Using the Deming Cycle as an Approach for Implementing a Training Program to Improve Nurses' Documentation Skills at King Fahd Specialist Hospital

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Abstract:

Background: *Nursing documentation serves as a legal record of the care provided, and any discrepancies, omissions, or inaccuracies can expose healthcare professionals and institutions to liability. Well-documented notes provide evidence of clinical judgment, timely intervention, and adherence to standard care protocols. The PDCA cycle is designed to encourage learning through action and reflection, allowing teams to make data-driven decisions and gradually move toward better performance.* ***Aim:*** *The aim of the present study was to use Deming cycle as an approach for implementing training program to improve nurses' documentation skills at King Fahd Specialist Hospital.* ***Method:*** *Quasi-experimental design was used, was conducted in all departments of King Fahad Specialist Hospital, Saudi Arabia on 100 staff nurses using three tools for data collection namely, Knowledge Nurses' Documentation Questionnaire, Nurses' Attitude for Documentation Questionnaire, and Nurses' Documentation Practice Auditing Checklist.* ***Results:*** *Finding of the present study revealed a substantial improvement in the total level of documentation skills knowledge, attitude and practice across the training phases. Also, there was a highly statistically significant positive correlation between total scores of documentation knowledge, attitude and practice.* ***Conclusion:*** *Using Deming cycle as an approach for implementing training program to improve nurses' documentation skills was effective in significantly improving nurses' knowledge, attitudes, and practices related to nursing documentation.* ***Recommendations:*** *Conduct regular audits of nurses' documentation practices using standardized checklists. Establish and regularly update standardized nursing documentation policies and procedures.*

Keywords: *Deming Cycle, Documentation Skills, Nurses, Training Program*

Introduction

Electronic health records (EHRs) are replacing hand written notes and represent a more accessible and uniform platform for nurse documentation. Documentation provides for continuity of therapy, allows interdisciplinary communication, aids clinical decision making and satisfies legal and professional obligations. Quality nursing documentation is a clinical responsibility and a professional duty that reflects the quality and safety of treatment (Harvey, Adsett, Mudge, Steele, & McRae, 2025).

Safe, continuous and high-quality patient care depends on accurate and timely nursing documentation. Timely inputs allow for real-time communication amongst healthcare providers, reducing treatment errors, duplications and omissions. Physicians, pharmacists, and allied healthcare providers are able to make informed patient care decisions based on the accuracy of nursing notes in reflecting assessments and interventions (Khwaji, et al., 2024). Monitoring modest changes in the patient's status can result in early medical intervention and avoid clinical deterioration (Jasem, & Younis, 2024).

Documentation supports therapeutic treatment and legal and ethical responsibilities. Nursing records can establish in court that care followed professional and institutional standards. The records assist courts and regulators judge malpractice care. Proper recordkeeping is ethical for promoting transparency, accountability, and patient autonomy. (Dokuba, et al., 2024) It indicates nurses' honesty and patient-centered care.

Nurses struggle to document properly and fast, despite its usefulness. Emergency departments and intensive care units are being plagued by time restriction. Nurses are often busy with paperwork and patient care and notes often late or poor. Dependability of patient records and quality of treatment may be affected by inadequate, confusing, or missing information due to time restrictions (Ernawati, Damayantie, Dewi, & Muliyadi, 2025).

Another big problem is the lack of standards for documentation and training for systems (Bjerkan, Valderaune, & Olsen, 2021). There are often complaints from nurses about the lack of documentation protocols and the legal ramifications. The shift to EHRs has also brought with it complexity of systems, technology problems and inconsistent documentation formats. Limited digital proficiency or lack of EHR system training might result in data entry errors and system navigation challenges that can compromise the quality of

documentation. Systematic training and institutional support are needed to tackle these difficulties (Kassie et al., 2023).

Poor documentation by nurses affects the continuity and accuracy of care and can threaten patient safety. Wrong or incomplete vital signs, prescription data or therapeutic processes might lead healthcare providers to make clinical decisions. The absence of an allergy in a patient's file can lead to inappropriate therapy and serious medication reactions. There are gaps in documentation across shifts or departments which might result in either duplication of activities or missed interventions. (Zaman, Goldberg, Kelly, Russell, & Drye, 2021)

Medical practitioners and institutions might be accountable for any errors, omissions or inaccuracies in nursing notes. Well documented notes demonstrate professional judgement, quick response and conventional treatment methods in medico-legal investigations. Even if treatment was delivered properly, poor or inconsistent documentation damages the legal argument. Documentation is vital for nurses' legal protection since courts tend to interpret "not documented" as "not done" (Yadav, 2024).

Limited documentation prevents health care institutions from tracking quality, identifying trends, and meeting certification standards. Documentation data are used for quality improvement audits, for benchmarking and for regulatory reporting. Biassed data analysis may occur from incomplete or inaccurate records, masking performance gaps and misrepresenting care outcomes. This has implications for policy, funding and reputation (Fatmawati, et al., 2024). Additionally, poor documentation may cause a lack of early intervention and preventive therapy, which can increase hospital readmissions and healthcare costs (Jasem, & Younis, 2024).

Interventions targeted at healthcare personnel and systems are needed to improve nurse documentation, including educational, technical and administrative. Successful solutions include documentation training and competency building. In-service training, simulation-based teaching, and case-based discussions encourage accurate, concise, and timely recording (Sloss, et al., 2024). Training should include paper-based and electronic systems and be scenario-based for actual application. SOAP (subjective, objective, assessment, plan) and SBAR (situation, background, assessment, recommendation) are tools that might help nurses in structuring and clarifying their nursing notes (Siauta, Imansari, & Lilipaly, 2024).

Another way is to optimise electronic health record (EHR) systems to make them more user friendly and to reduce paperwork. Simple user interfaces, templates, drop-down menus and voice-recognition capabilities minimise errors and increase productivity. Leadership involvement is key and nurse managers and administrators should review documentation, provide helpful suggestions, and foster accuracy and accountability. Policies should create clear documentation requirements, and institutions should give nurses with necessary time and resources to complete documentation effectively (Collins, 2025).

The Deming Cycle (PDCA) is a common paradigm for continuous quality improvement (CQI) in healthcare and other industries. The approach, established by Dr. W. Edwards Deming, combines the scientific method and iterative problem-solving to improve processes, systems, and results. It arranges, tests, and refines changes rationally. The PDCA cycle helps teams make data-driven decisions and enhance performance via action and reflection (He, et al., 2024).

Originally developed for industrial quality control, the Deming Cycle has gained favour in healthcare due to its scalability and emphasis on incremental improvements. It helps modern healthcare systems' objectives of increasing patient outcomes, efficiency, and staff accountability. High-quality nursing care demands ongoing growth in clinical skills, documentation, patient communication, and safety (Zhang, Gong, Li, & Zhu, 2024). The notion is particularly effective in nursing.

