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Unnecessary Repeated Tests in The Biochemistry Laboratory

Biyokimya Labroratwarında Gereksiz Tekrarlanan Testler

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ABSTRACT

Aim: This study aims to evaluate repeated tests and unnecessary repeated laboratory tests based on minimum retest intervals.

Materials and Methods: Data regarding thyroid-stimulating hormone (TSH), ferritin, C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) tests analysed in the İzmir Kemalpaşa State Hospital laboratory during 2023 were retrospectively obtained from the laboratory information system. Minimum retest intervals for these tests were determined according to the National Minimum Re-testing Intervals in Pathology guidelines developed by The Royal College of Pathologists, The Association for Clinical Biochemistry and Laboratory Medicine, and The Institute of Biomedical Science. Accordingly, the minimum retest intervals were defined as 28 days for TSH, 30 days for ferritin, 24 hours for CRP, and 7 days for ESR. Tests performed more than once per patient during the study period were categorized as repeated tests, whereas tests repeated within a period shorter than the minimum retest interval were classified as unnecessary repeated tests.

Results: The total numbers of TSH, ferritin, CRP, and ESR tests performed in the laboratory were 27,516, 19,836, 32,100, and 7,200, respectively. The number (percentage) of repeated tests was 1,402 (5.10%) for TSH, 1,726 (8.70%) for ferritin, 1,827 (5.69%) for CRP, and 1,020 (14.2%) for ESR. Among these repeated tests, the numbers (percentages) classified as unnecessary repeated tests were 148 (10.6%), 134 (7.76%), 118 (6.46%), and 107 (10.49%), respectively.

Conclusion: Unnecessary repeated laboratory tests contribute significantly to increased healthcare costs and workload inefficiencies. Increasing awareness among healthcare administrators and clinicians regarding the prevalence of unnecessary testing is critical for improving resource utilization and reducing avoidable expenditures.

Keywords: Unnecessary repeated tests, Retest interval, Laboratory costs.

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ÖZET

Amaç: Bu çalışmanın amacı, minimum yeniden test aralıklarına dayanarak "tekrarlanan testler" ve "gereksiz tekrarlanan laboratuvar testleri"ni değerlendirmektir.

Gereç ve Yöntem: 2023 yılı boyunca İzmir Kemalpaşa Devlet Hastanesi laboratuvarında çalışılan tiroid uyarıcı hormon (TSH), ferritin, C-reaktif protein (CRP) ve eritrosit sedimantasyon hızı (ESH) testlerine ait veriler laboratuvar bilgi yönetim sisteminden retrospektif olarak elde edildi. Bu testler için minimum yeniden test aralıkları; The Royal College of Pathologists, The Association for Clinical Biochemistry and Laboratory Medicine ve The Institute of Biomedical Science tarafından geliştirilen Ulusal Patolojide Minimum Yeniden Test Aralıkları kılavuzuna göre belirlendi. Buna göre minimum yeniden test aralıkları; TSH için 28 gün, ferritin için 30 gün, CRP için 24 saat ve ESH için 7 gün olarak kabul edildi. Çalışma süresi boyunca bir hastada birden fazla kez yapılan testler "tekrarlanan testler" olarak, minimum yeniden test aralığından daha kısa sürede tekrar edilen testler ise "gereksiz tekrarlanan testler" olarak sınıflandırıldı.

Bulgular: Laboratuvarda yapılan toplam TSH, ferritin, CRP ve ESH test sayıları sırasıyla 27.516, 19.836, 32.100 ve 7.200 olarak belirlendi. Tekrarlanan testlerin sayısı (yüzdesi) TSH için 1.402 (%5,10), ferritin için 1.726 (%8,70), CRP için 1.827 (%5,69) ve ESH için 1.020 (%14,2) idi. Bu tekrarlanan testler içerisinde gereksiz tekrarlanan test olarak sınıflandırılanların sayısı (yüzdesi) sırasıyla 148 (%10,6), 134 (%7,76), 118 (%6,46) ve 107 (%10,49) olarak hesaplandı.

Sonuç: Gereksiz tekrarlanan laboratuvar testleri, sağlık hizmetlerinde maliyet artışına ve iş yükü verimsizliğine önemli ölçüde katkıda bulunmaktadır. Gereksiz testlerin yaygınlığı konusunda sağlık yöneticileri ve klinisyenlerin farkındalığının artırılması, kaynak kullanımının iyileştirilmesi ve önlenebilir harcamaların azaltılması açısından kritik öneme sahiptir.

