2001

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2001   6

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2000   9   7

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EMR   ,   ,

. EKG, PFT

Scan   .

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.   Likert 5

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4.2   ,   4.3

. Data

4.29

2.7   2.9

.
4.0

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3.9   3.7

3.5 ,   3.3

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:   (EMR),   ,

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. 94 "   "

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95

(Telemedicine)

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. 96

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(EMR)

. ′97   2

'DEMIS'[1] (Defense Medical Information System)   .

2000   2

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'00   9   18

2001   2005

.

(DEMIS)

,   ,

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,   ,

(Paperless medical record)   .

(EMR)

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'00   9   18   (EMR)

(DEMIS)   .

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1)   DEMIS

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2.

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, (DEMIS) .

, (EMR) ·

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(,

2000).

1991

(national academy of science)

computer-based patient records: an essential technology of health care

,

1992   CPRI(Computer-based Patient Records Institute)

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(Zolot, 1999).

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2).

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3).

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EMR

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,

(, 1996).

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2) North Carolina Code. Medicine and Allied Occupations. § 90-412.
3) Nevada Code. Professions, Occupations and Businesses. NRS 629.021, NRS 630.020.

EMR   (, 1996).

          ,   (data capture function)   .

                                                                        .

          ,   (progression note)   ,

                                    .   (digital image

processing, DIP)   , EMR   DIP

                                                                  .

                                                                                      .

                                                                                      .

                              (authentication)   .

          ,   (storage function)   .

                              .   (EMR)

                                                                                              .

                              (back up)   2   , 3

                                                                  .

          ,   (information processing function)   .

                                                                                      .

                                                                                      (drug-drug

interaction)

                                                                  .

          ,   (information communication function)   .

- 6 -

(EMR)

,

.   'Read code 10'

'ICD-10'   .

,   (security function)   .

.

,   (information presentation function)   .

.

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2.

EPR, EMR, CPR, EHR   4

(, 1997).

. EPR(Electronic Patient Record)

EPR   EMR

,

. Patient Archiving & Documentation System (PADS)   EPR

.

. EMR(Electronic Medical Record)

, CPR

.

CPR

.

. CPR(Computer-based Patient Record)

CPR

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. CPR

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. EHR(Electronic Health Record)

CPR   ,

·   ,

                                           EHR

(, 1997).

3.   ·

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               1990

                                                  1994   S

                    (order communication system)

                                                  .   1995

               I   .

               EMR

                                        . 1998   J

                                                               .

                    ,

                                        .   D   2000

       .

                    .

(

, 1999).

1998   230

(medical record management system)

1998   52.6%   121

(, 1999).

1999

19   11   , 30

24

80%   (, 1999).

CPR   .

EPR   EMR

DB   .

900   I   D   EMR

500   J

EMR

EMR   CPR

.

CPR

1997   1999

, 2000

,   ,

.

CPR   , CPR

(, 2000).

‘01   6   (EMR)

I   D

J

,

.

•

1960

1991

GAO(General Accounting Office)

[4],   CPR

(CSTB, 1997).

CPR

COSTAR(Computer Stored Ambulatory Record), RMRS(Regenstrief Medical

Record System), TMR(The Medical Record)   (, 1999).

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4) GAO.MEDICAL ADP SYSTEMS ; Automated Medical Records Hold Promise
   to Improve Patient Care. General Accounting Office, 1991

COSTAR　　1968

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　.

　　　　　　　　　　　　　　　　　　　　　1978　　　　　COSTAR5

　　　　,　　　　　　　　　　　　　　　　　　　　　　. COSTAR

　　　　　　　　　　　　　　　　　　　.

　　　　　　　　　　　　　　　　,　　　　　　,　　　,　　　,　　　　　,

　　　　　　　　　　　　　　　　.

RMRS　　　　　　　　　　　　　　　　　　　　　1974

　　　　　　　　　. 1988　　　　　　　　　　25

　　　　2500

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　　　　　　　　　　　　　　　　　　　.

TMR　　1975

　　　　　　　　　　　　　　　.　　　　　　,

　　　　　　　　　　　　　　　　　X-ray

　　　　　　　　　　　TMR

. 1989　　　　　　　TMR　　　　　25

　　　　　.

　　　UCSF(University of California San Francisco)　　　1985

　　1988　　　　6　　　　　　　　　　　　　STOR(Summary Time

Oriented   Record),   1983

OMR(Online Medical Record)   ,

                              . 1995   56

                      ,

1995   1   70   2000   15

                        (CSTB, 1997).

                1999   Deloitte & touche healthcare centre of excellience

belgium   ,   ,   ,

      ,   ,   ,   ,   9   69   80%   55

(european commission-directorate general information society, 2000).

        1.   9

							3	
	10	11	8	11	10	7	12	69	
CPR functions									
Medical Record Registry									
Record Registry ( )	10	11	6	4	10	5	8	54	3
Archiving ( )	10	9	4	3	10	1	4	41	2
Clinical Patient Record									
(Registraton of clinical data)	10	9	3	3	6	3	8	42	15
(Order entry-Referral)	10	3	3	2	5	0	8	31	7
(Capture of results & portocols)	7	6	1	2	5	1	9	31	7
(Electronic prscription)	10	5	2	1	4	0	7	29	22
(Conclusions, discharge & referral)	10	8	3	1	5	1	7	35	8
EDI Interchange interface	10	6	2	0	3	3	6	30	3

,   ,

,   ,   ,   ,   .

, EDI   .

                78%,   59%,   61%,

        45%,   45%,   42%,

·   51%, EDI   43%

(1).

4.

