

Moving Forward: SOA's role in Indian Health Service IT Modernization

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Topics

- Why Medicine and SOA
- Indian Health Service
- IHS Health Information Technology (HIT)
- Interoperability of EHRs
- SOA
- Open Source



Why Does SOA matter in Medicine and Health

- Medicine is dependent upon the ability to synthesize data in predictable as well as novel patterns
- Diagnosis is dependent upon interoperable interactions in thought as well as action
- Clinical reminders are predictable, YET are dependent upon the individual patient
- There seem to be natural building blocks that can help organize multiple data feeds
 - Combine data, knowledge and behavior
- *Policies, practices, and frameworks must ensure that the right ideas and data (services) are provided and available for inclusion in the decision making process*

A world without SOA

- Clinical decision making and clinical care remains where it is today
 - The SOAP (subjective/objective/ assessment/ plan) recording model makes sense for a paper based system
 - The SOAP model made sense as the basis for initial HIT systems
 - However, this model is modular/constrained/predictable/defined
- Data being isolated at a facility level and not readily accessible across the enterprise
- Health Information Technology can not progress without a radical change in its interaction with providers and patients

A world with SOA

- The leap to a new paradigm of clinical thinking requires the flexibility to quickly modify data displays and services- more functionality
- Configure dynamically
- Respond to end user needs; better ‘ease of development’
- Retain conformance , performance and integrity
- Crosswalk and integration of IT into the medical delivery model

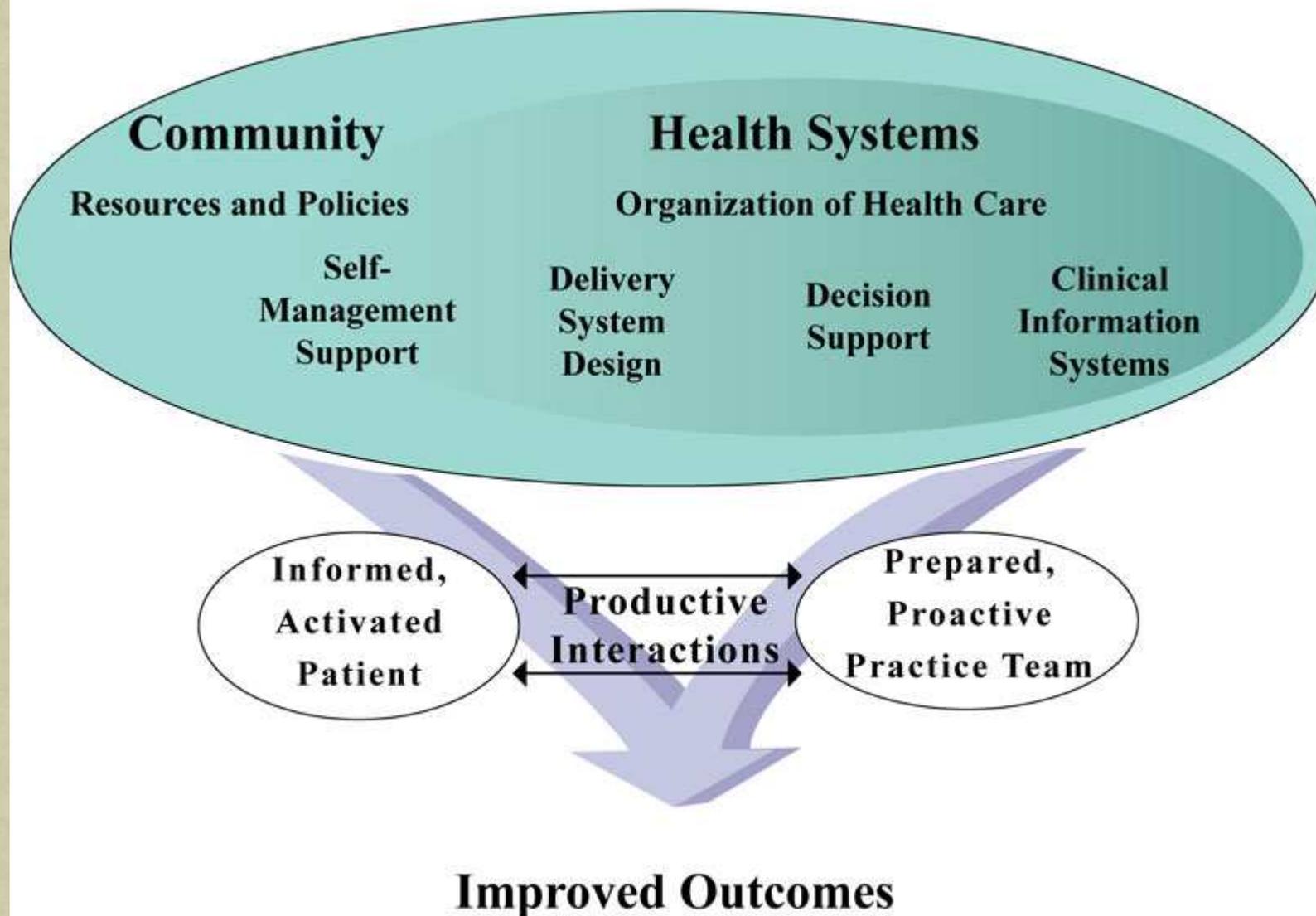
How do we move from here to there in a real world environment?

