EUROPEAN JOURNAL OF PHARMACEUTICAL
AND MEDICAL RESEARCH
www.ejpmr.com

"BASIC DIAGNOSIS" IN YOUR MIND TO LIMIT TYPE 1 ERRORS: A NEW HYPOTHESIS IN MEDICAL DIAGNOSTIC WORLD

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ABSTRACT

Medical errors (ME) are a major problem in all health environment and it is necessary for physicians to be familiar with the outcomes of possible diagnostic pitfalls. There is no significant guideline to classify medical errors according to their possible adverse events. Although it is important to remember that not all of medical errors lead to adverse event & vise versa (not all of adverse events are result from a medical error), but by classifying our medical errors we could possible to limit their burden. An important part of medical errors is diagnostic errors. In this study, with regards of elites' experiences (based on medical ethics & statistics), we try to explain a new hypothesis to classify diagnostic errors with electrodiagnosis approach. With regards of our theory, two types of errors can be differentiated so that type 1 errors will have more possible adverse effect than type 2 and so will be less tolerable. Our theory which we called it profit hypothesis, needs to be completed & approved by other physician in different medical domains.

KEYWORDS: diagnostic errors, electrodiagnosis, pitfalls, basic diagnosis, type 1 errors, type 2 errors.

INTRODUCTION

Medical errors are significant health problems[1,2,] the spectrum of which is spacious[3,4] & challenging.[5,6] Medical error is a preventable adverse event[7] that result from improper medical management & may or may not result in medical injury.[8] Diagnostic tests errors which can lead to undesirable adverse effects needs specially attentions.[9,10] The impact of different medical errors during a diagnostic test are not the same, so that some pitfalls have some errors may have more unfavorable adverse effects comparing to others. According to our knowledge, there is no significant hypothesis for classifying diagnostic errors considering their probable outcomes for the patients. Here is a question: "Is it possible to classify medical errors during a diagnostic test according to their probable upcoming adverse effects?"

In statistics, a null hypothesis is regarded & according to it, type I & II errors are described. This is the basis of our idea for classification of the errors. (Obvious rules of medical ethics are also was considered).

MATERIALS AND METHODS

As the hypothesis presenters are physiatrist mostly involved with electrodiagnostic study (EDx), this hypothesis is expressed from Edx point of view. An interesting matter is more than 400 EDx are performed in electrodiagnostic clinic of Imam Reza hospital (where the hypothesis presenters are working in), monthly. Imam Reza hospital is one of the most important academic hospital in Iran.

In a two steps action research, we asked 7 other experts physician who well known in EDx (physiatrists or neurologists) to answer our question in according to their previous experiences.(totally 9 answers to each question).

Step 1: The question was: Is one of the possible errors will have less adverse effect (medical, psychological or even economical)?
Step2: We asked the elites to identify for us (in many different clinical conditions) which possible errors will have less side effects? Different types of the questions were:
Question (Q1) - A normal person is reported as myopathy or a myopathic patient reported normal?
Q2- A normal child is reported as AIDP (receive IVIG) or an AIDP patient is reported normal? (loose this opportunity) while as you know , side effects of IVIG are very rare.

Q3- A polyradiculopathy is reported ALS or an ALS is reported polyradiculopathy? While you know that the patient is not candidate for lumbosacral surgery.

Q4- In previous circumstances which one is better: An unnecessary surgery is performed on an ALS case or an indicated surgery is postpone for a polyradiculopthy due to Edx report?

Q5- A mild Carpal Tunnel Syndrome is reported more severe, so be operated or a severe CTS is reported mild & the surgery postpone several weeks?

Q6-(Condition in which a client has been disabled in an accident & tested for determination of disablement degree & want to receive insurance) which error is worse? If for a client with severe nerve or plexus injury reported normal or less severe / for normal or mild lesion reported severe?

Above questions are a good prototype of common clinical challenging conditions in electrodiagnostic field. After this step the ideas were analyzed to clarify if there is a consensus between them or not? And then a hypothesis was developed.

RESULTS AND DISCUSSION

Step 1: 6 of the answers was "almost always" & 3 was "usually. So it seems in most of challenging situations the doubt is between 2 diagnosis.

Step 2: 5 answer was almost always, 3 was usually & one answer was some times. So there is an acceptable consensus that some errors are more tolerable comparing to others.

Step 3: It seems that at the time of decision making for each challenging case (at least in electrodiagnosis medicine), a good consensus can be reached that which probable error will lead to less adverse effects. For

example all of physicians believed that it is better that a case with radiculopathy report normal, vice versa it is less tolerable error to report a normal person as a root lesion so exposing him/her with an unnecessary surgery, anxiety & also waste of money. Such consensus (with different strength) was exist in most of other clinical conditions.

