Why don't medical graduates join programmes in hard science?

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A major problem offsetting current thrust in manpower development is the fact that the key sector of medical biotechnology progresses very slowly. The medical biotechnology programmes are mostly manned by those with a basic science degree rather than by clinicians turned into researchers. Is that satisfactory? Can a trend be created to induce medical graduates to join research programmes? Is such a trend desirable or even necessary? I briefly reflect on these to explore the stated and the unstated aspects.

The mindsets in education

Science seems to have disappeared in the engineering curricula, at the IITs. Engineering is no longer even remotely connected with physics and chemistry as before. Engineering science that has come in has replaced rather than augmented meaningful inputs of science into engineering. In agriculture, the component of science seems to be more reasonable though basic sciences are underplayed. They make up by way of training in statistics. In medicine, sciences have taken an awful beating. Compare this with the observation that, in sciences, the subjects are taught without professionalism, i.e. without letting the student acquire any skill or any sense of purpose.

People from sciences are very clear that a lot of science, when downloaded on budding doctors and engineers, will remedy the situation. Training in science in this country has led only to imitative and insubstantial science. One wonders whether pursuit of science has been only by those who had no other options.

Major evolving areas like biotechnology, drug design and development, and many others are more professional than scientific in their outlook and execution. We need interfacing. The oft-sighted example of the Indian success relates to computers and IT. If we take a hard look at our contribution to the total development as well megabucks, there is more hype than truth in it.

If we take any professional discipline, switch-overs have been few and far between. In medicine, these are virtually nonexistent. How do we plan for the future? Do we plan for rational choices by medical graduates or do we prepare the ground for irrational choices by the occasional and merely help facilitate the random events of switch-overs? My argument is definitely for the latter.

The undergraduate medical training: Where it all begins

A hard hat approach to academic curriculum and the subject/discipline loyalties have traditionally prevented disciplines from coming together. A trail of successful interactions/and change of disciplines by individuals becomes a common practice after a threshold for cross-over rate is breached. Very few medical persons have crossed the threshold of science in this country in the last few decades and the reasons are many.

It is important to grasp the singular fact that medical curriculum in our country has not undergone a revision in many decades. It is good that the syllabus has not become a playground for members of various 'Boards' of studies. On the other hand, much of modern science is lost to them which actually forms most of the basis for practising modern medicine. The result is, for example, that a whole lot of pharmacology is being practised with a marginal appreciation of what it takes to create a drug.

While in many places, the drudgery of gross anatomy by detailed dissection *a la* Cunnigham is reduced, suitable replacement with hard science in biochemistry and physiology is hardly done. Particularly, biochemistry has always been the neglected area in the medical curriculum. So we have entire generations of medical students with an increasing gulf between the current science and their curriculum.

Compounded with this is the fact that medical colleges admit only medical graduates for jobs to the extent that little research gets done. Most medical colleges are bereft of even the smallest of the investigative capabilities, basic or clinical, such that few medical students would have seen a research project in action. Thus, when it comes to a research career, they are dealing with the unnown. Informed decision becomes impossible.

Medical colleges are usually isolated from the university setting. So medical graduates hardly ever need to come in touch with science departments other than the non-clinical science departments, which are either service departments or exclusively function for undergraduate teaching.

This neglect has major ramifications. Physiology and pharmacology, the foundations of medical research, have never taken off in this country, without which much of biochemistry and newer cell biology can never be integrated into better oriented medical science programmes. Compare this with the West where the medically trained biochemists and those from agricultural universities/colleges contributed maximally to the foundations of biochemistry as we know it.

One of the most important aspects of medical training is the ability to use hands. Hand skills are something very sadly lacking among most science graduates. Asepsis and techniques thereof is yet another strong point for medical graduates with which science graduates would rarely compete.

Why do the science departments not attract medical graduates?

From a medical graduate's viewpoint, science departments are usually vacuous: there is no urgency, no apparent purpose and no immediate goal. Research is a very personalized activity. For a professionally trained person, a result must be tangible and not notional. That is something one rarely, if ever, sees in a science department. Most science laboratories in the West have an ambience that allows medical graduates to feel more at home. Indian labs, definitely in the universities and in most national labs as well, look empty with no overpowering activity that would entice a career-hungry professional with the promise of a better life after.

