ORIGINAL RESEARCH

ADLİ TIP DERGİSİ
TURKISH JOURNAL OF FORENSIC MEDICINE

Received: 19.01.2025
Accepted: 24.04.2025

The Importance of E-Pulse and Teleradiology Applications on Forensic Reports

E-Nabız ve Teleradyoloji Uygulamalarının Adli Raporlar Üzerindeki Önemi

Hüseyin Balandız[1], Duran Güralp Çelik[1], Burak Kaya[2], Halit Canberk Aydoğan[3]

[1] University of Health Sciences, Gulhane Faculty of Medicine, Department of Forensic Medicine. Ankara, Türkiye
[2] Artvin Branch of the Council of Forensic Medicine. Artvin, Türkiye
[3] Ministry of Health, Ordu Training and Research Hospital. Ordu, Türkiye

Öz

Amaç: Kat'i adli rapor hazırlanması sırasında karşılaşılan en önemli sorunlardan biri savcılıklar tarafından gönderilen tıbbi belgelerdeki eksikliklerdir. Bu çalışmada, geçmiş tıbbi belgelerinde eksiklik bulunan adli vakaların rapor hazırlama sürecinde e-nabız ve teleradyoloji uygulamalarının kullanılıp kullanılmadığı ve bu uygulamaların kat'i adli rapor sonucunu etkileyip etkilemediğinin belirlenmesi amaçlanmıştır.

Yöntem: Çalışmamızda Gülhane Eğitim ve Araştırma Hastanesi Adli Tıp Kliniği tarafından 01.08.2019 - 01.01.2023 tarihleri arasında düzenlenen 4091 adli rapor retrospektif olarak incelenmiş, adli rapor düzenlenmesi sırasında e-nabız ve teleradyoloji uygulamalarından elde edilen verilerin kullanıldığı tespit edilen 392 adli rapor çalışmaya dahil edilmiştir.

Bulgular: 392 olgunun %74,2'si erkek ve yaş ortalaması 36,1 idi. Olguların 125'inde e-nabız ve teleradyoloji uygulamalarından elde edilen tıbbi veriler adli raporun içeriğini veya sonucunu değiştirecek nitelikte katkı sağlamıştır. Adli rapor düzenleme aşamasında tüm olguların %89'unda sadece radyolojik görüntü ve raporları, %4.8'inde sadece epikriz raporları, %1.3'ünde sadece laboratuar test sonuçları, %4.5'inde radyolojik incelemeler ve epikriz raporları, %0.5'inde ise radyolojik incelemeler ve laboratuar tahlil sonuçları kullanılmıştır.

Sonuç: Sonuçlarımıza göre, e-nabız ve teleradyoloji uygulamalarının kullanımı, tıbbi belgelerin eksik olduğu durumlarda yapılacak yazışmaların sayısını azaltmakta, zaman ve kaynak tasarrufu sağlamaktadır.

Anahtar Kelimeler: Adli Tıp, Kat'i Adli Rapor, E-Nabız, Teleradyoloji.

Abstract

Objective: One of the most important problems encountered during the preparation of the final forensic report is the deficiency of the medical documents sent by the prosecutor's office. The aim of this study was to determine whether e-pulse and teleradiology applications were used in the report preparation process of forensic cases whose previous medical documents had deficiencies, and whether these applications affected the outcome of the final forensic report.

Methods: In our study, 4091 forensic reports issued by the Department of Forensic Medicine of Gülhane Training and Research Hospital between 01.08.2019 and 01.01.2023 were retrospectively reviewed, and 392 forensic reports were included in the study, which were determined to have data obtained from e-pulse and teleradiology applications while issuing forensic report.

Results: Of the 392 patients, 74.2% were male and the mean age was 36.1 years. In 125 of 392 cases, the medical data obtained from e-pulse and teleradiology applications made a qualified contribution to changing the content or outcome of the forensic report. When preparing the forensic report, only radiological images and reports were used in 89% of all cases, only epicrisis reports were used in 4.8% of all cases, only laboratory test results were used in 1.3% of all cases, radiological examinations and epicrisis reports were used in 4.5% of all cases, and radiological examinations and laboratory test results were used in 0.5% of all cases.

Conclusion: According to our findings, the use of e-pulse and teleradiology applications reduces the number of correspondences to be made in cases where medical documents are missing and saves time and resources.

