

Knowledge of Medical Students about Pathological Reports

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Abstract

Background: Considering that the only way to transfer data between the pathologist and the medical staff, particularly the therapeutic physician, is a documented report that serves as a base for the physician to diagnose the type, stage and beginning indications of the disease, it stands to reason that the therapeutic physician must possess sufficient proficiency in the comprehension of the pathological report. We aimed is to measure the ability of a medical student to correctly understand a pathological report at the end of a course of study.

Methods: This was a retrospective cross-sectional study. The subjects were 60 interns chosen randomly at different stages of internship. Each participant was given either a traditional or newspaper report format. Then, the questionnaires were handed out to assess the results.

Results: Overall, 61% of the participants answered the questionnaire. Depending on the topic of the report, there was a highly significant 44-73% differential in the answers given. On the other hand, in comparing the actual formats (traditional and newspaperial), no significant difference was observed. Furthermore, no significant difference was observed in the reports of those interns with more experience.

Conclusion: The study showed that possessing more proficiency in the topic had the most impact on the quality of the reports. Furthermore, the reports showed a more thorough understanding when the subject possessed better knowledge of a less complicated topic. Lastly, changing the format of the reports from traditional to newspaperial did not increase the level of comprehension.

Keywords: PATHOLOGY, REPORT, MEDICAL STUDENT

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Introduction

Communication plays an integral role in our lives and is the main means of transferring information between different fields of study (1). The importance of communication depends on the information being transferred and its application for the source and the receiver. One of the fields in which the importance of communication becomes most prominent is the medical field (2). It should be kept in

mind that in this regard, the communication between physicians and other staff of the medical team is as important as the doctor-patient relationship (3).

Pathology is a field encompassing both basic science and clinical experience and addresses the structural and functional changes in cells, tissues, and organs in different diseases (4). Reaching the right diagnosis is the most difficult part of managing a patient which significantly affects the knowledge about the disease and the treatment protocol (5). The microscopic view in most lesions is diagnostic but sometimes the histological findings cannot distinguish between different lesions. In such instances, the pathologist

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requires to know the medical history and physical examination of the patient to make the correct diagnosis (6,7). Physical examination of the patient and the para-clinical findings establish the base for the patient's diagnosis (8,9).

In most cases the only means of communication between the pathologist and other medical team members is the written report handed out to the patient and the medical team, on the basis of which the attending physician makes the final diagnosis for the patient. In this regard, the pathologists try their best to provide a complete report but typically pay less attention to the comprehensibility of the report (10). With the extensive advances made in laboratory instruments and facilities, an increase has been observed in the volume of acquired information from the specimens. However, it should be kept in mind that providing the extra information unrelated to the clinical presentation of the patient does not only help managing the patient, but can lead to bewilderment. Hence, unrelated extra information should be omitted as much as possible (11-13). Moreover, the extent to which readers comprehend a pathology report is directly related to their education and experience (14).

Accordingly, the pathologists should be always concerned about whether the medical team completely understands the pathology report or not. Two main templates are typically used to report pathological findings. In the traditional format that is generally used by the pathology departments, demographic characteristics of the patient are followed by reporting the macroscopic and microscopic findings of the specimen and finally the differential diagnoses and clinical notes are provided. The newspaperial format highlights the clinical diagnosis which appear in bold as the title in a specified section at the top of the report and is followed by the demographic characteristics of the patient and finally the macroscopic and microscopic findings of the

specimen (15).

To date, many attempts have been made to design protocols for homogenization and standardization of the obtained specimens but methods to improve the comprehensibility of the pathology reports are quite limited (16-18). We aimed to assess the ability of medical students to interpret pathology reports at the end of their internship and to determine the sources of misunderstanding. We also aimed to find out whether changing the format of the report from the traditional template to newspaperial format can improve the comprehensibility of the report or not.

