Essay
on
The Causes of Error in Medical Science
by
John Hope

December 1861
"And first we crave exceeding pardon for the audacity of the attempt; humbly acknowledging a work of such concernment unto truth, and difficulty in itself, did well deserve the conjunction of many heads."

(Sir Thomas Browne on Vulgar Errors)
The History of Medicine has, I think, been somehow termed "the Obituary of Error." The existence of numerous, perhaps I should say innumerable, discrepancies, inconsistencies, and contradictions, in the writings and practice of Medical Men at the present day, is but too evident. As of contrary things only one at most can be true or proper, Errors must abound in Medical Science, in every particular about which opinions differ, either on one side, or the other, or both. Besides these Errors which certainly exist, there may be others, for of different opinions both may be wrong, and on points about which there is no dispute, the profession may be unanimously wrong.

The following is an attempt to expose, in a general way, the Causes of the Errors which exist in Medical Science, or which have formerly existed in it.
I shall treat of the Causes of Error in Medical Science under three Heads.

I Ignorance of the End of the Science and of the proper way to reach that end.

II Obstructions to the attainment of true knowledge in Medical Science

III Causes Retarding the Advancement of the Science

I Ignorance of the End of the Science.
I assume that the end or aim of Medical Science is to give mankind the maximum of health and life compatible with our necessary relations in this world. I also assume that this end can only be attained. 1st: By acquiring a true knowledge concerning the structure of the human body, of the processes that go on in it, and of its relations to all extemal conditions or things. 2nd: By the application of this knowledge, guided by our Reason, to mankind, so as to protect their bodies from whatever will or may injure them, and, when their bodies are injured, to place them under the conditions the most favourable to recovery.

In other words Medicine is essentially Practical; and, although it tends perhaps more than
"But the greatest error of all is, mistaking the ultimate end of knowledge; for some men covet knowledge out of a natural curiosity and inquisitive temper; some to entertain the mind with variety and delight; some for ornament and reputation; some for interest and contention; many for lucre and a livelihood; and but few for employing the Divine gift of reason to the use and benefit of mankind." — Advancement of Learning
any other science to improve the intellects of its cultivators, its proper aim is really Objective Utility. This seems so obvious that it is difficult to understand how it can have ever been denied. But History tells us that it has sometimes been ignored or practically denied.

This was very generally the case during the thirteenth and one or two subsequent centuries when learning emerged from the barbaric darkness of the Middle Ages and the writings of the Ancient Greeks began to be studied. These great works were looked upon with so much admiration that they were regarded as perfect productions; so that Medicine, sharing the fate of all other sciences, was confined entirely to the study of Hippocrates, Galen, etc., the highest ambition of a savant being to expound learnedly a part of the works of one of these great masters. So the science instead of being studied with any practical therapeutic aim was so far degraded as to become merely an arena for the exhibition of the dialectic prowess of these schoolmen, and subservient to their pride and self-glorification.

Medicine has been also studied by many out
of Curiosity. This desire to find out the Causes of this is an almost essential characteristic of a Physician, and is perhaps necessary for the progress of the science; but it is a great error to make its gratification the End of Medical Study. The appetite for startling novelties when too much indulged becomes so voracious, that it cannot be appeased by dull dry facts, but must be fed from the boundless stores of imagination. So it was with the early Greeks who devoted themselves to drawing far-fetched analogies between the human body and external nature without having previously given themselves the trouble of examining particularly either physical or vital phenomena.

I rather think that this neglect of Therapeutics exists a good deal at the present day, particularly in some Continental schools of Medicine.
II Obstructions to the Attainment of True Knowledge in Medical Science.

A. Slavery. I place this at the head of the list not on account of its present importance, for undoubtedly in our time the Medical Profession of all others has least reason to complain of restraint on free action, because it is a thing of the past. Two or three examples will show what I mean by the word. Among the ancient Egyptians the Physicians were obliged to conform to certain written laws, supposed to have been composed by Hermes Trismegistus; if they prescribed according to these rules, they were not responsible for results, but if they broke them, even success would not shield them from the punishment, which was death.