Keywords: Forensic Medicine, Final Forensic Report, E-Pulse, Teleradiology.

How to Cite: Balandız H, Çelik DG, Kaya B, Aydoğan HC. The Importance of E-Pulse and Teleradiology Applications on Forensic Reports. J For Med 2025;39(1):78-85.

Correspondence: Assist. Prof. Hüseyin BALANDIZ, University of Health Sciences, Gulhane Faculty of Medicine, Department of Forensic Medicine. Ankara, Türkiye
E-mail: huseyinbalandiz@gmail.com

CC BY

INTRODUCTION

Hospital Information and Management System is the general name given to the group of software that performs the operations performed by computer programs and hospitals with which it interacts on the computer (1). In other words, it is a software system that starts with the registration of the patient from the moment he is admitted to the hospital and records all the processes of examination, consultation, treatment, surgery, imaging and hospitalisation.

E-pulse is an application that allows citizens and healthcare professionals to access health data collected by healthcare institutions via the Internet and mobile devices, and is actively used in Turkey. It is a personal health record system where people can manage all their health information and access their medical history in one place, regardless of where examinations, tests and treatments have been carried out (2).

The Teleradiology System of the Ministry of Health of the Republic of Turkey is another system that enables 24/7 (7 days 24 hours) web and mobile access to images of radiological examinations, reporting of these images, teleconsultation between radiologists, evaluation of medical images and reports in terms of quality and sharing with citizens through the e-pulse application (3).

Road traffic accidents, assaults, injuries caused by firearms and explosives, injuries caused by sharp objects, falls from heights, occupational accidents, poisoning, burns, injuries caused by electricity, allegations of torture, sexual assaults, suicide attempts, etc., fall into the category of "forensic cases" and a forensic report (General Forensic Examination Report) should be issued to such patients in hospital emergency departments, which are the first point of contact.

Articles 86 and 87 of the Turkish Penal Code (TPC) relate to the offence of intentional injury and prescribe a penalty for the perpetrator according to the severity of the injury. Final forensic reports issued by forensic medicine experts play an important role in the functioning of the legal and judicial system, as they determine the upper and lower limits of the punishment to be received by the perpetrator (4).

The final forensic reports, in accordance with Articles 86 and 87 of the TPC, answer the following questions: whether the injury is mild enough to be resolved with simple medical intervention; whether it causes a life-threatening situation; whether it causes a fracture or dislocation of a bone; whether it causes a permanent scar on the face or a permanent change in the face; whether it causes permanent weakening or loss of function of any of the senses or organs.

When preparing a final forensic report, forensic specialists examine all previous medical documents and the prosecutor's investigation reports of the person involved in the incident, conduct a final examination of the person, obtain consultations from relevant clinics if deemed necessary, and prepare a report indicating the severity of the injury using the "Guidelines for the Evaluation of Injury Crimes Defined in the Turkish Penal Code in Terms of Forensic Medicine".

One of the most important problems encountered in the preparation of a final forensic report is the lack of medical documents sent by the prosecution. Forensic medicine specialists cannot prepare a forensic report without obtaining these missing documents and have to request medical documents from the prosecution offices. This prolongs the process of preparing a forensic report and slows down the functioning of the legal system.

E-pulse and teleradiology applications can play an important role in overcoming this problem. In this

context, it is possible to access the person's medical history (epicrisis, hospitalisation documents, surgical records, biochemical tests, radiological examination results, etc.) and to draw up an accurate forensic report on the basis of the information obtained.

The aim of this study was to determine whether e-pulse and teleradiology applications were used in the report preparation process of cases for which a final forensic report was requested and where there were deficiencies in the previous medical records, and whether these applications had an impact on the outcome of the final forensic report.

MATERIALS AND METHODS

In our study, we retrospectively reviewed 4091 forensic reports that were issued by the University of Health Sciences, Gülhane Training and Research Hospital, Department of Forensic Medicine between 01.08.2019 and 01.01.2023. We included 392 final forensic reports that were identified as having received data from e-pulse and teleradiology applications during the forensic report preparation phase.

In the cases included in the study, parameters such as age, sex, origin of the incident, body site of injury, the purpose for which e-pulse and teleradiology applications were used (medical epicrisis, laboratory examinations, radiological images and reports, etc.) and whether the data obtained influenced the results of the forensic report were examined in detail.

