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# USİNG TİME-DRİVEN BENCHMARKİNG FOR MEASURİNG HEALTH SERVİCES PERFORMANCE UNDER COVID-19 PANDEMİC

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**ABSTRACT**

**Purpose**: The aim of this study is to analyze whether time-driven benchmarking might be a helpful tool in assessing healthcare operations during the COVID-19 pandemic.

**Theoretical framework:** The research examines the progress of eleven hospital procedures to analyze and evaluate them. This section also focuses on how time and cost data from the two hospitals we are exploring might be utilized to improve operations and performance, particularly in light of our time-driven benchmark.

**Design/methodology/approach:** The research focuses on how to analyze time-driven benchmarking for Measuring Health Services Performance under COVID-19 Pandemic. This assessment entails the use of a strategic approach to determine the results of the review process from all financial and non-financial components of studies, research, and scientific papers found online and elsewhere.

**Findings:** The results showed that the TD-ABC consisting of perspectives provides an innovative approach to evaluating the requirements for implementing the time-driven benchmarking in Two Iraqi hospitals, which helps Measuring Health Services Performance under COVID-19 Pandemic.

**Research, Practical & Social implications:** The study examined the challenges and constraints of whether time-driven benchmarking might be a helpful tool in assessing healthcare operations during the COVID-19 pandemic.

**Originality/value:** The study's originality value by assessing how to analyze time-driven benchmarking for Measuring Health Services Performance during the COVID-19 Pandemic in Two Iraqi hospitals.

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## USANDO BENCHMARKING BASEADO EM TEMPO PARA MEDIR O DESEMPENHO DOS SERVIÇOS DE SAÚDE SOB A PANDEMIA DE COVID-19

**RESUMEN**

**Objetivo**: O objetivo deste estudo é analisar se o benchmarking baseado em tempo pode ser uma ferramenta útil na avaliação de operações de saúde durante a pandemia de COVID-19.

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**Referencial teórico**: A pesquisa analisa o andamento de onze procedimentos hospitalares para analisá-los e avaliá-los. Esta seção também se concentra em como os dados de tempo e custo dos dois hospitais que estamos explorando podem ser utilizados para melhorar as operações e o desempenho, especialmente à luz de nosso benchmark baseado em tempo.
**Design/metodologia/abordagem**: A pesquisa se concentra em como analisar o benchmarking baseado no tempo para medir o desempenho dos serviços de saúde sob a pandemia de COVID-19. Essa avaliação envolve o uso de uma abordagem estratégica para determinar os resultados do processo de revisão de todos os componentes financeiros e não financeiros de estudos, pesquisas e artigos científicos encontrados online e em outros lugares.
**Resultados**: os resultados mostraram que o TD-ABC, que consiste em perspectivas, fornece uma abordagem inovadora para avaliar os requisitos para a implementação do benchmarking baseado em tempo em dois hospitais iraquianos, o que ajuda a medir o desempenho dos serviços de saúde sob a pandemia de COVID-19.
**Implicações de pesquisa, práticas e sociais**: o estudo examinou os desafios e as restrições de se o benchmarking baseado em tempo pode ser uma ferramenta útil na avaliação de operações de saúde durante a pandemia de COVID-19.
**Originalidade/valor**: o valor de originalidade do estudo avaliando como analisar o benchmarking baseado no tempo para medir o desempenho dos serviços de saúde durante a pandemia de COVID-19 em dois hospitais iraquianos.

**Palavras-chave**: Benchmarking Baseado no Tempo, Desempenho em Saúde, Benchmarking, Hospitais COVID-19.

**USO DE LA EVALUACIÓN COMPARATIVA BASADA EN EL TIEMPO PARA MEDIR EL DESEMPEÑO DE LOS SERVICIOS DE SALUD BAJO LA PANDEMIA DE COVID-19**