Indian Health Service

- A comprehensive health service delivery system for approximately 1.9 million of the 3.3 million American Indians and Alaska Natives from 564 federally recognized tribes in 35 states
- Fiscal Year 2010 Appropriated Budget was \$4.05 Billion
- Indian Health Service federal staff consists of over 15,000 employees, which includes approximately 2,700 nurses, 1000 providers, 600 pharmacists, and 300 dentists; tribally operated health facilities employ another 15,000

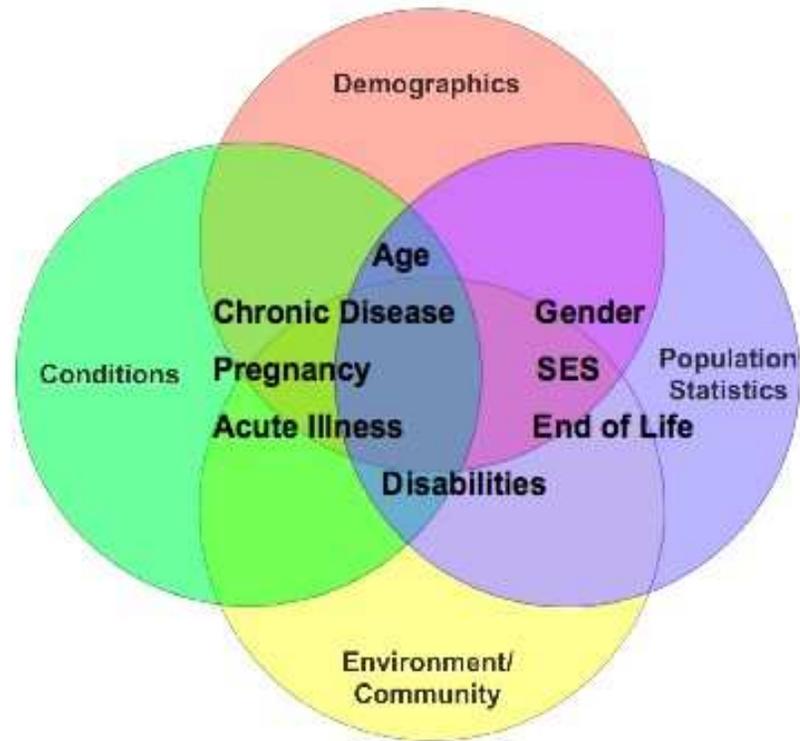


The Chronic Care Model



A Broader Picture of Health

- Personal Health
- Family Health
- Community Health
- Public Health
- Population Health
- Transparency of Data



