Physics

S.S.M. College, Dinanagar, District Gurdaspur (Punjab)

Abstract

The space of Material science covers immense area of logical information. Fundamental exploration on gatherings of nuclear or atomic radiation and gyromagnetic minutes prompted strong procedure for concentrating on sub-atomic design as well as strong grids. It prompted creation and advancement of present day clinical indicative and helpful devices which have upset the clinical practices. Progression in clinical explores as seen today will be well-near unimaginable without the utilization of the finding of Material science. The subsidizing made on Material science is truth be told one more approach to financing made on human wellbeing.

Introduction

Physical science is the science which manages the investigation of nature and normal peculiarities. It is the most central of the multitude of sciences. The domains of material science length distance from the sub atomic world to the entire of the universe, and time from under a billionth of a trillionth of one moment to the age of the universe. To concentrate on peculiarities across these epochal scales, to devise trial apparatuses that give all the more impressive means to survey nature and to make hypotheses that permit us to grasp what has been seen, are the objectives and the accomplishments of physical science. In developing our perspective on nature, physical science has significantly impacted our view in light of the hidden suspicion of Physical science that there is a request in the regular world and that the human brain can figure out that request. By producing new innovations and contributing adjoining sciences Physical science has assisted with changing our day to day existence, allowing a solace and opportunity of activity. In the past even in the in fact progressed countries, individuals gave the greater part of their energy to getting food and asylum. Physical science has done a lot to form the state of present day culture. The pursuit to comprehend rudimentary peculiarities has prompted extended perspectives on all nature and to phenomenal developments. Accordingly, the way of

this search is unusual. Physical science plays had a vital impact in the progression of clinical science. Clinical science has been upset by the revelations in Physical science previously. A progression of advances in Physical science straightforwardly affects clinical science Today virtually every one of the demonstrative and restorative devices of current clinics have their starting point in Physical science research.

Outline of clinical material science

The turn of events and execution of present day clinical medication owes an extraordinary arrangement to the commitment from material science. Material science as Applied to Medication or Clinical Physical science is presently a perceived, very much regarded, sub-specialty of Physical science. Clinical physicists are utilized to do explore, to execute the products of innovative work in the center (at times known as clinical material science or clinic physical science) and to show the new ages of clinical physicists both at scholastic specialty level and furthermore with "active" viable preparation. At the point when I started my vocation in the subject (in the mid 1970s) joining this multitude of roles was conceivable and energized. It was additionally anticipated (presumably ridiculously even around then) that one could turn ones hand to practically any part of the subject. There was in the UK very little award driven research and for the most part clinical physicists were exceptionally allowed to be imaginative, inventive and sweeping and to take an alternate route at whatever point this was proper. That was something to be thankful for. The subsidizing for this equitable "appeared to be accessible". Very soon a short time later, imported from the USA, a culture of award driven research arose in the UK and all through Europe and clinical physical science itself created many sub-claims to fame with fairly fake, at this point genuine, limits between them through which entry was not the least bit simple. It additionally became important to be more proscriptive regarding what exploration would be finished and afterward to adhere to those proposition. I felt that was not completely a decent move. I could grin a little to see now the development of award calls for cross-disciplinary exploration which, to my fairly more established mind, is a call to do what we were normally ready to do before these limits at any point existed. In any case, that might be to begin on too negative and pessimistic a note in light of the fact that the way of life of award driven research has likewise had the monstrous advantage of giving expanded subsidizing to

the subject, steadily growing divisions and the deluge of an abundance of ability that, in some measure on a basic level (through the Bologna cycle), knows no geological limits. Likewise it must be recognized that each part of clinical physical science has now become gigantically confounded and that understanding the drawn out objectives and the pathway to them is an essential piece of the examination cycle. It could likewise be seen that, though in the beginning of clinical physical science there was basically no conventional enlistment to the subject, with the progression of time have arisen brilliant preparation plots that not just show the proper fundamentals of the subject yet in addition guarantee administrative compliances and the support of high expert guidelines. In most evolved nations there are currently proficient associations whose transmit it is to cultivate the advancement of clinical physical science. In the UK this is the Establishment of Material science and Designing in Medication (IPEM) [1]; all through Europe it is the European League of Associations for Clinical Physical science (EFOMP) [2] and Universally it is the Worldwide Association for Clinical Physical science (IOMP) [3]. These preparation programs address the previously mentioned intricacy of present day clinical material science. Nonetheless, they should not be permitted to turn out to be so extensive thus smothering as to choke the growing drive of youthful learner minds particularly those restless to make authoritative commitments instead of have yet really preparing. Likewise it is important to guarantee that, as clinical physicists fundamentally center barely around a complicated point, they don't disregard the chance of horizontal reasoning from different fields and, surprisingly, those that are not essentially focused on medication.