        ,

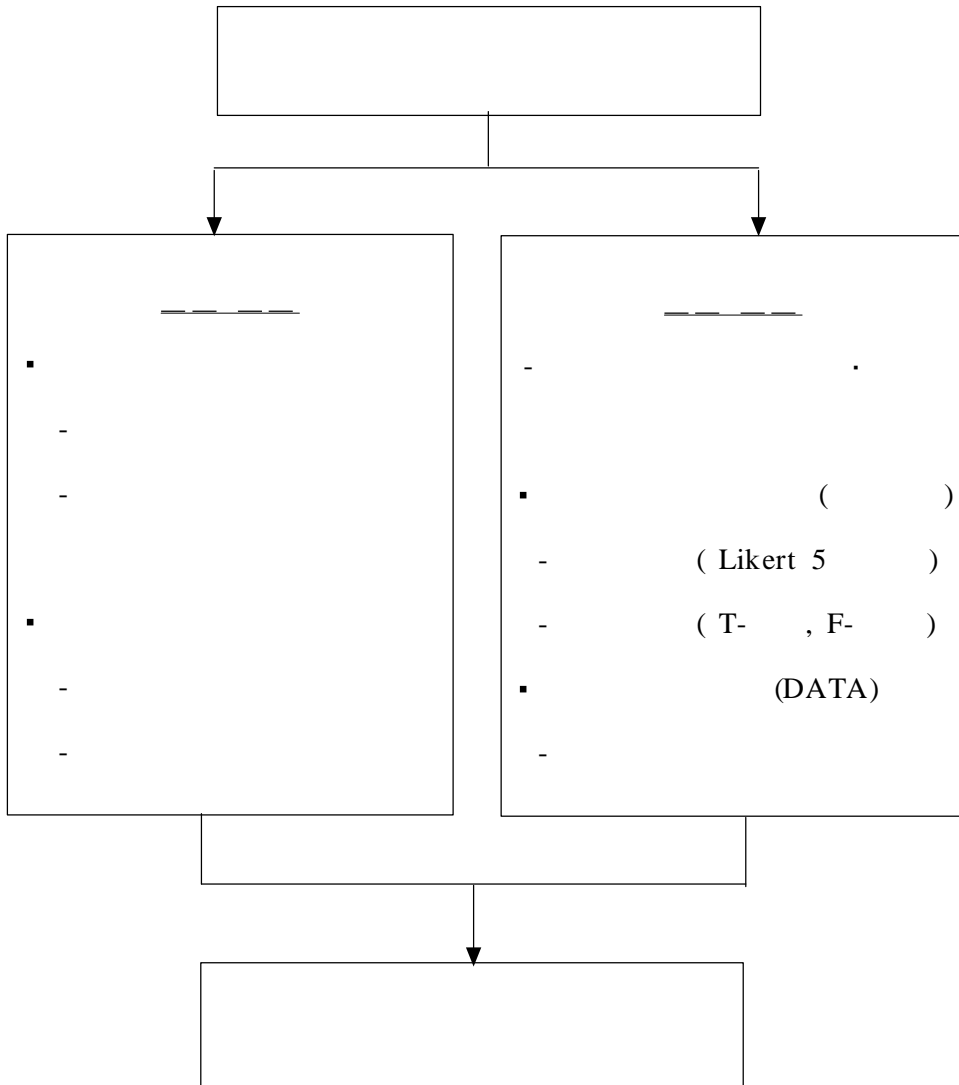   .

                                            .   ,

                ,

                              .

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.   <   2 >   <   3 >

(6 , 1998).

(OCS)   (EMR)

.   OCS

(paper-less medical record)

2.

	(EMR)	(OCS)
	1,2,3	

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EMR

7

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	(, , ,)	
	( )	
	( )	( )

EMR

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│                                 │
└─────────────────────────────────┘
        │
    ┌───┴────────────────────┐
    ▼                        ▼
┌──────────────────┐  ┌──────────────────────────┐
│   ——  ——         │  │      ——  ——              │
│                  │  │                          │
│ ▪                │  │ -                    .    │
│                  │  │                          │
│   -              │  │                          │
│                  │  │ ▪              (      )   │
│   -              │  │   -      ( Likert 5    )  │
│                  │  │   -      ( T-    , F-  )  │
│ ▪                │  │ ▪              (DATA)     │
│                  │  │                          │
│   -              │  │ -                        │
│                  │  │                          │
│   -              │  │                          │
└──────────────────┘  └──────────────────────────┘
        │                        │
        └────────────┬───────────┘
                     ▼
        ┌─────────────────────────┐
        │                         │
        │                         │
        └─────────────────────────┘
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1.

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Likert 5

T-   F-   .

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2.

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(DEMIS)   ,   (Data)

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46

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2= , 3= , 4= , 5=) .

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1998 2000 9

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2000 9 18 2001 6

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4 25 120 28 116 .

SPSS WIN8.0   .

Likert   5   (FREQUENCY)

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T   ,   F

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24   ′00   9   18

EMR   20   (data)   .

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1.

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EMR

<   4 >   .

4.

		J	I
	1000	500	900
Server	IBM S80	SUN ENT-5000	IBM S80
Client	Pentium III 346 17' monitor	Pentium III 650 21' monitor	Pentium 700 17', 19' monitor
OS( )	UNIX	UNIX	UNIX
LAN	ATM-LAN	ATM-LAN	FDDI
Middleware	Tuxedo	Forte	
DBMS	Oracle	Oracle	CHCHE
EMR	PACS	ER/ OR/ ICU	
EIS	I/ II		
PACS/ IMACS	(OO)	(OO)	(OO)
	3	3	2
	SDS	KCC / ( )	( )
	100%	100%	100%
	0%	100%	0%
Interface	0%	0%	0%

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(   ),   ,   ,   ,

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S80 Primary DB Server(ADAM) 　Secondary DB

Server(EVE) 2 　　　　　　　Clustering S/W, 　HACMP solution(　　2

)

365 　　　　　/ 　　　　　　　　　　　　．　　　　　DISK

DB 　　　　　　　　　　　　　　　RAID O+1(　　　　　2

: Mirroring 　)

TSM

S/ W   On-Line

              .   (DEMIS)   ＜   3 ＞   UNIX

(DB   )   PC   ATM Backbone

         .

