นิพนธ์ต้นฉบับ

Errors in laboratory requests in the In-Patient Department, King Chulalongkorn Memorial Hospital

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Objective : *To study the errors in laboratory requests in the In-Patient Department of King Chulalongkorn Memorial Hospital*

Design : *Prospective descriptive study*

Materials : *Laboratory requests from the In-Patient Department sent to the Clinical Chemistry Unit, Division of Laboratory Medicine, King Chulalongkorn Memorial Hospital during office hours between September 1 - 30, 1998.*

Methods : *All laboratory requests were considered using criteria based on laboratory medicine textbooks. Obtained data were analyzed and interpreted.*

Results : *There were 3,043 laboratory requests in this study. 63 % of the request forms were incomplete due to omissions, mistakes and use of non-standard abbreviations. Many errors were observed in aspects of the time that specimens were collected, diagnosis and patient identification. Only 0.72 % of the specimens were considered inappropriate.*

Conclusions : *Incomplete laboratory request form writing is the major error found in laboratory requests. Medical personnel should be more careful in writing request forms and in specimen collection.*

Key words : *Error, Laboratory request, Request form, Specimen.*

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วิโรจน์ ไววานิชกิจ. ความบกพร่องในการส่งตรวจทางห้องปฏิบัติการแพทย์แผนกผู้ป่วยในโรงพยาบาลจุฬาลงกรณ์ จุฬาลงกรณ์เวชสาร 2541 ก.ย; 42(9): 685-93

วัตถุประสงค์ : เพื่อศึกษาความบกพร่องในการส่งตรวจทางห้องปฏิบัติการทางการแพทย์แผนกผู้ป่วยในโรงพยาบาลจุฬาลงกรณ์

รูปแบบการศึกษา : การศึกษาเชิงพรรณาแบบไปข้างหน้า

วัสดุ : การส่งตรวจทางห้องปฏิบัติการทางการแพทย์ หน่วยเคมีคลินิก ฝ่ายเวชศาสตร์-ชันสูตร โรงพยาบาลจุฬาลงกรณ์ ในเวลาราชการ ระหว่างวันที่ 1 กันยายน ถึง 30 กันยายน 2541

วิธีการ : ใช้หลักการจากตำราเวชศาสตร์ชันสูตรในการพิจารณาการส่งตรวจทางห้องปฏิบัติการทั้งหมด ข้อมูลที่ได้ถูกนำมาวิเคราะห์และแปลผล

ผลการศึกษา : มีการส่งตรวจทางห้องปฏิบัติการทางการแพทย์รวม 3043 การส่งตรวจในการศึกษานี้ พบว่า 63 % ของใบส่งตรวจทางห้องปฏิบัติการมีไม่สมบูรณ์จากความไม่ครบถ้วนของการเขียน ความผิดพลาดของการเขียน การใช้อักษรย่อที่ไม่เป็นสากล พบความบกพร่องเป็นจำนวนมากเกี่ยวกับข้อมูลเรื่องเวลาในการเก็บสิ่งตรวจ, การวินิจฉัยโรคและการพิสูจน์บุคคล พบว่ามีสิ่งส่งตรวจที่ไม่เหมาะสมเพียง 0.72 %

บทสรุป : ความไม่สมบูรณ์ในการเขียนใบส่งตรวจทางห้องปฏิบัติการเป็นความบกพร่องที่พบมากในการส่งตรวจทางห้องปฏิบัติการทางการแพทย์ ดังนั้นจึงควรเน้นย้ำให้บุคลากรทางการแพทย์ตะหนักถึงความสำคัญในการเขียนใบส่งตรวจทางห้องปฏิบัติการและการนำส่งสิ่งส่งตรวจ

คำสำคัญ : ความบกพร่อง, การส่งตรวจทางห้องปฏิบัติการทางการแพทย์, ใบส่งตรวจทางห้องปฏิบัติการ, สิ่งส่งตรวจ

Laboratory work plays an important role in medicine. Many laboratory procedures are required for diagnosis and follow-up of diseases[1]. In order to get good laboratory results not only good laboratory techniques but also proper specimen collection is required. The first step of any laboratory procedure is specimen collection so all medical personnel should know correct methods to collect medical specimens. After the specimen collection, the next step is the request. Request forms should be completely and correctly filled out in order that the medical technologist can provide the correct laboratory procedure. The laboratory should use the criteria of the International Quality System. And when any laboratory procedure is completed, follow-up laboratory results are important. The last step is the interpretation of the laboratory results by the physicians in charge. Considering these chronological steps, there are two main groups of medical personnel who play important roles in the laboratory process - the medical personnel in the wards and the laboratory workers.