**RESUMEN**
**Objetivo**: El objetivo de este estudio es analizar si la evaluación comparativa basada en el tiempo podría ser una herramienta útil para evaluar las operaciones de atención médica durante la pandemia de COVID-19.
**Referencial teórico**: La investigación examina la evolución de once procedimientos hospitalarios para analizarlos y evaluarlos. Esta sección también se enfoca en cómo se pueden utilizar los datos de tiempo y costo de los dos hospitales que estamos explorando para mejorar las operaciones y el desempeño, particularmente a la luz de nuestro punto de referencia basado en el tiempo.
**Desenho/metodologia/abordagem**: la investigación se centra en cómo analizar la evaluación comparativa basada en el tiempo para medir el desempeño de los servicios de salud bajo la pandemia de COVID-19. Esta evaluación implica el uso de un enfoque estratégico para determinar los resultados del proceso de revisión de todos los componentes financieros y no financieros de estudios, investigaciones y artículos científicos que se encuentran en línea y en otros lugares.
**Resultados**: Los resultados mostraron que el TD-ABC que consta de perspectivas proporciona un enfoque innovador para evaluar los requisitos para implementar la evaluación comparativa basada en el tiempo en dos hospitales iraquíes, lo que ayuda a medir el desempeño de los servicios de salud bajo la pandemia de COVID-19.
**Pesquisa, implicações práticas e sociais**: el estudio examinó los desafíos y las limitaciones de si la evaluación comparativa basada en el tiempo podría ser una herramienta útil para evaluar las operaciones de atención médica durante la pandemia de COVID-19.
**Originalidade/valor**: el valor de originalidad del estudio al evaluar cómo analizar la evaluación comparativa basada en el tiempo para medir el desempeño de los servicios de salud durante la pandemia de COVID-19 en dos hospitales iraquíes.

**Palabras clave:** Benchmarking Basado en el Tiempo, Desempeño de la Atención Médica, Benchmarking, Hospitales COVID-19.

## INTRODUCTION

The last two years have seen a lot of changes in hospitals. Complex health services, high treatment costs, and budget constraints have made it more important for health services to be more efficient and provide high-quality services at a lower cost. As COVID-19 has spread,

hospital users' behavior has changed as well(Le Gal La Salle et al., 2021). The virus's spread and infection have changed how people get and use health care. It's also unclear what hospitals are doing to people using health services like COVID-19 therapy(San-Juan et al., 2022). As a result of this change, hospitals are becoming more efficient in providing and evaluating their services' value. It's time for hospitals to change more than ever, and they must figure out how to understand their new role, cost, and buy-in epidemic response(Carney et al., 2020). For this reason, hospitals have changed their focus from looking at inputs to the results, intending to prove that these results impact measuring how well they do(Ali et al., 2022), (Nishimoto et al., 2022). However, because of limited funds, hospital administrators are looking at how to use their resources best to change their financial methods in a new way. Time-driven benchmarking is one of the best ways. If a hospital wants to improve its service more efficiently, time-driven benchmarking can be very useful for them.

## LITERATURE REVIEW

In hospitals, you can get a lot of different kinds of health care (Krimmer et al., 2021). However, service and process costs aren't usually used to measure a company's performance (Rakotondrajoa et al., 2020). This is because they didn't know how to do a formal cost analysis of their services and operations, and traditional costing was the most common method. In the traditional costing method, direct costs like labor and materials are directly linked to services (Tsang et al., 2021). However, it's different when it comes to Depreciation, training, and power are examples of indirect costs that are often ascribed to certain benefits depending on various factors, such as volume, direct labor, and the number of hours of service (Reis et al., 2021). When indirect costs are low and the range of services is limited, traditional costing methods work well in these situations(Union et al., 2020) (Jayakumar et al., 2021). However, when there are a lot of different services, like in hospitals, indirect costs become more important than direct costs. As a result, hospitals are utilizing increasingly intricate methods like activity-based costing to understand better how much it costs to manage a hospital (Fang et al., 2021). Cooper and Kaplan are responsible for conceiving this form of substitute pricing. However, standard costing techniques cannot compare to the accuracy and effectiveness of ABC's indirect cost management compared to other costing methods (Constantinescu et al., 2022). ABC first allocates indirect costs for each activity and then the costs to the units of a product or service.

