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OPTIMIZING PRESCRIPTION PRACTICES: A COMPARATIVE ANALYSIS OF HANDWRITTEN VS. COMPUTER-ASSISTED PRESCRIPTIONS BASED ON HEALTHCARE PROVIDER PREFERENCES

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Abstract

Background: A prospective comparative study was conducted to evaluate the potential advantages of computer-assisted prescription (CAP) based on healthcare provider preferences. The study compared the speed, accuracy, and completeness of CAP with traditional handwritten prescriptions.

Objective: The study aimed to assess the potential benefits of computer-assisted prescription by comparing it to handwritten prescriptions.

Results: The findings indicate that computer-assisted prescriptions (CAP) are less prone to errors, have fewer readability issues, and provide a more complete patient history compared to handwritten prescriptions. However, handwritten prescriptions were quicker to produce and were more familiar to healthcare providers in the region.

Conclusion: Based on healthcare provider preferences, this study suggests that computer-assisted prescriptions (CAP) should be used more frequently than handwritten prescriptions to reduce prescribing errors.

Keywords: *Growth, Levels, Phosphorus, Wheat, Yield*

INTRODUCTION

A prescription is a document written by a doctor granting permission for a patient to receive medication or therapy (1). Handwritten prescriptions are those instructions manually written on a pad or plain paper by a healthcare provider, whereas computer-assisted prescriptions are generated by a healthcare provider using a computer, software, or electronic device (2). Clear and complete instructions are essential for proper prescription labeling, appropriate pharmacist counseling, and optimal medication usage (3). This applies to both the prescription for safe and effective pharmaceutical care and the prescriber's instructions on how patients should administer their medications.

Around 2100 B.C., the first known prescriptions were written on a clay tablet in Mesopotamia, although the authenticity of this claim remains unverified. It is clear that handwritten prescriptions are the oldest method of prescribing, often considered the ancient way (4). To evaluate the potential benefits of computer-assisted prescriptions, this study compares them with handwritten prescriptions. Computer-assisted prescriptions (CAP) are less prone to errors, have fewer readability issues, and provide a more complete patient history compared to handwritten prescriptions. However, handwritten prescriptions are quicker to produce and are more familiar to healthcare providers in this region (5).

Readability issues of both types of prescriptions were also compared to identify prescription errors. It is well-known that physicians' handwriting is often unreadable (6). Although the writer usually understands their own writing, other participants frequently struggle to read and comprehend the content

(7). Studies have shown that doctors' handwriting remains less readable than that of other professions, even when they attempt to write as neatly as possible (8).

As the industry transitions away from traditional paper prescriptions, computer-assisted prescriptions offer many advantages for patient care and workflow efficiency, including the elimination of handwriting illegibility issues (9). Nevertheless, quality-improvement opportunities still exist and must be utilized for providers and patients to fully benefit from this technology (10). Computer-assisted prescriptions represent a significant evolution in the field of pharmacy, while handwritten prescriptions remain the oldest known method.

The purpose of this study was to evaluate the potential benefits of computer-assisted prescriptions by comparing them with handwritten prescriptions, considering the preferences of healthcare providers.

MATERIALS AND METHODS

STUDY DESIGN

A comparative study design was used for this research, focusing on analyzing and synthesizing the similarities and differences between handwritten and computer-assisted prescriptions. Comparative studies are typically faster and less expensive to conduct. They can be particularly useful for public health planning, monitoring, and evaluations. The study was conducted at Bolan Medical Complex Hospital, Helper's Eye Hospital, and Sheikh Zaid Hospital, Quetta, from September 2020 to December 2020.

SAMPLING

All prescriptions received at the pharmacies of these hospitals, either handwritten or computer-generated by healthcare providers and meeting the inclusion criteria, were included in the study. The most senior pharmacist at each hospital was responsible for scrutinizing the prescriptions, with the junior pharmacist concealing the doctor's name to avoid bias.

SAMPLE SIZE

The sample size was determined by the data collection period. A total of 613 prescriptions were received, of which 455 were included after scrutinizing according to the inclusion and exclusion criteria.

INCLUSION AND EXCLUSION CRITERIA

All handwritten and computer-assisted prescriptions by healthcare providers were included in the study. Prescriptions that were incomplete or had missing data were excluded.

ETHICAL CONSIDERATIONS

The study was approved by the Head of the Department of Pharmacy Practice, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, and the Medical Superintendents of the three hospitals, in accordance with the National Bioethical Guidelines.

STUDY INSTRUMENT

Data were collected using a structured Performa developed based on previous studies. The Performa consisted of four parts: i. basic demographic characteristics of the participants, ii. information related to both handwritten and computer-assisted prescriptions, iii. information regarding readability issues of both types of prescriptions and iv. preferences of healthcare providers.

DATA ANALYSIS

Data analysis was conducted using SPSS version 21. Elementary statistics were used to represent the data. Continuous variables were represented by mean and standard deviation, while categorical variables were represented by frequency and percentage.