In order to obtain the best laboratory practice, all of the medical personnel should share in the process. Medical personnel in wards should have a proper system for collection of medical specimens, issuing requests and following the laboratory results. Laboratory workers workers should practice every procedure in accordance with the quality system.

This process is very important. If there are mistakes in any step, the laboratory results will not be accurate. Presently, at Chulalongkorn Hospital the concept of a quality system [2] in laboratory work is widely discussed but there has been no report about the errors in laboratory requests. If the detail about errors in laboratory requested in the hospital is identified, proper methods to solve the problems can be provided. Therefore, this study was designed to assess the errors in general practice laboratory requests of the In-Patient Department of Chulalongkorn Hospital.

Methods and Materials

This was designed as a prospective descriptive study. The study documents were all of the laboratory requests from the In-Patient Department sent to the Clinical Chemistry Unit of the Division of Laboratory Medicine of Chulalongkorn Hospital during office hours between September 1 - 30, 1998. This study included laboratory requests within only one-month period because of similarity in laboratory services in each month of a year. The study did not included Out - Patient Department because specimen collection was totally controlled by laboratory. The major reason for not studying laboratory requests during non-official hours was lack of complete services of the Division during those hours. Laboratory requests from emergency room and some units (HIV seropositive units, study units, research units) were excluded due to the fact that most of requests from those units use codes as identification so we cannot consider them in details. All laboratory requests were considered in two main topics-how complete were the request forms and how appropriate was the specimens by the investigator. Obtained data were transformed into tabular form with codes and consideration given based on criteria from laboratory medicine textbooks [3-8]. Interpretation of the analyzed data was carried out. Descriptive statistical analysis was carried out when appropriate. (Diagram 1)

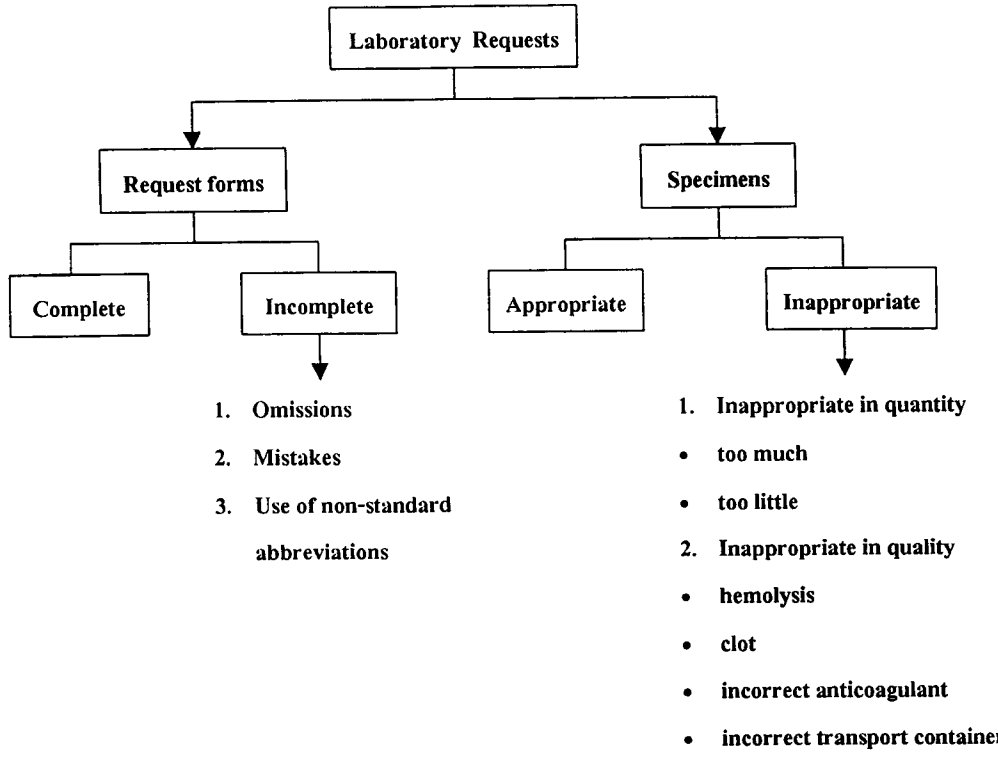

Diagram 1. Criteria used in this study.

