Electronic Clinical Records for Physiotherapists

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Abstract

Purpose: This pilot study compared traditional (paper-based) and electronic (computerized) clinical physiotherapy records. The content of the records and the software's user acceptability were considered. Methods: A neuro-musculoskeletal patient scenario involving two encounters (initial and follow-up) was scripted and role-played to each of three experienced physiotherapists (A, B and C). Participants assessed the patient and made traditional clinical records. After basic training in an electronic record system, they repeated the assessments and made electronic records via a laptop computer. Three experienced physiotherapists (A, D and E) each used their usual method to write a clinical report and an electronic record to write a report with the aid of the software's report tool. The two participants who wrote reports but did not assess the patient (D and E) received a brief software demonstration just prior to writing the electronic record report. The electronic and traditional clinical records and reports were compared regarding their content and completion time. Participants recorded their expectations and experience of learning and using the electronic record system via questionnaires. Results: Participants expressed initial apprehension regarding an unfamiliar documentation system, but generally found the electronic system easy to learn and use. Some would have preferred additional customization options. All traditional records contained pages that lacked patient identification details. The electronic records contained more details related to symptoms, social circumstances and physical examination findings. The participants used more time for assessment and recording the initial examination when using the electronic system. Participants reported easier data retrieval from the computerized records than from the traditional records. Conclusions: The electronic clinical record system may prompt more complete recording and facilitate better patient record identification. These effects have implications for patient care, communication between providers and clinicians' medico-legal protection. Further research is needed to determine the system's efficiency and to clarify the impact of other characteristics of electronic record systems for physiotherapists.

Introduction

The use of computerized records in healthcare is increasing but the vast majority of Australian physiotherapists continue to use traditional (paper-based) methods to record patients' clinical details.[1] While many clinicians consider traditional systems adequate, various advantages offered by electronic systems have driven their uptake in hospitals and by general practitioners and dentists.[2-5] Researchers and policy makers concerned with the economics and outcomes of healthcare have encouraged the shift to electronic records, with the aim of improved efficiency and the collection of a range data[4]

The primary purpose of a clinical record is to provide information about a patient's presentation and any care given, both to serve as a reminder for the clinician providing the care and for communication with future providers.[6] Records may also provide research data, enable clinicians to review their management decisions against evidence-based guidelines, and contribute to clinician's medico-legal protection.[7,8] Records may include a range of details about a patient's clinical pattern, including source, pathobiological mechanism, contributing factors, precautions and contra-indications to examination,

treatment and progression.[9,10]

Traditional records used by medical and allied health practitioners may include free text, diagrams (such as body charts) and check lists to help make recording more efficient or complete. Advantages include their low cost and clinicians' familiarity with their use. Electronic records are generally menu driven and contain structured data entry fields, which may include free text fields and diagrams. Data identifying a patient is automatically linked to clinical data and additional information, such as investigation results, reminder systems, and invoicing.[11] Reference information and decision support tools (eg prompts or warnings regarding appropriate care) can also be incorporated.[12]

Advantages offered by electronic systems include storing a very large volume of records in a very small space, easy production of backup copies and efficient data retrieval. Online access to patient records can overcome the logistical problems of moving records between practice locations and enhance communication with patients and other service providers.[3]

Healthcare providers have reported barriers to adopting an electronic clinical record system, including the need to upgrade technology, expense, reluctance to adapt to an unfamiliar system and the perception that a traditional system is adequate.[2,3] To date, health policy makers have not tried to persuade Australian physiotherapists to adopt electronic records, as they have medical practitioners. For physiotherapists considering this change, the cost of required hardware and software and the time taken to adapt to a new system will be weighed carefully against possible improvements in convenience and efficiency. A number of electronic record systems are now marketed to physiotherapists, but there is a lack of reported research regarding their usability and efficacy.