- Patient and community sharing of information
- Commitment to Health Equity

IHS Health Information Technology

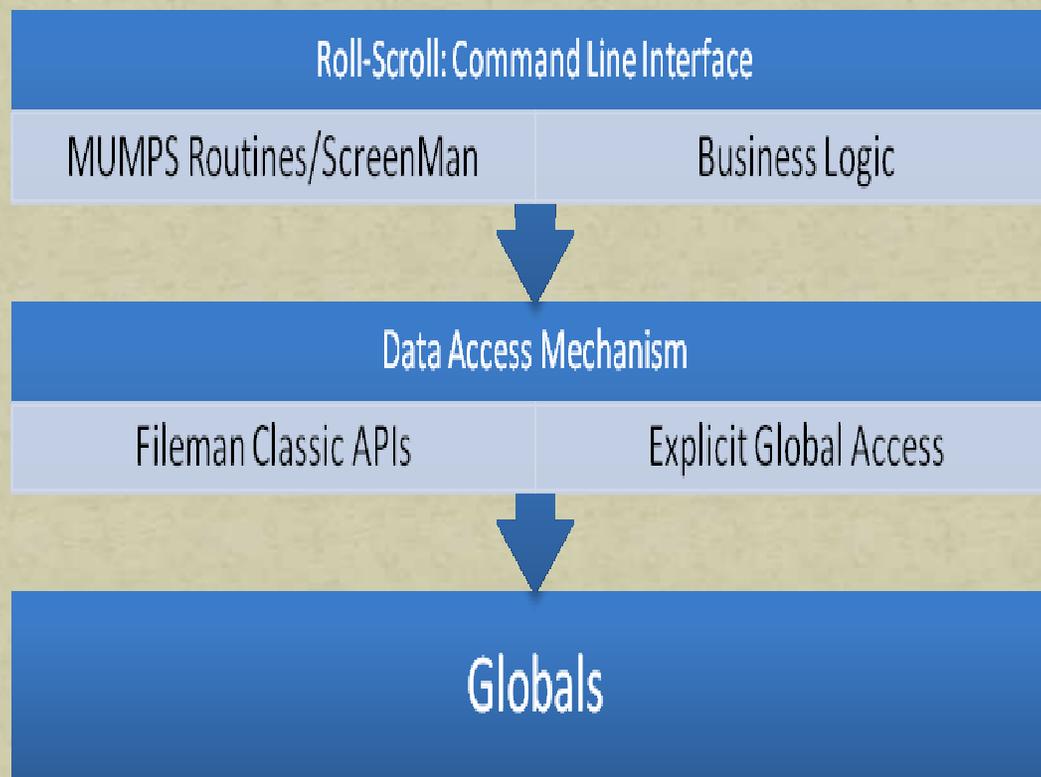
- Resource and Patient Management System (RPMS)
 - MUMPS-based, decentralized deployment, roll-n-scroll (Cache/Ensemble)
 - Suite of integrated/fragmented modules with confused metadata
 - **OVER TWENTY FIVE YEARS OLD**
- Electronic Health Record (EHR) – Graphical User Interface (GUI) – brings many functions to the provider in a convenient and user-friendly format
 - Modular display capability
 - Computer-based Provider Order Entry (CPOE)
 - Medications
 - Problem Lists
 - Lab Results
 - Allergies
 - Clinical Decision Support



