Relationship of using smart card and drug consumption management of MS specific patients

Masoudi Asl I.[1] *PhD*, **Nasiripour A. A.**[*] *PhD*, **Esmaeillou Y.**[1] *MSc*

[*]*Department of Health Care Services Management, Sciences & Researches Branch, Islamic Azad University, Tehran, Iran;*
[1]*Department of Health Care Services Management, Sciences & Researches Branch, Islamic Azad University, Tehran, Iran*

Abstract
Aims: The health system of Iran annually spends great amount of costs for supplying drugs. The general goal of the present research was studying the effects of smart card application in drug consumption management of MS patients in Tehran Medical Services Insurance Organization.
Methods: This research is a correlation study that was conducted in 2010 in Tehran. The statistical population of the present research was all MS patients covered by Tehran Medical Services Insurance Organization. Data were collected by field method by direct refer to the documents and using the data transfer form. In order to analyze the findings after and before smart card application, the average per capita of drug consumption, credits and prescriptions were analyzed. Then T-test, F-test and SPSS 16 Software were used for the analysis of the obtained data.
Results: There was positive significant relationship among smart card application during years 2007 (before application), 2008, 2009 (after application) and the rate of drug consumption ($p<0.009$), drug credits ($p<0.005$) and prescriptions ($p<0.001$).
Conclusion: Applying smart cards for recording medical and pharmaceutical related data can be an effective step towards reducing the drug consumption per capita, the rate of prescriptions and the patients' referring load. Therefore, application of smart cards results in the improvement of drug consumption management and control.

Keywords: Smart Card, Drug Consumption Management, Specific Patient

Introduction

Today the importance of information technology, as a way of increasing speed and accuracy in organization's different activities and as a result increasing their productivity, is clearly determined. Particularly organizations, whose different sections are located in remote geographical places, far from each other, or institutions which are obliged to do different and diverse kinds of works, solve their problems with the help of this technology [1]. The application of this technology in the realm of health services includes varieties of computations and daily processes, health and sanitation, business, informatics, scientific issues, management, direct connection from distant places, etc. Medical informatics is one of information technology's uses, which has caused great social changes in health and sanitation section [2]. To meet the necessary needs and to expand the uses and the value of this to patients and health care providers, emphasis has been placed on the structure of health-electronic documents [2]. Our knowledge and understanding of patient's main information leads us to creating systems which automatically gather and organize patient's information. The new technology called smart card is has reduced many of the problems and obstacles which patients of health and medical

centers face [3].
Health information smart card is a plastic credit card. Inserted into the card is a silicon chip in which personal information, medical insurance, and most medicine, vital and fundamental information of the holder is kept and saved, so as to help the doctor access these information as soon as possible when required to use them. The smart cards can be read by readable-card machines, under emergency circumstances inside the vehicle, by computers in drugstores, hospital, emergency room, doctors' offices, clinics, etc. [4]. Due to providing quick access to required information in time, health information smart cards allow the medical staff to meet patients' needs more efficiently [5].
On the other hand, considering the point that health and sanitation are of vital elements and are of efficient elements in stable development in each society, though, the role of medicine is also extremely fundamental, effective and determinant; therefore, medicine normally makes it impact obvious as the last and most sensitive stage in health and sanitation cycle [6]. Drug consumption management is of high importance in specific diseases. On one hand, the drug should reach the patient on time and on the other hand, the way of its consumption should be managed. Since the government grants subsidies for these medicines,

there is always the chance of the entrance of these medicines to illegal markets and the waste of drug subsidies on the part of exploitative people. The experience from other countries has shown that smart card could pave the way for patients' equal rights of access to services and more equal distribution of subsidies [7].

Ariayee's research in the name of "the stance of smart card in health electronic system" in 2008 declared that smart cards are used to confirm relations, control, preparing mechanism for completing strong security, distinct and rapid access to the data and their investigation and could also keep the data and use them for managing the data [8]. Also, *Rezaee Hache Soo* indicates the most important features of smart card as follows:

1) Smart card can stand against illegal and illegitimate use of information.

2) Provides the possibility of making use of medical services in every place and time when required.

3) It is time saving and eliminate the necessity of filling long medical forms.

4) It is easy to control this card and leads to increase in efficiency in medical environments and increase in the ability to discharge the patients who are under the control of their own information [9].