Primary server
DBMS
DBMS
7F
6F
5F
4F
3F
3F
Secondary server
2F전산실(1F 전면부)
10BT-FL   보장구
2F(2F 전면부)
10BT-FL   사병통합막사
2F(1,2 F 후반부 및 BT)
Switching HUB
사령부
이동지원대
Power HUB   복지회관

3.

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, DBMS,

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EMR   I

J   , D   ·   I

D
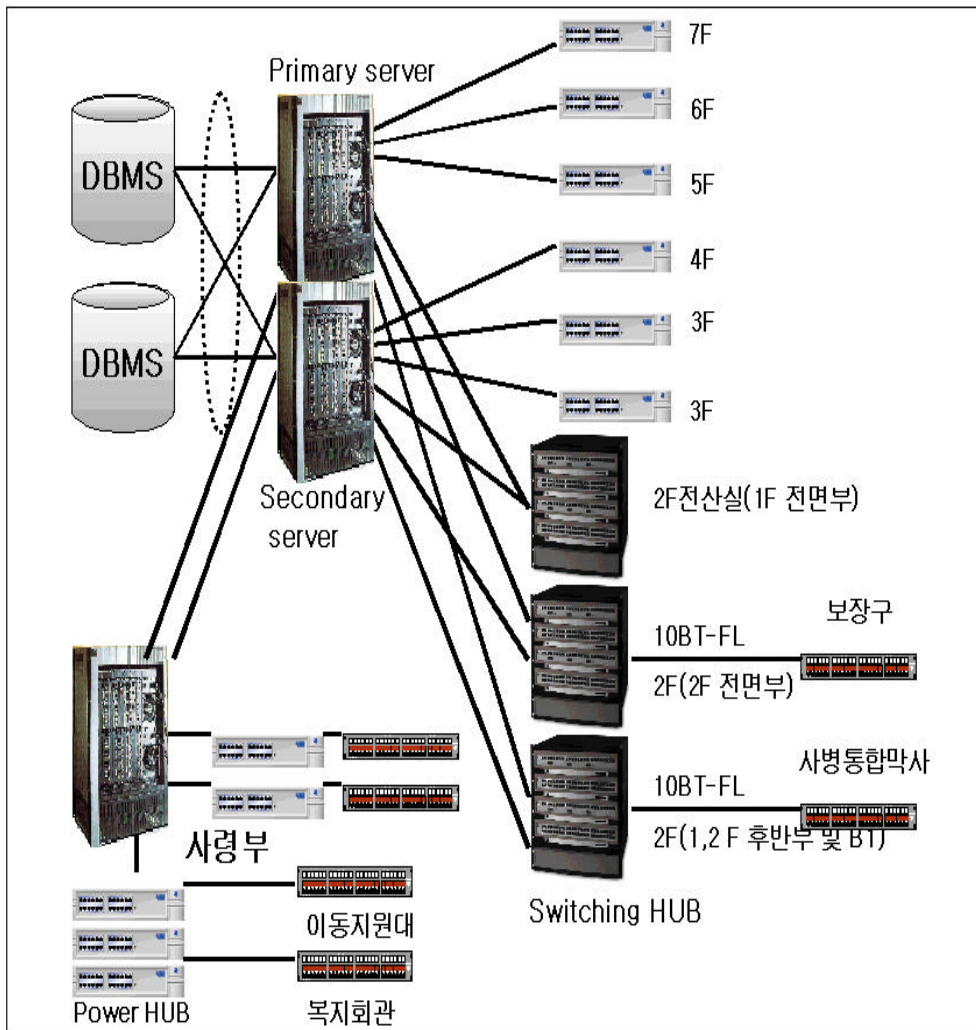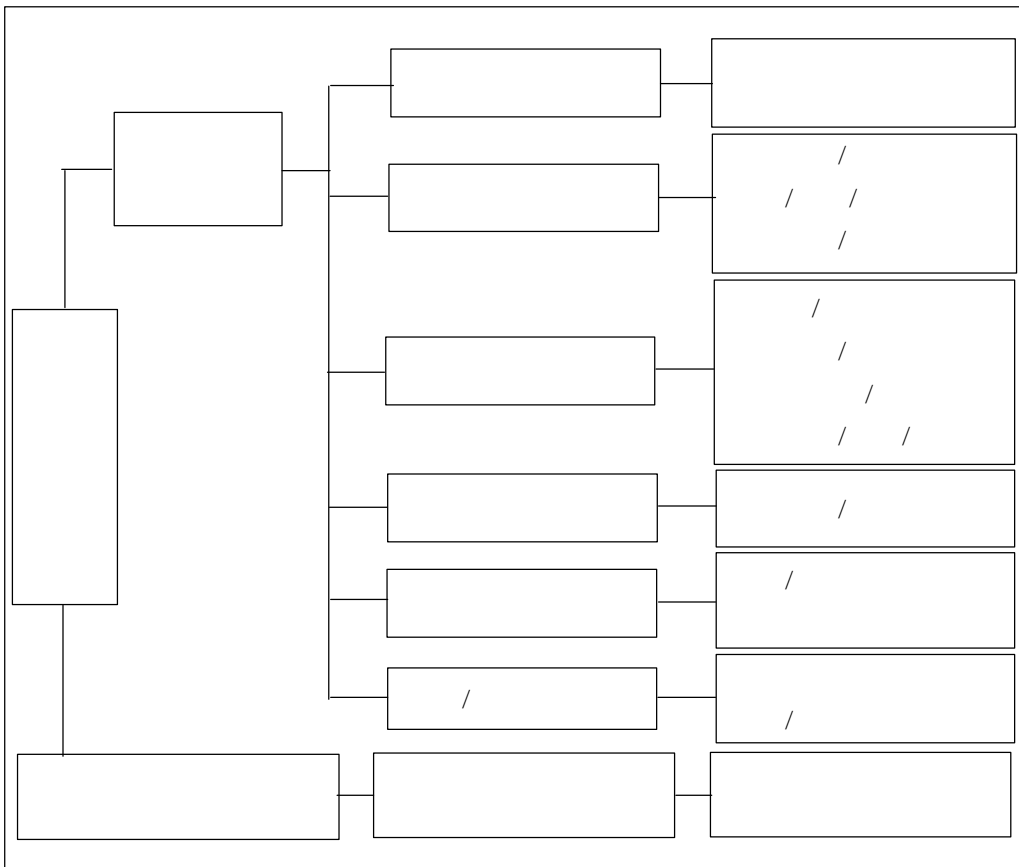
·   J

,

(Scan)

5.