Two example key contributions of physics to medicine

Seldom can or do any clinical physicists set off on a mission to make key disclosures, much as they might want to. That isn't a methodology prone to work. Rather, it is looking back that one can think back and recognize that specific key revelations or innovations or key comprehension of a peculiarity happened by individuals, whose names are presently perpetually recollected and connected with those occasions, "remaining on the shoulders of monsters" as Newton so expressively put it. "Success science", the science that has impacted the world always has commonly advanced along these lines. Most physicists, on the other hand, have performed significant "gradual science", tragically an expression much disdained by award subsidizing

bodies; yet this exceptionally steady science has frequently prompted the success milestones. Allow us to check a few models out. Business x-beam processed tomography (CT) has been hailed as the best unrest in radiology since the disclosure of the x-beam. The principal scanner, designed and worked by the English EMI Organization, was reported in April 1972. While still paving the way to this declaration was joint between a few researchers in London Emergency clinics, the DHSS (Branch of Wellbeing and Government backed retirement) and EMI it is the name of Sir Godfrey Hounsfield (28.8.1919-12.8.2004) which will continuously be related with the CT scanner. He made a reality what numerous others had dealt with and even "almost accomplished". He was knighted, turned into a FRS (Individual of the Imperial Society), got the 1979 Nobel Prize for Medication and was feted with distinction. His unique CT scanner remains in the London Science Exhibition hall close by the Apollo-10 lunar module that surrounded the moon, a without a doubt not un-purposeful juxtaposition. He has been referred to as one of the 1 000 most powerful individuals of the twentieth century [15]. However assuming one glances back at the set of experiences it tends to be seen that many common his vision. Alan Cormack (23.3.1924-7.5.1998) performed spearheading lab tests in 1963 and shared the Nobel Prize. Gabriel Blunt protected the (almost) CT rule in 1940. A CT scanner was supposedly implicit Kiev for clinical purposes in 1957. David Kuhl made a CT filter in 1965 [16]. One more key improvement in clinical material science is the creation of methods to convey power regulated radiotherapy for relieving diseases [17-20]. Most recognize that Anders Brahme of Stockholm, Sweden distributed the main paper making sense of crude procedures for accomplishing this [21]. He visited various other malignant growth Communities and work in these may have been animated to begin by his visits: (DKFZ-Heidelberg: Schlegel and Bortfeld; MSKCC-New York: Mohan and Mageras; ICRRMH-London: Webb). Mark Hymn, President of the NOMOS Organization declared the development of the World's most memorable business IMRT conveyance hardware, the Copy, in October 1992 and this ruled American conveyance of IMRT for around 3 years before multileaf-collimator-based strategies got up to speed and likely surpassed. However this advancement likewise didn't appear suddenly. An American mathematician, George Birkhoff made sense of in 1940 the standards by which any drawing could be made out of the superposition of a progression of straight lines from various headings and of various darkness, including negative obscurity, the expansion of deletion parts. Aside from the un-genuineness of negative x-beams this is the IMRT standard on the off chance that the lines are deciphered as x-beams and the image is deciphered as a portion circulation [22]. Basil Proimos presented the ideas of gravity obstructing to create

portion disseminations with sunken isodoses as some time in the past as 1940 [23]. Key being focused on here is that these are tourist spots that it's fair to say "matter". They have significantly altered how patients are analyzed and treated. Let us not maybe contend too firmly over which names ought to be connected to them. The honor of prizes and praises can be a disruptive business (witness the very high profile expounding on Damadian over the nonaward of the Nobel prize for attractive reverberation imaging [24]). The main point of contention for the future and prosperity of humankind is the actual milestone and, as found in these two models, it stands solidly on the shoulders of the monster work going before. At long last, it ought to be plainly said that numerous other comparative guides to these might have been referred to. I'm not wishing to say these are the two most significant milestones; they are two I comprehend.