In this course, in a research in the name of "investigating the treatment cost of patients inflicted with MS" which was done by *Talaee* in 2006, all the patients inflicted with MS who were under the medical services insurance of Markazi province were investigated; these people had referred to this center in 2005 to confirm the medicine. The number of patients inflicted was 65 and the drug cost of all the patients amounted 185,287,500 Rials [10]. The result of statically comparing of research findings was that drug cost of each visit of patients was 40% more than worldwide standards. The researcher to prevent the illogical use of drugs has proposed the use of an advanced information technology and the system of controlling the drug consumption [10]. Also, *Gooler*'s research findings and et al. in 1998 showed that the use of smart card would lead to 25% decrease in the visitor's numbers and also 14% decrease in the cost of controlling the insurer [11]. Brigs has shown in his research in 2000 that the use of this card would lead to average decrease of 20% in medicinal conflictions and an increase of 35% in controlling drug consumption by the patients [12]. Therefore, the use of efficient technologies including health information smart card to achieve the objectives of efficiency, effectiveness, the quality of service, the patients and staff's satisfaction, seems undeniable necessity [13].

Medical services insurance organization has tried in recent years to provide for the possibility of recognizing number and variety of specific patients in the country and the accomplishment of research on these patients and also automatic control of drug distribution stages in an informative system, specific patients' easy access to the needed medicines, and preventing from overlapping, and therefore the improvement in drug consumption management of these patients by implementing the distribution scheme of specific patients' drugs, using smart cards [14].

The main objective of recent research is to study the effects of using health information smart card on drug consumption management of specific patients (inflicted with MS) in Tehran medical service insurance organization.

Methods

These researches are of collaboration, practical and synchronic nature which were done in 2010 in Tehran medical service insurance organization. The people under investigation were all people inflicted with MS who were under the cover of medical service insurance of Tehran province. They were investigated by the census method.

Gathering the data was done in a field manner with personal attendance and direct access to the documents. These documents included all prescriptions, financial documents sent and received from medical service insurance, documents related to government credits, the organization's share and the extent and variety of mentioned medicine items of specific patients of medical service insurance during the years of 2007 to 2009. The instruments to gather the data were forms of gathering data, and transferring the data which the researcher has designed, in which all relevant and required information was registered from relevant documents. First, information relevant to expenditures, the sums of governmental credits, the organization's share and the number of patients' prescriptions together with the time of their visit was extracted in the years before implementation, that is, 2007 and to investigate more precisely and reaching firmer conclusions, the data was also extracted two years after implementation, that is, the years 2008 and 2009. Then, to investigate the data in the form of per capita calculations, the population of MS patients of the relevant year was computed in the same year and what was also computed was the information about the average per capita consumption, the per capita medicinal credits and the per capita of the specific

patients' prescriptions before using smart card in the year 2007 and after the implementation of smart card, that is, in the year 2008 and 2009. The effects of conflicting variables such as the increase in the cost of MS patients' medicines, which rose 20% from 2007 to 2008 and 15% from 2008 to 2009, was calculated and eliminated from the relevant years of consumption rate data and the rate of medicinal credits. Also, the rate of franchise was computed and eliminated from the data concerning organization's medicine credit rate in the relevant years, according to the changes in its commitment rate, and the government's aid such that in the year 2007, 30% of the cost was due to paid by the patient and 70% was up to organization, in the year 2008, 10% of the cost was up to the patient and

90% was up to the government and in the year 2009, all the cost was to be paid by the organization.

To investigate the relation between using card and computed cases and to analyze the obtained data, independent T test, F and software of Excel and SPSS 16 were used. Also, the descriptive statistical methods were used such as mean, standard deviation, frequency tables, and diagram of consumption rate, credit rate, the number of prescriptions, deductive statistical methods such as Variance Analysis. It is necessary to pinpoint that after investigating the chance of normal distribution of changing data of consumption rate, credit rate, and the number of services, it became obvious that the intended variables have normal distribution.