Hospitals use "activity" to describe something that happens for a specific reason, like categorizing, putting things on shelves, processing acquisition orders, and loaning items. ABC is described in a lot of literature as a system that can help hospitals make good decisions

(Koolmees et al., 2021). However, ABC has a lot of limitations. Among other things, there is a lot of subjectivity when it comes to figuring out how much time each hospital employee spends on each activity (Zimmerman et al., 2021); resources; too much time and money spent on collecting data; and the difficulties of modeling activities that involve more than one person (Wei et al., 2021). According to this article, TD-ABC (Time-Driven Activity-Based Costing) may be a suitable method for benchmarking research. Kaplan and Anderson developed the TD-ABC as a cost-management method to address the shortcomings of earlier systems. Based on a basic architecture that only requires two items (Tsang et al., 2021):

1. How much does capacity cost per hour?
2. How long does it take to complete the process for each activity?

Costing equations are based on how long it takes to do something (Cidav et al., 2021). Such time estimates can be easily seen, confirmed, and estimated with time equations that add up the times of each activity (Koolmees et al., 2021). These equations can be used to figure out all possible combinations of actions. Valuable Features: The literature on TD-ABC points out that accurate costing models can be built quickly and easily and that multiple drivers can be used. TD-ABC can also accurately estimate resource consumption and capacity utilization and how much money it will cost. It can also be used to predict what will happen in the future. Because of these benefits and advantages, combining TD-ABC with other methods allows hospitals to get better results and improve even more. As an example, the following are the possible pairings (Cidav et al., 2021):

1. Use benchmarking tools to learn more about what causes inefficiency and poor performance.
2. Use simulation modeling to find ways to save resources.
3. Using TQM to help hospital administrators figure out what tasks aren't worth doing
4. Using the Balanced Scorecards for performance measurements according to the approved strategy
5. Using complementary information systems.
6. Using complementary information systems.

Benchmarking is a process that includes sharing and exploiting local resources, as well as comparing them to the most well-recognized best practices in the area (Nishimoto et al., 2022). Benchmarking is a way to figure out what needs to be done so that you can have a positive and proactive competitive advantage over your rivals. Benchmarking can be used in three different ways: It's called benchmarking because it's a way to figure out how efficient and

effective a process is and how it works with other processes (Galagedera et al., 2020). Compare performance outcomes or metrics between businesses, such as pricing and reliability, to see how well each one is at what they do (Maron et al., 2021). Finally, strategic benchmarking looks at how businesses do, how well they do, and what factors help or hurt them (Zuiderwijk et al., 2021). As a result, this comparison can be made both inside and outside of an organization. For example, it can be done when looking at performance in an organization's units or data for other organizations (Kashyap et al., 2021). Process benchmarking is used in the healthcare industry, in particular, to look at how hospitals run daily and see if there are any problems (Le Gal La Salle et al., 2021). Hospitals may use this benchmarking to assess their processes' efficiency and ensure that hospitals and their employees stay on top of their activities. This may be done by looking at other hospitals to see how they do things to increase efficiency and effectiveness. Regularly, hospitals in many nations exchange data about their operations and services (Carney et al., 2020). Strategic health data is used to demonstrate to top management that their performance is comparable to that of international health institutions.

On the other hand, this information is used when hospitals need a lot of help from their parents to do well (McCann et al., 2021). In general, benchmarking studies use standard measures of transactional aggregates, such as the availability of healthcare workers, the evolution of medical equipment, and the time it takes for a hospital to respond. Consequently, benchmarking studies that include an internal knowledge of performance determinants are even more effective and precise (Hameedi et al., 2022) (Maron et al., 2021).TD-ABC and benchmarking models can help hospitals improve their performance by comparing how they do things. As a result of this integration, it is now possible to compare time equations and costs across different parts of the hospital, like departments and branches. TD-ABC supplements are existing benchmarking methods rather than replacing them (Militão & Tirachini, 2021). Separates process variances to find the root causes, whereas standard benchmarking only gives macro-outcomes (Cidav et al., 2021). There are a lot of ways that TD-ABC can help improve benchmarking models. For example, it can help you figure out how capacity utilization affects the figures you see. In these case studies, We will show the benefits of TD-ABC to get accurate information about how the hospital spends its time, money, and resources (Constantinescu et al., 2022)(Kuzma & Sehnem, 2022). Experiments show that using TD-ABC to deliver precise details on hospital operations has much potential. On the other hand, these studies have been done in minimal situations.

