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Review article

MEDICAL UNCERTAINTY: ARE WE BETTER OFF IN ERA OF EVIDENCE BASED MEDICINE?

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ABSTRACT

Uncertainty is inherent to the medical profession. Medical profession incorporates science and the scientific method with the art of being a physician. Every decision a clinician makes has some degree of uncertainty in it. There are several factors which result in medical uncertainty during clinical practice, and this could arise from physicians as well as patient factors, from test and treatment characteristics and practice environment. The inability to come at a conclusion, despite a thorough and reasonable evaluation generates anxiety amongst patients and physicians and the relationship between them may become strained and unproductive. Personal tolerance to ambiguity and uncertainty also plays a significant role in medical students when it comes to career choice. Medical Uncertainty may be technical, personal or conceptual. In the era of information overload and 'evidence based medicine' where guidelines, protocols and algorithms are available for every symptom complex and disease, one would expect medical uncertainty to be less if not totally eliminated but that is actually not the case. In fact, the protocols also threaten to depersonalize the relationship between the doctor and the patient. This article reviews the underlying mechanisms, causes and effects of medical uncertainty and also some methods to reduce uncertainty in today's clinical practice.

Keywords: Medical uncertainty, Evidence based medicine

INTRODUCTION

People prefer certainty in their lives and like to avoid risk and uncertainty. Everyone expects that professional people, including doctors, will give clear and unequivocal advice. However, medical science is far from exact. Virtually every decision a clinician makes has some degree of uncertainty in it. It is this uncertainty that makes the medicine 'a science and an art'¹. Medicine is a profession that incorporates science and the scientific method with the art of being a physician². The medical schools and colleges teach the science of medicine, but what the clinician practices is the art of medicine. Hippocrates³ commented, "Life is short, The Art long....experience fallacious and judgment difficult". The only certainty

in medicine is uncertainty and the appropriate response to uncertainty is Hippocratic humility.

The medical education traditionally revolves around the art of meticulous history taking, critically analyzing the signs and symptoms and organizing the patient's problems in a known category of disease. Clinicianstry to come to a perfect diagnosis and are disappointed when their approach fails to provide a clear diagnosis despite availability of latest investigations and evidence based medicine. All clinicians soon come to realize that uncertainty surrounds every aspect of medicine, from history taking, interpreting the physical signs, selecting an investigative procedure, sorting out the probabilities

in the differential diagnosis and assessing the outcome of a disorder.

In a study, it was observed that physicians used expressions of uncertainty in 71% of the time⁶. However; they may be oblivious of their uncertainty. Different terms like intolerance to ambiguity, risk averse and vagueness have been used in literature to describe uncertainty in medical professionals⁷. Budner⁸ introduced the term, 'intolerance of ambiguity,' as the tendency to perceive ambiguous situation as sources of threat. Personal tolerance to ambiguity and uncertainty also plays a significant role in medical students when it comes to career choice. Amongst medical students there is a higher intolerance of uncertainty in students who ultimately choose Anesthesia, Surgery, and Radiology as future residency options as compared to medical students who choose to go to Internal Medicine and Psychiatry⁹.

Types of medical uncertainty:

Three kinds of uncertainties have been identified¹⁰:

- 1) **Technical uncertainty** which occurs from inadequate scientific data,
- 2) **Personal uncertainty** which arises from being unaware of the patient's wishes; the patient and physician's personal preference and bias and
- 3) **Conceptual uncertainty** which arises from an inability of applying abstract criteria to concrete situations. While one could address the issue of technical and personal uncertainty with more experience and effort, the problem of conceptual uncertainty is likely to continue, since this indecisiveness or uncertainty is almost part of the doctor's personality.

Medical uncertainty in clinical practice: Human illnesses usually involve an abnormality of a complex biological system. The clinical expression of an illness involves the multi dimension interactions of the abnormalities of various self-regulated physiological mechanisms with the patient's environment. This is further complicated by the patients and physicians variability in expression and understanding of the problem. Variation in physician practice styles and organization characteristics (sites of medical care) are also linked to uncertainty¹¹.

Uncertainty arises when the physician must weigh probabilities. Patients' low tolerance for uncertainty presents an additional burden and a challenge for the

clinician^{12, 13}. Most clinicians respond to resolving uncertainty by action, and studies have revealed that this behavior could lead to increased hospital admissions and investigations^{14, 15}. It is therefore important to learn to manage uncertainty. All physicians experience uncertainty. What changes with increased clinical experience is the tolerance of uncertainty.

The patient and physician encounter has been described as 'the chain of uncertainty' that involves several links¹⁶. The several links in the chain include factors like biological variability of the case, uncertainty of the physician, the motives of the consultation, the prejudice and preference of the patient and the physician, medical errors, variability in medical opinions, and the differing beliefs of the patients and physicians. Uncertainty among medical student stems from personal ignorance, limits of available medical knowledge and an inability in distinguishing between the two¹⁷. One could therefore infer that in this era of information overload and "evidence based medicine" medical uncertainty should be less if not totally eliminated. Is that really the case?