Anahtar kelimeler: Gereksiz tekrarlanan testler, Tekrar test aralığı, Laboratuvar maliyetleri

INTRODUCTION

Unnecessary repeat laboratory testing is a significant concern in modern healthcare, as it can lead to patient discomfort, increased healthcare costs, and potential diagnostic inaccuracies. Over-testing often results from a lack of adherence to established guidelines for re-testing intervals, leading to redundant data that may complicate clinical decision-making. Implementing standardized re-testing intervals, based on evidence-based guidelines, is crucial to reducing these redundant tests. This approach not only conserves resources but also enhances the accuracy of patient diagnoses and the overall quality of care. By minimizing unnecessary tests, the efficiency of healthcare systems can be increased, patient burden reduced, and a higher standard of clinical practice achieved (1-4).

Despite the widespread occurrence of laboratory test overuse, healthcare providers often remain ambivalent about its significance. While the overutilization of these tests is acknowledged as a serious concern in terms of patient safety and financial burden, it is frequently regarded as less critical compared to other areas of healthcare. Physicians recognize the importance of addressing this issue but note that time constraints in daily practice prevent them from exercising sufficient care when ordering tests (5, 6).

The "National Minimum Re-testing Intervals in Pathology" report, collaboratively produced by The Royal College of Pathologists, The Association for Clinical Biochemistry and Laboratory Medicine, and The Institute of Biomedical Science, serves as a comprehensive guideline for clinicians and laboratory professionals. It provides evidence-based recommendations on the minimum intervals required to avoid unnecessary repeat testing. This helps to optimize patient care by reducing the risk of over-testing, minimizing patient discomfort, and improving the efficiency of laboratory services. The report emphasizes the importance of adhering to these intervals to ensure accurate and clinically relevant results, ultimately contributing to more effective healthcare management (7).

One of the critical strategies to reduce excessive and unnecessary laboratory test utilization is for healthcare institutions to

identify and address unnecessary test requests. In this context, our study aims to evaluate "repeat testing" and "unnecessary repeat laboratory tests" in biochemistry laboratories based on the recommendations outlined in the "National Minimum Re-testing Intervals in Pathology" report.

MATERIALS AND METHODS

Data regarding thyroid stimulating hormone (TSH), ferritin, human C-reactive protein (CRP), and sedimentation tests analyzed in the İzmir Kemalpaşa State Hospital laboratory during 2023 were retrospectively obtained from the laboratory information system. Minimum retest intervals for these tests were determined according to the National Minimum Re-testing Intervals in Pathology guidelines, developed by The Royal College of Pathologists, The Association for Clinical Biochemistry and Laboratory Medicine, and The Institute of Biomedical Science. Accordingly, the minimum retest intervals were established as 28 days for TSH, 30 days for ferritin, 24 hours for CRP, and 7 days for sedimentation.

The selection of these four tests was based on their clearly defined minimum re-testing intervals and the low incidence of clinical scenarios that would justify earlier repeat testing. In addition, these tests represent distinct laboratory categories—hormonal (TSH), iron metabolism (ferritin), inflammatory (CRP), and general screening (erythrocyte sedimentation rate)—and are frequently used in routine clinical practice. This approach allowed a broader assessment of unnecessary repeat testing across different types of laboratory investigations.

Tests performed more than once per patient during the study period were categorized as "repeated tests," while tests repeated within a period shorter than the minimum retest interval were classified as "unnecessary repeated tests." This classification was based on clear, evidence-supported criteria rather than subjective clinical interpretation.

Descriptive statistics were used for data analysis, and no comparative statistical tests were performed, as the primary aim of the study was to determine the prevalence of repeated and unnecessary repeated laboratory tests rather than to compare test groups statistically.

Ethical approval for the study was obtained from the Harran University Faculty of Medicine Ethics Committee (HRÜ/24.17.07).

RESULTS

Total numbers of TSH, ferritin, CRP, and sedimentation tests performed in the laboratory were 27516, 19836, 32100, and 7200, respectively. The number (percentage) of repeated tests were 1402 (5.10%), 1726 (8.70%), 1827 (5.69%), and 1020 (14.2%) for TSH, ferritin, CRP, and sedimentation, respectively. From these repeated tests, the percentages classified as unnecessary repeated tests were calculated as 148 (10.6%), 134 (7.76%), 118 (6.46%), and 107 (10.49%), respectively (Table 1). The numbers and percentages of total, repeated, and unnecessary tests for TSH, ferritin, CRP, and sedimentation according to services were presented in Tables 2 – 5.