Results

Complete data on 3,043 laboratory requests were collected during the one-month period. There were many types of medical specimens sent to the laboratory in that period (Table 1).

Table 1. Number and percentage of medical specimens sent to the laboratory, categorized by type.

Types of medical specimens	Number	Percentage
1. Blood	2,882	94.71
2. Cerebrospinal fluid	90	2.96
3. Peritoneal fluid	32	1.80
4. Pleural fluid	24	1.05
5 Urine	5	0.16
6. Pericardial fluid	1	0.03
7. Subdural fluid	1	0.03
8. Joint fluid	1	0.03
9. Fluid from skin lesion	1	0.03
10. No specific source	6	0.20
Total	3,043	100.00

In considering the laboratory request forms, 1,917(63.00%) of the total were considered inappropriately in terms of completeness and correctness. Major errors of the incomplete forms were omissions, mistakes and use of non-standard abbreviations. Omissions included failure to specify the specimen collection time, diagnosis and patient identification. Mistakes were caused by incorrect spelling and poor handwriting. Examples of non-standard abbreviations included HD for heart disease and CBD for common bile duct. Of the total incomplete forms, 1,070 forms were unspecific about the time that the specimen had been collected, 1,292 omitted diagnosis and 5 lacked any patient identification data (patient's name, sex, hospital number and ward) (Table 2).

In considering specimens, 22 (0.72%) of the total specimen collection forms were considered inappropriate in quality or quantity. In all cases, the physicians were consulted to have the new specimen collected. So much or little quantity of specimens that laboratory could not analyzed were considered inappropriate in quantity. Examples of inappropriate specimens in quality were hemolysis, clot and incorrect anticoagulant. Various inappropriate aspects of specimen were detected (Table 3).

Table 2. Number and percentage of completeness and incompleteness in writing laboratory request forms.

Laboratory requests	No.	%
Complete	1,126	37.00
Incomplete		
1. Only about time of specimen collection	847	27.84
2. Only about diagnosis	625	20.54
3. Only about patient identification	0	0.00
4. Only about 1 and 2	440	14.46
5. Only about 2 and 3	0	0.00
6. Only about 1 and 3	0	0.00
7. About 1,2 and 3	5	0.16
Total	3,043	100.00

Table 3. Number and percentage of completeness and incompleteness regarding specimen collection.

Specimen collection	No.	%
Appropriate	3,021	99.28
Inappropriate		
• In quantity		
* too much	1	0.03
* too little	8	0.27
• In quality		
* hemolysis	8	0.27
* clot	2	0.06
* incorrect anticoagulant	3	0.09
Total	3,043	100.00

There were only 2 (0.07%) requests considered as ideal examples of specimen collection and laboratory request forms. They contained all of the data required for the laboratory procedures including additional data such as methods used in the specimen collection and substances provided to the patient while the specimens were collected.

Discussion

From this study, a high incidence of errors in laboratory requests (63 %), especially laboratory request form writing, was found. Many request forms had more than one incomplete aspect. Omissions, mistakes and use of non-standard abbreviations were important reasons for the incompleteness of the laboratory forms. Though the importance of laboratory request writing is frequently taught in medical education, many errors were found in actual medical practice. Violation of the basic principles is commonly found in any practice due to neglect after becoming experienced. The ignorance and carelessness of some practitioners are commonly reflected in the laboratory requests that they wrote. Incomplete laboratory request forms can be hazardous to the patients and result in wasted time and money in consulting doctors to recheck their requests. Delayed and false laboratory results are important topics, especially in emergency unit. Therefore, medical personnel should pay attention to the writing of laboratory requests.