The prejudice against Anatomy, which existed so strongly among the Ancients, particularly the Greeks, who believed that the Ghosts of the dead could not cross the Styx till their bodies had been either buried or burned; and which, in a modified form, was widely spread among all nations, down to a comparatively recent date, has greatly fettered Medical Science, by leading to laws forbidding and restricting dissections. Though perhaps not a cause of positive Error, yet so far as it hindered the attainment of truth & Cause of Error, it may be taken as
another example under this head. These are cases of restrains laid on the profession from without, but it is a melancholy fact that freedom of professional opinion and action has been much more confined in almost all ages by professional despots or despotic schools. Some of those men whom we now look back upon with admiration, veneration, and gratitude, were in their day persecuted and so to speak excommunicated by the prevailing school of physicians for daring to have an opinion of their own. Indeed the History of Medicine is but the history of a dynasty of autocrats or tyrants with this peculiarity that some of these tyrants, as Galen, ruled the profession long after their death.

As Medical science, like all sciences, is in an imperfect condition, to be in a healthy state, must be in a pro-

gressive state; this kind of slavery by attempting to arrest its progress must in a manner stereotype its imperfections and propagate Error.

In the present day, if it seems to me that the profession is republican and democratic, I would vain think that the members of it do not abuse their liberty as mankind in general so often does.
Superstition

Superstition or credulity has been defined as "the admission of, and belief in, positive propositions without sufficient evidence." Granting this definition it is evident that, although superstition is not necessarily in every case a Cause of Error, it must generally lead to it. Yet while Truth is a unity, Error may be almost indefinitely multiplied.

This is such a general cause of Error that it would be useless to give any particular examples of its effects on Medical Science. But I may say that, while it has always, more or less, led Medical men into Error, they have, on the other hand, sometimes made no inconceivable use of it, for their own ends, deluding the public for the sake of pecuniary gain, and increased importance.

I think the abundance, almost say universality, of superstition must be explained by some natural instinct of man which causes him to abhor doubt or uncertainty on any subject and urges him to take decided opinions on every subject. But though all men have thus a tendency to superstition it is particularly developed in some, who, apparently from a weakness in their understanding are always ready to believe anything.
C Unreasoning Skepticism

As there are people whose minds are ready to grasp at and believe anything on little evidence or no evi-
dence at all, so, on the other hand, there are many
individuals who cannot be brought to see the force
of evidence that to others is perfectly sufficient, whom
it is often useless to try to convince even by precise
Sogic, and who are, as the Poet says

"Like to the women, who for ever

"Only recur to their first word, although

"One has been talking reason by the hour."

Fortunately, however, men of this stamp though generally
well stuffed full of Error themselves are not very apt to
infect their neighbours with their opinions and indeed
they are not the kind of people to affect much the progress
of Science either for good or evil. But Medical Science
has suffered much wrong at the hands of some of her
best adherents by their obstinate Skepticism and refusal
to believe truths the admission of which would upset
all their former opinions, and so wound their pride in
the most vulnerable part. It has, on this account,
been the fate of some great medical discoveries to
be ignored by the profession at the time.
"But the most absolute enemy unto knowledge, and that which hath done
the greatest execution upon truth, hath been a peremptory adhesion
unto Authority, and more especially, the establishing of our belief
upon the dictates of Antiquity."

Sir Thomas Browne on Bulgar Errors.
Excessive Respect for Authority

I think this has caused more Error in Medical Science than anything else. In some ages it has been exaggerated to an extent truly ridiculous. For example two or three Centuries ago the Generation for Hippocrates and his Aphorisms among almost all the members of the profession was so unbounded as to furnish a legitimate mark for the Comic Writers to exhibit their despicable wit on. With Molière it was a stock subject.

The descriptions of objects and of phenomena found in books are, even when both precise and correct, very apt to create erroneous impressions in the mind of the reader. For an Author when describing generally writes so to speak in the "Historic Present" as if he were in fancy pointing out to his audience appearances which they are gazing on as well as he, and expecting their attentive eyes to fill up the blanks in his description.