Applications of Physics in Medical Science

1. Understanding the Body at Molecular Level

The reason for clinical practice dwells in a comprehension of how the body capabilities. Body fills in because of total of capability of the natural atoms. Material science has contributed at the level of the sub-atomic construction and its capabilities. For instance, proteins are monster particles which give cells their inward mechanical help. They are likewise answerable for every one of the substance processes at the center of the life. Biophysicists have decided precise nuclear design of proteins by X-beam crystallography (the procedure for which W L Bragg and W H Bragg won the Nobel Prize in Material science in 1915) or by gas pedal innovation (An O Lawrence got the Nobel Prize of Physical science in 1939 for concocting the first of these gas pedal, the cyclotron).

Atomic engines are fundamental for the gig performed by the cells. The pulsating of the heart and capability of the cerebrum require one more sort of protein that produces electrical sign in cell. The Electro Cardiogram (ECG) and Electro Encephalogram (EEG) are indications of the tasks of proteins and are utilized for the analysis of heart and neurological illnesses. Biophysicists have likewise figured out how these proteins produce their electrical signs and this information has given us numerous treatments going from medication to treat unusual heart beats to the treatment of epilepsy.

2. Diagnosis

Material science assumes a perpetually significant part in determination. The utilization of ionizing radiation has been significant remedially for the greater part a

really long period. Naming red platelets with radioactive isotopes of chromium allows the lifetime of these cells to be estimated and this strategy can be utilized to decide whether paleness is the aftereffect of diminished creation or expanded obliteration of red platelets.

The radioactive examine utilizes antibodies that have been made radioactive: these antibodies recognize minute amounts of chemicals and different synthetics by restricting to them and giving a radioactive label that can be utilized to identify the presence of the particle. Since flagging particles, similar to chemicals, are available at minute fixations in the blood, Yalow got the Nobel Prize in 1977 for the improvement of strategy, the radio resistant examine. Other natural liquids, a few organs explicitly take up specific molecules or synthetic mixtures and this reality has empowered doctors to survey organs' capability as to distinguish the strain of harm by checking the take-up of these substances that have been labeled with radioactivity.

In isotope examining a radioisotope is brought into the body, as a rule through intravenous infusion. The isotope is then taken up in various sums by various organs. Its circulation not set in stone by recording the radiation it emanates and through changing its focus, perceiving the presence, size and state of the different anomalies in body organs is much of the time conceivable. The radiation produced is distinguished by glimmer counter, which is moved volatile over the organ being examined. These messages can then be electronically recorded and concentrated by clinicians. The isotope as a rule has a short half life and in this way rots totally before its radioactivity can make any harm the patient's body.

Various isotopes will more often than not amass specifically organs. For instance, iodine-131 gets comfortable the thyroid organs and can uncover different imperfections in thyroid working. Another isotope carbon-14 is valuable in studying irregularities of digestion that underlie diabetes, gout and pallor.

3. Therapy

Radiotherapy, the utilization of radiation sources in the therapy or alleviation of sicknesses, is the main utilization of atomic material science in medication (H. Bacquerel, M. Curie and P. Curie got the Nobel Prize in Physical science in 1903 for the revelation of radioactivity). Radiation treatment quite often utilizes ionizing radiation, profound tissue infiltrating beams, which can actually and synthetically respond with infected cells to annihilate them. Radiation treatment is utilized for disease and for blood confusion like leukemia. To obliterate malignant cells with negligible harm to typical sound tissue, the radiation might be directed to the body by embedding radioactive substances into the growths or by presenting the body to outer

wellsprings of high energy beams that enter inside. Ionizing radiation barrages the cells presented to it and break the sub-atomic bonds fundamental for cell development which annihilates the disease development that imitates quickly. The radiation sources are gamma producers which can be radium, radon or radioactive isotopes of such metals as cesium, cobalt, gold, iridium and tantalum. This kind of treatment stays one of the three choices for treating disease. Either alone or in blend with a medical procedure and chemotherapy, ionizing radiation is utilized as treatment for most malignancies.

This implies that a lot more extensive scope of tooth harm can be fixed, and that the fixes are significantly more strong than previously.

Contributions

Different commitments of this Exceptional Issue manage the examination toward material science based imaginative methodologies for the treatment of oncological illnesses or, more as a rule, propose the improvement of the techniques as of now utilized in a few clinical practices. Outer radiation treatment, brachytherapy, and theragnostic approaches are thought of, the improvement of patient results being the last and normal point of the examinations. The endeavor to uncover and comprehend the natural or radio-organic instruments overseeing such methodologies is additionally frequently featured.

In this specific circumstance, Crapanzano et al. propose in their audit [1] an outline of the inorganic and half breed nanoparticles of interest for X-beam based oncological medicines. The writers bring up how the physicochemical properties of the nanoparticles, along with the decision of surface functionalization and focusing on techniques, influence the vital boundaries of outer X-beam radiation treatment and X-beam enacted photodynamic treatment as far as energy testimony and all out conveyed portion in target tissues.