Various studies have assessed the impact of electronic systems on the quality of medical practitioners' records and the impact on patient care. Improved health outcomes have been linked to reminder tools in electronic systems.[13] Electronic medication prescribing systems have been linked to fewer prescription errors and reduced adverse medication effects.[14]

Studies on the completeness of records in each format have yielded contrasting results, partly explained by the type of data collected.[1,15] Electronic endoscopy records in a menu-driven, fully structured data entry format were significantly more complete than traditional records, probably due to the reminder effect the software provided.[15] The effect did not appear to be due to learning, as the completeness of records reverted to original levels a month after clinicians resumed traditional recording.

General practitioners collect a broader range of data, which is more challenging to clearly define and organize logically into structured data entry fields.[6] This may explain why a number of researchers have found electronic records were of poorer quality than traditional records.[1,6,9]

Issues of both completeness and accuracy of records have been raised.[1,6,7] In reviews of general practitioners' electronic records, designated data entry fields sometimes contained data not related to that field, and sometimes they included data that could not be verified on review of a videotape of the patient encounter.[6] While such data also appeared in traditional records, it appeared more often in electronic records, and in designated data fields rather than free text fields. This indicates that structured fields designed to encourage record completeness may also affect the record's accuracy.

Both traditional and electronic general practitioners' records have been found to be incomplete, and it has been demonstrated that they collect much more data than they record.[1,7] Some data has been found to be more complete in electronic records (such as details about telephone conversations with patients), and other data more complete in traditional records (such as symptoms details).

Problems associated with incomplete records include the inability of clinicians to review their performance, for example, against best practice guidelines. One study of general practitioners' records found only 9% of management decisions could be compared to evidence based guidelines. Additional data collected by physicians but not recorded (as verified by independent observers) enabled 69% of decisions to be reviewed. Unrecorded details included the nature and behaviour of symptoms, investigation results and screening for associated diseases.[7] The authors recommended the development of computerized systems to prompt and facilitate relevant data entry.

Another problem of incomplete records is exposure to medico-legal risk. Recent legal proceedings involving Australian physiotherapists demonstrated that details in clinical records such as informed consent, symptom progression, response to treatment, and the provision of instructions provides clinicians with legal protection.[8]

User acceptability of a range of electronic clinical record systems has been found to be high, provided administrative tasks do not need to be duplicated. Electronic systems have been associated with improved efficiency, more quality patient contact time, and enhanced physician's job satisfaction.[11] Even when they considered the quality of records was poorer, hospital-based medical practitioners have cited the advantages of patient information being more readily available.[16]

So it is not surprising that despite the pitfalls, many researchers advocate the further development of electronic systems, including tools to prompt data entry and possibly aid decision-making.[7,12] For clinicians who enter a wide range of data, the design and testing of appropriate systems is complex.[6,16] The wide variety of data recorded by different practitioners using a given recording method means that comparing recording methods, via measures of statistically significant difference, requires very large sample sizes.[6]

However, many physiotherapists will agree that "patient records will be increasingly computerized, whether better or worse than paper records," and so research exploring the options available to physiotherapists is needed.[6] A review of the literature by the authors found no studies comparing traditional and electronic physiotherapy records.

The aim of this pilot study was to compare a sample of traditional and electronic physiotherapy records for the same neuro-musculoskeletal patient presentation. We wanted to ascertain whether a structured electronic format led to more complete recording, if there was any impact on efficiency, and what the system's acceptability was to users.

Methods

Ethical clearance
Ethics approval was sought and received from the Human Research Ethics Committee of the University of South Australia.

Software
We used the Physiosphere electronic clinical record system.[17] Designed for manual therapists, it is structured with separate pages for different sections of the patient interview and physical examination. Check boxes, radio buttons and structured text fields are used to prompt data entry. Clinical reasoning cues can be displayed alongside the text boxes. The participants recorded in the version current at the time of testing (1.35D for participant A and 1.50J for the others) using a lap top computer. The software can also be used with a tablet personal computer.