Materials and Methods

This was a retrospective cross-sectional study. The sample population included medical students studying medicine at Iran University of Medical Sciences. Initially 6 pathology reports from clinical pathologists on 6 different topics of transurethral resection (TUR) of bladder and prostate, biopsy specimens from stomach and colon, curettage specimens of the endometrium and fallopian tubes, specimen from the first lumbar vertebrae, biopsy and bone marrow aspiration, neck mass and parotid gland were selected. According to the suggestions of a pathologist, the samples were categorized as cancer and non-cancer and regarding their complexity into difficult and moderate. Reports with similar contexts were provided in two different traditional and newspaperial formats. Sixty medical students in different stages of their internship were randomly selected from different hospitals and departments and two pathology reports on different topics provided in different formats were handed to each participant.

Of each report, multiple choice questions were asked from the students to evaluate their understanding from different aspects of the reports and they were given 15 minutes to answer the questions. The gathered questionnaires were then scored on the basis of

the number of correct answers. The participants were also asked about their confidence level in the findings of the reports on a scale of 1 to 10; 1 showing very little confidence and 10 as the complete confidence in the results. The scores were used to determine the extent of the students' understanding from the reports and to identify the more problematic topics and sections of the reports. Furthermore, the results of the two traditional and newspaperial formats were also compared with each other. SPSS software, version 20.0 (SPSS Inc., Chicago, IL, USA) was used to perform all statistical analyses. Quantitative and qualitative variables were presented as mean±standard deviation (SD) and frequency (percentage), respectively. We used Chi-square test for comparing qualitative variables and Student's t test for analyzing quantitative variables between the study groups. A P<0.05 was considered as statistically significant.

Sample of traditional pathology report format

Clinical impression: Patient with hematuria, bladder tumor and hypoechoic prostatic nodule.
 Mac: The specimen received in 2 fixative-free containers labeled as:
 A: Bladder mass composed of multiple ribbon like fragments of cream-brown soft tissue, TM: 2.1x1.2x0.7 cm, entirely submitted in 3 cassetts.
 B: Right lobe of prostate biopsy consists of 3 needle-shape fragments of creamy soft tissue, 3 cm in length and 0.2 cm in diameter. Entirely submitted in one cassetts.
A) BLADDER, CYSTOSCOPIC BIOPSY:
 -UROTHELIAL CARCINOMA, NON PAPILLARY, LOW GRADE ACCORDING TO WHO/ISUP GRADING SYSTEM, INFILTRATING LAMINA PROPRIA.
 -TUMOR ARISES FROM FLAT CARCINOMA IN SITUE, MULTIFOCAL -MUSCULARIS PROPRIA IS NOT INCLUDED.
 -NEUROVASCULAR INVASION, INCONCLUSIVE DUE TO MARKED CAUTERY EFFECT
B) RIGHT LOBE OF PROSTATE GLAND,

NEEDLE BIOPSY:
 -INVASIVE ADENOCARCINOMA, GLEASON SCORE: 4+4=8, 40%, IN AN OTHERWISE ACUTE PROSTATITIS.
 -EXTRAPROSTATIC EXTENSION IS NOT EVALUABLE.
 -PERINEURAL INFILTRATION IS NIL, IN EXAMINED SECTIONS.
ICD O-M 8140/3 ICD O-C 61.9

Sample of newspaperial pathology report format

DIAGNOSIS:

<p>A) BLADDER, CYSTOSCOPIC BIOPSY: -UROTHELIAL CARCINOMA, NON PAPILLARY, LOW GRADE ACCORDING TO WHO/ISUP GRADING SYSTEM, INFILTRATING LAMINA PROPRIA. -TUMOR ARISES FROM FLAT CARCINOMA IN SITUE, MULTIFOCAL -MUSCULARIS PROPRIA IS NOT INCLUDED. -NEUROVASCULAR INVASION, INCONCLUSIVE DUE TO MARKED CAUTERY EFFECT</p>	<p>B) RIGHT LOBE OF PROSTATE GLAND, NEEDLE BIOPSY: -INVASIVE ADENOCARCINOMA, GLEASON SCORE: 4+4=8, 40%, IN AN OTHERWISE ACUTE PROSTATITIS. -EXTRAPROSTATIC EXTENSION IS NOT EVALUABLE. -PERINEURAL INFILTRATION IS NIL, IN EXAMINED SECTIONS.</p>
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Clinical data : Patient with hematuria.
 Clinical diagnosis: bladder tumor and hypoechoic prostatic nodule.
GROSS DESCRIPTION:
 The specimen received in 2 fixative-free containers labeled as:
 A: Bladder mass composed of multiple ribbon like fragments of cream-brown soft tissue, TM: 2.1x1.2x0.7 cm, entirely submitted in 3 cassetts.
 B: Right lobe of prostate biopsy consists of 3 needle-shape fragments of creamy soft tissue, 3 cm in length and 0.2 cm in diameter. Entirely submitted in one cassetts.
ICD O-M 8140/3 ICD O-C 61.9