Descriptive statistical analyses were performed on the data obtained using IBM SPSS Statistics Data Editor program (IBM Ltd., Armonk, New York, USA, version 25.0).

Ethics committee permission for this study was obtained from the Gülhane Scientific Research Ethics Committee of the University of Health Sciences with the decision number 2023-315 dated 22.08.2023.

RESULTS

In our study, we retrospectively analyzed 4091 forensic reports issued by the Department of Forensic Medicine at Gülhane University of Health Sciences Training and Research Hospital between 01/08/2019 and 01/01/2023, and 392 forensic reports were included in the study that were determined to have data obtained from e-pulse and teleradiology applications.

Of the 392 patients included in the study, 74.2% (n=291) were male, 25.8% (n=101) were female, and the mean age was 36.1 (±16) years.

When the cases were analysed according to the origin of the incident, the most common origins were assault/aggression (n=172, 43.9%), in-vehicle traffic accident (n=89, 22.7%) and out-of-vehicle traffic accident (n=61, 15.6%) (Table 1).

Table 1. The Distribution of Cases in Terms of Event Origin

Origin of the Event	% (n)
Assault	%43.9 (172)
In-vehicle traffic accident	%22.7 (89)
Out-of-vehicle traffic accident	%15.6 (61)
Cutting and sharp instrument injury	%4.8 (19)
Fall from height	%4.6 (18)
Firearm bullet core injury	%4.6 (18)
Crushing under a heavy object	%1.8 (7)
Intoxication	%1.5 (6)
Shotgun pellet injury	%0.3 (1)
Explosive material injury	%0.3 (1)
TOTAL	**%100 (392)**

Of the cases (n=392); 31.1% (n=122) had head and neck injuries, 9.4% (n=37) had lower extremity injuries, 5.1% (n=20) had upper extremity injuries, 1.8% (n=7) had thoracic injuries, 1, 5% (n=6) had lumbar injuries, 1.3% (n=5) had abdominal injuries, 0.3% had genital injuries and 49.5% (n=194) had injuries involving more than one body region (Table 2).

Table 2. The Distribution of Cases According to Body Injury Sites

Body Injury Sites	% (n)
Multiple body parts	%49.5 (194)
Head and neck region	%31.1 (122)
Lower extremity	%9.4 (37)
Upper extremity	%5.1 (20)
Thoracic region	%1.8 (7)
Lumbar region	%1.5 (6)
Abdomen region	%1.3 (5)
Genital region	%0.3 (1)
TOTAL	%100 (392)

When the characteristics of the data obtained from e-pulse and teleradiology applications were evaluated, it was found that only radiological images and reports were used in 89% (n=349) of the cases, only data obtained from epicrisis reports were used in 4.8% (n=19), only laboratory test results were used in 1.3% (n=5), radiological examinations and epicrisis reports were used together in 4.5% (n=17), and radiological examinations and laboratory test results were used to prepare forensic reports in 0.5% (n=2) of the cases.

The detailed distribution of the data obtained from radiological images and reports was as follows; 81.1% (n=318) were computed tomography (CT) reports only, 4.6% (n=18) had direct radiographs, 1.1% (n=4) had ultrasonography reports, 0.8% (n=3) had magnetic resonance imaging (MRI) reports, and 6. 8% (n=25) used a combination of direct radiography, CT, MRI or ultrasonography (Figure 1).

Of 392 cases where medical data obtained from e-pulse and teleradiology applications were used in addition to existing medical records in the preparation of a final forensic report;

1. In 267 (68.1%) cases, the new data did not cause any change in the content or conclusion of the forensic report, while in 125 (31.9%) cases, the new data made a qualified contribution to the content or conclusion of the forensic report,