## DATA AND METHODOLOGY

How may time-driven benchmarking, also known as TDBM, be used to enhance the methods that hospitals use to evaluate how well they are performing? When measuring performance, do the results at the activity level provide more information at the overall level than the results at the activity level themselves? This case study compared two hospitals in Iraq, both located in Iraq. Both facilities have the resources necessary to treat patients with COVID-19. It is generally agreed that Hospital 1 falls under medium-sized hospitals. It is staffed by around 22 people who work full-time equivalent hours to manage its services. Hospital 2's staff comprises about 19 individuals working there full-time. The fact that these two hospitals are considerably diverse in size does not change the fact that they were both selected because they both provide comparable services and participate in similar health-related activities. Both hospitals were excellent destinations in their own right. They are equal in that they use the same resources, exhibit a high degree of collaboration, and provide opportunities for conducting observations and interviews. In addition, this comparative analysis solely considers pricing per-unit basis to exclude any potential bias brought on by resource quantities and sizes variations. Both qualitative and quantitative methods were used in this study's data collection process so that we could get all of the information that was required. Interviews of a qualitative kind were conducted with statistical examinations of data. Because of this, we could investigate the interplay between the three primary conventional hospital functions—laboratory examination, diagnosis, and treatment—and how they perform individually. The TD-ABC approach made use of it at one point. Everaert, et al. (Wei et al., 2021)(Hussaina & Abdulahad, 2022).outline six processes that must be completed to provide an answer to the research question and calculate activity costs (Tsang et al., 2021). Determine the total cost of all resources, the practical time capacity of all resources, the unit cost of all resources, the estimated time for each activity, and the unit cost of all resources multiplied by the estimated time. Obtain the total cost of all resources. To determine who would contribute to each project, we conducted many interviews. We began the discussions by speaking with individuals who worked at hospitals 1 and 2 and those who worked at hospitals 1 and 2. It was discovered that there were several charges for overhead. Following the collection of this information from the information systems of the medical facility, 11 processes were identified and categorized according to the roles they shared, as shown in Table 1. The expenditures were divided into direct costs (which included the wages of staff and the upkeep of medical equipment) and indirect expenses (which did not have direct fees).

In contrast to direct expenses, indirect costs included items like stationery, support, energy, training, and other things used to assist someone else in doing something. Indirect charges also included things like taxes. When we completed our research, we discovered that the two hospitals had varied expenses for various items, including salaries and subscriptions. As a result, it was difficult for us to compare the hospitals based on cost indicators. First, a financial burden was associated with payroll and basic administrative expenses. Then, they were changed from Iraqi dinar to their corresponding amounts in US dollars using the conversion rate of (IQD to USD in 2021–2022 = 1480). Therefore, the years 2021 and 2022 were selected as the period when the interviews and observations were carried out.

Table 1. Process and function types

| Function | Process |
|---|---|
| laboratory examination | polymerase reaction test<br>antigen test<br>nasopharyngeal swab |
| Diagnosis | MRI machine<br>blood test<br>iron stock test<br>D-dimer |
| Treatment | Antibiotics<br>Vitamins |

Source: Prepared by the authors (2022).

For each resource category, we assumed 90% of the theoretical capacity for humans and 95% of the theoretical capacity for machines. The theoretical time capacity of 42 hours per week was used for staff capacity. This computation yields a practical capacity of 46,8 hours per week, 2,268 minutes per day, 9,828 minutes per month, or 117,936 minutes per year (practical staff capacity = 42 x 90%). How was the cost per unit of time figured out? Once the resource's functional ability was determined, the overall cost was calculated by dividing the cost of the help by its operational capacity.

Table 2. The Cost per Minute for Each Resource Pool

| Resource | Cost per minute ($/min) |
|---|---|
| hospital management system (HMS) | 0.06 |
| laboratory examination | 0.92 |
| Diagnosis | 0.94 |
| Treatment | 1.04 |
| hospital employee (HE) | 0.13 |
| Doctor | 0.77 |
| Medical equipment maintenance | 0.09 |
| Computer maintenance | 0.39 |
| General overhead | 0.12 |

Source: Prepared by the authors (2022).

Direct observation was used to determine how long it took to accomplish an activity. For this data collection, several observations were made using a stopwatch over many days and at various times to avoid biases. The average values of each activity were used to develop time equations. Tasks were classified and arranged based on the fundamental operations that each institution carried out to standardize procedures and ensure accurate time estimations. Final cost calculations included multiplying resource unit costs per time unit by the estimated time needed to accomplish each activity and then to put all of these costs together to arrive at a final cost per process.