Sample of questionnaire

First question (diagnosis):

1- Is the muscular layer of the bladder infiltrated by the tumor tissues?

- Yes
- No
- The specimen does not contain the muscular layer
- Not mentioned

Second question (diagnosis):

2- What is the status of nerve infiltration by the tumor tissue in the prostate specimen?

- Positive
- Negative
- Cannot be determined
- Not mentioned

Third question (diagnosis):

3- Do premalignant changes are present in the bladder specimen?

- Yes
- No
- Not mentioned

Fourth question (diagnosis):

4- What does the number "M: 8140/3C61.9" refer to?

- The international coding system of diseases
- The number of pathology report
- Specifications of the number of type of specimens

not statistically significant and the differences between the scores of different reports were still statistically significant ($P < 0.001$, Table 2). The mean response rates for the first to sixth report were 44.6%, 58.3%, 70.5%, 66%, 73%, 44.6%, respectively (Table 2). The mean response rate for the cancer related reports (the first and sixth) was 44.8% which was significantly lower than the response rate of non-cancer reports (64.6%, $P < 0.001$).

As for the format of the pathology reports, the mean response rate for the traditional reports was 56.8 ± 21.6 which was not significantly different from the newspaperial reports with 59.3 ± 23.5 , assessed by the Student's t test ($P = 0.54$, Table 3).

Spearman correlation coefficient for the relation between the month of internship and the mean score showed a positive correlation which was not statistically significant ($P = 0.12$, $r = 0.142$, Figure 1). However, a significant positive correlation was observed between the confidence level and the score of participants (Figure 2).

Table 4 shows the analysis results of the data from each report separately. For the first reports where all the questions were evaluating the diagnosis aspect, the participants gained the lowest score from question number 2 (15%) and the highest score from the third question (75%). The second report included 6 questions with the lowest score obtained from the fourth question regarding the macroscopy aspect (15%) and the highest score obtained from the third question on the microscopy aspect of the report (100%).

All the questions in the third report addressed the diagnosis section of the report with the minimum score obtained from question number 2 (45%) and the highest from the third question (80%).

The first three questions of the fourth report were from the diagnosis section with the lowest

Results

In the analysis of the results an initial assessment of the overall response was performed, the mean of which was found to be $58.1 \pm 2\%$ with the maximum mean for the fifth report ($73 \pm 2.6\%$) and the minimum for the first report ($44 \pm 4\%$). One-way ANOVA showed that the differences in the mean score of the reports were statistically significant ($P < 0.001$, Table 1).

In order to increase the accuracy of the results, items with confidence scores of less than 5 were omitted and the mean score was calculated to be $61 \pm 2\%$; a change which was

Table 1. The overall response rate for each report, separately

Score	Descriptives					
	N	Mean	Std.Deviation	Std.Error	Minimum	Maximum
1.00	20	43.7500	19.65994	4.39610	0.00	75.00
2.00	20	55.8333	16.46812	3.68238	33.33	100.00
3.00	20	63.7500	28.64828	6.40595	25.00	100.00
4.00	20	66.0000	19.57442	4.37697	20.00	100.00
5.00	20	73.0000	11.74286	2.62578	60.00	100.00
6.00	20	46.0000	21.61871	4.83409	0.00	80.00
Total	120	58.0556	22.51914	2.05571	0.00	100.00
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Between Groups		13476.019	5	2695.204	6.555	.000
Within Groups		46870.278	114	411.143		
Total		60346.296	119			