		J	I
EMR	PACS	ER/ OR/ ICU	
	1000	500	900
	EMR	EMR	EMR
	EMR	EMR	OCS
	EMR	Scan	EMR
	EMR	Scan	OCS
	EMR	Scan	OCS
(/)			
PACS/ IMACS	(OO)	(OO)	(OO)
	100%	100%	100%
Interface	0%	100%	0%
	0%	0%	0%
			( )

,   /   ,

EMR   .   J

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                                          .   J   I

                          <   5 >

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- ▪   (OCS)

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            EKG, PFT,   .

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                  Scan   .

- ▪   Scan   .

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, '00 9 (DEMIS)

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Order( )

5. ( )

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<   6 >

· Chart Database
· Patient Medical Record DB
          Chart ·

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6.

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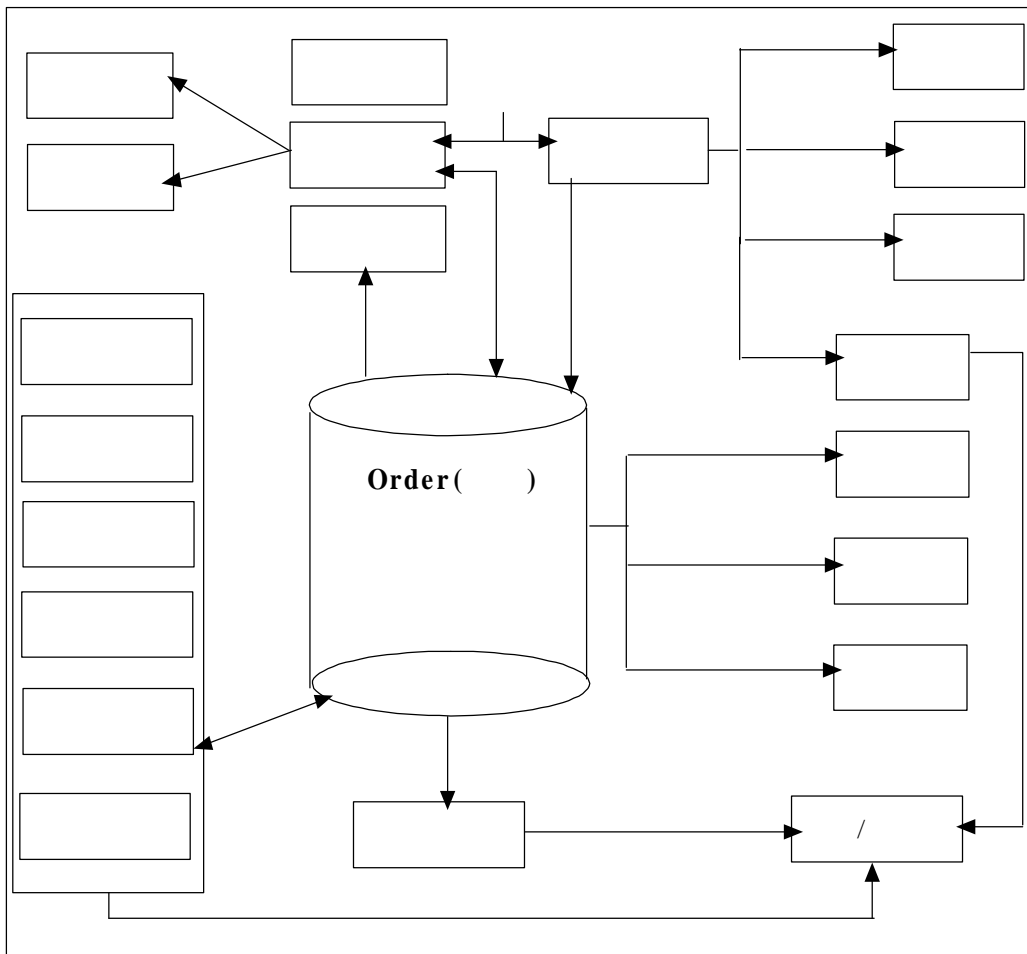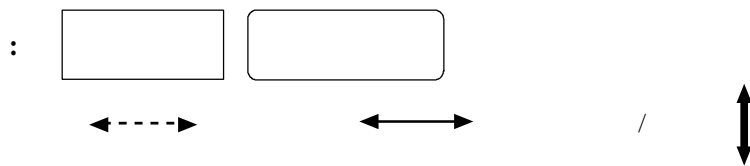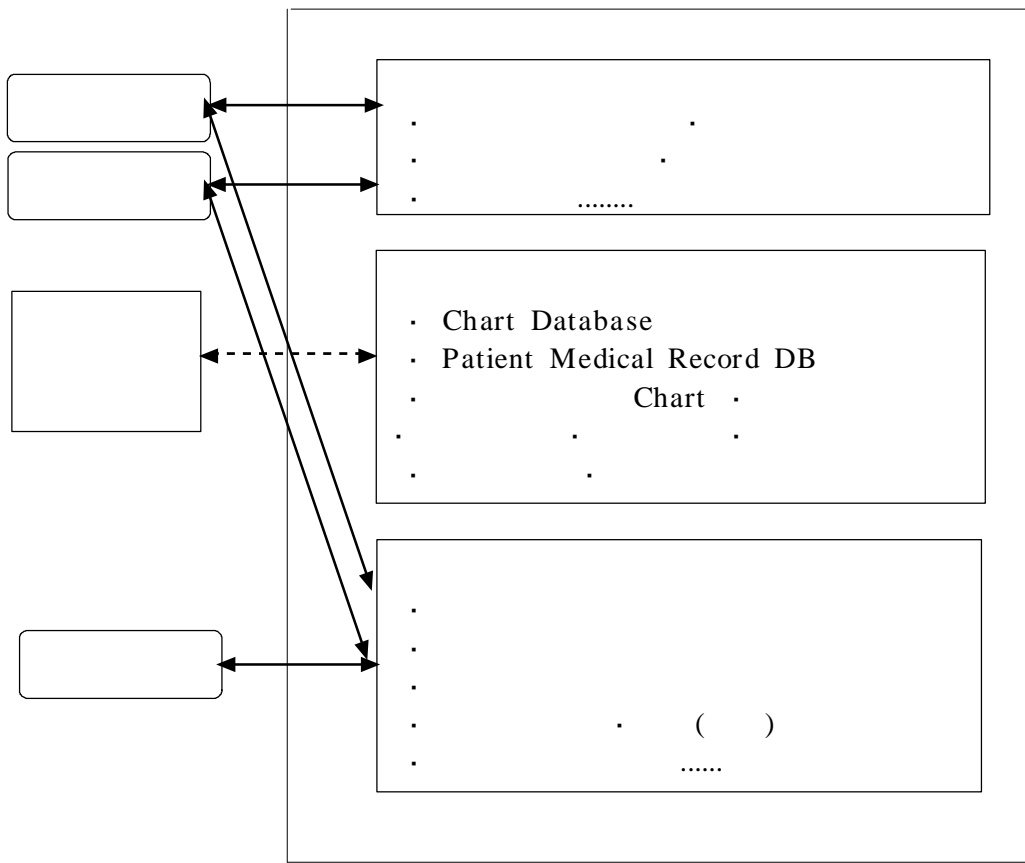
(EMR : Electronic Medical Records)