**Laboratory Examination**

The laboratory examination department is in charge of tests to diagnose infection with the emerging coronavirus (Covid-19) polymerase reaction test and antigen test, which are approved by the US Food and Drug Administration. The results are available within minutes if analyzed within the same hospital or several days or more if sent to an external laboratory. Tables 3–4 present the Laboratory examination function cost and time in hospitals one and 2.

Table 3. Laboratory examination function cost (hospital 1).

| Standard Activity | laboratory examination | | total |
|---|---|---|---|
| Actual Activity | Nasopharyngeal swab | Virus proteins smear | |
| Time per standard activity | 1.30 | | 1.30 |
| Average Time | 1.05 | 1.11 | |
| Cost per min | 0.66 | 0.65 | |
| Cost per Standard Activity | 0.86 | | 0.86 |
| Total Cost per Activity | 0.7 | 0.72 | |

Source: Prepared by the authors (2022).

Table 4. Laboratory examination function cost (hospital 2)

| Standard Activity | laboratory examination | | total |
|---|---|---|---|
| Actual Activity | Nasopharyngeal swab | Virus proteins smear | |
| Time per standard activity | 1.31 | | 1.31 |
| Average Time | 1.65 | 1.45 | |
| Cost per min | 0.70 | 0.69 | |
| Cost per Standard Activity | 0.95 | | 0.95 |
| Total Cost per Activity | 1.15 | 1 | |

Source: Prepared by the authors (2022).

**Diagnosis**

This section is applicable when COVID-19 symptoms begin to emerge. Five activities may be utilized to identify and detect a virus that causes disease: nasal and pharyngeal swab activities; resonance activities; blood test activities; iron store examinations; and D-dimer. Tables 5–6 present the diagnosing function cost and time in hospital one and hospital 2.

Table 5. Diagnostic function cost (hospital1)

| Standard Activity | diagnosis | | | | | total |
|---|---|---|---|---|---|---|
| Actual Activity | nasopharyngeal swab | MRI machine | blood test | iron stock test | D-dimer | |
| Time per standard activity | | | 1.65 | | | 1.65 |
| Average Time | 1.43 | 1.51 | 1.05 | 1.06 | 1.11 | |
| Cost per min | 0.40 | 0.39 | 0.10 | 0.12 | 0.18 | |
| Cost per Standard Activity | | | 0.4 | | | 0.4 |
| Total Cost per Activity | 0.57 | 0.59 | 0.1 | 0.13 | 0.2 | |

Source: Prepared by the authors (2022).

Table 6. Diagnostic function cost (hospital 2)

| Standard Activity | Diagnosis | | | | | total |
|---|---|---|---|---|---|---|
| Actual Activity | nasopharyngeal swab | MRI machine | blood test | iron stock test | D-dimer | |
| Time per standard activity | | | 1.84 | | | 1.84 |
| Average Time | 1.34 | 1.63 | 1.25 | 1.36 | 1.15 | |
| Cost per min | 0.45 | 0.43 | 0.13 | 0.15 | 0.17 | |
| Cost per Standard Activity | | | 0.49 | | | 0.49 |
| Total Cost per Activity | 0.6 | 0.7 | 0.16 | 0.2 | 0.2 | |

Source: Prepared by the authors (2022).

**Treatment**

To get rid of COVID-19, the treatment department is responsible for delivering all the serums and medicines that boost the immune system. In addition, a medication called Baxilovid, which includes the nirmatrelvir enzyme inhibitor, and an antidote, may be administered during this activity to combat the virus that causes COVID-19 illness by suppressing the action of a particular enzyme. As ritonavir for interferon, it slows down the degradation of nirmatrelvir. Tables 7–8 present the Treatment function cost and time in hospital 1 and hospital 2.

Table 7. Treatment function cost (hospital 1)

| Standard Activity | Treatment | | | | total |
|---|---|---|---|---|---|
| Actual Activity | Antibiotics | Vitamins | Baxilovid | Supplementary oxygen | |
| Time per standard activity | | | 1.56 | | 1.56 |
| Average Time | 0.50 | 0.65 | 0.31 | 1.46 | |
| Cost per min | 0.21 | 0.18 | 0.31 | 0.1 | |
| Cost per Standard Activity | | | 0.31 | | 0.31 |
| Total Cost per Activity | 0.1 | 0.11 | 0.1 | 0.15 | |

Source: Prepared by the authors (2022).

