Design of Medical Record Algorithms

Yohwan So*, Seoksoo Kim
Dept. of Computer & Multimedia Engineering
Hannam University, Daejeon, Korea

ABSTRACT

The following suggested algorithm is completed care report for the family medical history. Rn = U Pnj + U Dn^i : (j=1,2,...,j), (i=1,2,...,i), (n=1,2,..,n) The Rn(completed care report) integrates comprehensive patients reports ranging from patient P^2 to P^j including P^1 (oneself) with the doctors' care reports up to the care No. no by i number of doctors (D^1=doctor in charge, $D^{2,3,...i}$=doctors on corporation program.) This approach, since a participation in a family membership effectuates all of family members, can minimize the membership fees, thus enabling inter-family health care on a home doctor basis.

Keywords : *Telemedicine, Information sharing, Family member, Database, Algorithms*

1. INTRODUCTION

As demands for online-based patient care services are expanding, some Internet-based health services have undergone development. Patient medical history system for Internet-based distance health care is a part of e-business and catching the attention of many hospitals that are clamoring to incorporate online and offline services in order to offer a variety of services to clients and to expand client base. This distance medical care services combines online counseling with offline diagnosis and treatment. In general, the system ushers online clients into offline diagnosis. This system brings patients, doctors and pharmacists together online and allows them to interact in the process of diagnosis, prescription and dispensing to the effect of increasing efficiency of medical services and rendering the medical services more user-friendly. Some distance patient care connected with the system in a large-scale hospitals or government's health department is heading for the comprehensive portal medical services.[1,2]

This distance health care system must build a medical portal site and expand client base to be successful in e-business. However, studies or discussion on business and medical aspects of distance health care is just scratching the surface, while no online medical system has gone deep into the essence of the medical practices. To enhance e-business aspect of Internet-based distance health care system, efficient membership management, content services and more advanced patient care and diagnosis solutions intertwining online and offline activities are crucial tasks to service providers.[3,4]

2. A CLINICAL HISTORY RECORDING

The present off-line medical treatment system has many issues that need to be resolved. First issue will be patients distrust in hospitals and medical doctors. This has been brought forth by doctor wrong diagnoses made often, and also by their business-oriented and unkind attitudes, resulting in an inefficient medical treatment. Adding to that, patients have been encountering upon difficulties, in that they must be at a designated time at hospital, costing them considerable expenses for transportations due to time and space restraints. You may have experienced, sometimes, five to six hours waiting and only for five to six minutes treatment at most.[5]

To make things worse further, you may have been given even no treatment unless you are on time as arranged. As a possible way to resolve most of the issues mentioned, an Internet-based remote medical treatment system is applicable beyond time and space restraints. Currently, studies on remote medical systems are underway to develop systems for a resolution of these issues.

The figure 1 displayed protocols on the fee-based medical services connecting online, offline services, doctors and patient care at hospitals. First of all, clients' regular or irregular counseling with doctors via Internet is (A-1), doctors' corporation or questions and answers to follow up on the first counseling is (A-2), recording medical history is (A-3) and sharing medical records of family members is (A-4). [6,7]

On offline level, patient care is (B-1), questions & answers, doctors' corporation, keeping a record of medical history, sharing medical records of family members is (B-2), (B-3) and (B-4), respectively. For emergency services, patient care takes place in (C-1), (C-2) and (C-3) level. Patients care by doctors who are not in the system goes through (D-1), (D-2), (D-3), (D-4) and (D-5). In-patients take (E-1) and (E-2) steps. The system allows doctors to corporate and to share documents and view family members' medical history, when members is subject to emergency care and admitted to hospitals, put under the care of

*Corresponding author. E-mail: artso@hannam.ac.kr
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doctors who are not registered with the system. This open information flow ensures effective treatment, by reducing erroneous diagnosis and introducing timely, precise and low-cost treatment.