(CPR : Computer-based Patient Records)

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,   (   )   .

,   (Fact)   ,

(Rationale)

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(Link)   ,

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EMR

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(Paperless Medical Care)　　　　　　　　　.

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/ DB

DB

DB   DB   DB

DB

DB
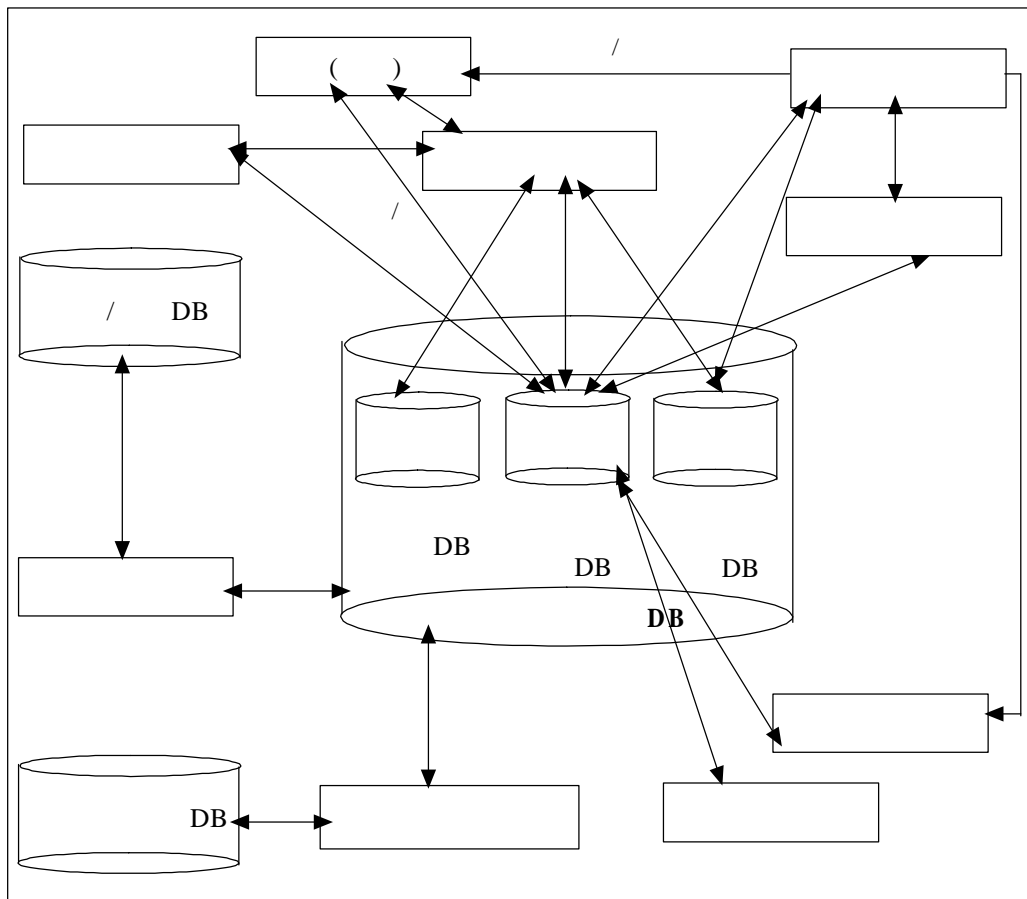
7.

(Order Communication System)

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OCS   EMR

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(scan)

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1)

( ) S/ W(WatchLog)

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) Client User WatchLog S/ W

(Lan Card Mac

address, IP address).

) WatchLog S/ W

S/ W (: Maxium 10).

) , ,

Monitoring

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2)

(DEMIS) ,

) : DEMIS (

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Set

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6.

, , , - , note,	, , , , note, note ( )	Scan
ICU note( )	ICU note( )	
/	/	
OP record ( )	OP record ( )	
( ) X-ray		
24 I/O	24 I/O	Scan ,
	(Caution)	Scan

´

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´ DB

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ICD-10

ICD-9CM   .   ,   ,   ,

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7>   .

7.