Table 8. Treatment function cost (hospital 2)

| Standard Activity | Treatment | | | | total |
|---|---|---|---|---|---|
| Actual Activity | Antibiotics | Vitamins | Baxilovid | Supplementary oxygen | |
| Time per standard activity | | | 1.71 | | 1.71 |
| Average Time | 0.51 | 0.67 | 0.32 | 1.53 | |
| Cost per min | 0.22 | 0.2 | 0.33 | 0.11 | |
| Cost per Standard Activity | | | 0.37 | | 0.37 |
| Total Cost per Activity | 0.11 | 0.13 | 0.11 | 0.17 | |

Source: Prepared by the authors (2022).

## RESULTS AND DISCUSSION

TDBM (time-driven benchmarking) is an important research topic we are trying to answer. An overview of the TDBM process is given in Table 9, which includes a comparison of Time-Driven Benchmarking between Hospital 1 and Hospital 2.

Table 9. Time-Driven Benchmarking between Hospital 1 and Hospital 2

| Function | Process | Hospital 1 | | Hospital 2 | |
|---|---|---|---|---|---|
| | | Cost | Time | Cost | Time |
| laboratory examination | polymerase reaction test<br>antigen test | 0.86 | 1.30 | 0.95 | 1.31 |
| Diagnosis | nasopharyngeal swab<br>MRI machine<br>blood test<br>iron stock test<br>D-dimer | 0.4 | 1.65 | 0.49 | 1.84 |
| Treatment | Antibiotics<br>Vitamins<br>Baxilovid<br>Supplementary oxygen | 0.31 | 1.56 | 0.37 | 1.71 |

Source: Prepared by the authors (2022).

As part of this research, an investigation into a pertinent issue is being carried out. How might hospitals improve performance evaluations using time-driven benchmarking (TDBM)? Our team investigated eleven distinct approaches to find an answer to this problem. Each institution makes decisions about laboratory testing, diagnosis, and treatment with cost and time considerations. When looking at the two hospitals' performance in their three significant duties, it would seem that hospital 1 is superior to hospital 2. When comparing prices, we discover that Low Hospital 1 is more affordable for most services but not for D-dimer. It is equivalent to Hospital 2 in terms of the length of the procedure periods. Even though both hospitals have the same amount of time for administering antibiotics, we discover that hospital 1 has lower timings in nine processes when we look at the periods involved. Hospital 2 has expenditures that are 62% more than hospital 1, even though the two hospitals are located around the same distance. It is mainly a result of the fact that the nasopharyngeal swab has the lowest possible unit cost of $0.7 per hospital. There was a lot of action taken for about one minute and five seconds. Work on an additional unit installed in hospital 2 took 1.65 minutes and cost them $1.15 respectively. For Hospital 2 to perform at the same level as Hospital 1, it will need to reduce its per-unit expenses by $0.45 and its processing times by 0.60 minutes. According to the research findings, the increase in cost for the hospital's two units during the 1.45-minute activity period was $1. If the hospital wishes to maintain its current level of excellence in providing this service, it will need to decrease the cost of each unit by $0.28 and shorten the procedure by 0.34 minutes. Compared to hospital 1, getting a diagnosis at hospital 2 takes 53% longer and costs 55% more. It is because a nasopharyngeal swab, which costs $0.57, is the item that can be purchased at a hospital at the lowest price. During 1.43 minutes, a significant amount of work was completed. During the 1.34-minute action, however, an additional unit in the hospital had to pay an additional $0.60 for it. On the other hand, the price of using an MRI machine at hospital 2 is exorbitant: $0.70 for a scan that lasts for 1.63 minutes. A blood test at hospital 2 comes with a rather hefty price tag. A blood test may be done in one minute and twenty-five seconds for $0.16. The cost of doing an iron stock test at hospital 2 is quite expensive. Completing the exam will set you back twenty cents in addition to the time it takes. It is priced at $0.20. A D-dimer at a hospital will save you a significant amount of money. 2. The cost is around $0.20 for an activity session that lasts 1.15 minutes. Hospital 2 must reduce the cost of each unit by $0.03 while maintaining the same amount of time spent on the nasopharyngeal swab to provide a service that is on par with that offered by Hospital 1. For Hospital 2 to achieve the same level of success as the nasopharyngeal swab, it is necessary to reduce expenses by $0.03 per unit while maintaining a time commitment of 0.6 minutes. They need to make a $0.11