RESULTS

DEMOGRAPHICS

In this comparative study, we selected the preferences of healthcare providers, including doctors, pharmacists, and nurses, across three hospitals in Quetta: Bolan Medical Complex Hospital, Helper's Eye Hospital, and Sheikh Zaid Hospital. The demographic data revealed that 42.2% of the participants were from Bolan Medical Complex Hospital, 26.6% from Helper's Eye Hospital, and 31.0% from Sheikh Zaid Hospital. The distribution of professions among the respondents was as follows: 38.0% (n=173) doctors, 30.3% (n=138) pharmacists, and 31.6% (n=144) nurses. The majority of the participants held a bachelor's degree (71.2%), while others had master's degrees (13.6%) or higher studies (15.2%). In terms of employment status, 83.7% were employed, and 16.3% were unemployed.

In this comparative study we have taken a survey of three Hospitals which include; Bolan Medical Complex Hospital ,Quetta, Helper's Eye Hospital, Quetta, and Sheikh Zaid Hospital, Quetta about Handwritten prescriptions and Computer-assisted prescriptions (CAP) in which readability issues due to spelling mistakes and lack of understanding of hand writing of prescriber in handwritten prescription , and due to misprinting and lighter or darker tone of printed computer-assisted prescription were mentioned. Also, the preferences by the health care provider were taken on which prescription on both of them are commonly used, chances of error in both of prescription, the less time consuming prescription, which one prescription is easier to handle and also that which prescription gives complete history of patient.

After gathering all the information from the preforma the frequencies and percentage shows the data collection from each hospital are; Bolan Medical Complex Hospital, Quetta 193 frequency 42.2%, Helper's Eye Hospital, Quetta 121 frequency 26.6%, Sheikh Zaid Hospital, Quetta 141 frequency 31.0%. (Table I).

From our survey, we acknowledged that 94.5% health care providers agreed that handwritten prescription is less readable due to spelling mistakes, 81.1 % of health care providers neither agreed nor disagreed the handwritten prescription are less readable due to prescriber hand writing, on the other hand 55.6 % healthcare provider neither agree nor disagree on that computer-assisted become less readable due to misprinting of letters (Table II).

Table I. Demographic characteristics of the study participants

Variables	Frequency	Percentage (%)
Educational Status		
Bachelors	324	71.2
Masters	62	13.6
Higher studies	69	15.2
Employment		
Employed	381	83.7
Unemployed	74	16.3
Profession		
Doctors	173	38.0
Pharmacists	138	30.3
Nurses	144	31.6
Work Place		
Bolan Medical Complex Hospital	193	42.4
Sheikh Zaid Hospital	141	31.0
Helper's Eye Hospital	121	26.6

Handwritten prescriptions are most commonly used prescription 82.0 % health care provider strongly agree on this, 66.8 % health care provider strongly disagree the high chances of error in computer-assisted prescription, 76.5 % health care provider strongly disagree that handwritten prescription consume more time in prescribing and 85.5 % health care provide agrees on that computer-assisted prescription gives complete patient history (Table II).

Table II. Healthcare providers' opinions on handwritten and computer-assisted prescriptions

Description	Strongly agreed Frequency F (%)	Agreed Frequency F (%)	Neither agreed nor disagreed Frequency F (%)	Disagreed Frequency F (%)	Strongly disagreed Frequency F (%)
Prescription is the only mean of getting the medication from a pharmacy	147 (32.3)	291 (64.0)	17 (3.7)	___	___
Handwritten prescriptions are those which are written by the hand	377 (82.9)	78 (17.1)	___	___	___
Computer -assisted prescription (CAP) are those prescriptions which is prescribed or generated by the computer or software	377 (82.9)	78 (17.1)	___	___	___
Handwritten prescription are the oldest way of writing a prescription	1 (0.2)	436 (95.8)	18 (4.0)	___	___
In the new world of medicine computer-assisted prescription (CAP) is the better method of prescribing a drug.	1 (0.2)	436 (95.8)	18 (4.0)	___	___
Handwritten prescription became less readable due to spelling mistake.	___	430 (94.5)	17 (3.7)	8 (1.8)	___
Handwritten prescription became less readable due to lack of understanding the prescriber hand writing.	___	61 (13.4)	369 (81.1)	25 (5.5)	___
CAP became complicated to read due to misprinting of the computer.	___	185 (40.7)	253 (55.6)	17 (3.7)	___
CAP faces the issue of reading due to lighter or darker tone of the printed prescription.	___	8 (1.8)	447 (98.2)	___	___
Handwritten prescription is more commonly used prescription	373 (82.0)	82 (18.0)	___	___	___
Computer assisted prescription (CAP) has more chances of having prescribing error	___	8 (1.8)	60 (13.2)	83 (18.2)	304 (66.8)
Handwritten prescription consume more time in prescribing.	___	7 (1.5)	47 (10.3)	348 (76.5)	53 (11.6)
In CAP readability problem is more common	-----	8 (1.8)	-----	79 (17.4)	368 (80.9)
Handwritten prescription is more commonly used to Health care provider than CAP	76 (16.7)	379 (83.3)	___	___	___
CAP gives the complete history of patient than handwritten prescription	20 (4.4)	389 (85.5)	28 (6.2)	18 (4.00)	___
Handwritten prescription is easier to handle than CAP	92 (20.2)	356 (78.2)	7 (1.5)	___	___