Quantitative imaging is one more repetitive point in different commitments of this Extraordinary Issue. As a matter of fact, the quantitative investigation of clinical pictures ended up being a strong methodology for working on symptomatic and treatment procedures, as well concerning creating prescient models.

Surface investigation is performed by Savini et al. [9] to portray the effect of the procurement point on Advanced Bosom Tomosynthesis (DBT) pictures. The creators reason that the DBT obtaining point influences the surfaces removed from DBT

pictures, and this reliance ought to be thought about while laying out baselines for classifiers of threatening tissue. Accordingly, surface examination in DBT can possibly be an option in contrast to other quantitative procedures, for example, model spectator strategies for scoring and looking at DBT pictures.

Quantitative examinations are additionally progressively utilized in atomic medication, both for analytic and helpful purposes. Di Martino et al. [10] feature how the Fractional Volume Impact (PVE) is the main variable of loss of measurement in Atomic Medication. Subsequently, to accomplish an exact measurement of the radioactivity fixation, PVE must be thought of and redressed, particularly in little designs. In this specific circumstance, the writers present another methodology for the revision of PVE, utilizing a post-remaking process beginning from a numerical articulation, which just requires the information on the Full Width at Half Limit of the Point Spread Capability of the imaging framework.

In the space of low-field MR-directed radiotherapy for cervical malignant growth, Cusumano et al. [11] assess the exhibition of the radiobiological boundary Early Relapse List ERITCP in foreseeing obsessive complete reaction. The outcomes recommend that ERITCP, determined by joining the growth volume estimated on the MR pictures gained at recreation and during treatment, is a promising reaction biomarker for cervical disease. On the off chance that approved on a bigger partner of patients, the utilization of this file can address a significant device to customize the therapy system with regards to the cervical malignant growth, moving towards the physical and practical conservation of the lighted tissues.

Mazzilli et al. [12] propose a self-loader division technique to portray the lungs of Coronavirus patients with respiratory disorder. The methodology depends on a hearty, administrator free ID of limit Hounsfield Unit (HU) values that recognize three locales of the lungs with instinctively clear useful significance. The following stage toward a completely programmed division is likewise considered by consolidating the executed strategy with a chart book of CT pictures of Coronavirus patients. The quantitative investigation completed on the HU histograms makes ready to the improvement of prescient models of early clinical result.

The central job of CT pictures examination in the Coronavirus pandemic situation likewise arises in the composition by Biondi et al. [13]. The creators propose a learn

about the characterization execution for Coronavirus patient visualization from programmed Man-made brainpower (simulated intelligence) division. They feature the chance of getting a solid computerized division of lungs and of Ground-Glass Opacities regions in CT checks involving non-regulated approaches and involving this division in an expectation pipeline for patient guess. Semi-managed division, executed utilizing a mix of non-regulated division and element extraction, is by all accounts a reasonable methodology for patient definition and could be utilized to prepare more perplexing models. This would be valuable in a popularity circumstance like the ongoing pandemic to help highest quality level division for man-made intelligence preparing.

The developing interest and utilization of simulated intelligence, for quantitative imaging, yet in a few different areas of medication, is featured by Avanzo et al. [14]. Specifically, in their audit, the creators sum up the principal uses of computer based intelligence in clinical material science and express their perspective on the job and the contribution of Clinical Physicists (MPs) in this developing situation by characterizing the difficulties of simulated intelligence in medical care for the MPs and by depicting the abilities the MPs can propose in this field.

At long last, the examination toward the turn of events or improvement of instruments and strategies for exact portion assessment, both in outside and inner dosimetry, affirmed to be exceptionally dynamic, and different commitments of this Extraordinary Issue manage this subject.

Arilli et al. [15] assess the consolidated utilization of the Essential Quality Screen (IQM, iRT Frameworks GmbH, Koblenz, Germany) transmission finder and SoftDiso programming (Best Clinical Srl — Chianciano Terme, Italy) for in vivo portion observing for the concurrent recognition of conveyance and patient arrangement blunders in entire bosom illumination. The creators show that the two gadgets give integral data and permit the quick location of a wide range of blunders. The proposed technique addresses another procedure in Quality Affirmation (QA) programs and would be a significant step in the right direction in the clinical daily practice to build the nature of outside bosom illumination.