No doubt there are some branches of the Science as Anatomy and Botany in which the reader can always have the Original before his eyes and by comparing it with the description can prevent any possibility of a misunderstanding with his Author; but unfortunately this is by no means the case in Pathology.
For diseases are of such a varying nature and appear before us under so many different forms, that it is in many cases difficult to obtain a sight of the original of a description, or, what is worse, to recognize it when it is seen. But even in Anatomy the grossest errors have from time to time been spread through the whole scientific world and some cases continuing for Centuries by simply neglecting to compare the assertions of authors with the objects they dogmatized upon: as for example the statements of Galen about the Arrangement of the blood vessels though utterly and to our eyes so palpably false were believed generally up to the Sixteenth Century.

But when an author is set up as a standard authority we are liable not only to imbibe the errors he has committed, and to misunderstand his meaning when he is right, but often to obtain incorrect copies of his works. For every great author is followed by a crowd of compilers, translators and revisers, who, generally speaking are a most industrious class of men and labour assiduously at the works of mutilation, misrepresentation and falsification that their efforts are often crowned with success, Truth and Error being bound together in an inextricable Knot of Confusion.
The Hippocratic Writings afford us a great historical example of errors arising from this latter source. For not only are they confused but also occasionally self-contradictory. Again the work of Pliny on Natural History has been evidently compiled almost altogether from earlier authors, and in some cases in which the original Greek works are still extant we know that he has copied very incorrectly.

The cause of truth has also been injured by authors attempting to exaggerate their own importance, and by aiming more at style than preciseness in their writings. Now the principal characteristic of a florid style is an abundance of adjectives. But the nearer a science approaches perfection the fewer adjectives should be used in demonstrating its facts. For example, in Pure Mathematics, they are almost, perhaps entirely, wanting.

When authors can be trusted only imperfectly about matters of fact, there is little use in saying how little they must be depended on in matters of opinion.

The great responsibility that hangs over Medical men, while practising their profession, affords a ready explanation of their anxiety to shield themselves under authority, which is to them very much what Precedent is to our law courts.
CE  Neglect of Authority

That life is too short and Medical Science too extensive for any one to work through all its details; that it is impossible for a single individual, or even for a single generation, to observe a sufficient number of facts, or to make a sufficient number of experiments on which to base all scientific knowledge; that it would be gross presumption for any man to throw overboard the collective wisdom of all his predecessors, are all too obvious to be insisted on. Besides, I think it an impossibility to be entirely independent of Authority and that it must affect to some degree, though perhaps it may be latently, even the most original works and ideas.

Though errors are perhaps not so apt to arise from Neglect of Authority as from the opposite extreme; yet when the latter has been carried to such an excess, that a violent reaction against Authority has ensued, the result has been Neglect of Authority.

I think this has been somewhat the case in the Medical Profession of late, for I think it not infrequently happens, that a medical writer when denying or casting a doubt upon the recorded experience of others argues that what he never observed is not likely to have occurred.
"No man can state the errors that have been occasioned by these Physiological Hypotheses. Writers, whose minds have taken a false colour under their influence, have saddled diseases with phenomena which existed in their own brains only; but which would have been clear & visible to the whole world had the assumed hypothesis been true."

Sydenham (Grand. of J. Se)
False Observation

Although Observation is the true method of increasing knowledge, yet it is as true that a diligent observer may fall into many errors, and that this is particularly the case in Medical Science.

For the phenomena of life are presented to their observers in such numerous phases, and are produced by such complex causes, that he is ever liable to confound some together, to overlook others. May what is worse he is always liable to observe phenomena which have no existence but in his imagination, more particularly when, as is generally the case, he has some preconceived theory relating to the subject he is investigating. So Butler speaks of Hudibras.

"His notions fitted things so well
"That which was which he could not tell
"But oftentimes mistake the one
"For the other as great clerks have done"
animals he supposed, naturally enough, that the uterus in the human female was double, and his theory was accordingly extended, so that he believed male children during pregnancy were carried in the right uterus, and female children in the left one.