The Deming Cycle is based on continuous improvement, the idea that no process is perfect but may be improved by intentional effort, feedback and learning. Once an improvement plan has been put into place and reviewed, it should be modified and put into place again to enhance performance. Nursing practice involves ongoing reflection and adjustment to facilitate patient safety, evidence-based care and organisational efficiency (Fan, & Zhou, 2025).

Teamwork and data-driven decisions are another PDCA cycle principle. The PDCA technique is well suited to such a planning and evaluation process focused on underlying causes, quantifiable objectives, and frontline staff, such as nurses, rather than a random or assumption-based change process. This contributes to better quality intervention, ownership by personnel, engagement and compliance with new practises (Zhang, Gong, Li, & Zhu, 2024).

The PDCA cycle begins with planning. In this approach organisations identify an issue or area for improvement, gather data and examine the causes. This phase is to set the goals, define the success criteria and develop a problem-specific intervention plan. The Plan phase would include documentation audits, conversations with people, and establish if nursing documentation issues are due to lack of knowledge, time constraints or poor system design. (Wu, 2024)

You should also plan resources, training, timetables and team responsibilities. The more you prepare, the more successful the intervention will be. In healthcare, a realistic, complete, and institutionally compliant plan may be developed through collaboration of nurses, IT specialists, educators, and quality assurance officers (Realyvásquez Vargas, et al., 2024).

The proposed intervention is tested in a controlled setting to establish its feasibility and effectiveness. This enables health care teams to carry out the approach while monitoring problems and side effects. One department or a few nurses may be provided with a new documentation training module. This step needs participants' input and real-time monitoring of the intervention (Rasheed, Abdelrahman, Gabra, & Abdelhakam, 2024).

The check phase extensively investigates the intervention's efficacy. The goals of the Plan phase are analysed and compared with audit findings, feedback surveys, performance measures and mistake rates. This phase enables stakeholders to evaluate whether the intervention met expectations and achieved improved outcomes (Rasheed, Abdelrahman, Gabra, & Abdelhakam, 2024).

This may include reviewing pre and post intervention samples, scoring for accuracy and completeness and collecting nurse and manager feedback to improve nursing documentation. If the intervention is successful, the team can move on. If results are bad, data will tell you why and what to change. The analytical step turns experience learning into sound decision-making (He, et al., 2024).

The results of the Check phase direct the organisation to determine whether to standardise, modify or stop the intervention in the act phase. If successful, the intervention could be rolled out to other units, embedded in standard procedures and supported by policy changes and training. Hospitals may mandate that all nurses complete documentation improvement training during onboarding or as part of ongoing professional development (Bunting & de Klerk, 2022).

Significance of Study

In hospital management, the patient's health is the priority. The PDCA cycle is the most used quality and safety management system in health care (Xiang, et al., 2024). Nursing documentation quality has an impact on patient safety and care. Nursing records may not fulfil high quality criteria of documentation for nursing process documentation. Documentation is one of the most important functions in nursing. Documentation in nursing also indicates that an organisation documents its planning, delivery, assessment and evaluation of patient care. Nursing records are good instruments for written communication (Gligor et al., 2024).

Their basic role is to improve and continue nursing and medical interventions for patients, to transfer patients' information to other health team members, to enhance professional autonomy, critical thinking skills, professional knowledge and nursing education, but the most important role is legal, because a suitable and correct document is the best witness to show health interventions for patients. Clinical nursing documentation allows nurses to assess the effectiveness of treatments and patient outcomes (Paans, et al., 2010). Proper recording of nursing care provides good legal defence. Good documentation helps exceptional patient care organisations and illustrates how nursing makes a difference to patient outcomes.

Aim of Study

The aim of the present study was to use Deming cycle as an approach for implementing training program to improve nurses' documentation skills at King Fahd Specialist Hospital.

Method

Research design

Quasi-experimental design was used to achieve the aim of this study.

Setting

The study was conducted in all departments of King Fahad Specialist Hospital, Saudi Arabia

Participant

Convenience sample was utilized, which included all available staff nurses (n=100) who were responsible for providing patient care in all inpatient units who fulfill the criteria of having a minimum of one-year experience work and available at time of data collection.

Tools of data collection:

Tool I. Knowledge Nurses' Documentation Questionnaire

This tool aimed to assess nurses' knowledge about nurses' documentation during different phases of training program. It was comprised of two parts:

The ***first part***: It was used to identifying personal characteristics of the study nurses such as, age, hospital, educational qualifications, years of experience, and attending training program.

The ***second part***: It was designed by researchers based on literature reviews to assess study nurses' pre-post knowledge about nurses' documentation skills. It consists of questions in the form of true and false and multichoice that related to nurses' documentation. The questions were scored as "1" for correct answer, and "zero" for incorrect answer.

Scoring system:

- Low (<60% of scores)
- Moderate level (60-80% of)
- High (> 80% of scores)

Tool II. Nurses' Attitude for Documentation Questionnaire

It was developed by Ayele, et al., (2021) to study participants towards nursing documentation. It includes 12 items to describe nurses' attitude regarding documentation. the responses of participant were assessed using a 5-point Likert scale ranging from strongly disagree (1) to Strongly agree (5). The total score for attitude questions was dichotomized into favorable and unfavorable attitude by mean score cut off point. Favorable Attitude. Those respondents who scored greater than or equal to the mean score of attitude questions (Andualem, 2018).

Scoring system:

- Low level (<60% of scores)
- Moderate level (60-80% of scores)
- High level (> 80% of scores)

Tool III. Nurses' Documentation Auditing Checklist.

It was developed by the researcher guided by literature (The Joint Commission (TJC) 2012, Perry, et al. 2014, Rauf, 2021) to assess the actual performance of staff nurses regarding documentation. It was developed in the English language, and was filled by the researcher it consists of two parts:

Part one was designed to gather information about the staff nurses' code number, working unit, data collection date, and time.

Part two was designed to gather information about the staff nurses' documentation performance. This concurrent audit checklist had 70

elements representing the documentation skills in nine aspects namely; nursing routines documentation (9 items), Documentation principle (7 items), Discharge planning (13 items), activities or findings at the time of occurrence (4 items), Documenting Nurses' Progress Notes (10 items), adverse Event/Incident Reporting (8 items), Hand-Off Report (4 items), & finely Patient Care Summary or Kardex (9 items) Legal aspect of documentation (6 items), Performance scores were from "1"to "zero" for done/not done, respectively.

