

(Article)

Assessing levels of documentation performance of the medical records during the first and third COVID-19 pandemic waves in Egypt

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Abstract

Objective: The quality of medical records plays a crucial role in patient care, hospital accreditation, and healthcare system development. This study aims to investigate the differences in medical record quality between the first wave of the COVID-19 pandemic and the third wave in Egyptian general hospitals. The impact of these differences on documentation performance and length of stay was also evaluated. **Methods:** A retrospective comparative study was conducted in seven governmental hospitals in Giza. The study assessed the performance and quality of medical records from the internal medicine departments and the intensive care units for adult patients. Evaluation criteria included documentation of identification information, administrative information, medical information, and care-provider information. Data was collected from medical records during the

first wave of the pandemic before the implementation of unified formal medical records and compared with records in the third wave after the implementation. A random sampling method was used to select a representative sample comprising $\geq 3\%$ of prior-year hospitalizations. **Results:** The results showed no statistically significant difference in the total scores of doctors' medical records between the two waves ($p < 0.001$). However, significant differences were found when comparing scores within each hospital. The length of stay did not show a significant difference between the two waves ($p = 0.005$), except in two hospitals ($p = 0.029$ & < 0.001). The diagnosis and patient outcomes showed significant differences between the two waves ($p < 0.001$). **Conclusions:** Overall, this comparative study demonstrated that during the COVID-19 pandemic, medical records' data quality was substandard. Greater care and scrutiny should be given to the documentation of data in medical records to guarantee patient safety and appropriate data use for research.

Keywords:

medical records, the COVID-19 pandemic, unified formal medical records, electronic medical record (EMR), documentation performance, and hospital accreditation.

1. Introduction

Medical record-keeping, from ancient papyrus to modern digital systems, remains fundamental to patient care, legal standards, research, and education [1, 2, 3]. Accurate and accessible medical records are crucial for quality patient care, operational efficiency, and financial stability in healthcare [4, 5, 6]. Conversely, incomplete or inaccurate records pose significant risks, leading to diagnostic errors, compromising patient safety, and incurring legal and financial liabilities [4,5,6,7].

The quality of medical records varies significantly based on factors such as healthcare facility type, medical condition complexity, and regulatory frameworks [8]. There is a continuous global imperative to enhance documentation quality through systematic charting practices, clear guidelines, and comprehensive training for healthcare providers [8]. While electronic medical record (EMR) systems offer robust solutions for efficiency and accuracy, many developing countries, including Egypt, still rely heavily on paper-based systems [9, 10]. These paper-based systems present limitations such as poor readability, fragmented data, missing critical information, and logistical challenges, often falling short of modern documentation standards [12, 11, 10].

The COVID-19 pandemic created an unprecedented global health crisis, intensifying existing challenges in medical documentation due to overwhelming patient surges and increased workloads [13, 14]. Early observations indicated a decline in compliance with nursing records during the pandemic's initial phases, highlighting the fragility of documentation practices under extreme pressure [15]. In response, the Egyptian Ministry of Health, in collaboration with the General Authority for Healthcare Accreditation and Regulation (GAHAR), initiated reforms to standardize medical documentation. A key measure was the gradual implementation of unified medical records in governmental hospitals starting in early 2021, aiming to streamline processes, enhance data accuracy, and ensure compliance with national accreditation standards. [16] Against this backdrop, our study provides a timely evaluation of medical record quality in Egyptian governmental hospitals during two distinct phases of the COVID-19 pandemic: the first wave (March-May 2020), representing the pre-unified record period, and the third wave (March-May 2021), following the initial implementation of unified forms. The primary objective was to conduct a comparative analysis of documentation accuracy and completeness between these periods, specifically

elucidating the tangible impact of the newly introduced unified formal medical record on adherence to GAHAR accreditation guidelines. Furthermore, we aimed to assess the influence of these evolving documentation practices on key patient-centric outcomes, including overall documentation performance and length of hospital stay.