Table 2. The overall response rate with confidence of more than 50%

Score	Descriptives					
	N	Mean	Std. Deviation	Std.Error	Minimum	Maximum
1.00	14	44.6429	20.04459	5.35714	.00	75.00
2.00	16	58.3333	16.10153	4.02538	33.33	100.00
3.00	17	70.5882	25.36498	6.15191	25.00	100.00
4.00	20	66.0000	19.57442	4.37697	20.00	100.00
5.00	20	73.0000	11.74286	2.62578	60.00	100.00
6.00	13	44.6154	18.53617	5.14101	20.00	80.00
Total	100	61.1833	21.48956	2.14896	.00	100.00
ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Between Groups		12289.008	5	2457.802	6.911	0.000
Within Groups		33429.298	94	355.631		
Total		45718.306	99			

Table 3. The overall response rate based on the report's format

Format	Mean	N	Std. Deviation	Minimum	Maximum
Traditional	56.8056	60	21.67056	0.00	100.00
News	59.3056	60	23.45266	0.00	100.00
Total	58.0556	120	22.51914	0.00	100.00

score from question number 1 (65%) and the highest from the second question (80%). The fourth and fifth questions referred to the macroscopy of the specimens and the mean scores for these questions were 55% and 60%, respectively.

In the fifth report, the lowest score was obtained from question number 5 on the microscopy

aspect of the report (20%) while questions 2 and 4 on the diagnosis and microscopy had a mean response rate of 100%.

Of the 4 questions from the sixth report, 4 pertained to the diagnosis and 1 addressed macroscopy of the specimen. The lowest mean score was for the fifth question (15%) and the highest for the second question, both

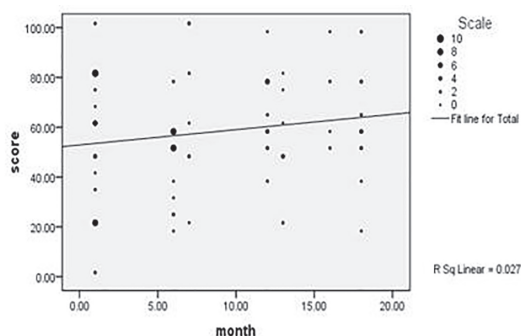


Figure 1. Correlation between the months passed from internship and the rate of correct answers

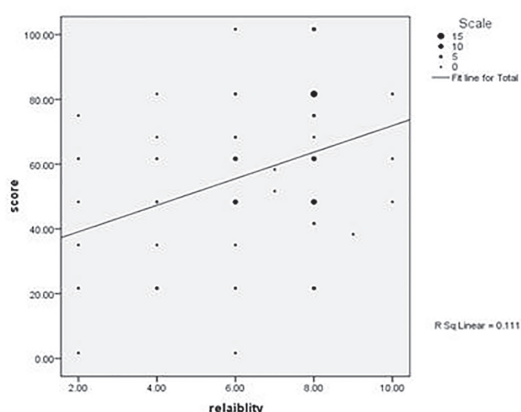


Figure 2. Correlation between confidence level and the rate of correct answers

pertaining the diagnosis aspect. The mean score for the question on macroscopy of the specimen was calculated to be 25%.

Discussion

In their study, Powsner and colleagues

(12) observed that 30% of surgeons did not understand the meaning of the pathology report correctly and although increased experience of the surgeons improved their understanding of the reports, it did not completely resolve the issue. In the present study, we included medical students and found out that the overall mean of understanding pathology reports with above the moderate confidence level was 61%, which is indicative of a 39% error in the interpretation of pathology reports. The highest mean score was calculated to be 73% for a hematology report and the lowest score was obtained from a cancer related report with a mean of 44%. Separate analysis of the reports showed a significantly lower score for the cancer related reports compared to the non-cancer reports with a mean of 45% calculated for the first and sixth reports on cancer-related topics and a mean of 65% for the other four reports on non-cancer subjects. This emphasizes the importance of the reader’s medical knowledge and experience on the topic of the report. However, this should also be mentioned that not all these misunderstandings lead to clinical errors since in most cases where the physician does not comprehend the meaning of the report, the issue is resolved by the physician asking the pathologist or studying related literature on the subject. In the study conducted by Powsner and co-workers, the rate of discrepancies on the diagnosis was found to be lower in the cancer-related topics compared to other reports, which might be