Scoring system:

- Low level (<60% of scores)
- Moderate level (60-80% of scores)
- High level (> 80% of scores)

Validity and reliability

Research instruments were assessed and amended for face and content validity by five experts. The reliability was tested using Cronbach alpha. The study instruments were translated and updated into Arabic by the researcher. The reliability of the instrument was tested using Cronbach's alpha in SPSS version 23. Cranach's Alpha was used to test the Knowledge Nurses' Documentation Questionnaire, Attitude for Documentation Questionnaire and Auditing Checklist. Calculated dependability was 0.93, 0.89 and 0.88 respectively.

Test run The tool feasibility and clarity was tested by randomly selecting and removing 10% (n=10) of the study sample.

From the ethical point of view:

Approval by Mansoura University Faculty of Nursing Research Ethics Committee. The trial was authorised by King Fahad Specialist Hospital. All participants were informed that they might leave the research at any point. All the participants were guaranteed of the confidentiality of data and privacy of the research sample throughout the study. The aim of the study was explained to the participants and an informed consent was signed.

Data collecting

The request of the research was from the Faculty of Nursing Mansoura University to the head of the hospital. The director of King Fahad Specialist Hospital in Buraydah, Saudi Arabia, gave his formal approval after explaining the aim of the study.

Planning: Documentation Requirements Identify the documentation parts that need to be enhanced based on problems and needs. Define KPIs to evaluate the training programme.

Implementation: Educate nurses on the format to improve documentation. Start logging training and documentation.

Monitoring/Evaluation: Review of nurses papers before and after training. Collect participant input on content, delivery and skill effect. Compare performance against baseline to identify gains.

The study has these stages.

• The Plan was authorised by the Research Scientific Ethical Committee of Faculty of Nursing, Mansoura University. After defining the goal of the study, an official letter was issued by the Faculty of Nursing at Mansoura University to the director of Saudi Arabia's King Fahd Specialist Hospital requesting approval.

The Knowledge Nurses' Documentation Questionnaire Attitude for Documentation Questionnaire and Practice Auditing Checklist are used to measure the knowledge of nurses. Attitude questionnaire for nursing documentation training to evaluate the knowledge and attitude before, during and after training. The study will take 20-30 minutes to complete.

• The researcher trained staff nurses in nursing documentation based on an assessment of data and literature.

The theoretical component consisted of the introduction to the programme. Topics covered include nursing documentation, skills, concepts and importance.

• The researcher, present, discussed the data acquisition. This was the period study pretest data originated from.

• The 8-hour training regimen included 4 sessions of 2 hours each for each group. The timetable, teaching sessions, media and programme booklet were also developed. Nurses were trained via focus groups. "Depending on availability and training, we have 20 nurses per group. On the first day, each participant was given a programme booklet by the researcher as instructional material.

• Small groups of staff nurses were taught. Nursing professionals are allocated to training groups according to availability and workload.

• Assess knowledge, attitude, and ethics of participants before, during, and after training Use pre- and post-training examinations, questionnaires or reflective tasks to assess programme effectiveness. Collect comments from participants and enhance the programme.

• Develop a comprehensive professional nursing documentation training manual. Use lectures, conversations, role-plays, and simulations to actively involve students. Provide programming training materials, handouts and resources.

• The teaching was done through brainstorming, lectures, films, group discussions and handouts prepared by researchers.

• Data collecting tools were given to the participants a short time after the session. The researcher used the same data gathering procedures

to compare post-test outcomes to pretest baseline values to track projected training progress.

Skills in test documentation before and after training to see progress.

Data analysis

The collected data was organized, tabulated and statistically analyzed using SPSS software (Statistical Package for Social Sciences, version 25, SPSS Inc. Chicago, IL, USA).

Results

Table (1): Personal characteristics of the studied staff nurses (n=100)

Characteristics	No.	%
Age years		
20-<30	65	65.0
>30-40	35	35.0
Mean±SD	***32.19±5.62***	
Years of Experience		
<1	3	3.0
1-< 5	11	11.0
>5-10	44	44.0
>10	42	42.0
Mean±SD	***11.10±3.16***	
Gender		
Male	17	17.0
Female	83	83.0
Educational qualification		
Secondary nursing diploma	74	74.0
High institute of nursing	10	10.0
Bachelor degree	8	8.0
Master degree	8	8.0
Marital status		
Single	24	24.0
Married	69	69.0
Widow	3	3.0
Divorced	4	4.0
Attending training programs about medication administration		
Yes	76	76.0
No	24	24.0

Table (1) shows the staff nurses' personalities. The study found that 65% of staff nurses were aged 20-30, with a mean age of 32.19±5.62 years. Only 44% of respondents had more than 5-10 years of experience, with a mean of 11.10±3.16 years. The majority (83%) were female. Nearly three-quarters (74%) had a secondary nursing diploma, and 69.0% were married. As. Most (76%) had attended documentation training programmes, whereas 24% had not.

.Table (2): Total Knowledge levels of documentation among the studied nurses through training program phases at King Fahad Specialist Hospital (n=100).

Knowledge total score level about documentation	Total knowledge level of the studied nurses through training program phases					
	Pretest		Posttest		After 3 months follow up test	
	No.	%	No.	%	No.	%
Low level (0-14)	23	23.0	8	8.0	16	16.0
Moderate level (15-18)	24	24.0	8	8.0	1	1.0
High level (19-25)	53	53.0	84	84.0	83	83.0
x^2 test P value	40.9280.0001*					

***Statistically significant (P < 0.05)**

Table (2) shows nurses' documentation knowledge across training programme phases. Across the three periods, knowledge levels significantly improved (x^2=40.928, p=0.0001). In the pretest, 53% of nurses had high knowledge, 24% had moderate, and 23% had poor. Most (84%) reached a high knowledge level following the training programme. After 3 months, good knowledge remained at 83% and poor level increased to 16%.

Table (3) displays attitude levels and mean scores for documentation among staff nurses over training programme stages. All three stages showed a substantial change in attitude levels (x^2=8.044, p=0.018). More than half (59%) of the nurses tested disliked paperwork before training, whereas 41% liked it. After the training, 60% were positive and 40% negative. At the 3-month follow-up, favourable attitudes dropped to 56% and unfavourable attitudes rose to 44%, indicating a partial regression but an improvement over baseline values.

Table (3): Levels of the studied staff nurses' attitude for documentation through training program phases at King Fahad Specialist Hospital (n=100).