Participants
The participants were 5 physiotherapists in Australia, each with more than two years of postgraduate experience in neuro-musculoskeletal physiotherapy Three participants had postgraduate (Masters) qualifications in musculoskeletal physiotherapy from the University of South Australia. Four were working full time as physiotherapists in the private sector in South Australia and one was working part-time in physiotherapy research unrelated to this study. None had used the software previously.

Patient scenario
A scenario was chosen in which the patient's symptoms and signs were consistent with a tension headache and mild irritation/compression of the left seventh cervical nerve root, with associated neck, left upper thoracic and left arm discomfort and digital paraesthesia. The scenario involved two patient encounters, an initial presentation and a follow up presentation a week later, when arm symptoms had resolved.

We considered this scenario suitable as it included multiple areas (neck, thorax, and arm) and types of symptoms (pain, restricted mobility, and paraesthesia). This meant there was a broad range of clinical data that participants might choose to record. The features of the presentation were familiar to the participants in their clinical work. A person with experience of these symptoms and previous experience role-playing presentations to physiotherapy students presented the scenario to each physiotherapist. To enhance consistency of presentation to each participant, details of the scenario were written down and reviewed by the 'patient' prior to each encounter, and each was monitored by one of the authors. In each encounter the patient answered questions and followed instructions, but did not provide unsolicited information.

Procedure
Traditional records made by three physiotherapists (A, B and C), were collected first. Each individually assessed the patient and recorded their findings for the two encounters in their usual format. Two participants used multiple, unformatted, ruled index cards (203mm x 128mm) and a body chart page of the same size. The third used two A4 (210mm x 297mm) pages that were preprinted with a body chart and headings for a range of personal and clinical data. While collecting all traditional records first may present an order bias, we aimed to prevent learning effects related to the electronic system influencing these records. Participant A also wrote a clinical report (a letter to a referrer) based on A's paper records.

These participants were then individually given a guided demonstration of the software (approximately 90 minutes) and were asked the questions listed in Questionnaire 1 about their initial impressions and expectations of using the system.

Questionnaire 1

Regarding the software:
1. *What do you like?*
2. *What might be the advantages of using it?*
3. *What don't you like?*
4. *What might be the disadvantages of using it?*
5. *Do you think the content of your clinical records*

would be different if you used the software? In what way?

6. *What modifications would you like?*

The patient encounters were repeated 3 and 4 weeks later. Participants independently practiced using the software during that time and passed a software skills test before recording their assessments electronically.

Participant A used his/her own electronic records and the software's report-writing tool to write a clinical report. Two additional participants (D and E) also wrote clinical reports. First, they each (individually) used B's paper-based records and their usual report-writing format to write a clinical report. They later received a 20 minute guided demonstration of the software, and then used B's computerized records (and the software's report tool) to a write another clinical report.

All five participants were asked the questions in Questionnaire 2 about their experience of using the software.

Questionnaire 2.

1. *How much time did you spend practicing using the software?*
2. *How did you find learning to use it?*
3. *What did you like about using it?*
4. *What didn't you like?*
5. *Were the reasoning cues helpful?*
6. *Do you have any comments about reviewing the data?*
7. *Can you comment about using the software in the clinic situation?*
8. *Do you have any comments about the report tool?*

The content of each record was assessed. We noted what identifying data was used, and what data was recorded based on the patient interview and physical examination. In the patient interview data we noted the number and type of clinical features recorded and how much detail (how many elements) were included in the record. For this purpose we defined a clinical feature as a component of the clinical pattern (such as vertebro-basilar insufficiency (VBI)). We defined elements as the smaller pieces of data that together comprise a clinical feature (such as dizziness, double vision, and tinnitus).

From the physical examination data, we noted how many (and which) structures were assessed, and the number of details recorded. We noted if informed consent for examination and/or treatment was recorded. We also noted the content of the clinical reports.