Table 4. The rate of correct answers to each question

	Question 1				Question 2				Question 3				Question 4				Question 5				Question 6			
	Diagnosis	Microscopy	Macroscopy	Percent	Diagnosis	Microscopy	Macroscopy	Percent	Diagnosis	Microscopy	Macroscopy	Percent	Diagnosis	Microscopy	Macroscopy	Percent	Diagnosis	Microscopy	Macroscopy	Percent	Diagnosis	Microscopy	Macroscopy	Percent
R1	*			20	*			15	*			75	*			65								
R2		*		65	*			85		*		100		*		15	*			50	*			20
R3	*			75	*			45	*			80	*			55								
R4	*			65	*			80	*			70		*		55		*		60				
R5		*		55	*			100	*			90	*			100	*			20				
R6	*			35	*			85		*		25	*			70	*			15				

due to the fact that these researchers included surgeons in their survey who naturally are more knowledgeable on such topics (12). We also observed that although an increase in the months passed from internship increases the confidence of the students in their answers, but does not significantly affect their scores. This observation shows that although during internship the ability of the students in reading pathology reports increases, but the educations are not enough.

In another survey, Ruby and co-workers (1) concluded that making a chart of the important clinical notes and emphasizing on these notes can increase the comprehensibility of a pathology report. In a Q-tracks study, Nakhleh and colleagues (11) assessed the physicians' satisfaction with pathology reports and found that the completeness and the format of the pathology report affects the physicians' satisfaction. Powsner and colleagues (12) also found that simplifying the format of a pathology report creates confusions and the more changes were applied to the report, the greater the disagreements and misunderstandings. In order to evaluate the effects of the report's format on its comprehensibility, two traditional and newspaperial templates were designed and in the latter format, the diagnosis part appeared in a separate section on top of the report followed by the other information. Comparing the results of the two formats revealed that the comprehensibility of the report is not significantly affected by its format.

In another analysis performed on the data we found that in the diagnosis aspect of the reports, errors are made in cases where the diagnosis is not directly pointed out and should be inferred from the text. For instance, in the sixth report, 35% correctly answered the question about the tumor being in situ or not and 15% correctly answered the question on the status of the specimen's margin. In the third report, the rate of correct answers was 45% on the question about the diagnosis of the curettage specimen and 55% on another question asking the possible diagnosis based

on the findings. Moreover, in the fifth report, the question asking about the cellularity of the bone marrow yielded 20% correct answers. In some cases, unfamiliarity with the specific terminology led to misunderstanding. For example, in the first report, the term NIL was used to determine involvement of nerves and so 85% did not get the correct interpretation. In another question inquiring about the involvement of muscular layer, the text included the term muscularis propria which refers to the mucosal layer. In this case, 80% of participant mistakenly concluded from the mentioned term that the muscular layer is involved. In the second report, although the term foreign body was mentioned in the report, 80% of the students did not know that bezoar could be referred to as a foreign body and so gave the wrong answer to the corresponding question. The terms "oxyntic mucosa" and "melanosis coli" were also mistaken for the presence of cancer. In the third report, for the diagnosis of the right fallopian tube the term "unmarkable" was used which was mistakenly interpreted by 30% of participants as the right fallopian tube not being found in the specimen.

Another important issue with understanding pathology reports is not being familiar with abbreviations used in this field. For instance, not knowing that the percent of passaged specimens for evaluation is presented as "E: ...%", 85% chose the wrong answer in the second report, 40% in the fourth report, and 75% in the sixth report. Moreover, not knowing the stages of preparing the specimen led to misunderstandings as well. In the fourth and fifth reports, questions asked about the stages of preparation were answered incorrectly by 35% of the participants. We also observed a significant positive correlation between confidence level and mean scores of the subjects. However, in contrast to Powsner and co-workers' study, we did not find a significant relationship between the number of sample containers and the rate of correct answers.

