Physician Familiarity with the Most Common Misdiagnoses: Implications for Clinical Practice and Continuing Medical Education

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Abstract

Introduction: The evaluation of Florida Primary Care Physicians' knowledge with the most common misdiagnoses and the possible impact of Continuing Medical Education (CME) classes on that knowledge will prove beneficial to physicians and health care personnel concerned with quality control and education of proper practices in the health care setting.Methods: An anonymous survey was created and sent via email to 551 licensed Internal Medicine and Family Practice physicians. The questions tested physician's knowledge of the most common misdiagnoses and the breakdown points resulting in misdiagnoses. The Rasch model was used to analyze subject's responses. The survey was sent to 551 physicians, 179 of whom responded. Of those who responded, 47.5% have a private practice, 71% are over the age of 45, and 90% are Board certified. The majority of physicians surveyed (55.4%) had over 16 years in practice. These figures mirror those of the general physician population in the state of Florida. Results: Of the 179 physicians (32.5% response rate) who completed the survey, 40% correctly identified Pulmonary Embolism as the most commonly misdiagnosed condition (in terms of relative incidence) but only 7% of physicians correctly identified infections as the most common misdiagnosis (in terms of total incidence). Interestingly, 58% of physicians understood that breast cancer is the most commonly misdiagnosed, which leads to malpractice. Conclusion: Most physicians are not aware of the most common misdiagnosis or of the most common process errors, which lead to misdiagnoses. Yet, physicians seem to be better informed about misdiagnoses that commonly lead to malpractice. This may be a result of physician bias, or a deficiency on the part of continuing medical education courses to present empirical material on the most common misdiagnosed conditions.

INTRODUCTION

Approximately 98,000 preventable deaths occur every year due to medical errors in the United States.[1] Medical failures are estimated to cost $17-29 billion per year, including more than $4 billion paid in malpractice lawsuits. Lawsuit claims due to misdiagnosis, failure to diagnose, and delayed diagnosis are the most frequent and most costly, surpassing those for surgical errors.[2-4] What is worse, the amounts are expected to rise in the coming years.[5] The above facts underline the importance of educating physicians and other health care workers about the most common misdiagnoses that are under-recognized.

Avoiding misdiagnosis is essential to maintaining a high quality of care in the medical setting. In one retrospective review, cases of prostate cancer were compared (using follow-up data) with the clinical outcome to assess the most probable reasons for error in the diagnosis of prostatic cancer. Of the 1791 cases reviewed, 133 (7.5%) of cases were reassigned to a non-malignant diagnosis. The reviewers noted that continuing education in prostatic morphology and immunohistochemistry may have helped reduce this error rate.[6] Another study found that almost two-thirds of patients attending clinics specially designed for transient ischemic attack (TIA) treatment took twice more than the recommended seven days to be seen by a suitably trained professional, attributable in large part to misdiagnosis.[7]

Misdiagnosis is a financial burden as well as a burden to quality of care. In an attempt to improve quality of care and cut costs, one tertiary care centre instituted measures to

avoid misdiagnosis and applied statistical and scientific principles of quality improvement. The result was a significant improvement in glucose control, use of enteral feeding, use of antibiotics, adult respiratory distress syndrome survival, usage of laboratory and imaging services, and appropriate sedation. A severity-adjusted total hospital cost reduction of $2,580,981 was attained, with intervention directly influencing 87% of the reduction.[8] This shows that a quality improvement program, with an emphasis on prevention of misdiagnosis, can have a significant financial impact on care while simultaneously reducing costs.

Faced with these numbers and incentives, many states in the USA have acted to enact legislation regarding continuing medical education (CME) in order to include courses on error prevention. In Florida, physicians are required to take at least two CME credit hours (biannually) on the prevention of medical errors in order to acquire or renew a medical license.[9] An important objective of these classes is to instruct health care professionals on common misdiagnoses and the major process errors that lead to the misdiagnosis.[10] With a curriculum based on empirical data, short-term, intensive CME programs can improve the ability of avoiding misdiagnoses.[11] Yet the majority of CME courses do not have or use empirical data regarding the most common misdiagnoses or the most common process errors as the basis of their curriculum.

In a recent national meta-analysis, McDonald et al. presented the five most commonly misdiagnosed conditions (as confirmed at autopsy and via malpractice proceedings) and the most common process errors.[12] This paper examines the physician understanding of empirical data on misdiagnosis. Such an evaluation will prove beneficial to physicians, health care personnel, and individuals concerned with quality control and education of proper practices in the health care setting.

METHODS

A five page anonymous survey was sent via email to a random sample of 551 licensed Florida Physicians (MD & DO) who practiced Family Medicine or Internal Medicine. The survey was sent using simple random sampling provided by Medical Marketing Services, Inc. The survey data was collected by Survey Monkey. Descriptive or independent variables collected in the survey included age, gender, primary practice, specialty board certification, degree and language spoken. The dependent variable was knowledge of misdiagnosis and the common process errors that lead to misdiagnosis. This was measured using six multiple choice questions.