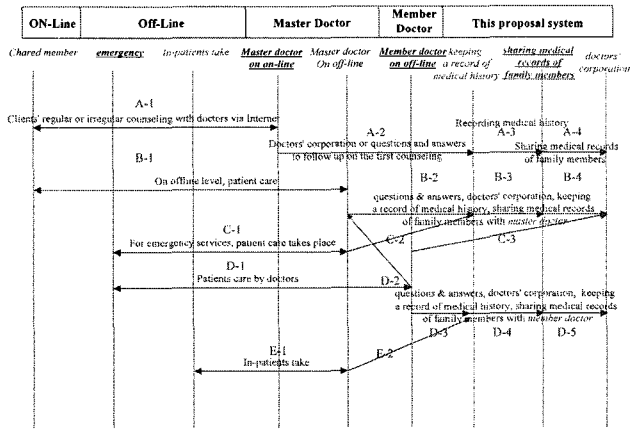

Fig 1. Protocols that connect fee-based medical services

3. THE MEDICAL RECORD ALGORITHMS

The medical record algorithms keep a log of counseling and patient care information for doctors to refer to before making diagnosis and treatment on a come-back patient. The figure 2 showed algorithms and the table 1 and 2 are the knowledge frame to for information.

Clients (patients) may view the recording of counseling and answers from their doctors as well as the results of treatment (RN).

To fulfill the objective of the system-efficient patient care, results of treatment (Rn) completed by doctors will serve as reference material: It goes into the archive of specialists to be used for corporation between doctors or by other doctors seeing patients with similar medical problems.

Writing RN includes description of decease, details of treatment, period of treatment other facts worth recording.

Specialists may view all the information about patients with medical problems they are specialized in.

Information on the archives is for viewing only. No modification is allowed.

Modification is permissible for a certain period during a treatment period.

```
P_Insert_Module(RN)
{       if( RN == "" )    {
                P1 = Write_Module();
                return P1; }
        else    {
                Show(RN);
                PN = Write_Module();
                RPN = RN + PN;
                return RPN;
        } }
D_Insert_Module(PN, RN)
{       if( RN == "" )    {
                Show(PN);
                D1 = Write_Module();
                R = PN + D1;
                return R;  }
        else    {
                Show(PN, RN);
                DN = Write_Module();
                RDN = RD + DN;
                R = PN + RDN;
                return R;  } }
```

Fig 2. Algorithms that connect doctor-patient information

Table 1. Knowledge Framework interconnecting databases between doctors and patients

	T1	T2	T3	.....	TN
Patient	P1	RP2=R1+ P2	RP3=R2+ P3	.....	RPN=RN−1+ PN
Doctor	D1	RD2=R1+ D2	RD3=R2+ D3	.....	RDN=RN−1+ DN
Result	R1=P1+ D1	R2=RP2+ RD2	R3=RP3+ RD3	.....	RN=RPN+ RDN

Table 2 Knowledge Framework for each respective disease

	T1			.....	TN		
Patient		....	P	.....	P^{n1}	.....	P^{nn}
	$P1 = P11+...+P1n$			.....	$PN = P^{n1}+...+ P^{nn}$		
Doctor	D^{11}	.....	D^{1n}	.....	D^{n1}	.....	D^{nn}
	$D1 = D^{11}+....+ D^{1n}$			.....	$DN = D^{n1}+....+ D^{nn}$		
Result	T^{11}	...	T^{1n}	.....	T^{n1}	...	T^{nn}
	$R1 = T^{11}+...+ T^{1n}$			.....	$RN = T^{n1}+...+ T^{nn}$		

* The comment of table 1 and table 2

- T1: First disease in a relevant medical field until a temporary treatment is completed.
- P1: A patients first consultations.
- D1: Diagnosis relative to first disease by a primary doctor
- R1: Relevant treatment results, where the combined results of P1+D1 are included.
- T11: First inter-reaction relative to first disease
- T1n: nth inter-reaction relative to first disease
- P11: First consultations relative to first patient disease
- P1n: nth doctors consultations relative to first patient disease
- D11: First Treatment relative to first patient disease
- D1n: nth doctors treatment relative to first patient disease
- RP2=R1+P2: Doctors consultations relative to 2nd patient disease, where the results of previous disease, and the consultations relative to present disease are included.
- RD2=R1+D2: Primary doctors treatments relative to 2nd disease, where the results of previous disorder, and the diagnosis and treatment relative to present disease

are included.
- R2=RP2+RD2: Treatment results relative to 2nd patient disease, where the consultations and treatments with a patient are arranged as final.