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	△		
	△		
	△		
	△		
	△		
	△		CP
	△		
○ △ (2			) .

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8.

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▪	▪
▪ (1).	▪ (2)
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-	- / -
▪	
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-	- - /

8.　　　　　　　　　　　(　)

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- 1

- 1

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- 　　　　　　　1　　　　　　　　　　(　)

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4.

(reliability)

Cronbach's alpha   alpha( )

(internal consistency)

< 9>.

9.

	Cronbach's
	0.86
	0.68
	0.90
	0.78
	0.88
	0.76
	0.69
	0.84
	0.83
	0.82
	0.81
	0.80
	0.76

·   ·

·   4

Likert 5   ·   ,   ,

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1)

                                                                                    4.2

                                                                    .

3.9   ′

                        ′   2.5

                                                                            .
                                        ′   ′

            4.1   ,   3.8   ,   3.9

                                                                            <   10>.

        10.

	( )		
▪	116	4.2	0.8
.			
▪	115	2.8	1.3
.			
▪	116	2.8	1.1
.			
▪	116	2.9	0.9
.			

10.　　　　　　　　　　　　　　　　　(　)

	( )		
■	28	2.2	1.0
■	27	3.9	0.8
■	27	2.8	1.0
■	115	2.1	0.9
■	115	2.5	1.1
■ 　　　　, 　　　,	116	4.1	0.9
■ 　, 　　,	115	3.8	1.1
■	116	3.9	0.9
■ 　　　　(Process)	116	3.8	0.9
■	116	3.8	0.8

2)　　　(Data)

　　　　　　　　　　　　　　　　　　　　　′

　　　　　　　　　　　　　′　　　4.3

　　　　　　　　　　　　　　3.9

2.8   2.9

.′

′   4.1

<   11>.

11.

		( )		
▪		116	4.3	0.7
▪	.. , EKG Scan	116	2.9	0.9
▪	.	116	3.9	0.8
▪	.	28	2.8	0.8
▪	.	28	2.9	1.1
▪	.	116	4.1	0.8

3)

,

,   .

4.0   .

3.5   , QA

12.

	( )		
▪	116	3.9	0.8
▪ .	116	4.1	0.8
▪ .	116	3.5	0.9
▪ QA .	116	3.5	0.9
▪ ( ) .	116	3.6	0.7
▪ .	116	3.3	0.9
▪ .	116	3.0	1.1

4)

´ ´ 4.0

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, ´

´ 2.8

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110   26 ,

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2.6   2.4 .

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< 13>.

13.

		( )		
▪ .	116	4.0	0.6
▪	116	3.2	0.9
▪ .	116	3.3	0.9
▪ .	116	3.2	0.7
▪ , , , Esc .	116	2.9	0.8
▪ (DEMIS) . - ?	110	3.2	0.9
▪ (DEMIS) . - ?	110	2.6	0.9
▪ (DEMIS) . - ?	108	2.5	0.7
▪ (DEMIS) .- ?	102	3.0	0.9

・　　　　　　　　　　　　　　　　　　・

　1)

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　　　，

　　・

　　　　　　　　　　　　　　・　　　　p<.001

　　<　14>.

　　14.

			F
29	3.1	0.5	1.986
23	3.4	0.5	
14	3.3	0.6	
16	3.2	0.4	
2	2.8	0.3	
5	2.8	0.8	
20	3.2	0.3	
4	3.1	0.6	
3	2.5	0.9	
Total	116	3.2	0.5	

14.   (   )

				F
	29	2.1	0.8	1.598
	23	2.1	0.7	
	14	2.4	0.9	
	16	2.7	0.7	
	2	2.1	0.7	
	5	3.0	0.0	
	20	2.3	0.4	
	4	2.5	0.4	
	3	2.8	0.8	
Total	116	2.3	0.7	
	29	2.1	0.8	8.493
	23	2.1	0.7	***
	14	2.4	0.9	
	16	2.7	0.7	
	2	2.1	0.7	
	5	2.9	0.1	
	20	2.3	0.4	
	4	2.5	0.4	
	3	2.8	0.8	
Total	116	2.3	0.7	
	29	2.1	0.8	1.806
	23	2.1	0.7	
	14	2.4	0.9	
	16	2.7	0.7	
	2	2.1	0.7	
	5	2.9	0.3	
	20	2.6	0.4	
	4	2.5	0.4	
	3	2.8	0.8	
Total	116	2.9	0.7	

***p＜.001

2)

.

.

p<.05   .

<   15>.

15.

				t
	26	3.9	0.7	-1.247
	80	4.1	0.7	
	26	3.5	0.7	-.960
	80	3.6	0.8	
	26	3.2	1.0	-.045
	80	3.2	0.8	
	26	3.5	0.6	-.918
	80	3.6	0.6	

3)

<   16 >

.

.

　　　　　3.86　　　　　　　　　3.67　　　　　　　　　　　　　　　p<.05

　　　　　　　　　　　　　　　　.

　　　　　　　　　　　　　　　　　　　　.

16 .

				t
	30	3.1	0.5	-.774
	86	3.2	0.5	
	30	2.4	0.6	1.180
	86	2.2	0.8	
	30	4.0	0.9	.545
	86	3.9	0.5	
	30	3.2	0.3	.731
	86	3.1	0.4	

17.

				t
	30	3.9	0.5	1.944*
	86	3.7	0.5	
	30	4.2	0.9	1.135
	86	4.0	0.7	
	30	4.0	0.6	1.624
	86	3.8	0.5	

.   .

.

18.

				t
	30	3.7	0.5	.227
	86	4.0	0.7	
	30	4.2	0.9	1.085
	86	3.5	0.7	
	30	4.0	0.6	1.980
	86	3.1	0.8	
	30	4.0	0.6	1.388
	86	3.5	0.5	

<   19 >

p<.05

.

.

p<.001

.   ,

.