Observing nature with these preconceived ideas he noticed that if, when labour was approaching, the right side of the abdominal tumour became depressed, the woman always gave birth to a boy, but on the contrary if the left side became depressed, it was always a girl. He also noticed that men who have the right testicle larger than the left always produce males.

I think it must be admitted that the simple fact of Hippocrates falling into such errors is a strong proof that observers generally are very apt to do so.

Examples of error arising from the confounding of different phenomena together are so plentiful that there is little use in mentioning any particular one. Perhaps the confused notions which existed till very lately about the diseases of the nervous centres afford one of the most striking illustrations I could give of this Cause.
False Experiment

In simple observation of nature, it is necessary not only to watch and note down phenomena but also to trace out their causes; and indeed the latter is generally by far the most difficult of accomplishment. "But in experiment on the contrary, all that has to be done is to watch the effects of a known cause, applied by the Experimenter."

The great condition of a perfect experiment is that a definite, known agent be applied. Can this condition be easily attained in Medical Science?

I think it almost impossible to perform a perfect experiment on a living structure both on account of its complexity and the intimate relations of its several parts with each other; and on account of its extreme liability to be acted on in some way or another by causes over which the experimenter has no control, which perhaps he may have cognizance of, but the effects of which he will seldom be able to separate clearly from those he himself produces in his experiment.

In Experimenting upon the effects of drugs upon the human body Error may also arise from not attending particularly to the amount or quantity of the substance administered. For although drugs
or medicines are generally divided into Classes, according to their effects on the body, in health and disease; yet there is scarcely any medicine which belongs to any one class and to it alone. That is to say that hardly any medicine has but one effect. I think the different effects are produced generally by using different quantities of the drug. I don't mean by "different effect" results different in quantity but different in quality, or kind, though no doubt that an increased quantity or dose often increases the effects without changing their nature. In order that I may explain more clearly what I mean allow $D$ to represent a drug $x$ and of two different quantities, then $Dx$ should be considered as quite a different substance from $Dy$.

For example, in the case of Poisons I think no substance can be said to be absolutely and essentially a Poison, but that it can only be called a Poison when the amount it produces the poisonous effects in is included in the definition. Opium is not essentially a poison, but an ounce of Opium is.

It is, I think, by entirely ignoring all this, that Homeopaths are enabled to bring forwards so many examples apparently illustrative of their law "Similia similibus curantur", even from "Allopathic" practice.
"To take one example among many: the Homoeopathists, say, 'Tartar Emetic is acknowledged to be a powerful remedy in Pneumonia, and in some cases of poisoning with the drug the lungs have been found gorged with blood.'

In medical experiments it is generally very difficult to be certain that the phenomena observed are really the results of the cause applied. A good example of this is afforded by that difficult and much-disputed question 'Is, or is not, Belladonna a prophylactic in scalding?'. There is abundant evidence, both in this country and on the continent, that when it is some cases when it was administered on an extensive scale that the proportion of individuals attacked by the disease, subsequent to taking the drug, was wonderfully small. But then it seems very difficult to make certain whether if the drug had not been given a larger proportion would have suffered. Indeed, in a case like this, direct evidence seems an impossibility.
II. Theasty Generalization

A mass of facts, however extensive, collected by observations and experiments, would be quite useless unless inferences were not deduced from them, which pointed to a practical application. That is to say, as Lanfranc of Milan said long ago of surgery, "omnis practicatus est theoreticus" for it is impossible to apply knowledge without reasoning, that is theorizing, on it.

No theory can be said to be true unless it is founded on facts of which the theorizer has a complete knowledge. But the Medical Profession has always had great temptations held out to it to cover its ignorance by a cloak of pretended knowledge, which would vastly increase its influence and importance. I may here say that I think it is either the increased conscientiousness of the profession, or the increased enlightenment of the public that is the cause of the flourishing state of Quackery at the present day.

