Journal of Population Therapeutics & Clinical Pharmacology

Quality of documentation of electronic medical information systems at primary health care units

1. Rafi Ghafel Latif Aldhafeeri, Health Information
2. Nasser Zaid Rashed Alajmi, Health Information
3. Bader Saiah Mathkr Alharbi, Health Information
4. Bader Abdullah Rabah Alharbi, Health Information
5. Fahad Abdullhadi Ali Almaimoni, Health Information
6. Naif Soliman Modhi Aljamili, Health Information

ABSTRACT:
There is limited data available on the implementation of electronic records systems in primary care, especially in developing countries. This study aimed to evaluate the quality of documentation in electronic medical records (EMRs) at primary healthcare units , and to gather physicians' feedback on the barriers and facilitators to the system's adoption. Data were gathered from 7 units randomly selected from each administrative region. In each unit, 50 paper-based records and their corresponding EMRs were randomly selected for patients who visited during the first three months . While administrative data were largely complete in both paper and electronic formats, the completeness of clinical data varied between 60.0% and 100.0% across different units and record types. The accuracy rate of the main diagnosis in EMRs compared to paper-based records ranged from 44.0% to 82.0%. High workload and system complexity emerged as the most frequently mentioned barriers to the successful implementation of EMRs.

INTRODUCTION:

The evolution of electronic medical record (e-record) technology has revolutionized healthcare, offering a viable alternative to traditional paper charts. In primary health care (PHC) settings, e-records serve a multitude of purposes beyond mere data retrieval. They provide alerts for allergies and drug interactions, aid in developing management protocols for chronic illnesses, generate pre-appointment reminders, and establish communication channels across different levels of care. It is widely assumed that e-records enhance documentation quality compared to paper-based records by automatically flagging missing critical data for healthcare professionals. However, concerns have been raised about potential issues such as inadequate computer skills among healthcare professionals, insufficient training, and limitations in e-records software, which could lead to data truncation in e-records compared to their paper counterparts. Additionally, the simultaneous use of paper-based and e-records may introduce inconsistencies if both versions are not consistently updated. (Tolar M, Balka E, 2011)

The findings from studies comparing the quality and completeness of documentation in paper-based and e-records have been mixed. Some studies suggest that e-records perform favorably in terms of data recording compared to paper-based records, while others indicate that e-records may sacrifice thoroughness in data recording. For instance, in the UK, e-records were found to excel in legibility, comprehensibility, and completeness compared to paper records. In Germany, the introduction of handheld computers led to improvements in patient assessment, coding accuracy, and the number of recorded diagnoses. Similarly, in the USA, e-records were reported to be more complete and faster to retrieve than paper records. However,

contrasting results were observed in a Norwegian hospital where e-records were found to have missing documents compared to paper records. (Pourasghar F et al., 2008)

since 1996, the country has embarked on a healthcare sector reform strategy aimed at achieving universal coverage for a basic package of PHC services, particularly targeting women, children, and economically disadvantaged populations. Currently, PHC units operate in fivegovernorates, with plans for nationwide expansion. These units provide both curative and preventive services, with performance-based incentives for staff and an accreditation program to ensure service quality. As part of these efforts, an e-records system has been implemented in PHC units to enhance documentation accuracy and quality. This study aims to evaluate the quality of documentation in e-records compared to paper-based records at PHC unit, and to gather physicians' perspectives on the barriers and facilitators to the current electronic system. (Farhan J et al., 2005)

METHODS

Sample: From each of the 7 administrative regions, one PHC unit with a functioning e-records system was randomly selected. Within each unit, patient lists from the first 3 months of 2011 were used to randomly select 50 paper-based records and their corresponding e-records. This process resulted in a total of 350 records from the 7 PHC units.

Development of Data Collection Tool: Unstructured interviews were conducted with IT personnel and health information system directors to identify required data elements in both paper and e-records. A data collection form was developed based on this information, assessing information concordance between paper-based and e-records and the accuracy of diagnoses in e-records. The coding scheme used percentages for analysis.