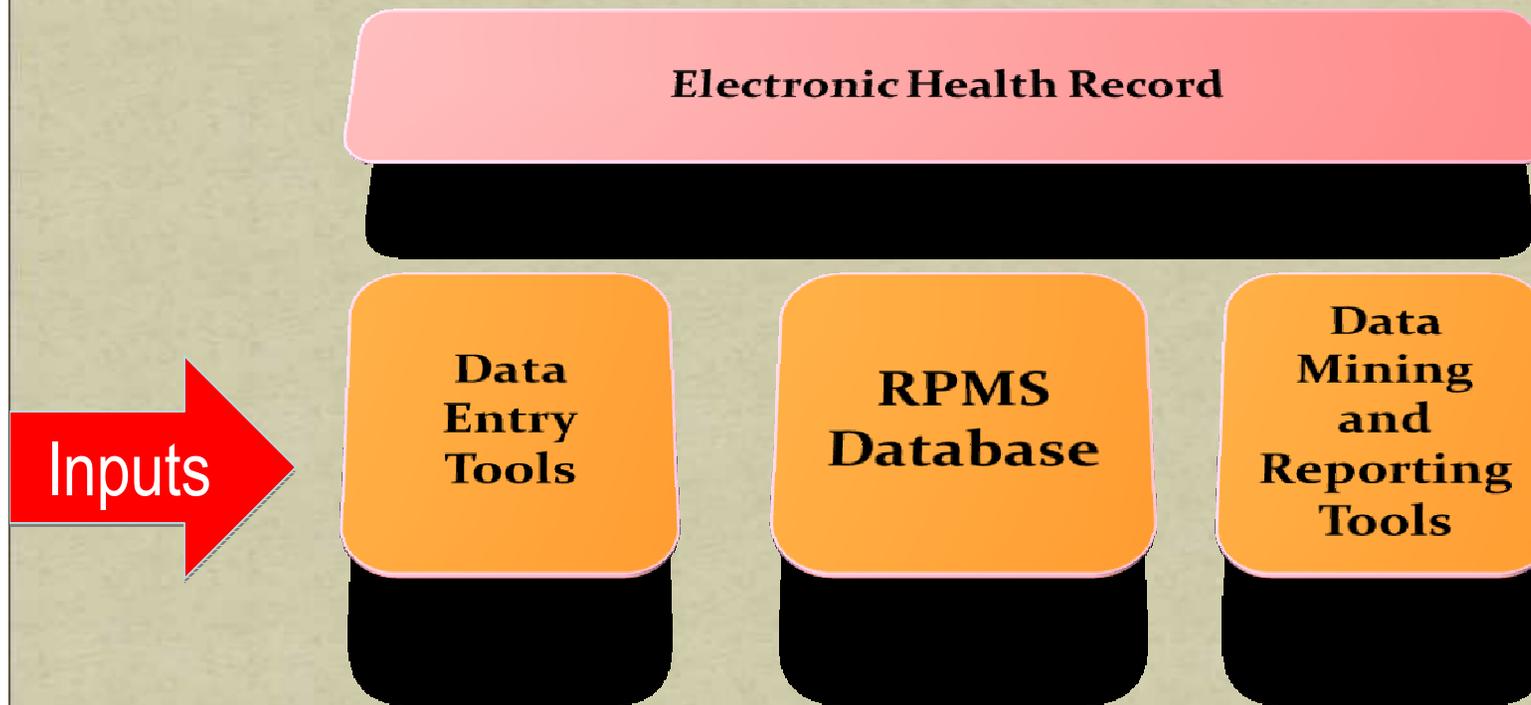
IHS Health Information Technology what worked

- Traditional Delivery Model in RPMS modules
- iCare – Population Management Tool
- Care Management Event Tracking (CMET)
- Clinical Reporting System (e-Quality for pt and pop)
- Patient Wellness Handout
- Health Information Exchange
 - Influenza-Like Illness (ILL)
 - Immunizations
 - Patient Summary (soon)
 - Community Alerts National Epidemiological Surveillance (CANES)
- National Patient Information and Reporting System (NPIRS) – data warehouse
- Personal Health Record