Table 1. The Numbers and Percentages of Total, Repeated, and Unnecessary Tests for TSH, Ferritin, CRP, and Sedimentation

Tablo 1. TSH, Ferritin, CRP ve Sedimentasyon için Toplam, Tekrarlanan ve Gereksiz Testlerin Sayıları ve Yüzdeleri

Tests	Number of Tests	Number of Repeated Tests (%)	Number of Unnecessary Tests (%)
TSH	27516	1402 (5.10)	148 (10.6)
Ferritin	19836	1726 (8.70)	134 (7.76)
CRP	32100	1827 (5.69)	118 (6.46)
Sedimentation	7200	1020 (14.2)	107 (10.49)

Table 2. The Numbers and Percentages of Total, Repeated, and Unnecessary Tests for TSH According to Services
Tablo 2. Servislere Göre TSH İçin Toplam, Tekrarlanan ve Gereksiz Testlerin Sayıları ve Yüzdeleri

Services	Total TSH Tests	Number of Repeated Tests (%)	Number of Unnecessary Tests (%)
Neurology	1100	78 (7.09)	13 (16.67)
Family Medicine	1650	135 (8.18)	15 (11.11)
Internal Medicine	17610	602 (3.42)	65 (10.80)
Obstetrics & Gynecology	3301	315 (9.54)	31 (9.84)
Cardiology	1128	81 (7.18)	8 (9.88)
General Surgery	1155	90 (7.79)	5 (5.56)
Other Clinics	1572	101 (6.42)	11 (10.89)

Table 3. The Numbers and Percentages of Total, Repeated, and Unnecessary Tests for Ferritin According to Services
Tablo 3. Servislere Göre Ferritin İçin Toplam, Tekrarlanan ve Gereksiz Testlerin Sayıları ve Yüzdeleri

Services	Total Ferritin Tests	Number of Repeated Tests (%)	Number of Unnecessary Tests (%)
Internal Medicine	12201	924 (7.57)	87 (9.42)
General Surgery	508	65 (12.8)	4 (6.15)
Obstetrics & Gynecology	4506	396 (8.79)	24 (6.06)
Cardiology	102	14 (13.73)	1 (7.14)
Family Medicine	1387	213 (15.36)	12 (5.63)
Neurology	901	95 (10.54)	5 (5.26)
Other Clinics	231	19 (8.23)	1 (5.26)

Table 4. The Numbers and Percentages of Total, Repeated, and Unnecessary Tests for CRP According to Services
Tablo 4. Servislere Göre CRP İçin Toplam, Tekrarlanan ve Gereksiz Testlerin Sayıları ve Yüzdeleri

Services	Total CRP Tests	Number of Repeated Tests (%)	Number of Unnecessary Tests (%)
Emergency	11306	46 (0.41)	6 (13.04)
Neurology	1001	115 (11.49)	9 (7.83)
Obstetrics & Gynecology	1031	157 (15.23)	11 (7.01)
Internal Medicine	14201	824 (5.80)	65 (7.89)
Urology	992	104 (10.48)	6,0 (5.77)
Family Medicine	1465	110 (7.51)	4 (3.64)
Chest Diseases	1723	412 (23.91)	10,0 (2.43)
Other Clinics	381	59 (15.49)	7 (11.86)

Table 5. The Numbers and Percentages of Total, Repeated, and Unnecessary Tests for Sedimentation According to Services
Tablo 5. Servislere Göre Sedimentasyon İçin Toplam, Tekrarlanan ve Gereksiz Testlerin Sayıları ve Yüzdeleri

Services	Number of Sedimentation Tests	Number of Repeated Tests (%)	Number of Unnecessary Tests (%)
General Surgery	203	42 (20.69)	5 (11.9)
Internal Medicine	4391	725 (16.51)	80 (11.03)
Orthopedics and Traumatology	601	91 (15.14)	9 (9.89)
Physical Therapy and Rehabilitation	1566	82 (5.24)	8 (9.76)
Infectious Diseases	58	21 (36.21)	1 (4.76)
Other Clinics	381	59 (15.49)	4 (6.78)

DISCUSSION

The findings of this study highlight the significant prevalence of both repeated and unnecessary laboratory testing, particularly in the context of TSH, ferritin, CRP, and sedimentation tests. In line with previous studies, the results indicate that a substantial proportion of repeated tests were unnecessary, thus underscoring the need for stricter adherence to established guidelines for re-testing intervals (8). The unnecessary repeat test rates of 10.6% for TSH, 7.76% for ferritin, 6.46 % for CRP, and 10.49 % for sedimentation demonstrate the potential for improvement in laboratory test utilization.

This study contributes to the current literature by presenting quantitative data on the prevalence of repeated and unnecessary repeat testing for frequently ordered biochemical parameters in a secondary hospital in Turkey. To our knowledge, there are few national data addressing this issue in accordance with international re-testing interval guidelines.

The analysis of repeated and unnecessary tests across clinical departments highlights significant inefficiencies in test utilization. High repetition rates, such as for ferritin in family medicine service (15.36%) and CRP in chest diseases service (23.91%), suggest potential overuse. Similarly, neurology service exhibited the highest unnecessary TSH test rate (16.67%), while emergency service had the highest unnecessary CRP rate (13.04%).