While existing literature has explored the effects of COVID-19 or quality control methodologies on medical documentation, many studies focus on contexts with prevalent EMR systems [17, 18]. Our research offers a unique contribution by focusing on the practical implications and real-world challenges of implementing unified paper-based medical records within a high-pressure, resource-constrained environment like the Egyptian public healthcare system during a global pandemic. We hypothesized that the diligent application and widespread adoption of the unified medical record form would lead to a measurable and statistically significant improvement in the quality of written medical records, contributing to enhanced patient care and operational efficiency. This study provides critical insights into the adaptability and effectiveness of documentation reforms in contexts where digital transformation is still nascent, offering valuable lessons for similar healthcare systems globally.

2. Methods

2.1. Study design and setting:

A retrospective comparative study was conducted during the COVID-19 pandemic at two distinct waves to determine medical records' quality improvement. We originally gathered data from medical records during the first wave of the pandemic (from March 2020 to May 2020), prior to applying the unified formal medical record in compliance with GAHAR accreditation standards

(16). Then, in addition to the unified records used during the third wave of the COVID-19 pandemic (March 2021 to May 2021), both gathered data from the first wave and the third one were compared. The research was conducted in seven Giza government hospitals. Medical records from other departments were eliminated when using the quality checklist to evaluate the effectiveness and caliber of files from the internal medicine department and the adult patients' intensive care unit who were over the age of 18. The study was as approved by the ethics committee of the Central Directorate of Research & Health Development at Egypt ministry of health and population (Approval Number: 5-2022/17).

2.2. Sampling and Sampling Techniques:

The sample size was calculated using the Epi Info statistical program to be representative of at least 3% of the total number of hospitalizations of the previous year, following the criteria provided in the most recent guidelines of quality **(15)**. The sample size for physicians' records was 495 for seven hospitals and increased by about 7.5% to 533, while for nurses' records, it was 455 for only six hospitals and increased by 3.5% to 471. The proportional allocation for the original sample size was distributed as follows: 50 records for Hospital A, 95 for Hospital B, 95 for Hospital C, 65 for Hospital D, 70 for Hospital E, 80 for Hospital F, and 40 for Hospital G **(Fig.1)**. The samples were selected randomly using a random sampling strategy.

2.3. Exclusion Criteria

Files were excluded from the study if they contained incomplete data (e.g., missing essential patient identification information, primary diagnoses, or critical progress notes that are fundamental for comprehensive quality assessment) or violated the inclusion criteria. Violations included records of patients under 18 years of age, records from departments other than internal medicine or intensive care units, or

records from non-governmental hospitals. For instance, records belonging to pediatric patients or from surgical departments were excluded.