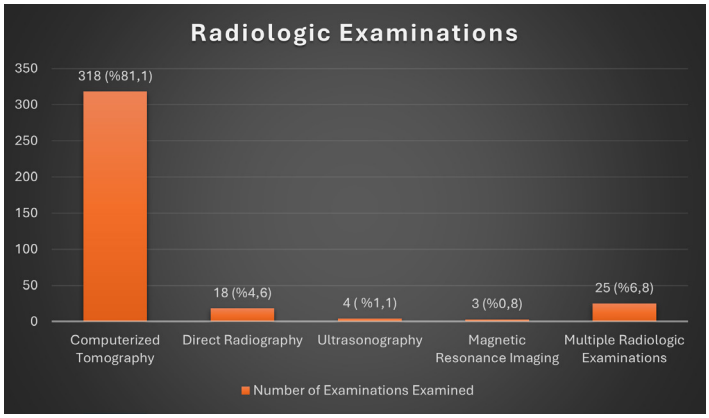

Figure 1. *The distribution of the use of radiological imaging and reports*

2. A total of 183 data changes were identified in 125 cases where the new data made a qualified contribution to the content or conclusion of the forensic report (although there were multiple data changes in some cases, the outcome of a single forensic report was affected on a case-by-case basis);

- In 12 cases (3.1%), the item "whether it caused life-threatening danger" in the forensic report was changed as a result of the addition of new data;
  - * In 1 case (0.2%), the initial forensic report, which was prepared as "a life-threatening injury", was changed to "there was no life-threatening injury, it was mild enough to be resolved with a simple medical intervention" when new data were added,
  - * In 11 (2.9%) cases, the initial forensic report, which was prepared as "no life-threatening injury", was changed to "life-threatening injury" when new data were added,
- In 70 cases (17.8%), the item "whether the injury is mild enough to be resolved with a simple medical intervention" was changed;

* In 62 (15.8%) cases, the initial forensic report, which was prepared as "mild enough to be resolved with a simple medical intervention injury", was changed to "not mild enough to be resolved with a simple medical intervention injury" when new data were added,
* In 8 cases (1.1%), the initial forensic report, which was prepared as "not mild enough to be resolved with a simple medical intervention injury", was changed to "mild enough to be resolved with a simple medical intervention injury" when new data were added,

- In 101 (25.7%) cases, the "fracture score" was changed;
  * In 76 (19.4%) cases, it was found that the initial medical records did not mention a fracture, and when new data were added, it was found that the patient did have a fracture,
  * In 18 (4.6%) cases, the patient was found to have more fractures than recorded in the medical records, and an increase in the fracture score was noted,
  * In 6 cases (1.5%) it was found that the patient who was reported as having a fracture in the initial medical records did not actually have a fracture,
  * In 1 case (0.2%), the number of fractures was found to be less than the number of fractures reported in the medical records. Therefore, the fracture score was reduced.

For the items "whether the injury is in the nature of a fixed scar on the face" and "permanent weakening or loss of function of any of the senses or organs", the relevant items were excluded from the scope of this study, as these items can be determined by the final forensic examination rather than using the data obtained from the e-pulse and teleradiology applications. Table 3 shows the effect of the data obtained from the e-pulse and teleradiology applications on the results of the forensic report.

Table 3. The effect of the data obtained from e-pulse and teleradiology applications on the results of the final forensic report

NUMBER OF CASES (%)	Result of the Forensic Report Based on the Initial Medical Documents Submitted	Forensic Report Results Changed After Addition of E-pulse Data
267 cases (%68.1)	No Difference	No Difference
1 case (%0.2)	Life-threatening Injury	NOT a Life-threatening Injury
11 cases (%2.9)	NOT a Life-threatening Injury	Life-threatening Injury
62 cases (%15.8)	MILD enough to be resolved with a SMI	NOT MILD enough to be resolved with a SMI
8 cases (%1.1)	NOT MILD enough to be resolved with a SMI	MILD enough to be resolved with a SMI
76 cases (%19.4)	NO Bone Fracture	There is Bone Fracture
18 cases (%4.6)	There is Bone Fracture	More bone fractures than mentioned (increased fracture scoring)
6 cases (%1.5)	There is Bone Fracture	NO Bone Fracture
1 case (%0.2)	There is Bone Fracture	Fewer bone fractures than mentioned (decreased fracture scoring)

SMI: Simple Medical Intervention

DISCUSSION

The preparation of a final forensic report is one of the most fundamental tasks of the forensic expert as an expert witness. When preparing a forensic report, linking a specific injury to the alleged incident is a serious challenge. Particularly in cases where there is a long period of time between the request for a report and the incident, it may be difficult to obtain the relevant medical records. For this process to be conducted in a sound manner, it is necessary to examine detailed medical records not only after the incident, but also in relation to the individual's pre-incident health status. However, individuals may provide incomplete or inaccurate information about their medical history, may have difficulty recalling past conditions, or may deliberately mislead (5).