4. ALGORITHMS FOR FAMILY MEDICAL HISTORY

The family medical history algorithms compile the medical history of all the family members to help doctors identify genetic health problems that may run in a family, corporate with other doctors, share counseling and medical share information for efficient treatment. The following the table 3 is the knowledge frame for family medical history algorithms.
$F^4 = (P4^2 + P4^3 + P4^4)$: F is comprehensive information that covers decease that have struck the family and treatment they have received. As an example, the treatment 4 aims at treating the present decease. F comes in when a new event in the family medical history arises. A head specialist is responsible for writing events and all the specialists may use them for doctor-to-doctor corporation (between doctors).
In other words, $F^{ij} = U\ Pn^j : (j=1,2,...,j)$.
$P4^1$: A patient is receiving 4th counseling.
$P2^{23}$ indicates the present status of family member 3, when the patient is getting 2nd session of care for a present decease. If family member 3 has no medical problem at present, $P2^{23}$ contains no information. Reversely, this factor has to be filled out when a patient has decease.
$P2 = P2^1 + F^2$: comprehensive information that relates a patient to his family (F:Family) in light of genetic decease, when a patient is in the 2nd session of care for his/her present illness. This indicator leads up to the final diagnosis material, after taking into consideration of all the diagnosis from doctors who participated in doctor-to-doctor corporation (between doctors).
The form of latest care and results go on R1(R2,...,Rn), a composite index that includes diagnosis from a master and other specialists. .
The above rule applies to second care. As a rule of thumb, doctors take into account the results of the first care (R1) for their second care.
This rule goes on for all the subsequent care (3,...n).
Summary of the results like RPn, Rn should be done by a master specialist. The summary will be used for next care.
Patients may view their personal counseling with doctors from database, doctors' answers to their questions as well as the results of treatment (Rn) composed by doctors.
As the objective of this system is to deliver efficient care to patients, the report of treatment result goes to the archives of a specialist who wrote the report, doctors on corporation program and other specialists taking care of the patients with the same decease.
Rn includes description of decease, details of treatment, period of treatment and other facts worth noting.
A specialist may view all the information about patients who have medical problems he/she is specialized in.
Previous records are not available for modification. They are for viewing only.
Modification is possible within 10 days of treatment to ensure accuracy of recording.
Master specialist can view all the information on patient counseling and diagnosis of specialists. As a moderator between doctors and as a guide, master specialist performs the final diagnosis for the sake of efficient patient care.

Table 3. Simulation table for family medical history

	T1				
	t1	t2	t3	.....	tn
Patient 1	$P1^1$	$P2^1=R1+P^{21}$	$P3^1=R2+P^{31}$	.....	$Pn^1=R(n-1)+P^{n1}$
Family 2	$P1^2$	$P2^2=R1+P^{22}$	$P3^1=R2+P^{32}$	.....	$Pn^2=R(n-1)+P^{n2}$
family 3	$P1^3$	$P2^3=R1+P^{23}$	$P3^1=R2+P^{33}$	.....	$Pn^3=R(n-1)+P^{n3}$
family 4	$P1^4$	$P2^4=R1+P^{24}$	$P3^1=R2+P^{34}$	.....	$Pn^4=R(n-1)+P^{n4}$
Doctor 1 (Master)	$D1^1$	$D2^1=R1+D^{21}+CD^2$	$D3^1=R2+D^{31}+CD^3$	.....	$Dn^1=R(n-1)+D^{n1}+CD^n$
Doctor 2		$D2^2=R1+D^{22}+CD^2$	$D3^2=R2+D^{32}+CD^3$	.....	$Dn^2=0$
Doctor 3			$D3^3=R2+D^{33}+CD^3$	.....	$Dn^3=R(n-1)+D^{n3}+CD^n$
Result	$R1=P1+D1^1$	$R2=\overset{4}{\underset{1}{U}} P2+\overset{2}{\underset{1}{U}} D2$	$R3=\overset{4}{\underset{1}{U}} P3+\overset{3}{\underset{1}{U}} D3$	.....	$Rn=\overset{4}{\underset{1}{U}} Pn+\overset{n}{\underset{1}{U}} Dn$