One of the contributors to this issue is the failure to follow the minimum re-testing intervals recommendations, which are designed to prevent overuse of tests. This not only leads to resource wastage but also increases the likelihood of patient discomfort and confusion due to excessive or irrelevant test results. Previous studies have shown that unnecessary repeat testing can increase the complexity of clinical decision-making and may even result in inappropriate treatment or delays in care (2-4). Our findings align with those of Kwok and Jones (2005) and Bai et al. (2020), who similarly reported high rates of redundant sedimentation tests and thyroid function testing in routine clinical settings.

The variation in unnecessary repeat test rates across different tests suggests that some laboratory parameters are more prone to overuse than others (8). The relatively high percentage of unnecessary sedimentation tests (10.49%) could be attributed to clinicians' reliance on this test as a routine inflammatory marker, despite the availability of more specific tests such as CRP. Similarly, the elevated rate of unnecessary TSH tests (10.6%) may be related to the chronic management of thyroid disorders, where frequent monitoring is often performed without consideration of recommended intervals. The persistence of high rates of repeat sedimentation tests and TSH testing despite guideline recommendations may also reflect systemic, institutional, and cognitive factors. In many healthcare settings, outdated laboratory protocols continue to permit early reordering of common tests, even when newer guidelines advise against it. In addition, limited feedback mechanisms mean that clinicians are often unaware of redundant orders. Diagnostic uncertainty and a desire for confirmatory evidence — a form of 'defensive medicine' — also contribute to repeated testing. Previous research has highlighted that such behavioral and organizational drivers play a central role in laboratory test overuse (2, 3, 5).

To address these issues, it is essential that healthcare providers are made more aware of re-testing interval guidelines and are encouraged to incorporate them into their daily practice. Educational interventions targeting both clinicians and laboratory personnel could be beneficial in reducing unnecessary testing. In this context, the implementation of automated systems—which integrate minimum retesting intervals into the laboratory information system to flag premature requests while ultimately preserving clinician discretion, as recommended by authorities such as the Canadian Agency for

Drugs and Technologies in Health (CADTH)—emerges as a balanced and effective solution to reduce redundant testing. Studies have shown that such system-based interventions can significantly reduce the frequency of unnecessary testing and improve the overall efficiency of healthcare services. However, the success of these interventions often depends on clinician engagement and system usability; poorly designed alerts may lead to alert fatigue, limiting their effectiveness (8-14).

The results of this study also point to the potential for significant cost savings and better resource allocation in healthcare. Reducing unnecessary laboratory tests can lower overall healthcare costs, conserve laboratory resources, and reduce the burden on both patients and healthcare providers. In a time when healthcare systems worldwide are striving for efficiency and cost-effectiveness, optimizing laboratory test utilization by adhering to evidence-based guidelines can make a meaningful impact (15). Beyond economic implications, minimizing redundant testing can reduce patient anxiety, unnecessary follow-up investigations, and iatrogenic harm from misinterpreted results. Systematic reviews have shown that diagnostic test overuse is common and may expose patients to unnecessary harm, including anxiety, unnecessary follow-up procedures, and potential iatrogenic effects (16).

While this study provides important insights into the prevalence of repeated and unnecessary testing, it has limitations that should be considered. The analysis was confined to a single hospital and focused on a limited set of tests. Further research, including multi-center studies with a broader range of tests, would provide a more comprehensive understanding of the scope of unnecessary testing across different settings. Additionally, future studies could explore the underlying reasons for repeated testing, such as clinician decision-making processes, patient expectations, or institutional policies, to develop targeted interventions for reducing overuse. Displaying information such as the test half-lives or the recommended minimum retest intervals on patient result forms may help increase clinician awareness and reduce unnecessary repeat testing. Such strategies could serve as simple yet effective educational tools to promote adherence to evidence-based re-testing intervals.

Our study did not implement an intervention regarding retesting. The results of our study can form the basis for planned institutional measures to prevent inappropriate retesting, including LIS-based alerts and clinician education programs to increase awareness of retest intervals.

In conclusion, the unnecessary repetition of laboratory tests is a persistent issue that not only affects healthcare efficiency but also patient care. By adhering to established guidelines for minimum re-testing intervals and implementing system-based interventions, healthcare providers can substantially reduce the rates of redundant testing. Displaying information such as the test half-lives or the recommended minimum retest intervals on patient result forms may help increase clinician awareness and reduce unnecessary repeat testing. Such strategies could serve as simple yet effective educational tools to promote adherence to evidence-based re-testing intervals. Future efforts should focus on integrating laboratory stewardship principles into medical education and hospital policy, ensuring sustainable adherence to evidence-based retesting intervals.

Ethics Committee Approval: Ethical approval for the study was obtained (Harran University Faculty of Medicine, HRÜ/24.17.07).

Conflict of Interest

The authors declare no conflict of interest.

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