During the preparation of the forensic report, the doctor evaluates in detail the available medical documents of the incident, examines the person if he/she has requested an examination and prepares a forensic report in accordance with the severity of the injury. The medical documents relating to the incident are of crucial importance to the forensic medicine specialist, both in the forensic reports prepared through the file and for forensic reports prepared by examining the person. However, it is not always possible to access all the medical records relating to the incident, and the process is prolonged with official correspondence to obtain medical records, leading to loss of time and waste of resources.

In a study by Karbeyaz et al, it was reported that a total of 2104 correspondences were made in order to prepare a forensic report for 1306 cases of suspected nasal fracture. In 781 of these cases, all medical records, radiological images and hospital records were requested, and in 12 of the cases in which hospital records were requested, it was noted that the correspondence was resubmitted because the requested medical records were incomplete (6). Kafadar et al. reported in a study that in 58.4% of cases, repeated correspondence was used to prepare forensic reports of cases with nasal fractures (7). E-pulse and teleradiology applications, which were introduced with the digitisation of healthcare as a solution to the difficulties encountered in this process, provide important benefits in the field of forensic medicine.

In our study, these applications eliminated the need to request medical records in 392 cases, saving both time and unnecessary correspondence. The ease of access offered by e-pulse and teleradiology applications allows patients to quickly access their past health information, thus largely eliminating the possibility of incomplete or inaccurate medical histories. In this context, digital solutions such as e-pulse and teleradiology not only avoid unnecessary correspondence, but also increase the reliability of forensic reports, leading to more accurate results.

As e-pulse and teleradiology applications have become more widespread in the healthcare sector, they have also gained an important place in specialised fields such as forensic medicine. The effective use of these technologies is increasing, particularly in the areas of sexual assault examinations, forensic psychiatric evaluations and forensic odontology (8). For example, in forensic reporting processes, accessing missing pre and post incident health information using e-pulse increases the accuracy and integrity of assessments. The results of our study support the critical role of applications such as e-pulse and teleradiology in the preparation of forensic reports. In our study, 31.9% (n=125) of the 392 forensic reports analysed changed their conclusions in the light of additional data obtained using these technologies. This rate is remarkable given

that even a small lack of information in the forensic reporting process can lead to serious loss of rights.

Acar and Baltacı's study emphasises that the data accessed through e-pulse has a direct impact on the results of forensic reports. This shows that it contributes positively to the completion of missing documents and fair judicial processes (9,10). In addition, telemedicine technologies have increased the efficiency of healthcare services in the forensic reporting process, especially with tools such as teleradiology and digital archiving. The overall benefits of digitalisation include patient safety, reduced medical errors and rapid access to health records (10,11). The integration of e-pulse and telemedicine applications into forensic processes not only strengthens existing practices, but also paves the way for a fairer and more effective forensic evaluation process. In the future, as the scope of these technologies expands, it is expected that digitalisation in forensic medicine will further contribute to both the protection of individual rights and the delivery of justice.

In our study, we found that e-pulse data was most commonly used to assess fractures. Determining the severity of injuries in forensic incidents is important in determining the punishment to be given to the people who caused these injuries (12). In these injuries, it may be valuable to determine the presence of bone fractures, which play an important role in the content of the forensic report. One study reported that 21.9% of the forensic cases in the research group had at least one fracture in any part of the body (13). Similar studies have shown that fractures in forensic cases occur at a rate of between 23% and 36% (6,14,15,16). This highlights the high incidence of fractures in forensic cases. However, it is equally important to recognise the presence of fractures. This situation may lead to requests for medical records through official correspondence, especially in the presence of suspected fractures in forensic specialists. At this point, the results of our study show that e-pulse and telemedicine applications offer important benefits and conveniences in the writing of forensic reports in cases where bone fractures are suspected, as bone fractures are frequently seen in forensic cases.

In recent years, the integration of the e-pulse system and teleradiology into clinical practice has gradually become more widespread, offering potential benefits in forensic assessments. In particular, in cases involving individuals with a history of multiple traumatic events, access to previous imaging records may be helpful in achieving a more comprehensive evaluation. The retrospective review of such imaging data might provide insights into distinguishing acute from chronic injuries and could assist in interpreting inconsistencies or patterns observed in clinical findings or testimonies. Accordingly, the structured use of digital health records such as those provided by e-pulse and teleradiology systems may enhance the objectivity and consistency of forensic medical evaluations.