Information overload: All health care professionals will acknowledge that there has been an information explosion in the health services over the past few decades. The huge amount of information is being gathered in pursuit of knowledge and in the name of the audit. The former provides the backbone of "evidence based medicine" and the later facilitates clinical governance^{18,19}. Hardly anyone would question the rationale behind the "evidence based medicine" movement. Reliable information is essential to both scientific advancement and process management. This need for information has led to such large quantities of evidence that clinicians need assistance in choosing which evidence should influence their practice. Properly collected and handled research and audit information should improve health service delivery²⁰ but there are limits to the information, both in its comprehensiveness and in its usefulness. In this era where everyone is busy 'publishing papers' (it is a mandatory requirement of certain universities for passing exams and for promotions) there are also questions concerning the quality of information.

Clinical dilemma: The existence of an information mountain provides a myth of certainty for the patient, the public and for health care policy-makers. But certainty is an illusion. However, much information or “evidence” there is to hand, a decision still has to be made and, at the point of making each decision, there will always be some uncertainty. The guidelines still leave the clinician the onus of making a decision. The main advantage of following “evidence based medicine” is that the clinician can pass the responsibility of the management outcome to protocols and guidelines. Protocols absolve the clinician who follows the protocols, but the clinician who does not follow protocols and algorithms may become an easy target for criticism. The protocols also threaten to depersonalize the relationship between the doctor and the patient.

The “placebo” effect: A crucial function of the clinician-patient relationship is that of containing the patient's anxiety, much of which arises out of uncertainties of various kinds. This “depersonalisation” of doctor-patient relationship threatens to destroy the placebo effect in the process of healing. The literature acknowledges that the placebo effect can be considered a boon to therapy²¹.

Causes of medical uncertainty: The causes of uncertainty are many, but the feeling of stress or discomfort, it creates is a familiar constant, though it may vary in intensity. Medical uncertainty is similar to the experience of irresolution or indecision in everyday life, but with additional responsibility for the patient.

Uncertainty in Diagnosis and Treatment: Three closely related problems make it difficult to determine whether or not a patient actually has a disease that needs to be diagnosed and treated.

The first problem is that the dividing line between “normal” and “abnormal” is not as clear and as sharp as the reading of medical textbooks suggests to a medical student. The clues on which the diagnosis of many diseases is based can be very difficult to see, with errors in both directions (missing a disease and ‘finding’ a non-disease).

The second problem is that many diseases do not by themselves cause pain, suffering, disability or threat to life. They are considered diseases only because they increase the chance of a disease developing in the future (the risk factors). Obesity, prehypertension,

prediabetes and hyperuricemia and dozens of such conditions fall in this category. This creates uncertainty in the physicians’ and the patients’ mind alike– ‘to treat or not to treat’.

Thirdly, the criteria for management of “diseases” are being continuously redefined in this era of “evidence based medicine”. Dyslipidemia and hypertension are classic examples. For management of hypertension, the target blood pressure that was 120/80 mmHg as per JNC 7 guidelines was revised to 140/90 mmHg by JNC 8 in 2013.

Diagnosis: Physicians vary widely in their application of clinical criteria, in their ability to elicit history, observe signs, interpret test results and record the observations. For example, only 53% of the physicians were definite in diagnosing cyanosis in patients with extremely low oxygen content. On the other hand, 26% of physicians said cyanosis existed in subjects with normal oxygen content²².

The errors occur even when physicians study hard evidence like x-rays and electrocardiograms. A set of 1807 x-ray films, containing 30 “positive” and 1760 “negative” films were read independently by ten physicians. As many as 32% of the positive films were reported as normal, while 2% of negative films were incorrectly reported as positive. When individual readers read the same films on two separate occasions, they disagreed with themselves about 20% of the time²³.

In another study, a test series of 100 tracings was selected: half had been reported routinely to show myocardial infarction, a quarter to be normal, and a quarter to show various abnormalities other than infarction. Nine experienced readers reported their opinions of these electrocardiograms on two separate occasions. They were allowed the choice of one of three reports-normal, abnormal, or infarction. Complete agreement was reached in only one-third of the 100 tracings, majority agreement in half, but there was considerable dispute about one tracing in five. After the second reading, it was found that on average, the readers disagreed with one in eight of their original reports²⁴.

Investigations & Procedures: For any patient condition, there are dozens of procedures that can be ordered, in any combination, at any time. The list of procedures that can be included in a workup of chest pain or hypertension span from simple history taking,

blood tests, ECGs, X-rays, echocardiography, stress test to thallium scan and coronary angiography. For detection of colorectal cancer, a physician can choose any combination of fecal occult blood tests, digital examination, sigmoidoscopy, barium enema, and colonoscopy or CECT abdomen. These are the procedures for well-defined diseases. The problem is augmented manifold if the clinician needs to select the investigations to evaluate vague symptoms like fatigue, body ache or headache.

Secondly, adding to the uncertainty of choosing a procedure is the fact that the value of any procedure depends on who performs it, on whom it is performed and circumstances of its performances.