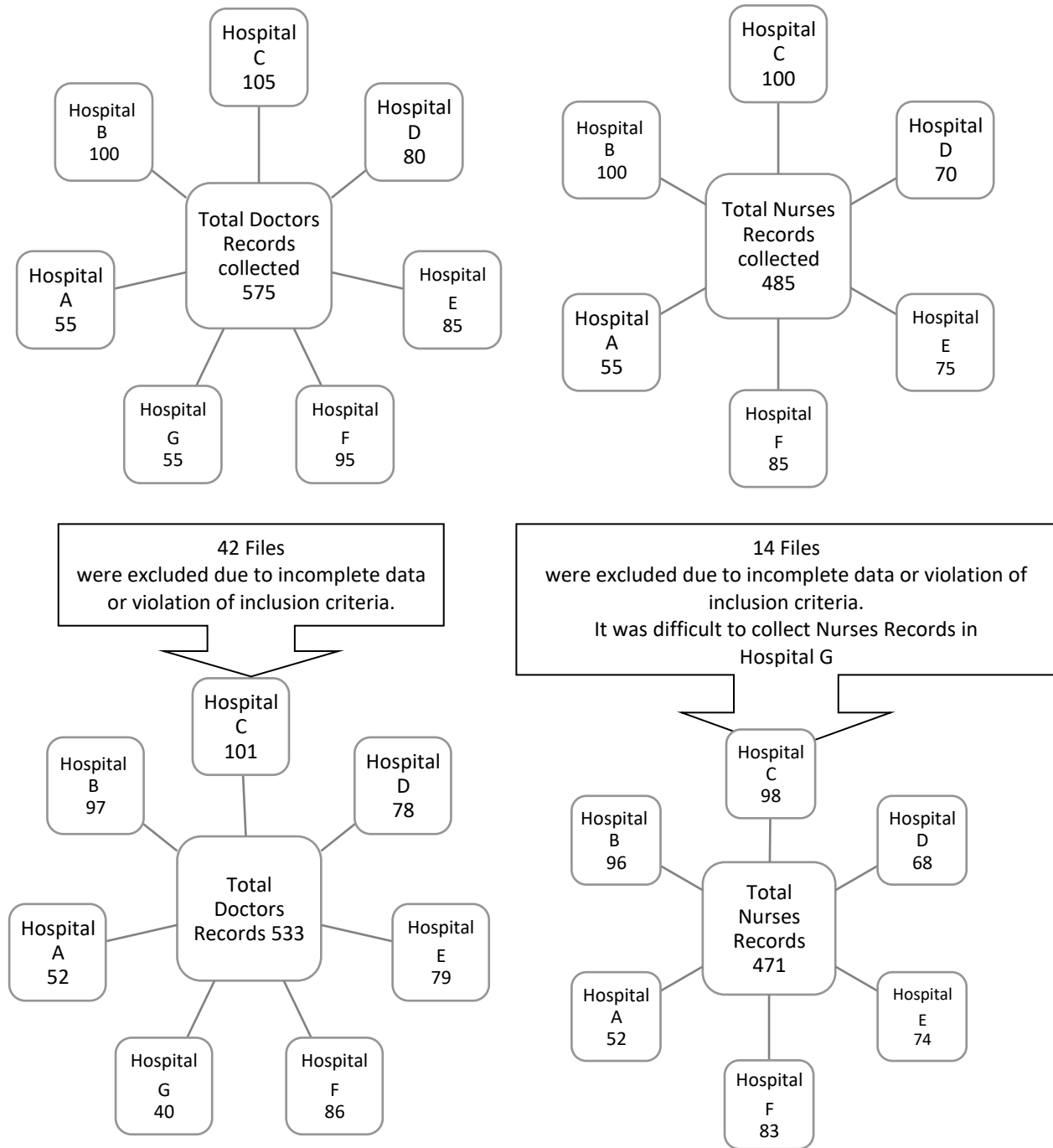


Figure 1: sampling technique of medical records for both physicians and nurses.

2.4. Data Collection Methods and Tools:

A well-trained research team consisting of physicians, clinical pharmacists, and nurses was established in every hospital to collect the data from paper medical records and complete the quality evaluation grid. Patient confidentiality was maintained through immediate anonymization of records post-data extraction, secure storage, and strict access limitations to authorized study personnel only, as approved by the ethics committee. We compared the scores of fulfillments of physicians' and nurses' written data in the medical record and how much it had changed during the COVID-19 pandemic in the first and third waves.

We also inspected the influence of the application of the governmental unified records during the first to third wave of the COVID-19 pandemic following the Egyptian Ministry of Health's authorization and application of the unified medical records since the beginning of 2021. The quality assessment of the paper medical records was managed using an evaluation grid that encompassed key elements of patient care documentation, divided into several categories. These included: admission information (e.g., patient identification, admission registration), medical information filled by physicians (e.g., physical examinations, diagnoses, progress notes, medical orders, clinical reviews, and discharge summaries), and daily nursing notes (e.g., nursing care plans, pain assessment charts, skin assessments, falling risks, documentation of physician oral orders, and clinical progress documentation). These elements were assessed for accuracy and completeness following GAHAR criteria.

Two online forms were created in Arabic to ease data collection from participating hospitals. One for the assessment of physician documentation and the other for the assessment of nurses' written

paperwork. The items were expressed as three answer choices. 2 points were assigned if the item was satisfied, 1 point when partially satisfied, and 0 if not.

Overall and specific area scores were calculated as proportions of satisfied items (excluding non-applicable ones). These included: (1) documentation rates of physicians' care plans and countersigned progress notes, (2) completeness of nursing records (care plans, pain/skin/fall risk assessments, and physician orders), (3) frequency of missing critical data (personal history, discharge summaries, or proper consent forms), and (4) presence of unified medical codes.