Total attitude for documentation (Each item was scored 1-5)	Total attitude for documentation among the studied nurses through training program phases						x² test p value
	Before		Immediate post		Follow up		
	No.	%	No.	%	No.	%	
• **Total attitude for documentation level**							
Unfavorable attitude	59	59.0	40	40.0	44	44.0	**8.044 0.018***
Favorable Attitude	41	41.0	60	60.0	56	56.0	
•**Total attitude fo documentation scor (12-60)**							
Range Mean±SD	**12-59 34.72±11.54**		**24-60 46.53±9.90**		**30-60 42.12±7.75**		
x ² value p value	**50.818 0.0001***						

Table (4) shows significant improvement in staff nurses' documentation practice levels and mean scores during training programme phases (x^2=50.818, p=0.0001). The total attitude mean score increased from 34.72±11.54 before training to 46.53±9.90 immediately post-training, with some decline at the 3-month follow-up. Across the three periods, documentation practice levels significantly improved (x^2=70.568, p=0.0001). Before training, 39% of nurses practiced high, 33% moderate, and 28% low. After the instruction, 89% of participants reached a high practice level, while moderate and poor practitioners decreased to 4% and 7%, respectively. At the 3-month follow-up, high practice remained at 82%, moderate increased to 11%, and low remained at 7%, showing the training program's continued efficacy. The documentation practice mean score significantly increased from 42.82±14.24 before training to 62.95±12.02 immediately after training, and remained high at 59.63±16.04 at the 3-month follow-up, out of a maximum potential score of 70 (x^2=106.153, p=0.0001).

Table (4): Total levels of documentation practice by the studied staff nurses through program phases at King Fahad Specialist Hospital (n=100).

Total documentation practice (Each item was scored 0-1)	Total documentation practice by the studied staff nurses through program phases						x^2 test p value
	Before		Immediate post		Follow up		
	No.	%	No.	%	No.	%	
• Total nurses' documentation performance skills level							
Low level (0-34)	28	28.0	7	7.0	7	7.0	
Moderate level (35-49)	33	33.0	4	4.0	11	11.0	**70.568 0.0001 ***
High level (50-70)	39	39.0	89	89.0	82	82.0	
•Total nurses' documentation performance skills score (0-70)							
Range Mean±SD	**5-70 42.82±14 .24**		**16-70 62.95±12 .02**		**6-70 59.63±16. 04**		
x^2 value p value	**106.153 0.0001***						

N.B. Nurses' documentation performance skills level was classified into; Low level (<50% of total scores), Moderate level (60-70% of total scores) and high level (>70% of total scores).

***Statistically significant (P<0.05)**

Table (5) shows the association between staff nurses' documentation knowledge, attitude, and practice ratings over training programme phases. All phases showed substantial relationships (p=0.0001). Higher pre-training knowledge was strangely related with a worse attitude (r= -0.591), potentially due to awareness-driven scepticism or workload worries. This connection flipped dramatically after training, exhibiting a highly positive correlation immediately post-training (r=0.802) and at the 3-month follow-up (r=0.766), suggesting that knowledge increases strongly correlated with documented attitude changes. The study found a positive correlation between knowledge and practice, with the strongest correlation observed immediately after training (r=0.979).

Table (6) shows the correlation between staff nurses' attitude scores and documentation practice throughout the training programme. The relationships were substantial throughout all phases (p=0.0001). Before training, attitude and practice scores were negatively correlated (r= -0.599), suggesting that nurses with higher practice scores had less positive attitudes, which may reflect task burden perception among experienced practitioners. A high positive association (r=0.739) occurred immediately after training.

Table (5): Correlation between total scores of knowledge of documentation, attitude and practice of documentation by the studied staff nurses through training program phases at King Fahad Specialist Hospital (n=100).

Variable	Total scores of knowledge of documentation of the studied staff nurses through training program phases					
	Before		Immediate post		Follow up	
	r	p value	r	p value	r	p value
Total attitude for documentation scores	-0.591	0.0001*	0.802	0.0001*	0.766	0.0001*
Total nurses' documentation practice scores	0.678	0.0001*	0.979	0.0001*	0.707	0.0001*

Table (6): Correlation between total scores of attitude and practice of documentation by the studied staff nurses through training phases at King Fahad Specialist Hospital (n=100).

Variable	Total scores of attitudes for documentation of the studied staff nurses through training phases					
	Before		Immediate after		After 3 months follow up	
	r	p value	r	p value	r	p value

Total nurses' documentation performance skills scores	-0.599	0.0001*	0.739	0.0001*	0.662	0.0001*

Discussion

Deming's cycle is a continuous quality improvement model which consists of a logical sequence of four key stages: Plan, Do, check and Act. Plan is the first step planning requires processes to identify hazards, risks and shortcomings in a patient safety management system, establish and implement plans for improvement. Do. involves several activities such as generating possible solutions, selecting the best of these solutions and perhaps using techniques like impact analysis to scrutinize them. In Check. nurses verify whether processes achieved desired results and effectiveness of the "do" step. For act phase point to if there are discrepancies found between what was planned and what was done, nurses need to analyze the cause and act to improve the situation (Regent et al., 2024).). Deming's cycle benefits include initially, it facilitates continuous improvement as, it is an iterative cycle encourages users to pursue ongoing improvements and the key is that it requires a commitment from leadership because the Deming cycle is not a one-time event. Also, Deming's cycle can be used for a wide array of organizational processes irrespective of the function. Finally, powerful as it's the steps are easy to understand and solutions coming from this cycle can have a significant impact on health care organization. Hospitals are under high pressure to raise quality and safe of care (Singh & Gandhi, 2024).

Nursing documentation is a fundamental component of professional nursing practice and a critical element in ensuring continuity, safety, and quality of patient care. Accurate and timely documentation serves as a legal record of the care provided, facilitates communication among healthcare team members, supports clinical decision-making, and contributes to patient safety outcomes. The effectiveness of nursing documentation is largely influenced by nurses' knowledge, attitudes, and practices, which collectively determine the quality and completeness of recorded information. Understanding the interrelationship among these factors is essential for healthcare organizations seeking to improve documentation standards and patient care outcomes (Jasem, & Younis, 2024).

Knowledge of documentation is a fundamental competency in nursing practice that encompasses nurses' understanding of documentation principles, standards, policies, legal requirements, and institutional guidelines governing patient records. It involves the ability to accurately record patient assessments, nursing interventions,

responses to treatment, and care outcomes in a clear, complete, and timely manner. Adequate knowledge of documentation enables nurses to maintain accurate health records that support continuity of care, facilitate communication among healthcare professionals, and provide evidence of the care delivered (Eriksson, et al., 2026).

The current findings demonstrated a statistically significant improvement in nurses' total knowledge levels regarding documentation across the different phases of the training program. Before implementation of the program, slightly more than half of the nurses possessed a high level of knowledge, whereas the remaining nurses were distributed between moderate and low knowledge levels. Immediately after the training program, the majority of nurses achieved a high level of knowledge, and this indicating a substantial enhancement in their understanding of documentation principles. Furthermore, the high level of knowledge was largely maintained at the three-month follow-up phase, although a slight decline was observed, as reflected by a small increase in the proportion of nurses with low knowledge levels.