The time taken for assessment, recording, and report writing by each participant was noted. We reviewed participants' responses to the questionnaires to assess the user acceptability of the electronic system.

Results
Content of records
<u>Identifying data</u>
All traditional records included some pages that lacked the date of the encounter and any identifying data (such as the patient's name). The electronic system linked the clinical record with the patient's details page, and displayed the patient's name, age and number of previous treatment sessions for this problem on each clinical data page.

<u>Patient interview data</u>
Electronic records contained more clinical features, particularly related to contributing factors, and precautions, and contraindications to examination and treatment (Table 1). Data regarding the patient's social and family circumstances and the presence or absence of psychosocial factors associated with a poorer prognosis (yellow, blue, and black flags) was also more frequent in electronic records.

Table 1. Patient interview data: Clinical features recorded.

Category of clinical feature	Number of clinical features		REASON FOR VARIATION
	Traditional records	Electronic records	
SOURCE	13	14	The relationship between symptoms was more frequently recorded in electronic records
Pathobiological mechanism	9	7	Symptoms severity and irritability was recorded less frequently in electronic records
Contributing factors	5	9	Psycho-social variables were more frequently recorded in electronic records
Precautions and contraindications	15	20	Screening for weakness, weight loss, use of specific medications, and VBI was recorded more frequently in electronic records
Progression of the condition since the initial encounter	4	7	Change in medication use since the initial encounter was only recorded in electronic records

Clinical features are generally comprised of several elements, and the number of these indicated the amount of detail in a record (Table 2). Electronic records contained more elements, particularly related to symptoms and screening questions.

Table 2. Patient interview data: Number of elements recorded.

Patient encounter	Number of elements		Reasons for variation
	Traditional records	Electronic records	
INITIAL	74	112	Electronic records contained more symptom areas on the body chart, more descriptions of symptoms, more symptoms with specific aggravating factors, more details re: VBI and medication use
Follow-up	5	7	Electronic records contained more screening for change in medication use
Total	81	119	

Physical examination data

Up to five structures were tested according to the records (Table 3). Electronic records tended to contain data related to more tests.

Table 3. Physical examination data: Number and types of tests recorded.

Structure tested	Test types	Number of tests		Reason for variation
		Traditional records	Electronic records	
Intervertebral joints	Movements • Active physiological • Passive physiological • Passive accessory Palpation	7	8	Passive physiological movements were recorded more often in electronic records
Peripheral joints (shoulder)	Physiological movements	1	1	
Muscles	Palpation Length	4	5	Muscle length was recorded more often in electronic records
Nervous system	Neurodynamic Neurological function	5	6	Neurological examination was recorded more often in electronic records

In recording results of the above tests, participants often included several details (e.g. movement in several planes or palpation findings at several segments). Traditional records included 71 test details and electronic records 92, as listed in Table 4. The

additional details in the electronic records were related to posture, active neck movements, passive neck mobility and neurological examination findings.

Table 4. Physical examination data: Number of details recorded.

Number of test details		
Paper-based records		**Computerized records**
INITIAL ENCOUNTER	51	65
Follow-up encounter	20	27
Total	71	92

Informed Consent
Informed consent was not recorded in any record, despite a prompt (tick box) in the treatment page of the electronic records.

Clinical reports
Two reports based on traditional records were typed using Microsoft Word and one was handwritten. The number of clinical details in the traditional and software-assisted reports was the same.

Efficiency
Assessment
For the initial encounter, the average time for assessment and recording was 30 minutes for traditional and 40 minutes for electronic records. Assessment and recording of the follow-up encounter took an average of 16 minutes for traditional and 13 minutes for electronic records. As noted above, the amount of content in the electronic records was greater.

Clinical reports
The average preparation time was 11.3 minutes for traditional and 10.7 minutes for electronic reports. As noted above the amount of content was the same.