Outcomes: One of the important causes of medical uncertainty is measuring the outcomes of medical procedures conducted on the patients. The main problem is the natural variation in the way people respond to a medical procedure. If same operative procedure was to be conducted on two identical people who were identical in all respects, one may die on the table and other may not. Therefore, because of this natural variation we can only talk about probabilities of various outcomes. Be its sensitivity or specificity of a diagnostic test or outcome of a certain treatment.

Determining the management plan: Almost all medical procedures have multiple outcomes- some good and some bad. The expected reduction in anginal chest pain and effort intolerance after a coronary artery bypass surgery is accompanied by, in fact preceded by, hospitalization, cutting open of chest, pain, anxiety, financial expense and of course a chance of operative or post-operative mortality. Even the best doctor cannot guaranty a positive only outcome. Since outcomes are multiple and risks are involved, risks and benefits of a procedure have to be weighed carefully regarding different modalities of management of any medical condition. Uncertainty is further added because the decisions about medical procedures are typically made by the physicians on behalf of their patients. And to do this the communication skills of the physicians are of utmost importance.

Communication Skills: The patients must be able clearly understand the need, the risks, the benefits and various outcomes of all the options available to them. Inadequate communication skills could often result in

an inability to comprehend the patient's concerns. The common communication deficiencies have been listed in Table 1.

Table 1²⁵: Common patient-physician communication deficiencies

Not allowing patient to narrate the problem in his own words and interrupting the patient early.
Inability to bring out all of the patient's apprehensions
Inability to appreciate patient's anxieties and worries
Not assuring the patient that all his problems will be addressed.
Undermining the patient's role in the decisions-making process.
Not ensuring that the patient has understood the decision taken by the clinician on his/her behalf.

Factors affecting medical uncertainty-Numerous patient and physician factors could affect the clinical decisions and result in medical uncertainty (Table 2).

Table 2²⁵: Patient and physician factors causing medical uncertainty

Patient Factors	Physician Factors
1. Vagueness in history	1. Poor communication skills
2. Wrong prioritizing of history	2. Incorrect appraisal of probability
3. Patient's subconscious avoidance of risk associated with disease.	3. Physician's tolerance to uncertainty
4. Variability in investigations results	4. Inappropriate test interpretation
5. Inconstant response to treatment	5. Failure to apply evidence-based treatment
6. Availability to various sources of information on same topic	6. Inability to assess the best evidence
7. Impact of society and culture	7. Effect of medical organization and local practice environment
	8. Fear of litigation

Coping with uncertainty: Physicists have long recognized the uncertainty principle²⁶. Uncertainty, like anxiety, cannot be "killed". It can only be lived with, controlled, or uncontrolled. The doctors need to be educated into maturity and wisdom that they require to be able to accompany people in times of need, contain their own and their patients' anxieties and facilitate healing and recovery in an uncertain world²⁷. The different techniques of dealing with uncertainty include quantitative methods and qualitative methods. Evidence-based medicine

(EBM) has been described as a technique to combine physician's clinical expertise with the use of the best available evidence and incorporating the patient's personal values in coming to a management plan²⁸. Hewson and colleagues²⁹ identified nine strategies that they felt were effective in managing uncertainty in primary care. The best techniques for minimizing uncertainty include a combination of qualitative and quantitative approach and the use of tacit reasoning³⁰. These include steps that incorporate the principles of medical decision-making, risk assessment and communication of uncertainty. Using this framework and incorporating the strategies when discussing with a patient with an uncertain diagnosis could improve the quality of patient-physician communication and reduce uncertainty to a large degree. These strategies can be summarized as below:

1. Clinicians should make it clear to the patient that they are willing to answer any questions about their health.
2. Clinicians should acknowledge that there is a tremendous information explosion and should suggest valid sources of information including valid web-sites.
3. Clinicians should be open-minded and admit ignorance if they are unable to answer a question but volunteer to find the answer.
4. They should listen sympathetically and explore the apprehensions of the patients.
5. They should concede their own preference and explain that to the patients.
6. They should nurture a sense of collaboration and involve the patient equally in the decision-making process.
7. Clinicians should use a language which is easily understood by the patient and also explain the results using a method which is most meaningful to the patient.
8. If there are more than one option on the medical treatment, that should be explicitly informed to the patient.

CONCLUSION

There are several factors which result in medical uncertainty during clinical practice, and this could arise from physicians as well as patient factors, from test and treatment characteristics and practice environment. By understanding the tenets of medical

uncertainty and practicing the well-established techniques that have been outlined, physicians could probably decrease their as well as patients' stress and anxiety especially while dealing with patients with vague and/or serious illness. Finally, the modern day doctor should also remember and apply the age old doctrines of clinical medicine (1) *Trust* between the doctor and the patient, (2) *Honesty*: the doctor should be open about the limits of his/her own knowledge and capabilities. Such openness is only possible when the doctor trusts the patient, (3) *Awareness*: of the complex processes behind medical uncertainty and that the failure of some degree will remain the doctors' unavoidable companion throughout their career and finally (4) *Kindness* and caring are the prerequisites of clinical medicine.

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