2.5. Statistical methods

Data was analyzed using IBM SPSS Advanced Statistics (Statistical Package for Social Sciences), version 28 (*SPSS Inc., Chicago, IL*). Numerical data was described as median and interquartile range, while qualitative data was described as numbers and percentages. The McNemar-Bowker test was used to examine the relationship between paired qualitative variables for tables larger than 2x2. Testing for normality was done using the Kolmogorov-Smirnov test and the Shapiro-Wilk test. Comparisons between the medians of two dependent measurements were tested using the Wilcoxon signed-rank test. A p-value less than or equal to 0.05 was considered statistically significant. All tests were two-tailed.

3. Results

3.1. Assessment of physicians' performance of documentation:

The total number of physicians' medical records collected from the seven participating hospitals was 533. The differences between the median scores of the first and third wave in each hospital separately are shown in Table 1. The only statistically significant difference between the two waves' scores was found only in Hospitals A, B, and F ($p < 0.001$ for each). The median score

increased from 26, 7, and 22 to a level of 32, 15, and 27, respectively, in third wave of the previously mentioned hospitals, indicating better adherence to GAHAR guidelines than in the first COVID wave (**Fig.2**), supplementary materials.

Table 1 compares total physicians' scores of documentations among hospitals between the two COVID waves (the first and third waves)

Hospital	Total physicians' Score		P value
	First wave (n=237)	Third wave (n=296)	
	Median (IQR)	Median (IQR)	
Hospital A	26 (24-26)	32 (32-32)	<0.001
Hospital B	7 (5-9)	15 (9-16)	<0.001
Hospital C	18(14-21)	16 (13-19)	0.102
Hospital D	17 (16-19)	16 (12-18)	0.317
Hospital E	5 (1-11)	5 (3-10)	0.153
Hospital F	22 (21-25)	27 (27-27)	<0.001
Hospital G	12 (8-15)	15 (13-19)	0.169
Total	18(7-23)	15(11-20)	<0.001

P≤0.05 is statistically significant, analysis done using Wilcoxon signed-rank test

3.2. Assessment of nurses' performance of documentation:

Out of the total of 471 medical records of nurses, we found that the nurses' performance agreed with the doctors' performance. The median scores of the first and third waves in each hospital separately are shown in Table 2. The only statistically significant difference between the two waves' scores was in Hospitals A, B, E, and F ($p<0.05$), with an increased median score in the

third wave than in the first. However, no statistically significant difference was found between two COVID waves regarding hospitals C and D ($p = 0.893$ & 0.076 , respectively) **Fig.2**, supplementary materials.

Table 2 comparing total nurses' scores of documentations among hospitals between two Covid waves (the first and third waves):

	Total Nurses' Score		p-value
	First wave (n=246)	Third wave (n=225)	
	Median (IQR)	Median (IQR)	
Hospital A	40 (39-40)	42 (42-42)	0.001
Hospital B	16 (13-18)	23(21-27)	<0.001
Hospital C	24(22-27)	25(24-27)	0.893
Hospital D	24(22-27)	25(23-28)	0.076
Hospital E	17.5 (13-21)	23(20-27)	0.003
Hospital F	33(31-35)	42(42-42)	<0.001
Total	25(20-33)	26(22-31)	<0.001

$P \leq 0.05$ is statistically significant, analysis done using Wilcoxon signed-rank test