The issue of in vivo dosimetry in charged molecule radiation treatment is considered by Cirrone et al. [16]. The creators research the reasonableness of another on the web, painless, biasless identifier for relative portion observing. The finder, safeguarded by both a public Italian and a Global patent, takes advantage of the possibility that when a pillar current is infused into the body of a patient going through a charged molecule treatment, the ongoing itself can be gathered involving a conductive cathode in touch with the skin of patient. In the wake of describing the framework in vitro, starter in

vivo tests feature the capacity of the gadget in going about as bar observing during a proton treatment and its capacity in the check of the right portion conveyed among the different parts of the treatment.

A radiation finder with a generally longer history is the GEMPix, a locator created at CERN a couple of years prior. It couples two advancements, the Gas Electron Multiplier as an intensifier for electric charges and four profoundly pixelated Timepix ASICs as readout. Leidner et al. [17] propose a far reaching survey about the clinical utilizations of GEMPix. The creators depict instances of the utilization of this gadget for relative portion estimations in X-beam radiation treatment and hadron treatment. A few primer estimations performed to check the capacities of GEMPix in proton tomography are likewise shown, as well as the latest use of the identifier in the field of microdosimetry. A conversation about on-going and future improvements finishes up the survey.

In the edge of inside dosimetry, the concentrate by Milano et al. [18] focuses on the approval of a stage, named MCID, in view of patient-explicit pictures and direct Monte Carlo (MC) recreations for inside dosimetry in the radioembolization of liver growths with ⁹⁰Y-marked microspheres. The approved stage permits the quick execution of a customized MC dosimetry, in view of patient imaging information. Furthermore, the creators explore the effect of tissue inhomogeneities on the dosimetric assessment for the radioembolization treatment and the expected improvement of a MC approach in this treatment.

Similar treatment procedure for liver injuries, in light of percutaneous removal utilizing ⁹⁰Y microspheres implanted into a sealant framework, is considered by D'Arienzo et al. [19]. In this original copy, the consumed portion per unit regulated movement is surveyed in little sores by MC estimations thinking about an improved on calculation. Moreover, a logical equation got from MC computations that integrates the consumed portions for ⁹⁰Y is proposed. The creators reason that in a situation of the intra-tumoral infusion of microspheres, the proposed condition can be helpfully utilized in the treatment arranging of round sores of little size (down to 0.5 cm measurement) furnishing portion gauges in close concurrence with MC computations.

Ultimately, under the primary subject of dosimetry, the Extraordinary Issue incorporates the concentrate by Gonzales et al. [20] which add to the improvement of a reasonable convention for fingernail electron turn reverberation (ESR) dosimetry valuable for the standard checking of the furthest point openings of clinical specialists dealing with radiation sources. The creators research the impacts of substance therapy utilizing dithiothreitol (DTT) on the progressions of the ESR

spectra in lighted and unirradiated fingernails after a long stockpiling time. The outcomes show that the treatment of fingernail tests with DTT lead to a huge decrease of the foundation signal. They additionally bring up that cooler capacity of the examples is more compelling than vacuum capacity. Besides, after the DTT therapy, the fingernail tests gave great sign strength to both foundation and radiation-prompted signals with less intra-individual varieties.

Conclusion

Physical science is contributing straightforwardly to the clinical consideration by giving information on the body at the sub-atomic level with new logical devices and symptomatic strategies. From the therapy of cornea to the analysis of mind infections, use of the disclosures of physical science play predominant part and thus, it changes the clinical practices. Physical science is resolving progressively complex issues of clinical science. Notwithstanding essential examination, it additionally contributes straightforwardly to the nature of clinical consideration by giving new scientific apparatuses, demonstrative methods, and treatments. X-beam tomography significantly affects x-beam diagnostics; attractive reverberation imaging is broadly viewed as a progressive development in clinical diagnostics.

Ultrasonic imaging is one more of the harmless analytic devices from Material science. Lasers are tracking down progressively boundless applications in medication. Laser medical procedure replaces a few exceptionally fragile or horrible tasks with basic and direct systems. Fiber-optic endoscopes epitomize numerous new symptomatic instruments. Joined with lasers, the endoscopes can be utilized to give new treatments that might supplant elaborate surgeries. Atomic medication and radiation treatment have a lot of commitment to restorative determination and treatment. Innovations of such many new instruments and advancements from Physical science are today improving the nature of medical services of people. Physical science incredibly affects the headway of clinical science. The speculation on Material science is additionally the venture on human wellbeing.

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