This may be related to the effectiveness of the educational intervention, which provided nurses with structured, evidence-based information and practical guidance on documentation standards and procedures. The program likely enhanced participants' awareness of the importance of accurate documentation, clarified misconceptions, and strengthened their understanding through interactive learning activities and continuous feedback. The sustained high knowledge levels at the follow-up phase may reflect the retention of learning gained from the program and the opportunities for nurses to apply the acquired knowledge in their daily clinical practice.

However, the slight decline observed at follow-up could be attributed to reduced reinforcement of the educational content over time, workload pressures, limited opportunities for continuous training, or the natural forgetting of information when regular refreshers and ongoing educational support are not available. These finding of the study is congruent with Zhang et al., (2025), who conducted a study to investigate nursing staff's current knowledge-attitude-practice(KAP) regarding nursing document quality control and to explore effective methods to enhance their awareness of nursing documents' importance through intensive training in a tertiary hospital in China, and reported that nurses' baseline knowledge concerning nursing documentation quality control was moderate before training. Following the intensive educational intervention, nurses demonstrated significantly higher knowledge scores and improved understanding of documentation quality requirements.

They added that the gains achieved after training were maintained during subsequent evaluations, indicating the lasting impact of continuous educational efforts. These findings closely align with the sustained high knowledge levels observed during the follow-up phase of the current study. This is the same view of Bibi, & Ahmed, I(2026) who conducted a study to evaluated the effectiveness of a structured training program in improving staff nurses' knowledge of nursing documentation and revealed that improved nurses' knowledge about documentation after implementing rraning program.

They added that Nursing documentation is essential for patient safety, continuity of care, quality improvement, and legal accountability in hospital settings. However, persistent gaps in staff nurses' knowledge about standardized documentation practices highlight the need for effective educational interventions. This finding highlights the effectiveness of the structured educational intervention in addressing existing knowledge gaps related to nursing documentation. Finding of the present study also is agreed with Yuswardi, Maurissa,, Nizami,., & Mayasari,.(2025) conducted a study to evaluate the effectiveness of a training programme for nurses' knowledge regarding Integrated Patient Progress Notes (IPPN) and found that significant improvement in nurses' competency in documenting Integrated Patient Progress Notes (IPPN) following a structured training program. This suggests that the training program effectively enhanced the nurses' understanding and ability to apply integrated documentation techniques, crucial for improving patient care quality and safety.

The finding of the present study is supported by Jasem & Younis (2024), who studied nurses' knowledge toward nursing documentation, and reported that many nurses possessed acceptable to good levels of knowledge regarding nursing documentation; however, knowledge gaps remained among a considerable proportion of participants. The researchers emphasized the importance of continuous educational programs and refresher training to enhance and maintain nurses' knowledge levels, corresponds with the current study, where a proportion of nurses demonstrated moderate and low knowledge levels before training, while knowledge improved substantially following the educational intervention.

Similarly, Ahmed, Mostafa, & Yassein (2023), who studied the effect of a clinical documentation training program on nursing personnel's documentation skills, and found that nurses initially exhibited insufficient knowledge and documentation competencies prior to training. After participation in the educational program, most nurses achieved satisfactory levels of documentation knowledge and skills and concluded that structured training significantly enhanced

nurses' understanding of documentation requirements and improved their ability to apply documentation standards in clinical practice, which is consistent with the substantial post-intervention improvement observed in the current study.

Nurses' attitude toward documentation refers to their beliefs, perceptions, feelings, and willingness to engage in documentation activities as an integral component of patient care. It reflects the value nurses place on accurate, complete, and timely record-keeping and their recognition of documentation as a professional responsibility rather than merely an administrative task. A positive attitude toward documentation encourages nurses to maintain high standards of record accuracy, supports adherence to institutional policies and professional guidelines, and promotes accountability in clinical practice. Conversely, negative attitudes may result in incomplete, delayed, or inaccurate documentation, potentially compromising patient safety and continuity of care (Glass, et al., 2026).

Current results revealed a statistically significant improvement in attitude levels across the different phases of the program. Before the implementation of the training program, more than half of the studied nurses exhibited an unfavorable attitude toward documentation, whereas less than half demonstrated a favorable attitude. Immediately after the training program, this pattern shifted, with the majority of nurses expressing a favorable attitude and a smaller proportion maintaining an unfavorable attitude.

At the three-month follow-up, the proportion of nurses with a favorable attitude decreased slightly, while the proportion with an unfavorable attitude increased modestly, indicating some decline over time; however, attitudes remained more positive than those observed before the training program. With a highly significant improvement in the mean attitude scores which observed across the training program phases. This may be attributed to the educational content that increased their awareness of the importance of documentation in ensuring patient safety, continuity of care, professional accountability, and legal protection. Furthermore, the enhancement of nurses' knowledge and documentation skills may have strengthened their confidence and fostered more positive perceptions toward documentation practices.

The slight decline in attitude scores observed at the three-month follow-up could be related to workplace factors such as increased workload, time constraints, staffing shortages, and the lack of continuous reinforcement. Nevertheless, the persistence of significantly higher attitude scores compared with baseline indicates the lasting positive influence of the training program on nurses' attitudes toward

documentation. In the same vein, Zhang et al. (2025), who studied nurses' knowledge, attitude, and practice regarding the importance of quality control of nursing documents and the influence of intensive training in a tertiary hospital in China, and reported a significant improvement in nurses' attitudes toward nursing documentation following the intensive training intervention.

The authors found that nurses demonstrated more positive perceptions regarding the value of documentation quality control after training compared with their pre-intervention levels, indicating that structured educational programs can effectively strengthen favorable attitudes toward documentation. As well as, Bolado et al. (2023), who studied documentation practice and associated factors among nurses working in public hospitals in Wolaita Zone, Southern Ethiopia, and found that positive attitudes toward documentation were significantly associated with better documentation practices. The study revealed that nurses who possessed favorable perceptions regarding the importance of documentation demonstrated higher compliance with documentation requirements than their counterparts with negative attitudes and highlighted the importance of educational and supportive interventions in promoting positive attitudes toward documentation among nurses.

Besides, El Hady & El Sayed (2024), who studied the medical documentation process at the Poison Control Center of Ain Shams University, reported that healthcare providers generally recognized the importance of proper medical documentation for ensuring continuity of care, legal protection, and quality improvement and the findings indicated that enhancing awareness and providing continuous education regarding documentation standards contributed to improving staff perceptions and commitment toward accurate and complete documentation practices which can positively influence healthcare professionals' attitudes toward documentation and sustain improvements over time. Practice of documentation refers to the actual performance of recording patient-related information by nurses in accordance with established professional, legal, and organizational standards.