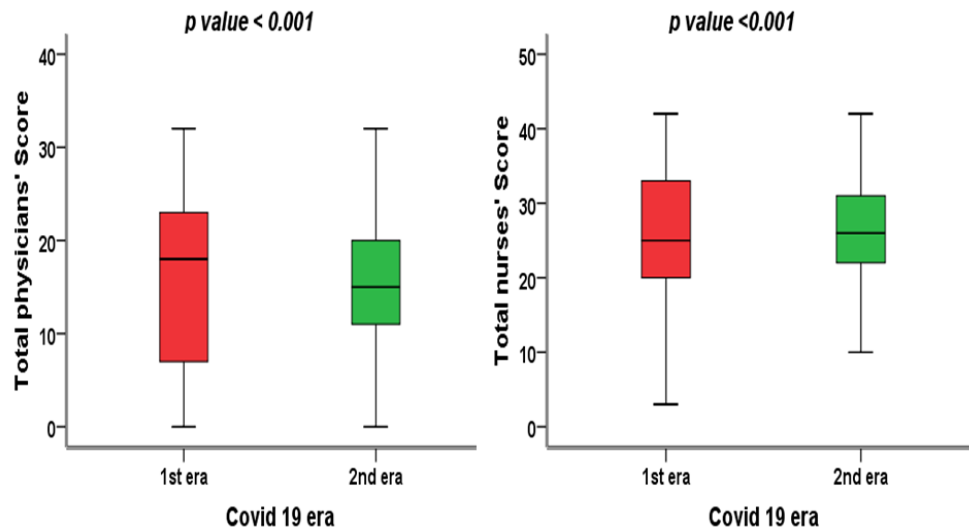


Figure 2: Total score distribution among Doctors and Nurses' Medical Records during the two waves of Covid-19

3.3. Regarding patients' length of stay (LOS) (days) Fig.3:

The median LOS of all hospitals had a statistically significant difference across the two COVID waves ($p = 0.005$), with a decreasing length of hospital stay in the third wave compared to the first wave, from 7 (IQR 3-13) to 6 (IQR 3-10), respectively. The differences between the median LOS of the first and third waves in each hospital separately were not statistically significant, except in Hospitals E and F ($p=0.029$ & <0.001 , respectively), Table 3.

Table 3 compares Length of stay (days) among hospitals between the two COVID waves among Doctors' Medical Records:

Hospital	Length of stay (days)		p-value
	First wave	Third wave	
Hospital A	4 (3-7)	7 (3-10)	0.842
Hospital B	6 (4-10)	5 (4-8)	0.284
Hospital C	3(2-5)	6 (4-9)	0.078
Hospital D	5(2-7)	6.5(3-12)	0.317
Hospital E	5 (2-11)	4 (2-8)	0.029
Hospital F	16 (10-22)	10 (7-13)	<0.001
Hospital G	11 (3-14)	6 (3-13)	0.097
Total	7(3-13)	6(3-10)	0.005

$P \leq 0.05$ is statistically significant, analysis done using Wilcoxon signed-rank test

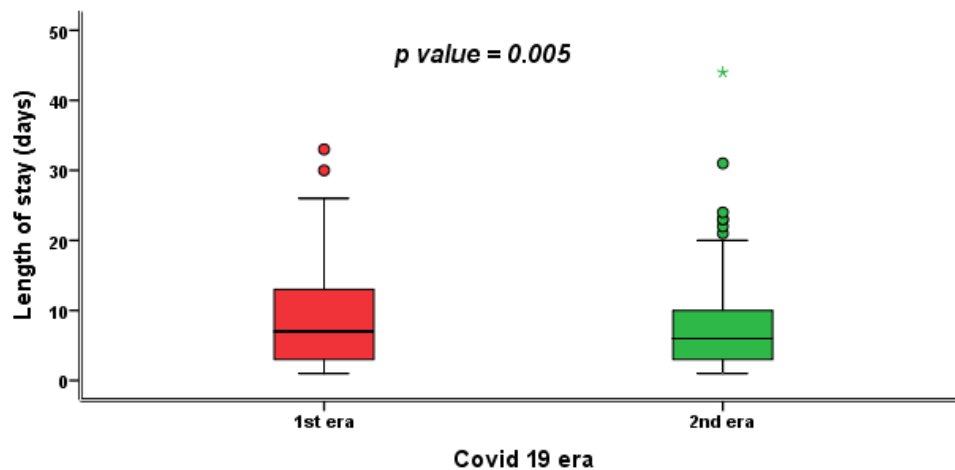


Figure 3: Length of stay (LOS) (days) during the two Covid-19 waves

3.4. Regarding patients' outcomes:

Additionally, the patient's final outcome stated in the medical records of the two waves, which were recorded as Discharge Against Medical Advice (DAMA), improved, referred to another hospital and death was compared as indicated in Table 4.