In statistics, an experimenter usually frames a null hypothesis with the intend of rejecting it. The concept of type I & II errors (also called error of first & second type respectively) is derived from null hypothesis.[1]

Our hypothesis (We named it **profit hypothesis**) is based on these principles. According to this hypothesis in different medical situations it is possible to consider a basic diagnosis for the client at the first visit. This basic diagnosis is equivalent to null hypothesis which was explained before. After that we will be able to classify our possible diagnostic errors.

Here we define 3 new concepts in medical errors (from Edx point of view).

Type 1 errors (ME1): occurs when the basic diagnosis is true, but erroneously fails be accepted by the physician.

Type 2 errors: is incorrect acceptance of a false basic diagnosis.

If this hypothesis is accepted by different specialist, then we will be able to classified medical errors to less tolerable medical errors (ME1) & more tolerable medical errors (ME2) errors. Here we explain our hypothesis in 6 different common Edx doubtful situation mentioned above as Q1-Q6. (S1-S6 Respectively).

S1: Diagnosis of myopathy is accompanied with specially psychiatric adverse effect, so the according to profit hypothesis, basic diagnosis will be that the client is normal.

	Normal person	person with myopathy
Normal EDx impression	NO error	Type 2 error (ME2)
Impression: myopathy	Type 1 error (ME1)	NO error

S2: Due to advantage of IVIG in AIDP & little side effects, the basic diagnosis for the child who admitted for EDx & sustained for ADIP will be AIDP (not normal)

	child with AIDP	Other than AIDP
EDX impression: AIDP	NO error	M2 error
Impression: Other than AIDP	M1 error	NO error

S3: According to the consensus, considering psychiatric effects of motor neuron disease, basic diagnosis is" polyradiculopathy"

	Polyradiculopathy	Person with ALS
Impression: polyradiculopathy	NO error	M2 error
Impression: ALS	M1 error	NO error

S4: Suppose in previous example, the patient is candidate for Surgery. To prevention of unnecessary surgery the profit hypothesis is that the patient have mild motor neuron disease.

	Person with motor neuron disease	Person with polyradiculopathy
Impression: MND	NO error	M2 error
Impression: polyradiculopathy	M1 error	NO error

S5: The profit hypothesis is that the patient has less severe degree of disease.

	Mild CTS	Moderate CTS
Impression: Mild CTS	NO error	M2 error
Impression: Moderate CTS	M1 error	NO error

S6: The profit hypothesis is that the highest level of injury has been occurred.

	Client with highest level of injury	With mild level of injury or without significant injury
Impression: severe injury	NO error	M2 error
Impression: less severe injury or normal	M1 error	NO error

According to our study, it seems that almost always in electrodiagnosis field, high level of consensus can be reached for classification of pitfalls, so that one type (ME1) has more possible adverse effect in upcoming days comparing to other type (ME2). In statistics type 1 error is less tolerable than type 2.[11] Here is also ME1 errors would be less tolerable from medical ethics point of view.

There are studies that classify medical errors mainly according to their cause, but we have not found any comment for classification according to the outcomes. There are studies show an error rate between 1% & 8% while adverse event was reported between 3.7% & 16.6%[5] so between one-half to one-quarter of adverse events judge as errors (preventable). If we suppose that most of medical errors are ME2 (remains to be determined in other studies), ME1 errors are more prone to adverse events & most of errors will not result in adverse event.

We asked some of the expert physician in electrodiagnosis field to fulfill this hypothesis in order to codify an instruction for classification of the pitfalls according to their possible adverse effects. We also recommend to implement different researches to identify acceptable amount of each errors for a qualified physician.[12]

Definition of profit hypothesis is not very difficult. The physician needs to suppose that if the displacement is happen so that he/she would be the patient (at any situation) what does he/she like to be reported/decided? (In uncertainty conditions).

It is also possible to state this hypothesis for conditions where an error happened & the physician had more than 1 options (ME1, ME2…MEn)

We believe that this hypothesis can expand to most of medical fields. For example when there is a doubt for report certain clinical diagnosis, prescribe significant drug, perform significant surgery etc.

This hypothesis could be a base for complementary articles & could be modified by other specialists. Classification of medical errors or pitfalls would be easily perform by acceptance of profit hypothesis.

Conclusion: Several solution have been recommended to decrease medical errors or limit harmful burden of it.[8-10,13-19] We believe it is possible to classify this errors into more harmful or more acceptable, at least in electrodiagnostic field.[12] To extend this theory to other medical fields, basic diagnosis for different medical situations should be determine. Then during diagnostic process, each patient will be considered as the basic diagnosis unless another diagnosis will be proven. Type 1 errors will be erroneously fails of basic diagnosis & type 2 errors will be incorrect acceptance of basic diagnosis. In this model type 1 errors (ME1) will have more possible adverse effects and so will be less tolerable.

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