



## Review article

# The impact of health information technology on organ transplant care: A systematic review



Zahra Niazkhani<sup>a,b</sup>, Habibollah Pirnejad<sup>a,c,d,\*</sup>, Parviz Rashidi Khazaei<sup>e</sup>

<sup>a</sup> Department of Health Information Technology, Urmia University of Medical Sciences, Urmia, Iran

<sup>b</sup> Nephrology and Kidney Transplant Research Center, Urmia University of Medical Sciences, Urmia, Iran

<sup>c</sup> Institute of Health Policy and Management (iBMG), Erasmus University Rotterdam, Rotterdam, The Netherlands

<sup>d</sup> Inpatient's Safety Research Center, Urmia University of Medical Sciences, Urmia, Iran

<sup>e</sup> Department of Electrical and Computer Engineering, Urmia University, Urmia, Iran

## ARTICLE INFO

## Article history:

Received 29 April 2016

Received in revised form 1 December 2016

Accepted 19 January 2017

## Keywords:

Health information technology

Transplantation

Systematic review

Patient outcome

Cost-effectiveness

CPOE

## ABSTRACT

**Background:** Health Information Technology (HIT) has a potential to promote transplant care. However, a systematic appraisal on how HIT application has so far affected transplant care is greatly missing from the literature. We systematically reviewed trials that evaluated HIT impact on process and patient outcomes as well as costs in organ transplant care.

**Methods:** A systematic search was conducted in OVID versions of MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane, and IEEE databases from January 1990 to December 2015. Studies were included if they: (i) evaluated HIT interventions; (ii) reported results for organ transplant population; (iii) reported quantitative data on process, patient, and cost outcomes; and (iv) used a randomized controlled trial or quasi-experimental study design.

**Results:** Primarily, 12,440 publications were identified; from which ten met inclusion criteria. Among HIT systems, uses of clinical decision support systems (CDSS) targeting different aspects of the complex organ transplant care were common. In terms of process outcomes, HIT positively impacted the timeliness of care, laboratory and medication management practices such as promoting therapeutic or diagnostic protocol compliance by clinicians, and reducing medication errors. Regarding patient outcomes, HIT demonstrated a beneficial impact on the percentage of post-transplant patients with normal lab values and decreasing immunosuppressive toxicity and also deviation from the predefined immunosuppressive therapeutic window. However, in terms of mortality, readmission, rejection, and antiviral resistance rates, the impact was not clearly established in the literature. Finally, these systems were associated with savings in the costs of transplant care in three studies.

**Conclusion:** This is the first study reviewing HIT impact on transplant care outcomes. CDSSs have mainly been reported to support transplant care in realizing the above-mentioned benefits. However, to make conclusions, more evidence with less risk of bias is warranted. Several gaps in the literature, including comparison of the impact of commercial systems in different transplant settings, was identified which can motivate future research.

© 2017 Elsevier B.V. All rights reserved.

## 1. Introduction

Transplant patients require expensive, long-term, and complex chronic care. From long before undergoing transplantation through frequent post-transplantation follow-up encounters, transplant patients are directly or indirectly cared for by a variety of healthcare

providers including physicians, nurses, coordinators, pharmacists, and other medical professionals. The complex, lifelong care is centered around immunosuppressant and graft monitoring, as well as prevention and treatment of common complications such as infection, cardiovascular disease, malignancy, and hematological and bone disorders [1,2]. Despite the availability of comprehensive evidence-based clinical practice guidelines and recommendations for managing organ transplant patients (see for example [1–5]), care complications are prevalent among this high risk patient population [5–10]. Studies have shown that post transplant events and

\* Corresponding author at: Department of Health Information Technology, Urmia University of Medical Sciences, Emergency Alley, Resalat Blvd, 5714783734, Urmia, Iran.

E-mail addresses: [pirnejad.h@umsu.ac.ir](mailto:pirnejad.h@umsu.ac.ir), [h\\_pirnejad@yahoo.com](mailto:h_pirnejad@yahoo.com) (H. Pirnejad).

complications impose a major economic burden for healthcare systems [11–13].

A prerequisite for providing high quality care for the transplant patient population is the availability of rich and reliable clinical data. However, in a majority of transplant programs, the data and information required for transplant patient care is scattered over multiple inpatient and outpatient documents and systems. This situation constitutes a big challenge for the majority of transplant care programs [14,15]. To effectively meet their organizational and clinical requirements, transplant programs invest in costly data collection practices [16,17]. For many transplant programs, these practices heavily rely on paper-based data management systems despite their inherent limitations and shortcomings. A recent survey of US liver transplant programs showed that the use of paper-based manual processes for immunosuppressive monitoring is still dominant [18].