19.

				t
	30	3.9	0.5	-2.260*
	86	3.6	0.5	
	30	4.2	0.9	-4.304***
	86	3.5	0.9	
	30	4.0	0.6	.364
	86	3.3	0.6	
	30	4.0	0.6	-3.111**
	85	3.0	0.7	
	30	4.0	0.6	-4.199***
	86	3.4	0.4	

*p<.05 **p<.01 ***p<.001

<   20 >

1-2

(p<.1).

2.3

3.1

.

20.

	( )			F
1	15	3.5	0.5	1.961
2	5	3.6	0.5	
3	2	2.9	0.2	
5	6	3.1	0.7	
6	21	3.1	0.5	
7	67	3.2	0.5	
Total	116	3.2	0.5	
1	15	2.5	0.6	.538
2	5	2.1	0.2	
3	2	2.5	0.7	
5	6	2.5	1.1	
6	21	2.3	0.7	
7	67	2.2	0.7	
Total	116	2.3	0.7	
1	15	3.9	0.5	.153
2	5	4.1	0.5	
3	2	4.0	0.0	
5	6	3.8	0.6	
6	21	3.9	0.8	
7	67	3.9	0.6	
Total	116	3.9	0.6	
1	15	3.9	0.5	.684
2	5	4.1	0.5	
3	2	4.0	0.0	
5	6	3.2	0.6	
6	21	3.9	0.8	
7	67	3.9	0.6	
Total	116	3.9	0.6	

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21.

				F
1	15	3.6	0.5	1.229
2	5	3.9	0.4	
3	2	3.3	0.5	
5	6	3.4	0.5	
6	21	3.7	0.4	
7	67	3.8	0.5	
Total	116	3.7	0.5	
1	15	4.0	0.9	1.457
2	5	4.4	0.9	
3	2	4.0	0.0	
5	6	3.7	0.5	
6	21	3.8	0.8	
7	67	4.2	0.8	
Total	116	4.1	0.8	
1	15	3.8	0.5	1.632
2	5	4.2	0.6	
3	2	3.7	0.2	
5	6	3.6	0.5	
6	21	3.7	0.5	
7	67	4.0	0.6	
Total	116	3.9	0.6	

< 표 22 >

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1	15	4.1	0.6	.520
2	5	4.3	0.7	
3	2	3.8	0.4	
5	6	3.8	1.1	
6	21	4.0	0.7	
7	67	4.0	0.7	
Total	116	4.0	0.7	
1	15	3.9	0.6	2.884 *
2	5	4.1	0.6	
3	2	3.0	0.0	
5	6	2.9	1.3	
6	21	4.0	0.8	
7	67	3.6	0.7	
Total	116	3.6	0.7	
1	15	3.4	0.8	.600
2	5	3.2	0.6	
3	2	2.8	0.4	
5	6	3.2	0.8	
6	21	3.0	0.8	
7	67	3.1	0.9	
Total	116	3.1	0.8	
1	15	3.8	0.4	1.597
2	5	3.9	0.5	
3	2	3.2	0.0	
5	6	3.3	0.9	
6	21	3.4	0.6	
7	67	3.6	0.6	
Total	116	3.6	.06	

*p<.05

23.

	( )			F
1	15	3.4	0.5	.253
2	5	3.7	0.3	
3	2	3.6	0.2	
5	6	3.5	0.7	
6	21	3.5	0.6	
7	67	3.5	0.5	
Total	116	3.5	0.5	
1	15	3.5	0.8	.342
2	5	3.2	0.8	
3	2	4.0	0.0	
5	6	3.3	1.2	
6	21	3.2	0.8	
7	67	3.3	1.0	
Total	116	3.3	0.9	
1	15	3.1	0.5	2.663*
2	5	2.9	0.3	
3	2	2.8	0.2	
5	6	3.3	0.9	
6	21	3.1	0.4	
7	67	3.4	0.6	
Total	116	3.2	0.6	
1	15	3.2	0.3	.193
2	5	3.2	0.3	
3	2	3.3	0.1	
5	6	3.3	0.6	
6	21	3.2	0.4	
7	67	3.3	0.4	
Total	116	3.3	0.4	

*p<.05

24.

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	19	3.2	0.6	.130
	97	3.2	0.5	
	19	2.4	0.7	.735
	97	2.3	0.7	
	19	3.6	0.8	-2.071*
	97	4.0	0.6	
	19	3.1	0.4	-.618
	97	3.1	0.4	
	19	3.7	0.5	-.418
	97	3.7	0.5	
	19	3.8	0.9	-1.661
	97	4.1	0.7	
	19	3.7	0.6	-1.362
	97	3.9	0.5	
	19	3.1	0.4	-.618
	97	3.1	0.4	
	19	3.9	0.9	-.605
	97	4.0	0.7	
	19	3.3	0.7	-1.693
	97	3.6	0.7	
	19	2.9	1.0	-1.256
	97	3.2	0.8	
	19	3.4	0.7	-1.551
	97	3.6	0.6	

* p < .05

p<.01

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	19	3.6	0.5	1.010
	97	3.5	0.5	
	19	2.8	0.9	- 2.676 **
	97	3.4	0.9	
	19	3.1	0.5	- 1.286
	97	3.3	0.6	
	18	3.0	0.9	1.200
	96	2.8	0.6	
	19	3.2	0.4	- 1.089
	97	3.3	0.4	