Incomplete data about the time that specimen was collected can result in misinterpretation of laboratory results [3-8]. Some biochemical substances are fragile so that the level of them will vary with time. Some biochemical substances are useful in decisions of treatment in one period but not useful in other periods. If the time that the specimen was collected is known, delayed specimen processing can be adjusted for. It is waste of time to investigate expired specimen. Furthermore, when the laboratory results are reported, the medical personnel should not delay treatment. [9]

Incomplete data about diagnosis [3-8,10-11] is another error that should be avoided. The diagnosis of the patient should be included in the request form because it can be a clue for the laboratory investigation. In cases where laboratory results are unusual, a recheck investigation is required. Writing the diagnosis in the laboratory request can save time in consulting doctors to recheck. It can be considerable help if data about the underlying method used for the specimen collection and substances that patient received while the specimen was collected are included because these factors cause variations in many laboratory results.

Error in patient identification [3-8,9-11] is a topic that should be of significant concern. It can be the most hazardous error because incorrect patient identification invariably means incorrect laboratory results. Incorrect laboratory results can lead to a patient's death in the worst case [12]. This study could not observe each specimen collection process but it did check the identifications in the request forms. This study concidered the main identifications - patient's name, sex, hospital number and ward - which should not be omitted. Request forms were found that lacked these three important identifications. If the study considered all other identifications, many more errors would have been found.

In this study, most of the complete data on the forms were about these three topics, and this implied that many medical personnel neglect or overlook the importance of laboratory request writing. Perhaps the present laboratory request forms are too complicated and cannot be easily understood. Or perhaps, many medical personnel consider that writing laboratory requests uses too much time. So improving this is very important.

In considering specimen quality and quantity, less than one percent displayed errors. Perhaps this is because there are sufficient guidelines for specimen collection for medical personnel in the wards. Or it can imply that when medical personnel in the wards had questions about the requested specimen collection, they chose to find proper method instead of possibly making mistakes.

In this study, relation between sources of laboratory requests and errors was not considered. It is more useful to study the causes of errors than the sources of errors. It is no need to know who did the errors and it is better to find the methods to improve the quality. This study was a prospective study. Although this study design was good for finding causes of errors but there might be some problems of bias in finding errors. Therefore, further study should be carried out in order to compare the data of laboratory requests errors. Laboratory requests within other hospitals may have difference so further study, multi-center type, is recommended too.

According to the data accumulated and the problem from the studied document's perspective, the strategies to reduce errors in laboratory requests should include the following:

1. It is essential that all of the medical personnel realize the importance of correct and complete laboratory requests. Standard guidelines[3-8] according to specimen processing should be established specifically for different health care practices and should be uncomplicated as possible (Table 4).

Table 4. Specimen processing guidelines.[3-8]

Steps	Keys
1. Decision making	• with indication • without contraindication
2. Specimen collection	• correct collection procedures • without contamination • control variation
3. Issuing request from	• universal precaution • complete issuing (no omissions, mistakes and use of non-standard abbreviations)
4. Specimen transportation	• universal precaution • effective transportation
5. Specimen presentation	• rejection criteria (hemolysis, clot, incorrect anticoagulant, incorrect transport container)
6. Laboratory analysis	• universal precaution • quality control, quality assurance, quality management • ISO
7. Reporting system	• information management system • follow-up result

2. A proper system for collection and issuing requests should be continuously emphasized, supervised, monitored and properly adjusted when necessary.
3. Medical technologists should check all laboratory requests sent to the laboratory. Incomplete request forms or inappropriate specimens should be rejected.
4. The ignorance and carelessness of some practitioners are commonly reflected in the request forms they write. Errors in laboratory requests may be hazardous tot he patients and result in a waste time and money in consulting the doctor in-charge to have the request forms corrected or the new specimen collected. Do not neglect or overlook the importance of laboratory requests. Thought that it is not useful for the medical technologists in the specimen processing is not correct.
5. Laboratory requests via the computer network can reduce the errors in issuing the request forms. There should be a good laboratory information system in the hospital.

Conclusions

Laboratory procedures will be successful if there is an effective system. To get the best quality laboratory procedure results, both medical personnel in the wards and laboratory staff must cooperate well with each other. And a high quality system in the laboratory is as important as proper specimen processing in the wards. In order to obtain the ideal laboratory processing, all medical personnel should fulfil their responsibilities as best. The best results mean not only success in the laboratory process but also success in the treatment of the patient.

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