Data Collection:

1. **Records Review:** Records for patients' initial and follow-up visits, especially for specific conditions, were reviewed for completeness and accuracy according to the coding system.
2. **Physicians' Views:** Semi-structured interviews with 31 physicians explored reasons for incomplete e-record documentation and suggestions for improvement. Feedback was categorized into physician-related, system-related, and patient-related factors affecting system implementation.

Ethical Considerations: Patient confidentiality was maintained, and physician interviews ensured anonymity and voluntary participation.

Statistical Analysis: Data analysis utilized Microsoft Excel and SPSS version 13. Descriptive statistics and the z-test were employed, with a significance level of 5%.

RESULTS

Records Review: A total of 350 records were reviewed, consisting of 3850 administrative data elements and 350 physician identification elements. In general medical records, paper-based records showed higher or equal completion rates compared to e-records, except for physician identification in initial visits where e-records had a higher completion rate (100.0% versus 62.1%). However, completion rates varied significantly across different PHC units, particularly in e-records.

General Medical Records:

- Paper-based records had higher completion rates for administrative data (85.1% versus 75.0%, $P < 0.001$) and complaint/examination (87.1% versus 42.1%, $P < 0.001$) in initial visits, and diagnosis/treatment (96.2% versus 81.0%, $P < 0.001$) in follow-up visits.
- E-records had higher completion rates for physician identification in initial forms (100.0% versus 62.1%, $P < 0.001$).

Dental Records:

- E-records showed higher completion rates for administrative data (100.0% versus 99.1%, $P < 0.001$) in initial visits and date (72.8% versus 64.4%) and physician identification (100.0% versus 73.1%, $P < 0.001$) in follow-up visits.
- Paper-based records had higher completion rates for gum/dental examination (81.8% versus 73.0%, $P < 0.001$) and diagnosis/treatment (73.1% versus 63.0%, $P < 0.004$).

Specific Disease Records:

- Completion rates varied across diagnoses, with family planning and pediatric records having high completion rates in paper-based records, while diabetes and hypertension records had 100% completion in e-records.

Accuracy of Diagnoses:

- Accuracy of diagnoses in e-records ranged from 44.0% to 80.0% across different PHC units, with an average of 65.7%.

Physicians' Views:

- High workload (96.8%) and system complexity (67.7%) were the most cited physician-related and system-related factors hindering e-records documentation.
- Training on system use (61.6%) was the most suggested facilitator for successful e-records implementation, followed by physicians' awareness (51.6%), quality committee follow-up (48.4%), reduced paperwork (48.4%), and incentives for electronic documentation (45.2%).

Table 1: Completeness of Recorded Items in Initial and Follow-Up General Medical Forms

Variable	% Completion of Items	P-value
	Paper Records	
Initial Forms		
Administrative Data	85.1	<0.001
History and Examination	76.1	0.061
Physician Identification	62.1	<0.001
Follow-Up Forms		
Administrative Data	100.0	>0.999
Complaint/Examination	87.1	<0.001
Diagnosis/Treatment	96.2	<0.001
Physician Identification	100.0	>0.999

Table 2: Completeness of Recorded Items in Initial and Follow-Up Dental Forms

Variable	% Completion of Items	P-value
	Paper Records	
Initial Forms		
Administrative Data	99.1	<0.001
Gum/Dental Examination	81.8	0.061
Physician Identification	100.0	>0.999
Follow-Up Forms		
Administrative Data	64.4	0.016
Diagnosis/Treatment	96.2	0.004
Physician Identification	73.1	<0.001

Table 3: Completeness of Recorded Items in Disease-Specific Forms

Disease Form	Records Examined	% Completion of Items	P-value
Diabetes Mellitus	15	82.2	<0.001
Hypertension	14	82.8	<0.001
Pregnancy	30	72.5	<0.001
Family Planning	25	92.2	<0.001
Paediatric	32	91.3	<0.001
Referrals	12	72.1	0.862