CONCLUSION

In our study, we evaluated the impact of e-pulse and teleradiology data on the outcome of the forensic report. According to our results, the use of e-pulse and teleradiology applications reduces the number of correspondences in cases where medical records are missing, saving time and resources.

In addition, radiological images and reports accessed through teleradiology have been found to contain bone fractures that are not mentioned in the general forensic examination report and other medical documents. Additional data can be obtained even in cases where it is not thought that there may be missing medical documents. In this way, forensic reports can be properly prepared. In order to prevent the loss of rights of both

the victim and the accused in forensic procedures, and to ensure that reports are written in the shortest possible time, we believe that the routine control of e-pulse and teleradiology applications should be routinely checked

Acknowledgement

Conflict of Interest

The authors declare that they have no conflict of interests regarding content of this article.

Financial Support

The Authors report no financial support regarding content of this article.

REFERENCES

1. HBYS (Hastane Bilgi Yönetim Sistemi). https://dijitalhastane.saglik.gov.tr/ TR,4881/hbys-hastane-bilgi-yonetim-sistemi.html access date 27.12.2024
2. e-Nabız. https://enabiz.gov.tr/ access date 03.01.2024
3. Teleradyoloji Sistemi. https://teleradyoloji.saglik.gov.tr access date 27.12.2024
4. Türk Ceza Kanunu. https://www.mevzuat.gov.tr/mevzuatmetin/1.5.5237.pdf access date 27.12.2024
5. Kaya K, Hilal A, Çekin N. Maluliyet kavramı ve hesaplamada öne çıkan sorunlar. J For Med. 2018;32(1):30-36.
6. Karbeyaz K, Düzer S, Düzer S, et al. 1306 Nazal Kırıklı Olgunun Adli Rapor Sürecinin Değerlendirilmesi. Bull Leg Med. 2015;20(2):99-103.
7. Kafadar H, Kafadar S. Burun Kemiği Kırıklarının Türk Ceza Kanunu Çerçevesinde Değerlendirilmesi. Bull Leg Med. 2013;18(1):20-24.
8. Zvarova J, Dostalova T, Hanzlicek P, et al. Electronic Health Record for Forensic Dentistry. Methods Inf Med. 2008;47(01):8–13.
9. Seydaoğulları Baltacı A, Acar K. Effective using of E-Nabız and Teletıp Applications in Reporting Forensic Cases with Case Examples. J For Med. 2022;36(1):37-39.
10. Kayserili A, Colkesen Tefiroğlu E. Dijital Sağlık Hizmetlerinin Hastane İdarecileri Tarafından Değerlendirilmesi. SABİTED. 2023;3(2):26–38.
11. Güngör Ketenci P, Aydın Büyük S, Aras Balcı Z, et al. E-nabız Uygulamasının Bilinirliği: Bir Üniversite-Eğitim Araştırma Hastanesi Örneği. Hacettepe Sağlık İdaresi Dergisi. 2021;24(1):63-80.
12. Şimşek Ü, Atalay E, Çeliksöz AH, et al. Travmatik Kemik Çıkığı Olgularının Adli Tıbbi Değerlendirilmesi. Osmangazi Journal of Medicine. 2024;46(4):592-598.
13. Canverenler S, Ünüvar Göçeoğlu Ü, Balcı Y. Adli Tıp Polikliniğine Başvuran Olgularda Kemik Kırıklarının Değerlendirilmesi: Tanımlayıcı Araştırma. Türkiye Klinikleri J Foren Sci Leg Med. 2022;19(1):20-9.
14. Çeliksöz AH, Emiral E, Doğan B, et al. Adli Nitelikli Olgularda Kemik Kırıklarının Değerlendirilmesi. J For Med. 2020;34(3):134-140.
15. Korkmaz T, Kahramansoy N, Erkol Z, et al. Acil Servise Başvuran Adli Olguların ve Düzenlenen Adli Raporların Değerlendirilmesi. Med Bull Haseki. 2012;50(1):14-20.
16. Gamsız Bilgin N, Dokgöz H, Kar H. Eski ve Yeni Türk Ceza Yasasına Göre Düzenlenen Adli Raporların Karşılaştırılması. Bull Leg Med 2006;11(2):64-70.