It encompasses the accurate, complete, timely, and systematic documentation of patient assessments, nursing diagnoses, interventions, responses to care, and evaluation outcomes throughout the healthcare process. Effective documentation practice ensures continuity and coordination of care among healthcare providers, supports clinical decision-making, enhances patient safety, and provides a reliable legal record of the care delivered. High-quality documentation practices also contribute to quality assurance,

healthcare planning, and organizational accountability (Ali, et al., 2026). The current results demonstrated a highly significant improvement in documentation practice levels across the different phases of the training program. Prior to the implementation of the training program, a minority of the nurses exhibited a high level of documentation practice, while approximately one-third demonstrated a moderate level and more than one-quarter showed a low level of practice. Immediately following the training program, a marked improvement was observed, with the majority of nurses attaining a high level of documentation practice.

At the three-month follow-up assessment, the high level of documentation practice was largely maintained. These findings indicate the sustained effectiveness of the training program in enhancing nurses' documentation practices, and the mean practice score increased substantially from the pre-intervention phase to the immediate post-intervention phase and remained relatively high at the three-month follow-up assessment. Although a slight decline was observed compared with the immediate post-intervention phase. This improvement may be attributed to the effectiveness of the training program in enhancing nurses' understanding of documentation standards, increasing their awareness of the importance of accurate record-keeping, and developing their practical documentation skills through structured educational sessions and guided practice.

The marked increase in practice levels immediately after the intervention suggests that the program successfully translated theoretical knowledge into clinical practice. The maintenance of relatively high practice levels at the three-month follow-up further indicates that nurses were able to retain and apply the acquired skills in their work settings. However, the slight decline observed at follow-up compared with the immediate post-intervention phase may be related to factors such as reduced reinforcement of learned skills. In the same vein, Elghabbour, Eldiasty, & Elzohairy (2020), who studied the effect of a documentation training program on staff nurses' documentation skills, and reported a statistically significant improvement in nurses' documentation performance following program implementation. Their findings revealed that nurses demonstrated markedly better documentation skills after receiving the educational intervention compared with their baseline performance, confirming the effectiveness of structured training programs in improving documentation practices.

Similarly, Ahmed, Mostafa, & Yassein (2023), who studied the effect of a clinical documentation training program on nursing personnel's documentation skills, and found that nurses' documentation practices improved significantly after participation in

the training program and reported substantial gains in documentation competency among nursing personnel during the post-intervention phase, indicating that educational training can effectively enhance the quality and accuracy of nursing documentation.

As well as, Zhang et al., (2025), who studied nurses' knowledge, attitude, and practice regarding the importance of quality control of nursing documents and the influence of intensive training in a tertiary hospital in China, and found that intensive training significantly improved nurses' documentation-related practices and demonstrated notable enhancements in practice scores following the training intervention, with nurses exhibiting greater compliance with documentation quality standards after the educational program.

In align with the current findings, Ranjbar et al., (2021), who studied the use of electronic software for nursing documentation among nursing students, reported improvements in documentation performance after exposure to structured educational and technological interventions and concluded that training combined with supportive documentation systems contributed to better documentation accuracy and completeness among participants. Besides, Jasem & Younis (2024), who studied nurses' practice toward nursing documentation, found that a considerable proportion of nurses demonstrated inadequate or moderate levels of documentation practice, highlighting the need for continuous educational interventions to improve documentation performance and emphasized that training and professional development programs are essential for enhancing nurses' documentation competencies, which supports the significant improvements observed in the current study following program implementation.

Current results revealed that the correlation between knowledge and attitude, a negative correlation was found before training, indicating that higher pre-training knowledge was paradoxically associated with a less favorable attitude, possibly reflecting awareness-driven skepticism or workload concerns. However, this correlation reversed strongly after training, showing a highly positive correlation immediately post-training and at the 3-month follow-up confirming that knowledge gains were strongly associated with improvements in attitude toward documentation. This finding may be explained by the fact that before the training program, nurses who possessed relatively higher knowledge about documentation may have been more aware of the complexities, time demands, legal implications, and challenges associated with accurate documentation, leading to a less favorable attitude toward the process. In contrast, nurses with lower knowledge

levels may not have fully recognized these challenges, resulting in a less critical attitude.

Following the training program, the significant increase in knowledge was accompanied by a better understanding of the importance, benefits, and practical application of documentation in ensuring patient safety, continuity of care, legal protection, and professional accountability. In the same vein, Zhang et al., (2025), who studied nurses' knowledge, attitudes, and practices regarding the importance of nursing document quality control and the impact of intensive training in a tertiary hospital in China, reported that intensive educational interventions significantly improved nurses' knowledge and attitudes simultaneously.

The authors found that nurses who demonstrated higher post-training knowledge scores also exhibited more positive attitudes toward documentation quality management, indicating a close interrelationship between knowledge acquisition and attitudinal improvement. Their findings support the current study's post-training and follow-up results, emphasizing that structured training can transform knowledge into positive professional attitudes toward documentation. Similarly, Kassie et al., (2023), who studied medical documentation practice and its association with knowledge, attitude, training, and documentation guideline availability through a systematic review and meta-analysis in Ethiopia, found that healthcare professionals with adequate knowledge and favorable attitudes were significantly more likely to demonstrate appropriate documentation practices.

The review further highlighted training as a key factor in strengthening both knowledge and attitude domains. These findings are consistent with the current study, suggesting that educational interventions can create a synergistic relationship between knowledge and attitude, ultimately improving documentation behavior. Likewise, Jasem & Younis (2024), who studied nurses' performance regarding nursing documentation in pediatric wards at Mosul hospitals, found that nurses with better understanding of documentation standards generally demonstrated more positive perceptions toward documentation responsibilities and achieved higher performance levels. The authors emphasized that educational preparation and continuous professional development contributed to improving both nurses' competency and their willingness to engage effectively in documentation activities. This finding aligns with the positive post-training correlation observed in the current study, where increases in knowledge were accompanied by more favorable attitudes.

Regards correlation between total scores of attitude and practice of documentation by the studied staff nurses through training phases at King Fahad Specialist Hospital, current results revealed the correlation between total scores of attitude and practice of documentation by the studied staff nurses through training program phases. Statistically significant correlations were found across all phases. Before training, a negative correlation was observed between attitude and practice scores, suggesting that nurses who scored higher on practice assessments tended to have less favorable attitudes prior to the intervention, which may reflect task burden perception among experienced practitioners. Immediately after training, this relationship shifted to a strong positive correlation, indicating that improved attitudes were significantly associated with enhanced practice performance following the training program. This may be explained by the fact that some nurses who demonstrated better documentation practices were performing documentation primarily due to organizational requirements, professional obligations, or routine experience rather than personal conviction or positive attitudes toward documentation.

