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# Implementation of Electronic Health Record Systems in Physical Therapy – A Systematic Review

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## INTRODUCTION

The rising tide of clinical information coupled with the expanding uses of health data have exposed the inadequacies of the current paper-based health information infrastructure. With the growing national agenda to adopt information technology in healthcare, we felt the need to filter this push through the lens of a critical, systematic review of the literature pertaining to physical therapists.

## Objective

Our review addressed these specific questions:

1. What are the benefits and barriers to implementing an electronic health record (EHR) in physical therapist practice settings?
2. What are the key factors for success in implementing an EHR in these settings?

## METHODS

We systematically reviewed the literature to identify relevant articles, guided by the Institute of Medicine's (IOM) concept of an EHR<sup>1</sup>.

## EHR Definition

Eight categories of EHR **core functionalities**:

1. Health information and data
2. Results management
3. Order entry/management
4. Decision support
5. Electronic communication and connectivity
6. Patient support
7. Administrative processes
8. Reporting and population health management

**Primary** uses of an EHR are associated with care provision.

## Study Identification

We searched MEDLINE, CINAHL, and Ovid's All EBM Reviews (inception to October 2004), and AMIA Annual Symposia proceedings (1998-2004). Articles were limited to those in refereed journals published in English (n=2,002). We hand searched bibliographies and also contacted authors and experts. A total of **2,010** studies were eligible.

## Study Selection

Studies were included if they met all criteria:

1. An EHR was the intervention of interest
2. The EHR contained the IOM core functionality of health information and two or more others
3. The study described a primary use of an EHR
4. Physical therapists were study participants
5. The paper reported benefits or barriers to EHR implementation

Three authors independently evaluated potentially relevant articles, and **18 met our predefined inclusion criteria** ( $\kappa=.68$ ).

## Study Evaluation

Three authors independently reviewed each article and rated it according to standard criteria<sup>2</sup> for levels of evidence ( $\kappa=.73$ ).

## Study Data Extraction

Three authors independently extracted the study design, setting, system characteristics, outcomes, results, and conclusions. Formal meta-analytic methods were precluded because of study heterogeneity, hence this is a qualitative analysis of the literature.

## RESULTS

Seventeen of 18 studies were rated evidence level 4, and one was rated evidence level 5. Six articles reported results on the same EHR at the Texas Institute for Rehabilitation and Research, and were analyzed together. The 13 studies described EHRs that operated on all major historical classes of computers and were implemented in a variety of practice settings. Twelve of 13 studies described EHRs that used software developed in-house while only one used commercially available software. Table 1 summarizes the study characteristics. Figures 1, 2, and 3 summarize the benefits, barriers, and key success factors in implementing EHRs.

Table 1. Studies of EHRs in Physical Therapy

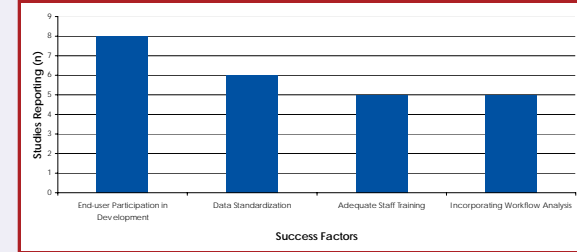
Author(s)	Date	Setting	System Characteristics
TIRR* Studies	1968-1974	Sub-acute rehab hospital	Mainframe computer with remote terminals
Savander and Stutz	1973	Acute care hospital	Mainframe card-oriented computer
Savander	1977	Acute care hospitals (n=4) and outpatient clinics	Mainframe computer
Lehmann et al	1984	Sub-acute rehab hospital	Minicomputer with remote terminals
Brown and Gordon	1986	Sub-acute rehab hospital	Unspecified
Sulton et al	1987	Sub-acute rehab hospital	Microcomputer
Zimny and Tandy	1993	Outpatient physical therapy clinic	Microcomputer
Shields et al	1994	Acute care hospital	Mainframe computer with monthly downloads to microcomputer network
Crosswhite et al	1997	Acute care hospital	Unspecified
Eiseman	1999	Sub-acute rehab hospital and outpatient clinics	Mainframe computer for management system, microcomputer for clinical system
Mazzoni-Madigan and Burchick	2000	Non-profit rehab agency; early intervention program	Microcomputer network with remote access
Swope	2000	Outpatient clinics	Microcomputer network with remote access
Kaur et al	2004	Sub-acute rehab hospital; telerehab program	Microcomputer network with remote access

\*TIRR = Texas Institute for Rehabilitation and Research

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Figure 3. Key Factors for Success in Implementing EHRs



## DISCUSSION

- There is a paucity of high-quality evidence on EHRs in physical therapy, but current literature suggests that EHRs may have important benefits.
- We synthesized our findings and developed recommendations, which are given in Table 2. All are **grade C recommendations**.

Table 2. Evidence-based Recommendations

1. Incorporate workflow analysis into the system design and implementation
2. Include end-users, especially clinicians, in the system development activities
3. Devote significant resources for training
4. Commit to data standards
5. Pursue the efficient capture of coded data
6. Plan and test carefully to ensure adequate software and hardware system performance

## Implications

This review highlights the need for much work yet to be done. EHRs are not a panacea; high quality trials are necessary to demonstrate whether or not such systems have benefits worth their investment.

## REFERENCES

1. Institute of Medicine (IOM). Committee on Data Standards for Patient Safety. Board on Health Care Services. Key Capabilities of an Electronic Health Record System. Washington, DC: National Academy Press; 2003.
2. Oxford Centre for Evidence-Based Medicine. Levels of Evidence and Grades of Recommendations. Available at: [http://cebm.net/levels\\_of\\_evidence.asp](http://cebm.net/levels_of_evidence.asp).

Figure 1. Benefits of EHR Implementation

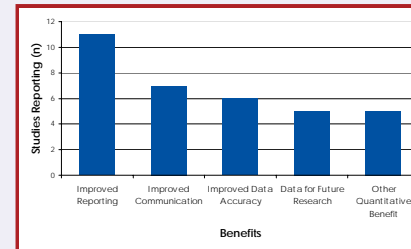


Figure 2. Barriers to EHR Implementation