Using the McNemar test, the results showed that there was a significant difference (with p value < 0.001) in comparing the scores of patients' outcomes in the two waves. The percentage of cases improved according to medical records findings, decreasing from 61.2% in the first wave to 52.6% in the third wave, while the percentage of DAMA remained constant throughout the two waves (10.5%). The percentage of cases either referred to another hospital or died increased from 4.6% & 23.7% to 7.9% & 28.9%, respectively).

The observed decrease in the percentage of improved cases from the first wave (61.2%) to the third wave (52.6%) is a complex finding influenced by multiple factors beyond just documentation quality. Firstly, it is plausible that the patient cohort in the third wave presented with a higher severity of illness, potentially due to the emergence of new viral variants, which could inherently lead to a lower rate of documented improvement. Secondly, the escalating strain on hospital resources, including bed availability and healthcare personnel, during the third wave might have impacted the overall quality of care delivered, thereby influencing patient outcomes. Thirdly, it is crucial to differentiate between the documentation of patient outcomes and the actual clinical trajectory; the decrease might reflect a shift in documentation practices under high-pressure conditions, where the focus might have been on critical events rather than detailed progress of improvement. Lastly, a subtle reporting bias or a more conservative approach to classifying patient outcomes by overwhelmed healthcare providers could also contribute to this observation. While our study did not investigate the clinical underpinnings of these outcomes, we acknowledge these multifactorial

influences and suggest that further dedicated research is warranted to elucidate the specific clinical and operational factors contributing to this trend.

Table 4: Compares the final patient's outcome in physicians' medical records between two COVID waves:

All hospitals collectively	Patient final outcome (First wave)						P value
		Improved	Referred to another hospital	DAMA	Death	Total	
Patient final outcome (third wave)	Improved	61 (40.1%)	0 (0)	0 (0)	19 (12.5%)	80 (52.6%)	<0.001
	Referred to another hospital	7 (4.6%)	4 (2.6%)	1 (0.7%)	0 (0)	12 (7.9%)	
	DAMA	10 (6.6%)	0 (0)	6 (3.9%)	0 (0)	16 (10.5%)	
	Death	15 (9.9%)	3 (2.0%)	9 (5.9%)	17 (11.2%)	44 (28.9%)	
Total		93 (61.2%)	7 (4.6%)	16 (10.5%)	36 (23.7%)	152 (100.0%)	

DAMA: Discharge against medical advice

The analysis is done using the McNemar-Bowker test

4. Discussion

The COVID-19 pandemic exerted unprecedented pressure on global healthcare systems, significantly impacting the operational dynamics and documentation practices within medical facilities. Healthcare professionals, particularly physicians and nurses, faced heightened physical and psychological stress, which invariably affected their daily clinical responsibilities and increased

the demands associated with medical record documentation [16, 17]. In response to these challenges, substantial administrative and organizational efforts were initiated to enhance the quality and functionality of healthcare systems. A pivotal development in Egypt was the introduction of a unified medical record system, designed to standardize documentation practices across all governmental hospitals in accordance with General Authority for Healthcare Accreditation and Regulation (GAHAR) standards.[9]

This study aimed to comparatively assess the accuracy and completeness of paper-based medical records during two distinct phases of the COVID-19 pandemic in Egypt: the first wave (pre-unified record implementation) and the third wave (post-initial unified form implementation). Our evaluation encompassed various critical aspects of medical record-keeping, including admission information, medical history, clinical reviews, medical order management, clinical progress documentation, and discharge data, all rigorously assessed against established GAHAR criteria. The primary objective was to determine the tangible impact of the newly introduced unified forms on documentation quality and compliance.

Our analysis revealed statistically significant differences in the quality scores of medical records for both physician and nurse documentation in only three of the seven participating hospitals (Hospitals A, B, and F). This suggests a localized improvement in documentation practices and adherence to GAHAR guidelines during the third wave. However, a notable finding was the overall decrease in the total median score for physician documentation, from 18 in the first wave to 15 in the third wave. This decline may be attributed to the persistent and overwhelming workload experienced by healthcare professionals in other hospitals, even after the introduction of the refined

medical record system. This observation aligns with previous research indicating the detrimental effects of high workload on documentation compliance during crises.[15 ,14]

Consistent with our findings, a pre-post observational study by Fernández-Castro et al. (2021) demonstrated a reduction in compliance with nursing records related to pressure ulcers, falls, and social vulnerability during the initial phases of the COVID-19 pandemic [14]. This highlights the fragility of documentation practices under extreme pressure and the challenges in maintaining comprehensive record-keeping amidst overwhelming patient surges.