These nurses may have perceived documentation as time-consuming, burdensome, and an additional workload, leading to less favorable attitudes despite acceptable practice levels. This finding suggests a disconnect between what nurses did and how they felt about documentation. Following the training program, the correlation shifted to a strong positive relationship, indicating that improvements in nurses' understanding of the value, benefits, and legal importance of documentation enhanced their attitudes and were accompanied by better documentation practices. The training likely increased awareness, confidence, and motivation, helping nurses recognize documentation as an integral component of quality patient care rather than merely an administrative task.

In the same vein, Ahmed et al. (2024), who studied the effect of a clinical documentation training program on nursing personnel knowledge and practice, reported that educational interventions significantly improved nurses' perceptions and acceptance of documentation processes, which was reflected in better documentation performance after program implementation. The authors emphasized that training enhanced nurses' understanding of the importance of accurate documentation, thereby fostering positive attitudes that translated into improved practice.

Their findings support the current study's observation that positive attitudinal changes following training are closely associated with enhanced documentation performance. Similarly, McCabe et al.

(2022), who studied best practices in medical documentation through the implementation of a structured educational curriculum, found that participants demonstrated increased appreciation of documentation standards and improved documentation behaviors following the educational intervention. The study highlighted that training reduced resistance toward documentation requirements and strengthened participants' confidence and commitment to proper documentation practices. These findings are consistent with the current results, particularly the strong positive association observed between attitude and practice immediately after training.

The authors emphasized that educational programs that combine theoretical content with practical application facilitate the transfer of knowledge into clinical documentation behaviors. Similarly, Bolado, et al., (2023), who studied documentation practice and associated factors among nurses working in public hospitals in Southern Ethiopia, found that nurses with higher levels of documentation knowledge were significantly more likely to demonstrate good documentation practices than those with lower knowledge levels and highlighted knowledge as one of the strongest predictors of documentation performance, indicating that nurses who understand documentation standards are more capable of implementing them consistently in patient care records. As well as, Kassie et al. (2023), who conducted a systematic review and meta-analysis examining medical documentation practice and its association with knowledge, attitude, training, and guideline availability in Ethiopia, reported that nurses possessing adequate documentation knowledge were significantly more likely to exhibit satisfactory documentation practices and concluded that knowledge is a critical determinant of documentation quality and that educational interventions substantially contribute to improving practical documentation behaviors.

Conclusion

The current results concluded that the training program was effective in significantly improving nurses' knowledge, attitudes, and practices related to nursing documentation. Following the intervention, substantial improvements were observed, with the majority of nurses achieving high levels of knowledge and practice and developing more favorable attitudes toward documentation. Although a slight decline was observed at the 3-month follow-up, the levels of knowledge, favorable attitudes, and high documentation practices remained considerably better than those recorded before the training program, indicating sustained effectiveness. Moreover, the significant positive

correlations among knowledge, attitude, and practice following the intervention confirmed that improving nurses' knowledge was associated with more favorable attitudes and better documentation performance. Recommendations For staff nurses

- • Attend regular training and refresher programs on nursing documentation.
- • Apply standardized documentation principles consistently in daily practice.
- • Ensure that documentation is accurate, complete, clear, objective, and timely. • Review documentation guidelines regularly and seek clarification when necessary. For head nurses
- • Conduct regular audits of nurses' documentation practices using standardized checklists.
- • Provide immediate constructive feedback and guidance regarding identified documentation deficiencies.
- • Organize periodic in-service training based on nurses' identified learning needs. • Discuss common documentation problems during staff meetings and clinical supervision. For nursing directors Establish and regularly update standardized nursing documentation policies and procedures.
- Ensure the availability of appropriate documentation guidelines, forms, and resources.
- Include documentation competency in nurses' performance appraisal and professional development.
- Support regular competency-based training and follow-up assessments.
- Consider high-quality nursing documentation as an essential patient-safety and quality-care indicator.
- Ensure the availability of appropriate documentation resources and technological support. For future research
- Conduct studies using larger samples and different healthcare settings.
- Examine the long-term sustainability of documentation training beyond three months.
- Investigate organizational, workload, and technological factors affecting documentation practices.
- Compare different educational approaches for improving and sustaining documentation competency.

References:

- *Abd El Rahman, A. I., Ibrahim, M. M., & Diab, G. M. (2021). Quality of Nursing Documentation and its Effect on Continuity of patients' care. Menoufia Nursing Journal, 6(2), 1-18.*
- *Ahmed, S. S., et al. (2024). Effect of Clinical Documentation Training Program on Nursing Personnel Knowledge and Practice.*
- *Ahmed, S. S., Mostafa, G. M., & Yassein, N. H. (2023). Effect of Clinical Documentation Training Program on Nursing Personnel's Documentation Skills. International Journal of Chemical and Biochemical Sciences, 24(9), 116-24.*
- *Ahmed,S., Mostafa,G., & Yassein,N.(2023). Effect of Clinical Documentation Training Program on Nursing Personnel's Documentation Skills, International Journal of Chemical and Biochemical Sciences (ISSN 2226-9614) 24(9) (2023): 116-124*
- *Azzolini, E., Furia, G., Cambieri, W., Ricciardi, M.& Poscia,A. (2019). Quality improvement of medical records through internal auditing: a comparative analysis. Journal of Preventive Medicine and Hygiene. 60(3): E250.*
- *Bail, K., Merrick, E.,Bridge, C., & Redley.B (2021). Documenting patient risk and nursing interventions: record audit. Australian Journal of Advanced Nursing. 38(1): 36-44*
- *Bian, L., Li, J., Li, W., Hu, X., & Dai, M. (2022). [Retracted] Analysis of the Effect of Holistic Nursing in the Operating Room Based on PDCA and Evidence-Based Nursing in the Otorhinolaryngology Operating Room: Based on a Retrospective Case-Control Study. Contrast Media & Molecular Imaging, 2022(1), 4514669.*
- *Bjerkan, J., Valderaune, V., & Olsen, R. M. (2021). Patient safety through nursing documentation: Barriers identified by healthcare professionals and students. Frontiers in Computer Science, 3, 624555.*
- *Bolado, G. N., Ayalew, T. L., Feleke, M. G., Haile, K. E., & Geta, T. (2023). Documentation practice and associated factors among nurses working in public hospitals in Wolaita Zone, Southern Ethiopia. BMC nursing, 22(1), 330.*
- *Bunting, J., & de Klerk, M. (2022). Strategies to improve compliance with clinical nursing documentation guidelines in the acute hospital setting: A systematic review and analysis. SAGE Open Nursing, 8, 23779608221075165.*
- *Chen, J., Li, Z., Ma, W., Tang, Y., Liu, C., Ma, S., ... & Zhang, Q. (2024). Enhancing the timeliness of EMR documentation in resident*

doctors: the role of PDCA cycle management. BMC Medical Education, 24(1), 1367.