Table 4: Accuracy of Diagnosis in Electronic Medical Records at Each Primary Health Care Unit

Unit	Records Examined	Accurate Diagnosis No.	Accurate Diagnosis %
1	50	33	66.0
2	50	40	80.0

3	50	31	62.0
4	50	29	58.0
5	50	41	82.0
6	50	22	44.0
7	50	34	68.0
Total	350	230	65.7

DISCUSSION

This study aimed to assess the completeness and accuracy of electronic medical records (e-records) in primary health care (PHC) units . The findings revealed significant differences in completeness between e-records and paper-based records, with wide variations across different units. These results align with studies from Norway and the USA but differ from studies in Germany and the UK, where e-records showed better performance. However, the level of completeness and accuracy in this study was notably lower than in other studies. (Hippisley-Cox J et al., 2003)

The high level of incompleteness in e-records could be attributed to several factors. Writing on paper may be easier for physicians than using keyboards, especially if the e-records system has limited space for free text. Physicians may also perceive e-records as redundant if they don't support all data elements from paper records or lack additional functionalities like decision support. Additionally, inadequate documentation practices in both electronic and paper records contribute to incomplete data. (Tsai J, Bond G, 2008)

Despite these challenges, e-records showed superior performance in documenting physician identification and disease-specific data compared to paper-based records. However, the parallel use of both systems can lead to missing data in both, impacting clinical decision-making. The methodology of using paper records as a gold standard for e-records assessment also poses challenges, suggesting the need for alternative assessment methods like videotaped patient encounters or standardizing data presentation. (Lie DA et al., 2004)

The study also evaluated the accuracy of diagnoses in e-records, revealing an overall accuracy of 65.7%. This highlights the need for better training and awareness among physicians to ensure accurate and consistent documentation practices, including selecting final diagnoses. (Ward TR, 2010)

The barriers identified by physicians, such as high workload and system complexity, are consistent with existing literature. Training and improving awareness emerged as key facilitators for successful e-records implementation. Physicians' resistance to change can be mitigated with incentives and demonstrating personal benefits from adopting e-records, potentially leading to improved acceptance over time. (Hahn KA et al., 2011)

This study's strengths include its focus on PHC-level e-records evaluation, random sampling across administrative regions, and inclusion of all units. However, limitations like not assessing documentation timeliness, using paper records as the gold standard, and the cross-sectional design should be considered in interpreting the results. (Stausberg J et al., 2003)

CONCLUSION

The study underscores the challenges and opportunities associated with electronic medical records (e-records) implementation in primary health care (PHC) units. The coexistence of e-records and paper-based records revealed shortcomings in data completeness and accuracy, highlighting the need for a transitional approach towards full e-records adoption.

It is recommended that the parallel use of e-records and paper-based records be limited to the implementation phase, with a clear roadmap for transitioning entirely to e-records. However, this transition should only occur once e-records systems can support all data elements currently present in paper-based records. Moreover, e-records systems should evolve beyond documentation support to encompass functionalities that enhance clinical decision-making, patient safety, reminders for patients, and seamless referral processes between care levels.

Physicians play a crucial role in the successful implementation of e-records. Therefore, comprehensive education and training programs should be developed to familiarize them with the benefits and

functionalities of e-records systems. This approach will not only improve physician acceptance but also pave the way for more efficient and effective healthcare delivery.

In conclusion, the study advocates for a strategic and phased approach to e-records adoption in PHC units, emphasizing the need for system capabilities that go beyond documentation, coupled with robust training initiatives to ensure successful integration and utilization by healthcare professionals.