For the public know very well that the profession does not pretend to have any infallible remedies, so the Quack has always this advantage over the regular practitioner that his theory is at once complete and simple, and his cures certain. Of course in most cases this advantage is very short-lived for
for it vanishes as soon as experience teaches the public that the nostrum is not infallible.

Premature Generalization in Medicine is I think best illustrated by the Nomenclature of Disease or morbid states. Nosology is essentially a generalization and in an imperfect science like Medicine it is very apt to cause Error. For as observation and experience continually extending are always modifying our notions of the nature of things, one of two results must ensue.

Either Nosology must be continually changing, or the meaning of Terms must change along with the notions of things. In either case Confusion and consequent Error is almost sure to result. For on the one hand if names were continually changing it would only be by immense labour that one could understand the meaning of books written at different periods, and the scientific language of different medical schools would be a senseless jargon to another. But on the other hand if every writer, while retaining the old terms, attached his own peculiar ideas to them it is evident that Confusion must result, and Error must result also especially in the heads of the junior members of the profession, always supposing that they are industrious enough to study the works of at least two authors on one and the same subject.
I suppose it might be asked, "Since technical names and terms are apt to cause error, why use them at all?"

Doubtless special names—as those of most diseases—are of little or no practical use. For physicians generally do not treat a medical case according to its specific name but according to the pressing symptoms peculiar to the case. But still to cure the errors arising from nosology by removing their cause would be, I think, to make use of a remedy much more hurtful than the disease. For in that case it would be simply impossible for one medical man to convey pathological ideas to another. I cannot conceive by what circumlocution he would be enabled to express without using technical terms the meaning of such a word as "inflammatory." Besides this absolute necessity for such terms, they have another use namely to act as ballast to steady our ideas, which otherwise would become very loose and unsettled.
III. Causes Retarding the Advancement of the Science

A. The Extent of the Science.

Medicine embraces such a wide field of knowledge and is composed of so many different branches that it may be generally admitted as impossible for one man to become master of it in all its extent. Each special branch therefore has its own cultivators who devote themselves exclusively to it. Although this is not only proper, but necessary, it is a fertile cause of delay.

For these different subjects are so intimately connected with each other that it is impossible for them to advance (much), but in concert. But men of science do not labour regularly and steadily, like workers in a factory, who, though each one attends to his own division of the labour, under the guidance of a common master, keep such pace with each other, that the different pieces of work can, immediately when finished, be fitted together each other so as to form a complete whole. On the contrary, it is often the case that one branch of the science, by lagging behind the rest, retards their progress and that of the science as a whole.

A good example of this is I think to be seen in the slow advancement in Physiology and Pathology when Organic Chemistry was so much neglected, and
in their rapid progress of late, consequent upon the brilliant discoveries in that science. Even supposing however that men of science could be made to work in concert yet they could not work so quickly as they could if entirely independent of each other. In this they may be compared to soldiers marching in an army who, though keeping step perfectly, can with difficulty make 15 or 20 miles a-day. For the rate of progression of the whole must be regulated by the strength of the weakest.

Another Cause retarding the Advancement of the science is the comparatively small number of labourers. For although the Profession can count its numbers by tens of thousands it is but a small proportion of this host which sincerely and earnestly devotes itself to scientific work. Looking upon the Medical Profession in this light, it may be divided into three groups or classes.

1st. Those who practice the profession merely as a business and way of making bread. Many of these men are earnest workers, but their energies are devoted principally towards their own advantage. They prostitute their powers to the profession because it “pays.”

2nd. Those members of the profession who though ready enough to notice any singular or new phenomenon...
that chance throws in their way; and eager enough to communicate such to the profession at large, of course with some speculations attached to it; do not give themselves the trouble to make any minute and particular observations. I think, from what I have seen, a very large proportion of the profession may be put into this class.

3rd. The few who really devote themselves to Medicine as a science, and make its advancement their life-work.

Another Retarding Cause in Medical Science is the secrecy of discoverers. But I cannot help thinking that its influence has been more apparent than real,