Medically related research usually gets done in a few laboratories in collaboration with clinicians. The role of the clinicians is often no more than supplying samples. However, since the science departments are more interested in producing the next occasional paper than the

next product, the entire paraphernalia that seeks professional answers for professional problems is missing. If someone is looking for a drug that affects a telomerase or a gyrase, he will at best do some kinetics and stop with the claim of a lead compound with a statistically significant higher activity of 105 to 110% compared to an available drug, both gifted often from a Western company. The commitments required for comprehensive testing, individual and collaborative work in manning toxicology, high throughput screening and other professional activities are so distant for those who claim to do medically relevant research that any sensible medical graduate would rather go abroad than work here. For a scientist, such commitments for professional work would be non-remunerative since only publications count in assessing careers.

To this, add the sobering thought. The best of the science careers also offer far less money than what a good clinician could make; so why bother?

Is it necessary to have doctors doing medical research?

This question is not as naive as it sounds. Since few medical people do research in science departments, we have to decide whether we can afford to improve the existing programmes using primarily science graduates from basic medical sciences like biochemistry or physiology. A parallel needs to be sought. Take the example of agriculture. Is a plant breeder better suited to agricultural research than a botanist? The insistence on tangible end points is seen in the agricultural rather than in the science graduates.

A professional background prepares the individual for an outlook different from a science background. In focused research, particularly with potential applications, such a viewpoint is of advantage. It prevents us from getting lost in trivial details. The major complaint in the country is that the results never see the light of the day. This transition from lab bench to the field requires a whole lot of activities which are so alien to science training that are not even respected. Looking into practical requirements has never been our forte. Fellowships and awards are no substitutes to career planning. Consequently many important areas dry up for lack of workers.

Science in professional degrees: Some conundrums

In agriculture, as in engineering, some economics is taught. The curriculum in agriculture has enough content to enable one to become an entrepreneur. The goals are visible for the undergraduate to comprehend.

The only equivalent in the medical curriculum is statistics. For some strange reason it is referred to as biostatistics, possibly as a euphimism for descriptive statistics. What will make the medical graduate pay attention to statistics as a subject? Even in Social and Preventive Medicine, an important subject in the medical curriculum, statistics gets a dismal treatment. Even today, techniques such as tomography, imaging, computer-aided reconstructive surgery and so on are grafted rather than home grown, limiting possibilities for innovation.

Outside the domain of agricultural education, statistics as a subject is conspicuous by its neglect. Science students are never taught what even the medical students are taught! Thus, any possibility of a common language is absent in scientific communication.

There are important areas in Indian research, where this kind of lacunae cost us heavily. Take for instance the vaccine for leprosy. With all the claims and counter claims, no one bothered to insist that we should first define whom to vaccinate! Unnecessary controversies have affected major episodes like the plague at Surat or the MIC disaster at Bhopal, the price we pay making epidemiology a major neglected quantitative discipline in the country.

Therefore when it comes to assessing market size/requirements, be it a drug or be it a service, lack of reasonable estimates to incidence and prevalence results in a severe limitation of what can or should be done. The drug companies cope with this by their own marketing surveys. Lack of an organized effort however, robs the investigators of robust estimates of the impact of the problem at hand. Vacuous claims and plans emerge, diluting the effort.

There must be some way to find out what is the clinching point for a clinically trained person to be forced to think in a cross-disciplinary manner. Other than case reports, most clinicians do not know what research is. In agriculture today, you cannot think of plant breeding without random block design. The situation forces what constitutes a minimal objective assessment of the problem at hand. On the other hand, there is nothing compelling, other than the fear of suits of malpractice, for the clinicians to keep track of what they do. Peer pressure is nonexistent in most situations. Lack of medical records probably represents the singular and the largest crime of modern medicine in this country. Thus objective assessment of the modes of treatment, multifactorial aetiologies and risk analysis, could become more handy to the clinicians when armed with the fruits of IT revolution. If a curriculum change becomes feasible it is towards such areas that the changes would be helpful.

Professional vs science education

One often wonders why there are so many bright young children that we see around in schools, that slowly vanish to the extent that we cannot get enough applicants for advanced programmes? Is it alright for a very bright young person to eschew the academic and get to treating patients? I would say, why not? Research is considered to be a normal end point to seek for a science degree and many opt for it for want of anything definitive to do. Choice by default is as bad as neglect by default. The problem is one of increasing the opportunities for the occasionally interested to latch on to a good programme early in the career. Medical colleges need to plan their curriculum so that their wards could change from the medical stream to any other steam if necessary. The approach is not one of design/determinism, but rather a permissive style that allows accidents to happen. It is clear that in a country where much research is imitative rather than original, the lead is unlikely to come from science/research establishments.

Unfortunately those who sit through committees that decide the line of action would consider such views far too idealistic and not pragmatic enough for evolving a firm line of action. The result: we remain *in status quo ante*!

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