Table 1- per capita drug consumption rate of MS patients with the elimination of the effect of increase in drug cost during 2007 to 2009

Index→ Time period↓	Mean (Rials)	SD	Deviation from the mean	Confidence distance 95% from the least amount	Confidence distance 95% from the most amount	t	Freedom degree	Level of significance
2007 – 2008	52.751	3.0335	8.7564	8.2414	4.6795	3.142	11	0.009
2007 – 2009	-4.4305	52.652	47.657	-6.1155	-2.7445	-5.785	11	0.0001
2008 – 2009	4.4305	52.652	47.657	2.7445	6.115	5.785	11	0.0001

Results

The average per capita rate of drug consumption was 2,433,995/25 after the elimination of the effect of increase in drug cost in 2007 (before the implementation of smart card) and had decreased to 2,001,023/67 in the year 2009 and to 2,168,853/58 in the year 2008 after the implementation of smart card which this decrease was significance statistically (Table 1).

The average of per capita medicine rate of MS patients had a downward trend after eliminating the effect of increase in drug cost and franchise during the years

2007 (before using smart card), 2008, 2009 (after using smart card) and had decreased in a significant way (Table 2 and 3).

Table 2- The average of per capita medicine credit rate of MS patients under the cover of medical service insurance organization of Tehran province with the elimination of the effects of increase in drug cost and franchise

Index→ Year↓	Mean (Rials)	Number	SD	Deviation from the mean
2007	2190966.67	12	400686.521	115668.235
2008	1913693.67	12	174488.293	50370.431
2009	1062956.50	12	121860.942	35178.224

Table 3- Investigating per capita reduction in the rate of medicinal credits of MS patients in medical service insurance organization of Tehran province with the elimination of the effects of increase in drug cost and franchise during the years of 2007 to 2009

Index→ Time period↓	Mean (Rials)	Confidence distance 95% from the least amount	Confidence distance 95% from the most amount	t	Freedom degree	Level of significance
2007 – 2008	277273.000	101450.426	453095.574	3.471	11	0.005
2007 – 2009	128010.167	937126.401	1318893.932	13.007	11	0.0001
2008 – 2009	850737.167	792621.024	908853.309	32.219	11	0.0001

The average per capita of medicine prescriptions of MS patients had decreased by 23% from 76% in 2007 to 58% in 2008 and by 1.7% from 58% in the same year to 0.57% in 2009 (Table 4).

Therefore, the per capita rate of medicinal

prescriptions in the year 2007 (before using smart card) and in 2008 and 2009 (after using smart card) has been different and has decreased and that this decrease has been statistically significant (in safe distance of 95% and with p<0.001).

Table 4- Per capita medicinal prescriptions of MS patients in medical service insurance organization of Tehran province during the years of 2007 to 2009

Index→ Year↓	Mean	Median	SD	Total
2007	0.7642	0.7800	0.06487	9.17
2008	0.5808	0.5800	0.04562	6.97
2009	0.5700	0.5500	0.05187	6.84

Discussion

The findings showed that by using smart card, the annual per capita average of drug consumption, between the years of 2007 and 2008 has decreased 11% (275,142 Rials) and between the years of 2008 and 2009 has decreased 8% (167,830 Rials) and that this rate of decrease in the drug consumption rate in its entirety is a significant amount and the cause of this tangible and prominent change can be ascribed to using smart cards. The per capita average of medicinal prescriptions of MS patients has decreased 23% in the year 2008 in comparison with the year before, 1.7% in the year 2009 in comparison with the year before. Also, the per capita average credit rate has fallen, in a downward trend, 12% from 2007 to 2008 and 44% from 2008 to 2009. Therefore, evidently by equating the conditions before and after the use of smart cards, the employment of this card has led to the decrease in per capita drug consumption, in credits and medicinal prescriptions and improvement in consumption management.

Brigs's research findings correspond with the results of present research in terms of reduction and control of drug consumption due to using smart card. Also, he has indicated in another part of his research that health information smart cards lead to decrease in the number of visits by each patient to receive services and also lead to increase in access to health care [12]. Present research also showed that the per capita medicinal prescriptions and also per capita visits after the use of smart card have decreased and managed and this itself is one of necessary indexes to demonstrate the improvement in consumption management. *Ghahremani* has indicated in his research, too, that drug consumption results in 65% increase in visit numbers, both in public and private sectors, which were far from worldwide standards and indexes of health world organization. The findings of the mentioned research has ascribed its causes to cultural factors and has emphasized that there should be planning, scrutiny and fundamental changes in the sector who prescribe medicine, in the sector providing medicinal services, in the consumer, contrary to the present research which emphasizes on using technology and update technology and their employment in all dimensions [15]. Also, *Talaee*'s research findings, based on the necessity of using smart card to prevent the increase in consumption and its illogical status, correspond entirely with the present research findings in terms of decrease in the drug consumption and the rate of medicinal credits [10]. *Saleh Zamani* has suggested the specific patients' problems as lack of papers in medical insurance offices for specific patients; their being early used up due to frequent visits and increase in the visit numbers. It was stated in the findings of present research that by using smart card and eliminating old methods such as using papers and prescription's notebook, the number of prescriptions will decrease and violations and problems will diminish to their smallest extent [16]. The findings of present research correspond with the findings of *Gooler* et al. research in terms of medicine and with regard to decrease in the drug consumption rate and in the number of visits [11].