A significant disparity was observed between the quality of physician and nurse documentation, with physician forms exhibiting more deficiencies and lower scores. This could be largely explained by the shortage of specialized physicians during the pandemic, which necessitated the involvement of medical professionals from diverse specialties, not always directly related to pulmonary and intensive care management, in the treatment of COVID-19 patients. The deployment of non-specialized physicians likely impacted the accuracy and quality of data recorded, as well as overall daily work performance. These results resonate with the observations of Kasaie et al. (2021), who also reported a significant impact of the COVID-19 pandemic on documentation workflow within Intensive Care Units (ICUs) [18]. Furthermore, Holmgren et al. (2020) noted an increase in the time spent on Electronic Medical Records (EMR) during the pandemic, leading to adverse effects such as reduced quality of care, increased healthcare costs, and staff burnout.[16]

A cross-sectional study involving 372 nurses across eight public hospitals revealed inadequacies in nursing care recording practices when compared to evolving quality requirements in the health sector. This study underscored the influence of factors such as years of experience, availability of

documentation guidelines, and the suitability of nurse-to-patient ratios on nursing care documentation. Notably, appropriate nursing care documentation was found to be nearly four times more prevalent among nurses attending to patients not experiencing stress, worry, pain, or distress, compared to other nurses [19]. This further emphasizes the impact of environmental and patient-related stressors on documentation quality.

Regarding patient length of stay (LOS), our study observed a slight, though not overtly ameliorated, improvement between the two pandemic waves, even after the implementation of updated records. We hypothesized that a longer LOS might correlate with the prevalence of unrecorded information. This aligns with a previous retrospective analysis demonstrating an association between missed documentation in Electronic Health Records (EHR) and increased LOS in preoperative patients [20]. This suggests that comprehensive and accurate documentation can contribute to more efficient patient flow and reduced hospital stays.

Analysis of patient outcomes revealed a consistent rate of Discharge Against Medical Advice (DAMA) across both waves. However, the percentage of cases showing improvement based on medical record findings declined in the first wave but increased in the third wave. Conversely, the proportion of patients who either passed away or were transferred to another hospital increased. These findings are consistent with a descriptive research design assessing nurses' documentation practices in critical care units, which indicated that critical care documentation was often either absent or incomplete.[21]

The urgent need for improved documentation practices is underscored by the potential threat inadequate documentation poses to patient safety and favorable outcomes. Nursing documentation serves as an invaluable instrument in nursing practice, and its completeness is paramount for

ensuring high-quality care and enhanced patient outcomes [22]. Efficient nursing documentation demonstrably improves the assessment of nursing care and provides robust evidence of the care delivered, directly influencing patient outcomes [23]. A descriptive study conducted at Tanta University Hospitals in Egypt revealed a highly statistically significant positive correlation between the continuity of patient care and the quality of nursing documentation, further emphasizing the critical necessity of professional nursing documentation for optimal patient-related outcomes and high-quality care.[24]

During the data collection phase of our study, a critical observation was the absence of ICD-10 medical coding in the medical records of any hospital across both study waves. This finding is strongly correlated with the suboptimal documentation practices identified in these hospitals. Rahmathulla et al. (2020) reported that the implementation of a medical coding system in healthcare significantly enhances the documentation of diseases and their complications, facilitating improved tracking of healthcare outcomes. Such systems also assist healthcare professionals in providing more effective and sustainable care, while simultaneously optimizing payment and billing processes [25]. The lack of standardized coding thus represents a significant barrier to data quality and utilization.