reduction in the price of operating the MRI machine and a 0.12-minute decrease in the amount of time it takes. It is necessary to reduce the cost by $0.06 and the amount of time by 0.2 minutes. There must be a reduction in the price of the iron stock test. Additionally, there should be 0.3-minute time savings. Because the cost of the D-dimer is equivalent to a decrease in time of 0.04 minutes, the calculation is as follows: Therapy at hospital 2 takes the same amount of time as treatment in hospital 1, even though it costs 52% more than treatment in hospital 1. If hospital 2 aspires to be on par with hospital 1, it will need to make a reduction of $0.01 per unit in the price of antibiotics and vitamins. Additionally, it has to reduce $0.02 in the cost of supplementary oxygen per unit. It is recommended that the times of the three tasks described above be decreased by a total of 0.020 seconds.

## CONCLUSIONS

The subject investigated for this study was: How can hospitals improve their performance evaluation by adopting time-driven benchmarking (TDBM)? Two Iraqi hospitals implemented the TD-ABC model and benchmarking to solve this problem. The model and benchmarking focused on three essential hospital functions: laboratory testing, diagnosis, and therapy. As an illustration of how TD-ABC has progressed, we can see that it now offers information on service charges and a breakdown of the elements contributing to those prices. It is just one example of how TD-ABC has developed.

Additionally, TD-ABC allows hospital administration to quickly uncover and evaluate chances for improvement, which helps them to make intelligent decisions about the best possible allocation of resources. The key finding that emerged from the investigation of the first study question was the realization that TD-ABC might be used to enhance hospital process benchmarking by discovering areas needing improvement. Using TD-ABC in hospitals as part of this study helps to provide a more excellent knowledge of a variety of hospital activities, which is another contribution this research makes. When hospitals restructure to comply with COVID-19, the process becomes more complicated. As a direct consequence of increasing complexity, existing services are undergoing retooling, new services are being established, and budgets are being lowered. In this challenging environment, evaluating a hospital's performance is impossible just by looking at the facility's overall analysis and outcomes. As a direct consequence of benchmarking, there is doubtless that further assistance in terms of both resources and infrastructure is required. Internal benchmarking may improve local process management by allowing for the measurement and recording of changes, verifying allocation and prioritization decisions, and facilitating review activities.

Additionally, it was explored whether or not, in contrast to the results at the macro level, data at the activity level provided additional insights into benchmarking processes. The workflows of Hospital 1 and Hospital 2 are compared side by side using TD-ABC analysis to determine which establishment has the best practices in terms of efficiency and cost. The administration of the hospital would not be possible without the TD-ABC analysis. As a result, hospital 1 could erroneously feel that it outperforms hospital 2 in every aspect of macro performance and that there is no need to alter its operating procedures. Nevertheless, the findings of this investigation indicate that the two hospitals have much to gain from one another.

Consequently, comparing this may lead to discovering techniques to improve mutually favorable hospital performance. Because of this, we have concluded that while macro data may be utilized as a point of departure for comparisons, the underlying micro results provided by activity disaggregation reveal significant variances. Because of this, time-driven benchmarking not only makes employees and superiors much more aware of the results but also provides crucial information that can be used to explain changes in a positive light to workers and superiors. This improvement in benchmarking lends support to a greater focus on reducing costs and achieving outcomes while placing less of a load on the hospital's resources. It encourages hospitals to reevaluate roles, customs, and activities throughout the workflow rather than spending time on problems that can be managed by exchanging information. It prevents hospitals from wasting time on issues that can be handled. Using time-driven benchmarking to measure how long things take, hospital processes can be improved or simplified, variability can be decreased, and workflows can be standardized. The limits of the research included an attempt to measure the performance of health services in light of the COVID-19 pandemic for two hospitals in the Iraqi environment through the use of the Time-Driven Benchmarking technique. Suggestions for future work include trying to use the costing technique on the basis of time-oriented jobs to measure the performance of health services in light of the new shift of the COVID-19 pandemic.

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