** p<.01

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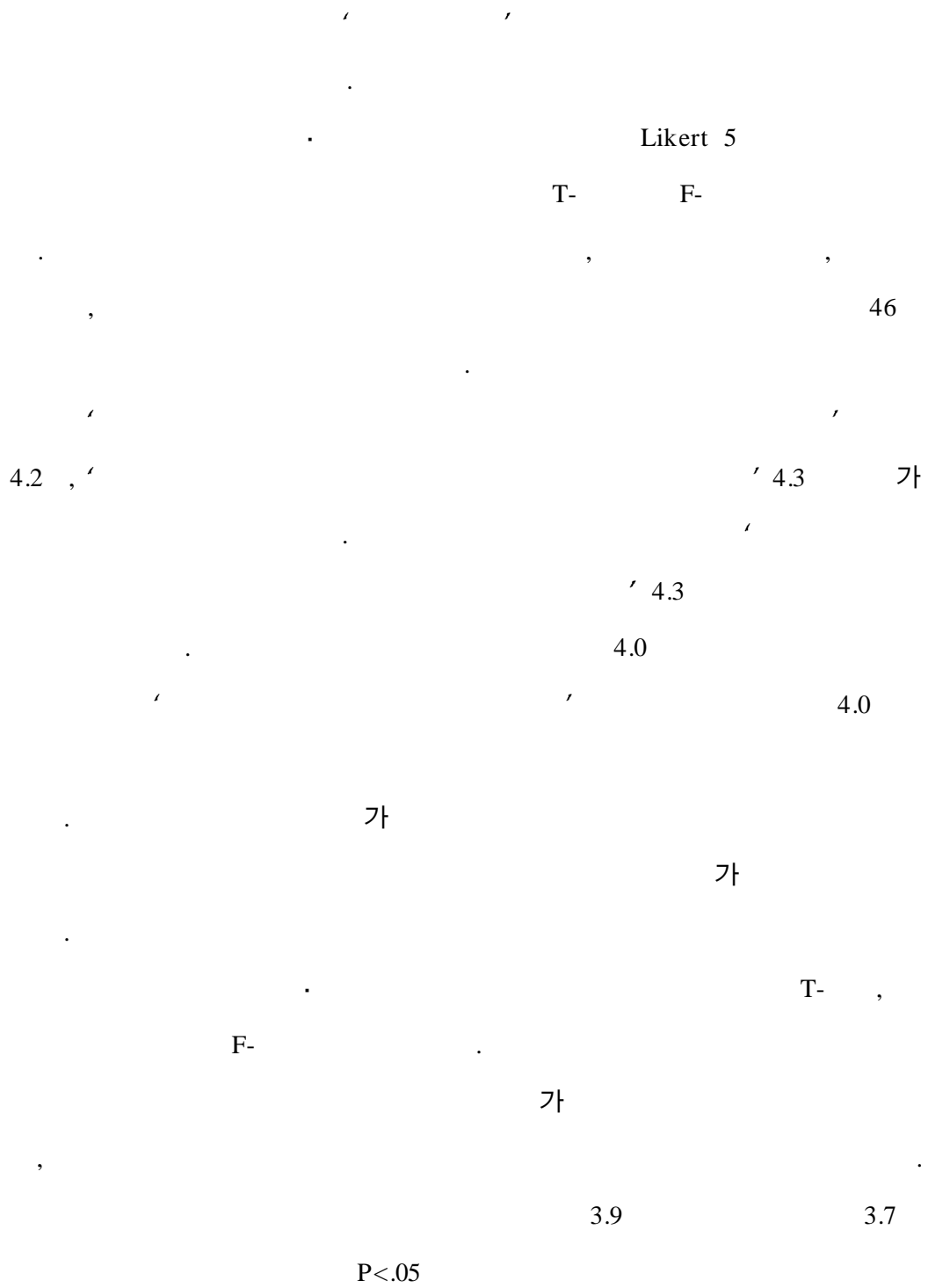
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ABSTRACT

The Features and the Effects of Computer-based Medical Record in Military Hospitals

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Health Science and Management

Yonsei University

(Directed by Professor Hae Jong Lee, Ph.D.)

This research looks at the features of computer-based medical record[5] in military hospitals during the period 7 months from September 2000 by comparing Electronic Medical Record(EMR) to the paper documents of medical history. This study measures the value added by the computerization to anticipate how the computing environment in military hospitals will develop.

The system in military hospitals has the user interface to implement EMR for outpatients and hospitalization. This system allows the users to enter and keep track of the records of

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5) DEMIS : Defense Military Information System

emergency treatment, daily care journal, operations, anesthesia and intensive care units. Testing results including EKG and PFT and medical consent forms can be scanned into the system. The server and network runs on 24 hours a day/ 7 days a week to ensure the operations of hospital goes on without stoppage.

The effects of EMR are broken down to the benefits brought to users and the accuracy of the content for analysis. The accuracy of content in computerized system doesn't improve from the hand-written documents. However, the computerized system helps user better track the data in digitized archives and gives you overall picture of day-to-day operations. The formats and the categories of windows come from the documents of the army and have been altered. Some of the formats have been created for the computing systems.

Likert 5 points are used to measure the user effectiveness of the EMR on the military hospitals. The system was marked 4.2 points in terms of being easy-to-record and 4.3 point for fast search capability. In data processing speed, respondents gave an average of 4.29 points for helping them reduce the search time and devote more time for dealing with patients. However, shorter time for document search doesn't translate into more time for seeing patients (2.7 points for visiting patients and 2.9 points for hospitalized patients). On questions about whether the system helps increase the effectiveness of treating patients, the results came out with 4.0 points, reflecting the overall satisfaction over

the system's contribution to effective patient treatment.

Users marked 4.0 points for utilization rate of the computerized documents. In evaluating the system development, respondents pointed out that the lack of interface integration between the different work process and departments.

By department, commissioned nurses responded that entering the data is handy, while emergency rooms and physical therapists have the lowest rate. However, the user rate was very marginal. In fast processing of data, there are notable differences as commissioned doctors marked 3.9 points, trailed by nurses with 3.7 points. Nurses are better at keeping the data up to data and managing the data (3.5 points) than doctors (3.3 points). The user effectiveness dissipates over the time, as it was highest in the first one or two months and continues to drop after that. The user effectiveness is higher for those with no exposure to computerized documenting systems and those who have used the system.

The computer-based medical record can be easier to operate with enhanced functions, provided that users are committed to implementing the program. This system will help improve the medical services by facilitating the administration tasks and will be a leader of medical computing system, when it is spread to all military hospitals. Therefore, it requires a total commitment from the top military brass down to the operators to utilize the system to its maximum and work to improve its current shortfalls.