* The comment of table 3

* Dn^i : Doctor i's diagnosis on doctor-to-doctor corporation No. n
Dni = R(n-1) + Dni + CDn : (i=1,2,...,i), (n=1,2,..,n)
"n" refers to 1 ~ n care on the same decease. "i" is doctor "1 ~ i." In other words, this formula updates the present situation to the last diagnosis material (R(n-1)) and the add the materials coming out of corporation between doctors (CD^n).

* Pn^j : (j=1,2,...,j), (n=1,2,..,n)
"n" refers to care No. 1 ~ n for the same decease. (j=1) is a patient and (j=2,3,...,j) is other family members suffering from the same decease.

* Rn: The completed care report
$Rn = U\ \ Pnj + U\ Dn^i$: (j=1,2,...,j), (i=1,2,...,i), (n=1,2,..,n)
The completed care report integrates comprehensive patients reports ranging from patient P^2 to P^j including P^1 (oneself) with the doctors' care reports up to the care No. no by i number of doctors (D^1=doctor in charge, $D^{2,3,...i}$=doctors on corporation program.)

* CD^n : (n=1,2,..,n): Corporation between doctors on care No. n

5. CONCLUSIONS

This paper's suggestion is about hereditary facts between family members. Diagnosing patients from the point of patients temporary conditions, and so performing primitive examinations and treatments, can lead not only to frequent wrong diagnoses, and to huge medical expenses and times to the patients, but even to critical situation of patients or taking lives away.
The following suggested define is completed care report for the family medical history.
$Rn = U\ \ Pnj + U\ Dn^i$: (j=1,2,...,j), (i=1,2,...,i), (n=1,2,..,n)
The Rn(completed care report) integrates comprehensive patients reports ranging from patient P^2 to P^j including P^1

(oneself) with the doctors' care reports up to the care No. no by i number of doctors (D^1=doctor in charge, $D^{2,3,\cdots i}$=doctors on corporation program.)

As a means to cut these cases down to a minimum, sharing medical treatment information between family members is suggested. This approach makes possible understanding physical constitution and environment between family members, and can result in bringing a faster treatment effect if some family member suffers from a similar disease. This approach, since a participation in a family membership effectuates all of family members, can minimize the membership fees, thus enabling inter-family health care on a home doctor basis.

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Yohwan So

Received a B.F.A. degree in Computer Graphic from Hong-Ik University 1992, and M.F.A. degree in Computer Graphic from Hong-Ik University 1995, and M.S. degree in Communication engineering from New York Institute of Technology 1998.

In 2003 he joined the faculty of Hannam University where he is currently a professor in Department of Computer & Multimedia Engineering. His research interests include 3D Animation, Virtual Reality, and Computer Graphics. He is a Member of KCA, KSSCAS, KMS, KSBDA, KSDS, and DCS.

Seoksoo Kim

Received a B.S. degree in computer engineering from Kyungnam University 1989, and M.S. degree in Information engineering from Sungkyun-kwan University 1991 and Ph D. degree in Information engineering from Sungkyunkwan University 2002.

In 2003 he joined the faculty of Hannam University where he is currently a professor in Department of Computer & Multimedia Engineering. His research interests include Multimedia Communication systems, Distance learning, Multimedia Authoring, Telemedicine, Multimedia Programming, Computer Networking. Information Security. He is a Member of KCA, KICS, KIMICS, KIPS, KMS, and DCS.