Since it has been emphasized in different researches on the importance of consumed drugs of specific patients due to their high costs and their shortage in the medicine market of the country and the necessity of accessing to these medicines, as such, with the investigation of the findings of this research it would be claimed that using smart card can eliminate problems and diverse misuses through increase in speed and accuracy in controlling consumption, and preventing illegal provision and illogical methods of consuming these medicines by rationing and legalizing the medicine receipt and obliterating human errors. This gives a lot of help to managers and decision makers of health systems while they make policies and design huge strategies in this regard, by using the results of employing these kinds of technologies. Also, the undeniable advantages of this advanced technology in the health section have clearly been demonstrated, with the investigation of the researches done in this field which are reported in their own proper place. The use of this advanced technology has been a right choice due to the fact that it creates an organized and rapid structure in order to access information and the patient's relevant experiences, and as a result, it decreases the cost amount. Its use in the country nationwide could be effective in the provision of better medical and health services and also in decreasing cost, along with eliminating drawbacks and providing enough awareness and training to the medical and health staff and the society's people.

Conclusion

The use of health information smart card, in order to register information relevant to medical and medicinal services, can be an effective step in reducing the per capita drug consumption rate, the medicinal credit rate, medicinal prescriptions and frequency of visits. Therefore, using health information smart card has a vital role in drug consumption management, control and improvement.

References

1- Aghajani M. Analyze and compare hospital information systems. Teb Tazkiyeh J. 2002;10(47):29-36. [Persian]
2- Torabi M, Ramezanghorbani N. The role of information and communication technology on health knowledge of high school students. J Zanjan Univ Med Sci. 2007;15(58):49-56. [Persian]
3- Gemplus.com [homepage on the Internet]. Geraldo: All about smart cards; c1999 [update 2000 Oct 10]. Available from: http://www.gemplus.com/basics/what.html
4- Jones T. The introduction of electronic cash: Smart card technology international. London: Global Projects Group; 2010. Available from: http://www.civilica.com/Paper-SNRLP01-SNRLP01_019.html
5- Grogan D. Smart card in health care: A logical evolution. 3rd ed. Roseville: Rocklin Publication; 2007.
6- Laing Ro. Rational drug use: An unsolved problem. Top Doct. 1990;20(2):101-3.
7- Rozbahani V. Health smart card. Canada: Medical Services Insurance Organization; 2004.
8- Ariayi M. Health smart cards status in e-health system. Kerman Univ Med Sci J. 2001;1(2):18-9. [Persian]
9- Rezae Hacheso P. Comparative study of standards for content, structure and electronic health records: A glossary and selected organizations from the perspective of model for Iran [dissertation]. Tehran: Iran University of Medical Sciences; 2008. [Persian]
10- Rekab Talae P, Safari M. Studying health care cost of patients [dissertation]. Markazi: Markazi MSIO; 2007. [Persian]
11- Inan Gule R, Murat Z, Mustafa S. Smart cards: A specific application in the hospital. J Med Sys. 2006;22(6):46.
12- Briggs J. Smart cards in health: Healthcare computing group. Portsmouth: University of Portsmouth; 2000.
13- Roderick N. Smart cards: The key to trustworthy health information systems. BMJ. 1997;314(7080):573-7.
14- Administration of Drug and Drug Statistics. Drug statistics in 2004. Tehran: Kimidaroo Publication; 2005. [Persian]
15- Ghahremani Saghir H. How to use medication to prevent uncontrolled? Gilan; Congress to Prevent Waste of Resources, 2005. [Persian]
16- Salehozamani M, Rashvand F. The educational needs of patients with MS. MS Soc J. 2008;18(3):25-6. [Persian]