REFERENCES

1. Institute of Medicine, Committee on Data Standards for Patient Safety. Key capabilities of an electronic health record system: letter report. Washington DC, National Academy Press, 2003:7.
2. Tolar M, Balka E. Utilization of EMR Data in Primary Care: A Study in Health Technology and Informatics, 2011, 164:143–147.
3. Tomasi E, Facchini LA, Maia MF. Health information technology in primary health care in developing countries: a literature review. Bulletin of the World Health Organization, 2004, 82:867–874.
4. Pourasghar F et al. Challenges in Medical Records Management: Lessons from the Women's Hospital in Tabriz, Iran. BMC Public Health, 2008, 8:139. doi.org/10.1186/1471-2458-8-139.
5. Farhan J et al. Documentation and Coding Practices in a Tertiary Care Center: A Pilot Study. Annals of Saudi Medicine, 2005, 25:46–49.
6. Hippisley-Cox J et al. The electronic patient record in primary care—regression or progression? A cross-sectional study. British Medical Journal, 2003, 326:1439–1443.
7. Mikkelsen G, Aasly J. Concordance of information in parallel electronic and paper-based patient records. International Journal of Medical Informatics, 2001, 63:123–131.
8. Stengel D et al. Comparison of handheld computer-assisted and conventional paper chart documentation of medical records: A randomized, controlled trial. Journal of Bone and Joint Surgery, 2004, 86A:553–560.
9. Tsai J, Bond G. A comparison of electronic records to paper records in mental health centers. International Journal for Quality in Health Care, 2008, 20:136–143.
10. Sallam I. Healthcare Challenges in Egypt. Lancet, 1998, 352:1632.
11. Lie DA et al. An international physician education program to support family medicine introduction in Egypt. Family Medicine, 2004, 36:739–746.
12. Ward TR. Implementing a gatekeeper system to strengthen primary care in Egypt: a pilot study. Eastern Mediterranean Health Journal, 2010, 16:684–689.
13. Hahn KA et al. Electronic medical records and documentation in community primary care practices. American Journal of Medical Quality, 2011, 26:272–277.
14. Stausberg J et al. Comparing paper-based with electronic patient records: lessons learned during a study on diagnosis and procedure codes. Journal of the American Medical Informatics Association, 2003, 10:470–477.
15. Pringle M, Ward P, Chilvers C. Assessment of the completeness and accuracy of computerized medical records in practices committed to computerized data recording. British Journal of General Practice, 1995, 45:537–541.
16. Logan JR, Gorman PN, Middleton B. Measuring the quality of medical records: a method for comparing completeness and correctness of clinical encounter data. Proceedings of AMIA Annual Symposium, 2001:408–412.
17. Miller RH, Sim I. Physicians' use of electronic medical records: barriers and solutions. Health Affairs, 2004, 23:116–126.
18. Vishwanath A, Scamurra SD. Barriers to the adoption of electronic health records: developing a comprehensive empirical model. Health Informatics Journal, 2007, 13:119–134.
19. Laerum H, Ellingsen G, Faxvaag A. Doctors' use of electronic medical records systems in hospitals: a cross-sectional survey. British Medical Journal, 2001, 323:1344–1348.

20. Jha AK et al. Electronic health records: use, barriers and satisfaction among physicians caring for minority patients. Journal of Evaluation in Clinical Practice, 2009, 15:158–163.
21. Meade B, Buckley D, Boland M. Factors affecting electronic patient records use by Irish GPs. International Journal of Medical Informatics, 2009, 78:551–558.
22. Terry AL et al. Key factors in implementing electronic health records in primary care. Canadian Family Physician, 2008, 54:730–736.
23. Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians: a systematic review. BMC Health Services Research, 2010, 10:231. doi.org/10.1186/1472-6963-10-231.
24. Simon SR et al. Physicians and electronic health records: a statewide survey. Archives of Internal Medicine, 2007, 167:507–512.
25. El-Kareh R et al. Trends in primary care clinician perceptions of a new electronic health record. Journal of General Internal Medicine, 2009, 24:464–468.