User Acceptability
Participants A, B and C reported an average two hours independent practice with the software (range 1.5-2.5 hours). They expressed initial apprehension about an unfamiliar recording system. Their concerns included:
- "It may take time to get up to speed;" and
- "Typing during assessment" may interrupt to the natural flow of communication.

After recording with the software, favorable comments included:
- "The structure guides the examination, quicker access to records" (A);
- "Screening reminders, less likely to miss information, legal protection" (B); and
- "Less writing/physical demands (on the clinician), legal protection, time saving once proficient" (C).

Some participants would have preferred modifications to the software, including:
- "Time consuming initial session, would like short cut keys" (A);
- "Would like to customize symbols" (B);
- "Couldn't draw pictures, would like spinal cord compression prompt on the body chart" (C); and
- "I don't like having to use multiple screens to view all data" (D).

Other comments included:
- "The initial session was time consuming but follow-up sessions quicker" (A);
- "Time longer but only as I was doing more" (B);
- "(I was) initially focused on the screen more than the patient but adjusted rapidly" (B); and
- "I was aware of less eye contact but felt patient interaction was OK. With my general practitioner using a computer, I feel their attention is engaged and that their records are more thorough than if a computerized system is not used" (C).

All participants reported that they did not use the clinical reasoning cues. Some considered they might if the presentation was unfamiliar. Physiotherapists who wrote clinical reports said retrieving data was easier from the computerized records.

Discussion
These findings support the argument for structured recording formats as a broader range and higher number of clinical details were found in the electronic records. Due to the small sample size we did not analyze data for statistical significance. However, we believe the quality of the additional data in the electronic records (particularly screening for vertebro-basilar insufficiency) should be highlighted due to the potential patient safety and medico-legal implications of neglecting to collect or record it. One electronic and two traditional records did not include screening for spinal cord compression. We were surprised no records included informed consent, despite the electronic system displaying a tick box for this. This suggests that inclusion of designated fields alone may not

be sufficient to prompt entry of important data.

The aspect of the electronic system most acceptable to users was easy data retrieval (report writers preferred accessing data from the electronic system), and those performing assessments felt more confident in the completeness of their records. The efficiency of the system requires further evaluation, particularly as participants used more time and recorded more data in the electronic records. All were relatively unfamiliar with the electronic recording method compared to many years using traditional records.

With a large volume of records, the effect of easier data retrieval from electronic systems may be expected to increase, whether for tracking the progress of a particular clinical sign over time for an individual, locating a particular file, or locating a section of a file. As this study demonstrated, it is very easy for part of a patient's paper-based records to lack sufficient identifying data, which can be a factor in misplacement of records.

Features of electronic records beyond the scope of this pilot study may impact significantly on efficiency. These include portability of records, inclusion of x-ray images, access via a network, and integration with invoicing and appointment scheduling. For some clinicians these features may be more important than record completeness.

Limitations
This pilot study considered a limited range of features of one electronic record system. We collected all traditional records first to limit learning effects, but this enabled an order effect. This, and the small number of participants and records collected, limits generalization of findings. Records were made in a simulated clinical situation and participants had limited familiarity with the software. The quality of the records may change as the user becomes more familiar with using the software over time in a normal clinical setting

Further research, with a larger number of clinicians, randomization of recording method, and a range of patients over time in the real clinical situation will enable collection a larger, authentic record sample, made by clinicians equally proficient with each recording method. Control for learning effects may require a different study design, such as random assignment of recording method.

Conclusions
The completeness of physiotherapists' clinical records may be enhanced by an electronic record system that uses a structured data entry format. Record identification may also be enhanced. Apprehension about using a new system and concern about the influence of the new technology on patient-therapist communication may be barriers to the uptake of electronic records. The ease of data retrieval offered by electronic records aids their user acceptability, as does the potential for prompts to aid record completeness and possibly enhance patient safety and clinician's legal protection. Further research is needed to determine the system's efficiency and to clarify the impact of other characteristics of electronic record systems for physiotherapists.