The questions asked included: 1- What is the most common misdiagnosis according to autopsy (in terms of total incidence)? 2- What is the most common misdiagnosis according to autopsy (in terms of relative incidence)? 3- Which of the following is NOT one of the main factors leading to misdiagnosis according to autopsy? 4- What is the most common misdiagnosis according to malpractice (in terms of total incidence)? 5- What is the most common misdiagnosis according to malpractice (in terms of relative incidence)? 6 - Which of the following is NOT one of the main factors leading to misdiagnosis according to malpractice? In the survey, it was clarified that “total incidence” refers to the sheer number of cases and that “relative incidence” refers to the number of cases divided by the incidence of that particular case.

We used the Rasch model to analyze subject’s responses to the multiple choice questions. With Rasch analysis, raw scores are converted into standardized units. These standardized units are called logits (for log-odds unit) and are considered to be interval level measures. The logits have a mean of zero and a standard deviation of one. Scores typically range from -4 to +4 with a higher score indicating more knowledge of the subject matter. For example a physician receiving a zero Rasch score would be at the mean level, a physician with a 1.0 Rasch score would be one standard deviation above the mean.

After the Rasch technique converted the nominal scale scores to interval levels of measurement, a generalized linear estimation technique was used to model the independent variables age, gender, primary practice, specialty board certified, degree and language spoken on the Rasch dependent variable. Here the distribution function is the normal distribution with constant variance and the link function is the identity. The unknown parameters were estimated with maximum likelihood. If significant differences are found in the whole model, linear contrasts are used to identify specific differences. Descriptive statistics are also applied to the data. Ethics approval for the study was obtained from the Nova Southeastern University Institutional Review Board (IRB) (reference number: 11309).

RESULTS

The total number of responses gathered was 179 (response rate = 32.5%). Of those who responded, 47.5% have a private practice, 71% are over the age of 45, and 90% are Board certified. The majority of physicians (55.4%) surveyed had over 16 years in practice. These figures mirror those of the general physician population in the state of Florida. Table 1 provides descriptive information.

Figure 1

Table 1. Descriptive Statistics

Variable	Level	Percentage	Number
Gender	Male	24%	43
	Female	76%	136
Practice Type	Community Hospital or Clinic	82%	147
	University Hospital	18%	32
	Hospice	3%	5
	Group Practice	85%	152
	Other	16%	29
Specialty	Family Medicine	44%	79
	Internal Medicine	37%	66
	Emergency Medicine	4%	7
	OB/GYN	1%	2
	Radiology	5%	9
	Other	9%	16
Age	26-30	3%	5
	31-35	6%	11
	36-40	14%	25
	41-45	12%	21
	46-50	11%	20
	51-55	16%	29
	56-60	15%	27
	61+	16%	29
Board Certification	Yes	84%	150
	No	16%	29
Medical Degree	DO	30%	54
	MD	45%	81
	MD (International)	25%	45
Languages Spoken	One	100%	179
	Two	36%	64
	Three	11%	20

Of the Florida physicians who completed the survey, only 40% correctly identified Pulmonary Embolism as the most commonly misdiagnosed condition (in terms of relative incidence). Moreover, only 7% of physicians correctly identified infections as the most common misdiagnosis (in terms of total incidence). On the other hand, 58% of physicians understood that breast cancer is the most common misdiagnosis that leads to malpractice. Only 35% identified common process errors leading to misdiagnosis. A similar percentage of physicians (29%) do not think that history and/or physical exam is important in preventing misdiagnosis. Table 2 shows the study questions, along with the physician response rate for each answer.

Figure 2

Table 2a. Study Questions

1. What is the most common misdiagnosis according to autopsy (in terms of total incidence)?

Answer Options	Response Percent
Genetic Disease	3.6%
Infections	7.2%
MI	23.0%
Neoplasm	19.4%
Pulmonary Emboli	46.8%

2. What is the most common misdiagnosis according to autopsy (in terms of relative incidence)?

Answer Options	Response Percent
Stroke	5.0%
Infections	8.6%
Aortic Aneurysms	24.5%
Neoplasm	23.0%
Pulmonary Emboli	38.8%

3. Which of the following is NOT one of the main factors leading to misdiagnosis according to autopsy?

Answer Options	Response Percent
Not Pursuing a Clinical Finding	20.1%
Atypical Presentation	12.9%
Not Providing Follow Up	10.1%
Physician Knowledge	35.3%
Error in Lab Results	21.6%

4. What is the most common misdiagnosis according to malpractice (in terms of total incidence)?

Answer Options	Response Percent
Breast Cancer	58.3%
Fractures	6.5%
Stroke	2.2%
Hematological Cancer	1.4%
MI	31.7%

5. What is the most common misdiagnosis according to malpractice (in terms of relative incidence)?

Answer Options	Response Percent
Fractures	8.6%
Infections	8.6%
Breast Cancer	46.0%
Stroke	6.5%
MI	30.2%