Our study carries significant implications for policymakers in Egypt as they strategize for the post-COVID era concerning healthcare system development and documentation practices. The continued reliance on paper-based systems for all healthcare workflows has demonstrably led to daily data omissions and presented numerous obstacles for administrative, research, and quality assurance teams. In contrast, studies such as that by Jedwab et al. (2019) have shown that transitioning from traditional paper-based information systems to electronic medical records

(EMRs) provides nurses with a more valuable and easily accessible source of information, leading to improvements in workflow, drug administration, adherence to guidelines, and error detection [26]. This underscores the urgent need for digital transformation in Egyptian healthcare to enhance efficiency, accuracy, and overall data management.

We acknowledge a limitation in our study: the assessors were aware of the study's purpose, which could theoretically introduce observation bias. However, rigorous efforts were made to mitigate this potential bias through the implementation of a standardized evaluation grid. This grid utilized predefined criteria and an objective scoring system (2 points for satisfied, 1 for partially satisfied, and 0 for not satisfied), aiming to ensure consistency and reduce individual subjectivity. Furthermore, patient confidentiality was strictly maintained through immediate anonymization of all records post-data extraction. While complete blinding of assessors was challenging given the retrospective nature of this review, these measures were designed to enhance the reliability of our findings. Future research endeavors could explore methodologies that facilitate assessor blinding where feasible to further strengthen study design.

5. Conclusions

This comparative study illustrated that there was incompetence in the quality of data in medical records during the COVID-19 pandemic. Efforts made to unify medical files weren't enough to handle the problem. So, documentation of data in medical records should receive more attention and observation to ensure patient safety and proper utilization of data for research purposes. It is also recommended to cope with global digitalization with less dependence on paperwork and consider electronic medical recording conversion and applying the ICD code system.

6. Recommendations

Training programs should be held regularly to help healthcare professionals understand the importance of the completion and accuracy of data in medical files. The quality team should be encouraged to have a better role when performing early data analysis during patient admission to ensure better performance and high-quality data documentation, so quality guidelines need to be updated to encompass all documentation points regarding doctors' and nurses' performance. International classifications for diseases should be enforced to help with proper reporting and monitoring of diseases and their complications through the application of ICD codes to medical records. EMR is no longer a luxury; depending on paperwork has different negative impacts on the process of documentation, expressed in data missing and a lack of error tracking. So, it became very critical that administrative steps be taken to apply and ensure proper changes from paperwork to electronic records as an implementation of the governmental vision for digitalization transformation.

7. Limitations

The uncompleted and documented loss of data, even that of the patient's identification and some results of daily tests, is due to the abiding dependence on the paperwork in medical records.

Some of the medical records obtained during the selected first wave were not from COVID ICU, which influenced outcome results in the first wave in two hospitals (Hospital C and Hospital F). Also, the unavailability to collect data from nurses' medical records in Hospital G. Additionally, the retrospective design may introduce selection bias, as unavailable or incomplete records could skew results. Furthermore, the study did not account for potential differences in patient case

severity (e.g., ICU admission rates, comorbidities) between pandemic waves, which may have affected documentation practices and outcomes.

8. List of Abbreviations:

CDS: Clinical Decision Support

EMR: Electronic Medical Records

EHR: Electronic Health Record

GAHAR: General Authority for Healthcare Accreditation and Regulation

ICD: International Classification of Diseases

ICU: Intensive Care Unit

MRA: Medical Record Abstraction

SDE: Structured Data Entry

DAMA: Discharge Against Medical Advice

9. Ethics approval and consent to participate:

The present study was conducted under good clinical practice, the Declaration of Helsinki, and the World Health Organization's guidelines. The "Research Ethics Committee" (REC No. 5-2022/17) of MOHP's Central Directorate for Research and Health Development reviewed and approved the research protocol.

10. Consent for publication:

Not applicable.

11. Availability of data and material:

The datasets during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

12. Competing interests:

“The authors declare that there is no conflict of interest regarding the publication of this article.”

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14. Authors contributions:

A.SH. R. the conception and design of the study, S.M, M.M.G, A.E.E, M.A.A, T.A, M.S, M.S & M.M.S. acquisition of data, D.H.A. & R. M.A. analysis and interpretation of data, N.M.K, H.Y.I, S.A.A, drafting the article and revising it critically for important intellectual content, N.M.E. final approval of the version to be submitted. All authors have read and approved the manuscript.

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