Health Information Technology (HIT) can play a pivotal role in supporting transplant care by managing data, information, and clinical workflow [19]. Early HIT developments in transplantation date back to 1988 when researchers at the University of Pittsburgh described their effort to develop a center-oriented transplant information management system [20,21]. Since then, similar reports on the design or use of systems for different aspects of transplant care have populated the literature (see for example [15,22–26]). These types of clinical systems have the potential to change the organization of care by redesigning care processes and improving efficiency, effectiveness, and quality of care [27]. However, the development and implementation of HIT is often expensive in terms of personnel, time and money. Moreover, unintended consequences may accompany the deployment of such systems [28]. Therefore, when planning to develop and implement HIT, policy makers, care providers, and healthcare organizations often inquire about an evidence-base impact of such systems on the processes of care, patient outcomes, and resource utilization.

To date, many published studies describe the design, implementation, and use of HIT in organ transplant settings [29]. However, a systematic appraisal on how HIT application has so far affected transplant care is greatly missing from the literature. Therefore, through this study, we aimed to systematically identify and synthesize trials that evaluated the effect of HIT on processes and patient outcomes as well as costs in organ transplant care. The result of our systematic review will enlighten transplant organizations, care providers, and researchers as to where and how to reap full benefits of such systems in providing the complex care for their transplant patients.

## 2. Methods

This review was conducted according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses: the PRISMA statement [30].

### 2.1. Search strategy

A comprehensive literature search was conducted in OVID versions of MEDLINE, EMBASE Classic and EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane Library and the IEEE database for English-language citations including full texts, abstracts, and reports published from January 1, 1990 to December 4, 2015. For this search, we developed a Boolean search strategy using key words and MeSH terms related to two areas of interest i.e.; the study setting or patient population (e.g.; transplantation OR transplant unit OR transplant center) AND the HIT intervention of interest (e.g.; computerized order entry system OR decision making; computerized OR alert system; medication OR

therapy; computer-assisted OR diagnosis; computer-assisted; OR medical record systems; hospital information systems; and electronic health records; etc.). In order to not miss relevant studies of early HIT applications in the transplantation domain; we used a long time span. Appendix A in Supplementary material provides details of our search terms and search strategy in MEDLINE. Similar searches were conducted for each of the other databases used in this review. Electronic searches were supplemented by manual review of the reference lists of included studies.

### 2.2. Inclusion and exclusion criteria

A study was included in this review if it met the following inclusion criteria: (1) the intervention of interest was an HIT system including an electronic medical record, computerized physician order entry system, clinical decision support system, or electronic communication system for data interchange between transplant care providers; (2) the control group used a handwritten or paper-based system, or was a less advanced system compared with an electronic system with a more advanced functionality, (3) the users of the system were transplant physicians, nurses, pharmacists and/or nurse coordinators, (4) the intervention (i.e. the HIT system of interest) was used to provide daily routine care, (5) the patient population concerned either (i) transplant candidates in the pre-transplant evaluation phase, (ii) hospitalized transplant patients in an inpatient setting to receive an organ transplant or care for transplant complications such as rejection or immunosuppressive toxicity, or (iii) post-transplant patients followed in an outpatient setting, (6) the study was an original research article, and (7) the study design was either a randomized controlled trial (RCT), non-randomized controlled trial (NRCT), controlled before-after (CBA) study, interrupted time series (ITS) or before-after trials.

We excluded hematopoietic stem cell transplant studies, lab and simulation studies, qualitative studies, HIT systems used merely for collecting data for research purposes, systematic reviews, commentaries, opinion papers, editorials, and articles describing theoretical or technical background without evaluating the HIT system.

### 2.3. Review procedures and data extraction

The combined search strategies identified 12,440 electronic records (after removing duplicates), which were screened for eligibility. Fig. 1 shows the flow diagram of our review procedure. ZN primarily screened all the titles and abstracts to find relevant studies based on this study's review objectives. A second reviewer (either HP or PRK) independently examined a random sample of these citations.

Among these citations, 66 potentially eligible publications were selected for full review. To retrieve original articles or to get more information, five authors were contacted of whom three responded [31–33]. An inquiry to access an unavailable study published in 1994 was unresponsive therefore the paper was excluded (Appendix B in Supplementary material). Another unresponded enquiry was for missing information in an included article. We referred to these missing points in Table 1. All full text articles were reviewed in detail for inclusion in the final review set according to our inclusion criteria mentioned earlier. Reasons for exclusion at this stage are given in Appendix B in Supplementary material.

Two authors (ZN and either HP or PRK) independently extracted the following main study characteristics from each paper in the final set of publications: general information (first author and the year of publication, country of origin), study objectives and outcomes measured (process outcomes, patient outcomes, or costs), study design, study setting, patient population (sample size, type of organ transplant), the intervention i.e., the HIT system in use

Download English Version:

<https://daneshyari.com/en/article/4966657>

Download Persian Version:

<https://daneshyari.com/article/4966657>

[Daneshyari.com](https://daneshyari.com)