6. Which of the following is NOT one of the main factors leading to misdiagnosis according to malpractice?

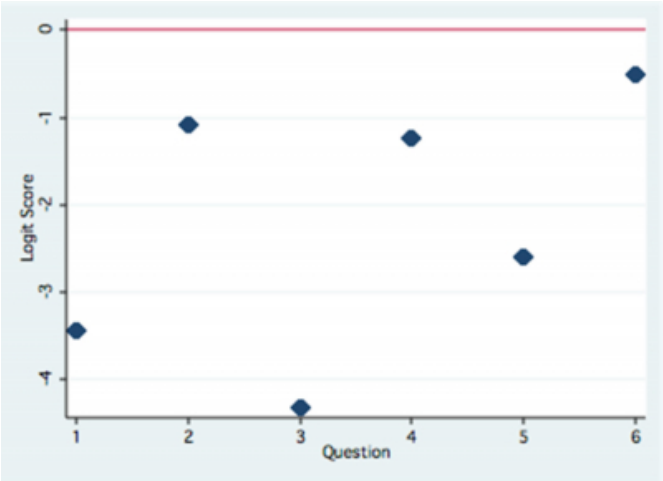
Answer Options	Response Percent
Obtaining a Good History	18.0%
Providing Proper Follow Up	10.8%
Performing Adequate Physical	10.8%
Interpreting Diagnostic Test	10.8%
Correct Performance of Test	49.6%

*Correct answer (and the percentage of individual identifying the correct answer) is highlighted & italicized.

The Rasch model indicates that all respondents had a difficult time answering the questions. Recall that a Rasch score (logit) of zero indicates average ability; however, all logit scores were below zero (Figure 1).

Figure 3

Figure 1. Rasch Scores



Question three was the most difficult question as it possessed a logit score of -4.31, which indicates that respondents have 1.3 percent chance of answering the question correctly. Question six was the least difficult, yet respondents still had only a 38% chance of correctly answering the question. Table 2 provides the probability of the respondents answering each question correctly.

Figure 4

Table 2b. Rasch Scores Conversion to Probability

Question	Logit	Probability of Answering Question Correctly	Change in Probability
1	-3.43	3.14%	---
2	-1.08	25.35%	22.21%
3	-4.31	1.33%	-24.03%
4	-1.24	22.44%	21.12%
5	-2.59	6.98%	-15.47%
6	-0.51	37.52%	30.54%

The generalized linear model indicated no significant prediction in scores based on age, gender, primary practice, specialty board certified, degree and language spoken.

Where:

$g(\mu)$ is identity link function that links the random component, $E(Y)$, to the systematic component.

A_i is the age of ith person;

G_i is the gender of ith person;

PP_i is the primary practice of ith person;

SP_i is the specialty board certification of ith person;

D_i is the degree of ith person;

L_i is the language spoken of ith person;

Therefore, it assumed that physicians responding to our survey could not identify proper misdiagnosed criteria.

DISCUSSION

The results suggest that most physicians are not aware of the most common misdiagnoses. Moreover, the results show that most physicians are not aware of the most common process errors, which lead to misdiagnoses. This is possibly reflective of an educational gap of the physician's knowledge of misdiagnoses. There are a number of potential causes of this gap, including mandatory CME requirements that are not reflective of current incidence of misdiagnoses, a disparity between malpractice claims and misdiagnoses, and lesser recollection of illnesses without a prolonged or chronic course.

In the State of Florida, CME to physicians on the prevention of medical errors is a mandate of ongoing licensure and each physician is required two hours per biennium on the subject.[13] There is a variability amongst materials in mandatory continuing education courses. Moreover, it has been shown that these mandatory courses do not impact physician practices.[14] In fact, the low number of responses in this study may be due to a possible lack of knowledge on the subject matter being tested.

Furthermore, our study demonstrates that physicians were more likely to recognize misdiagnoses that lead to malpractice claims. This could be explained by the risk model that promotes self-education on conditions that mitigate risk. The conditions that were not recognized by the participants in our study as leading misdiagnoses (infections and pulmonary embolism) are conditions with relatively short courses, whereas breast cancer (that was recognized

more frequently) has a more indolent course. The repetition of exposure to patients with prolonged courses that were misdiagnosed could explain the heightened awareness of the practitioner to these conditions.

It should also be noted that variables such as medical degree, board certification, or place of practice does not predict knowledge of the most common misdiagnosed conditions or the most common process errors. Further, it is apparent from the data that physicians are more informed about misdiagnoses that commonly lead to malpractice than those which do not. Perhaps there is an inherent bias in that those who teach and/or attend the continuing medical education courses towards misdiagnoses which lead to malpractice. Presently, continuing medical education courses may not be adequately presenting data on misdiagnosis or the most common process errors, which lead to misdiagnosis. These implications for CME will be examined in a future paper.

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