References

1. Hamilton WT, Round AP, Sharp D, Peters TJ. The quality of record keeping in primary care: a comparison of computerized, paper and hybrid systems. Br J Gen Pract. 2003;53:929-33.
2. John JH, Thomas D, Richards D. Questionnaire survey on the use of computerization in dental practices across the Thames Valley Region. Br Dent J. 2003;195:585-90.
3. Waegemann CP. Opinions Commentary. Mod Healthc. 2004;34: 24.
4. Classen DC, Metzger J. Improving medication safety: the measurement conundrum and where to start. Int J Qual Health Care. 2003;15 Suppl 1: i41.
5. Carr-Bains S, de Lusignan S. Moving to paperlessness: a case study from a large general practice. Inform Prim Care. 2003;11:157-63.
6. Logan JR, Gorman PN, Middleton B. Measuring the quality of medical records: a method for comparing the completeness and correctness of clinical encounter data. Proceedings of the 2001 AMIA Annual Symposium; 2001 Nov 5-7; Washington DC, USA. Hanley and Belfus; 2001. p. 408-12.
7. Spies TH, Mokkink HGA, De Vries PF, Grol RPTM. Which data source in clinical performance assessment? A pilot study comparing self-recording with patient records and observation. Int J Qual Health Care. 2004;16:65-72.
8. Australian Physiotherapy Association. Legal Matters: Is the tide turning? In Motion. 2004; June/July:16-7.
9. Bordage G, Limieux M. Cognitive structures of experts and novices: semantic structures and diagnostic thinking of experts and novices. Acad Med. 1991;66:570-2.
10. Jones MA, Rivett DA. Introduction to clinical reasoning. In: Jones M, Rivett D, editors. Clinical Reasoning for Manual Therapists. Oxford: Butterworth Heinemann; 2004. p. 3-24.
11. Erstad TL. Analyzing computer based patient records: a review of literature. J Healthc Inf Manag. 2003;17:51-7.

12. Wilson A, Duszynski A, Ly A, Turnbull D, Beilby J. Evaluation of the acceptability of a computerized primary health care framework for the assessment and management of cardiovascular risk. Proceedings of the International Conference on Qualitative Research in IT & IT in Qualitative Research; 2004 Nov 24-26; Brisbane, Australia. Brisbane: QualIT; 2004.
13. Hasman A, Safran C, Takeda H. Quality of health care: informatics foundations. Meth Inf Med. 2003;42:509-18.
14. Potts AL, Barr FE, Gregory DF, Wright L, Patel NR. Computerized physician order entry and medication errors in a paediatric critical care unit. Pediatrics. 2004;113:59-63.
15. Gouveia-Oliveira A, Raposo VD, Salgado NC, Almeida I, Nobre-Leitao C and de Melo FG. Longitudinal comparative study on the influence of computers on reporting of clinical data. Endoscopy. 1991;23(6):334-7.
16. Embi PJ, Yackel TR, Logan JR, Bowen JL, Cooney TG and Gorman PN. Impacts of computerized physician documentation in a teaching hospital: perceptions of faculty and resident physicians. J Am Med Inform Assoc. 2004;11(4):300-9
17. Physiosphere.com [homepage on the Internet]. Geneva: Adoc-Services; [updated 2005 Oct 5; cited 2005 Oct 5]. Available from: http://www.physiosphere.com.

FOOTNOTES

We used Physioshpere software (versions 1.35D and 1.50J), English language version and a Dell Latitude lap top computer with a Hitachi DK23CA-10 Disk Drive and Windows 2000 Professional. Physiosphere can be viewed at www.physiosphere.com. Physiosphere is produced by Adoc Services. Contact Christophe Richoz, ADOC Services, PO Box, CH-1703 Fribourg, Switzerland or email info@adoc-services.biz.

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