- *Chen, J., Pan, L., Qiu, Y., & Jin, L. (2025). Efficacy of the PDCA cyclic care model in improving lung function and speed of recovery in children with mycoplasma pneumonia. American Journal of Translational Research, 17(3), 1792.*
- *Cho, H., Nguyen, O. T., Weaver, M., Pruitt, J., Marcelle, C., Salloum, R. G., & Keenan, G. (2024). Electronic health record system use and documentation burden of acute and critical care nurse clinicians: a mixed-methods study. Journal of the American Medical Informatics Association, 31(11), 2540-2549.*
- *De Groot, K., De Veer, A. J., Munster, A. M., Francke, A. L., & Paans, W. (2022). Nursing documentation and its relationship with perceived nursing workload: a mixed-methods study among community nurses. BMC nursing, 21(1), 34.*
- *De Groot,K., De Veer,A. Munster, A., Francke, W., & Paans.A. (2022). Nursing documentation and its relationship with perceived nursing workload: a mixed-methods study among community nurses. BMC Nursing. 21(1): 1-12.*
- *Ding, K., Kong, F., Chen, T., Yu, Z., Tian, R., & Zhang, S. Value-Driven Pdca Framework: A Quantified Operational Model for Multi-Tier Enterprise Management Systems.*
- *Eriksson, B., Svartengren, M., Dahlgren, A., Lindblom, J., & Arakelian, E. (2026). Digital Documentation—A Nonprioritized Subject in Higher Nursing Education. A Qualitative Study With Educators. Journal of PeriAnesthesia Nursing.*
- *Flores, D. H. F., Blácido, D. I. R., Cevallos, D. M. P. R., Hidalgo Penadillo, D. N. H. P., & Nuñez, M. L. M. V. (2025). Enhancing Competency-Based Learning with Neutrosophic Regression and the Deming Cycle. Neutrosophic Sets and Systems, 80(1), 35.*
- *He, K., Li, J., Yang, C., Wu, J., Wu, B., & Xia, H. (2024). Clinical application and nursing experience of the plan-do-check-act cycle in daytime varicocelectomy. BMC nursing, 23(1), 118.*
- *Hu, J., & Tang, C. (2024, July). A developed Plan-Do-Check-Act and contextual teaching and learning model. In IET Conference Proceedings CP886 (Vol. 2024, No. 12, pp. 912-915). Stevenage, UK: The Institution of Engineering and Technology.*
- *Johnson, L. G., Macieira, T. G., Madandola, O. O., Priola, K. J., & Keenan, G. M. (2025). Charting the path forward: Nursing perspectives on documentation and change. Nursing Outlook, 73(4), 102463.*

- *Joseph, J., Moore, Z. E., Patton, D., O'Connor, T., & Nugent, L. E. (2020). The impact of implementing speech recognition technology on the accuracy and efficiency (time to complete) clinical documentation by nurses: A systematic review. Journal of clinical nursing, 29(13-14), 2125-2137.*
- *Joshi, N., Bakshi, H., Chatterjee, A., & Bhartia, S. (2022). Initiative to improve quality of paediatric ward-round documentation by application of 'SOAP'format. BMJ Open Quality, 11(Suppl 1), e001472.*
- *Kamil H, Rachmah R and Wardani E. What is the problem with nursing documentation? Perspective of Indonesian nurses. Int J Africa Nurs Sci. 2018; 9: 111-114.*
- *Lin, C. Z., & Cheng, J. H. (2025, May). Integrating the PDCA Cycle Assessment Method into the Development of MR Pneumatic Glove Rehabilitation Aids: A Case Study in Hand Rehabilitation for Stroke Patients. In International Conference on Human-Computer Interaction (pp. 257-271). Cham: Springer Nature Switzerland.*
- *Liu, C., Liu, Y., Tian, Y., Zhang, K., Hao, G., Shen, L., & Du, Q. (2022). Application of the PDCA cycle for standardized nursing management in sepsis bundles. BMC anesthesiology, 22(1), 39.*
- *Mayangsari, M., Ulwiyah, N., & Qoyyimah, U. (2023). WILLIAM EDWARD DEMING'S MODEL PLANNING. Edusoshum: Journal of Islamic Education and Social Humanities, 3(3), 146-153.*
- *McCabe, M. E., Mink, R., Turner, D. A., Boyer, D. L., Tcharmtchi, M. H., Werner, J., ... & Mason, K. E. (2022). Best practices in medical documentation: a curricular module. Academic Pediatrics, 22(8), 1271-1277.*
- *Miljanović, M. (2025). The Application Of The Pdca Cycle To The Creation And Development Of A City Brand. Serbian Journal of Engineering Management, 10(1).*
- *Oliveira, N. B. D., & Peres, H. H. C. (2021). Quality of the documentation of the Nursing process in clinical decision support systems. Revista latino-americana de enfermagem, 29, e3426.*
- *Pan, N., Luo, Y. Y., & Duan, Q. X. (2022). [Retracted] The Influence of PDCA Cycle Management Mode on the Enthusiasm, Efficiency, and Teamwork Ability of Nurses. BioMed research international, 2022(1), 9352735.*
- *Pan, N., Luo, Y. Y., & Duan, Q. X. (2022). [Retracted] The Influence of PDCA Cycle Management Mode on the Enthusiasm, Efficiency, and Teamwork Ability of Nurses. BioMed research international, 2022(1), 9352735.*

- *Salameh, W. E. M. K. B., Mohammad, A. A. S., Alshurideh, M. T., Alolayyan, M. N., Hunitie, M. F. A., Rababah, M. W., ... & Al-hawajreh, K. M. (2025). Evaluation of applying the PDCA cycle on medication administration in the emergency departments. In Intelligence-Driven Circular Economy: Regeneration Towards Sustainability and Social Responsibility—Volume 2 (pp. 319-330). Cham: Springer Nature Switzerland.*
- *Yang, Y., Long, S., & Xu, Y. (2025). Construction of a stroke green channel process based on the PDCA cycle management model and its impact on stroke prognosis. American Journal of Translational Research, 17(3), 2221.*
- *Youssef, E. & Mohamed. A.(2021). Impact of Documentation Practice Training Program for Nurses: On the Job versus Off the Job. Egyptian Journal of Health Care. 12(4): 343-350.*