Conclusion

We found that about a third of medical interns have difficulties in understanding pathology reports. Although it is not clear what proportion of these misunderstandings lead to clinical errors, but the high rates demand major attention and should surely be addressed. The results also showed no significant effect of changing the report's format on its comprehensibility and so such changes are not suggested. The knowledge and education of medical students was found to be lacking on the preparation processes of samples and the specific terms used in pathology reports, and so it is recommended that a rotation in the pathology departments be added to the medical internship courses for the students to have the chance to get acquainted theoretically and practically with the details of services provided in the two anatomical and clinical sections of these departments and acquire the necessary information. It is also suggested that a similar study be conducted on medical graduates and residents to assess their knowledge about pathology reports as well.

Conflict of Interest

The author declares no conflict of interest.

References

1. Ruby SG. Clinician interpretation of pathology reports: confusion or comprehension? *Arch Pathol Lab Med.* 2000;124(7):943-4.
2. Feinmann J. Brushing up on doctors' communication skills. *The Lancet.* 2002;360(9345):1572.
3. Galloway M, Taiyeb T. The interpretation of phrases used to describe uncertainty in pathology reports. *Patholog Res Int.* 2011;2011.
4. Kumar V, Abbas AK, Fausto N, Aster JC. *Robbins and Cotran pathologic basis of disease.* 9th ed. Canada: Elsevier Health Sciences; 2014.
5. Major RH, Delp MH, Manning RT. *Major's physical diagnosis: An introduction to the clinical process.* The University of Michigan: WB Saunders Company; 1981.
6. Jones A, Franklin C. An analysis of oral and maxillofacial pathology found in adults over a 30-year period. *J Oral Pathol Med.* 2006; 35(7):392-401.
7. Jones A, Franklin C. An analysis of oral and maxillofacial pathology found in children over a 30-year period. *Int J Paediatr Dent.* 2006;16(1):19-30.
8. Ali M, Baughman RA. Maxillary odontogenic keratocyst: a common and serious clinical misdiagnosis. *J Am Dent Assoc.* 2003;134(7):877-83.
9. Markel SF, Hirsch SD. Synoptic surgical pathology reporting. *Hum Pathol.* 1991;22(8):807-10.
10. Broder S. Rapid communication—the Bethesda system for reporting cervical/vaginal cytologic diagnoses—report of the 1991 Bethesda workshop. *JAMA.* 1992;267(14):1892.
11. Nakhleh RE, Souers R, Ruby SG. Physician satisfaction with surgical pathology reports: a 2-year College of American Pathologists Q-Tracks Study. *Arch Pathol Lab Med.* 2008;132(11):1719-22.
12. Powsner SM, Costa J, Homer RJ. Clinicians are from Mars and pathologists are from Venus: clinician interpretation of pathology reports. *Arch Pathol Lab Med.* 2000;124(7):1040-6.
13. Valenstein PN. Formatting pathology reports: applying four design principles to improve communication and patient safety. *Arch Pathol Lab Med.* 2008;132(1):84-94.
14. Leslie KO, Rosai J, editors. *Standardization of the surgical pathology report: formats, templates, and synoptic reports.* Seminars in Diagnostic Pathology; 1994.
15. Wyatt JC, Wright P. Design should help use of patients' data. *The Lancet.* 1998;352(9137):1375-8.
16. Nygren E, Wyatt JC, Wright P. Helping clinicians to find data and avoid delays.

- The Lancet. 1998;352(9138):1462-6.
17. Powsner SM, Wyatt JC, Wright P. Opportunities for and challenges of computerisation. The Lancet. 1998;352(9140):1617-22.
18. Wright P, Jansen C, Wyatt JC. How to limit clinical errors in interpretation of data. The Lancet. 1998;352(9139):1539-43.