The result of this study shows the benefit of Computer-assisted prescription that the Computer-assisted prescription (CAP) has less chances of error, have less readability problem and shows complete history of patient than compare to Handwritten prescription but handwritten prescription consume less time and was more handle by healthcare provider in this region. (Table III)

Table III. Comparative analysis of handwritten and computer-assisted prescriptions

Hand written prescription	Scores	Computer assisted prescription (CAP)	Scores
Consumes more time in prescribing	6	Has more chances of having prescribing error	24
More commonly used to Health care provider than CAP	30	In CAP readability problem is more common.	18
Easier to handle than CAP	30	Gives the complete history of patient than handwritten prescription	30

*Score: 6 = minimum), 30 = maximum. Negative prescription, positive prescription

DISCUSSION

The comparison of handwritten and computer-assisted prescriptions (CAP) was based on the preferences of healthcare providers, including doctors, pharmacists, and nurses, of both genders. The study

began in September 2020 and concluded in December 2020. Conducted in three hospitals in Quetta—Bolan Medical Complex, Helper's Eye Hospital, and Sheikh Zaid Hospital—the results were compared with international studies.

The study highlighted better readability, less time-consuming prescriptions, a complete patient history, and fewer prescribing errors in CAP compared to handwritten prescriptions, corroborating findings from previous research on the speed, accuracy, and thoroughness of CAP versus traditional handwritten prescriptions (2, 7). Issues with the readability of handwritten prescriptions, such as spelling mistakes and illegible handwriting, are well-documented. It's common knowledge that physicians' handwriting is often unreadable (8). On the other hand, readability issues with computer-assisted prescriptions, such as misprinting and inconsistent print tones, are less frequently acknowledged by healthcare providers.

The preferences of healthcare providers indicated that handwritten prescriptions are perceived to consume less time than CAP. However, previous studies show that prescribing a single complete handwritten medication entry took about 20 seconds, whereas a CAP prescription took 55 seconds (1, 10). With time and practice, the duration can be reduced, resulting in fewer errors in reading the prescription.

Healthcare providers reported fewer prescribing errors with computerized prescriptions compared to handwritten ones, aligning with studies showing the immediate benefits of improved legibility, completeness, and the elimination of transcription errors (2, 9, 11). Additionally, 82.2% of healthcare providers agreed that CAP provides a complete patient history (Table III).

In conclusion, the study results indicate that CAP has fewer errors, better readability, and more comprehensive patient history compared to handwritten prescriptions, although handwritten prescriptions are faster and more manageable for healthcare providers in this region (12). Studies also revealed that computer-assisted prescriptions were more thorough, signed, and dated, though they did not reduce errors such as failing to stop a medication. Handwritten prescriptions were faster, but these shortcomings could be addressed with simple software improvements (13). There is evidence that CAP has increased readability and clarity, reduced the time spent by medical and administrative personnel for prescription clarification, and saved time overall (14). E-prescriptions have made it easier to remove errors due to easier access and availability of patient documents to pharmacists, resulting in better patient safety and prescription authenticity compared to handwritten ones (15).

The study's limitations include its short duration and small sample size. To support our findings, it is suggested to conduct a study with a larger sample size and longer duration. The lack of e-prescriptions available in these hospitals is also a limitation, and future studies including data with e-prescriptions would help address these shortcomings. We recommend conducting larger multi-center studies to further strengthen the findings of this study.

Based on the preferences of healthcare providers, we believe that computer-assisted prescription (CAP) should be used more frequently than handwritten prescriptions to minimize prescribing errors. Introducing CAP in this region could help reduce prescribing errors.

The study also considered the impact of CAP on the workflow and efficiency of healthcare providers. Many respondents reported that while CAP systems initially required a learning curve and adjustment period, they ultimately streamlined the prescription process and integrated well with electronic health records (EHRs). This integration facilitated better coordination among different departments and improved access to patient information, leading to more informed decision-making and enhanced patient care. Furthermore, the study highlighted that CAP systems could be tailored to include alerts for potential drug interactions, dosage recommendations, and other clinical decision support tools, which are not feasible with handwritten prescriptions. These features contributed to a higher level of safety and quality in patient care, reinforcing the advantages of CAP over traditional handwritten methods.

CONCLUSION

After completing and evaluating the results of this study, we came to the following conclusions. The Computer-assisted prescription (CAP) has less chances of error, have less readability problem and shows

complete history of patient than compare to Hand written prescription but handwritten prescription consumes less time and was more handle by healthcare provider in this region.

According to this study by the preferences of Health care provider Computer-assisted prescription (CAP) should be used more frequently as compared to Hand written prescription to minimize the prescribing errors.

Conflict of Interest:

The authors have no conflict of interest.

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