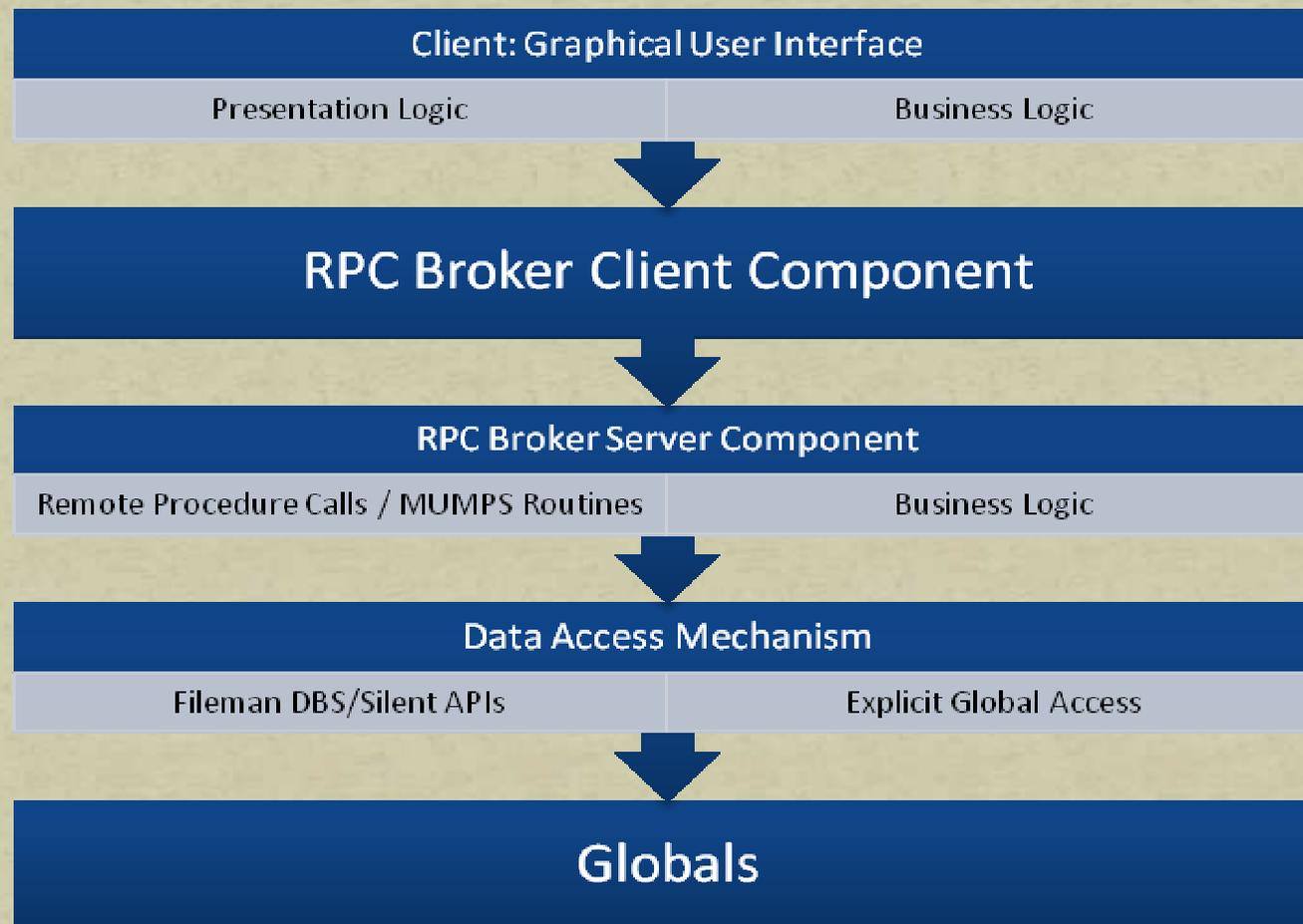
RPMS Legacy Roll and Scroll Modules



RPMS Electronic Health Record Pre SOA



RPMS Legacy Desk Top Applications



What made RPMS work?

- File structure designed to support standard care delivery model
 - Application model consistent with VISTA
 - Addition of equivalent of HDR files in the back end
 - What needs to be exposed in the data layer?
 - Evaluation of the V Pharmacy File/ Pharmacy Module
 - Pharmacy module file more robust than V (visit) pharmacy file
 - Over 100 fields
 - Less than 10% used over 95% in the V file
 - More data fields populated in the pharmacy package
- Facilitated development of structured as well as ad hoc queries
- Recognition of additional domains and applications to support population and public health
- How do we get to the next stage?
 - Who needs what /where do they need it/ why do they need it
 - How do we get to 'services'?
 - Are there interim steps that we take to 'get there'?

What SOA may require

- Defined benefits
- Affordable
- Commitment to transition plan
- Enterprise architecture integration
- Federated Database system
- Interoperability

SOA at IHS

- IHS has some SOA (can you have some SOA??)
 - SOA has been most effective for IHS where the systems interact with each other
 - Personal Health Record (PHR) (screen shots follow)
 - Health Information Exchange functions
- IHS is evaluating more SOA
 - The concept of services fits the modularity of RPMS and functions of health care delivery
 - Network bandwidth and information exchange capabilities are starting to be in place to support SOA
 - SOA has open source technologies
 - Extensibility, sustainability



SOA at IHS (cont'd)

- Challenges to SOA
 - Insufficient network bandwidth in many IHS and Tribal locations
 - The Federal Communications Commission's National Broadband Plan estimated that only 8% of IHS and Tribal sites have sufficient broadband capacity for health IT
 - Limited funding for new innovation so looking to reuse where possible
 - Trade-off between open-source modularization and effective control of the existing infrastructure



PERSONAL HEALTH RECORD



Navigation Area



Easily manage your health records online

IHS patients can view their medical information using the Personal Health Record (PHR) online tool. To begin using PHR, complete the online application by clicking the link below.

[Register to Use PHR](#)

PHR User Login

Username

Password

Indian Health Service (IHS) | [Terms and Conditions](#) | [Privacy](#)

Laboratory Results

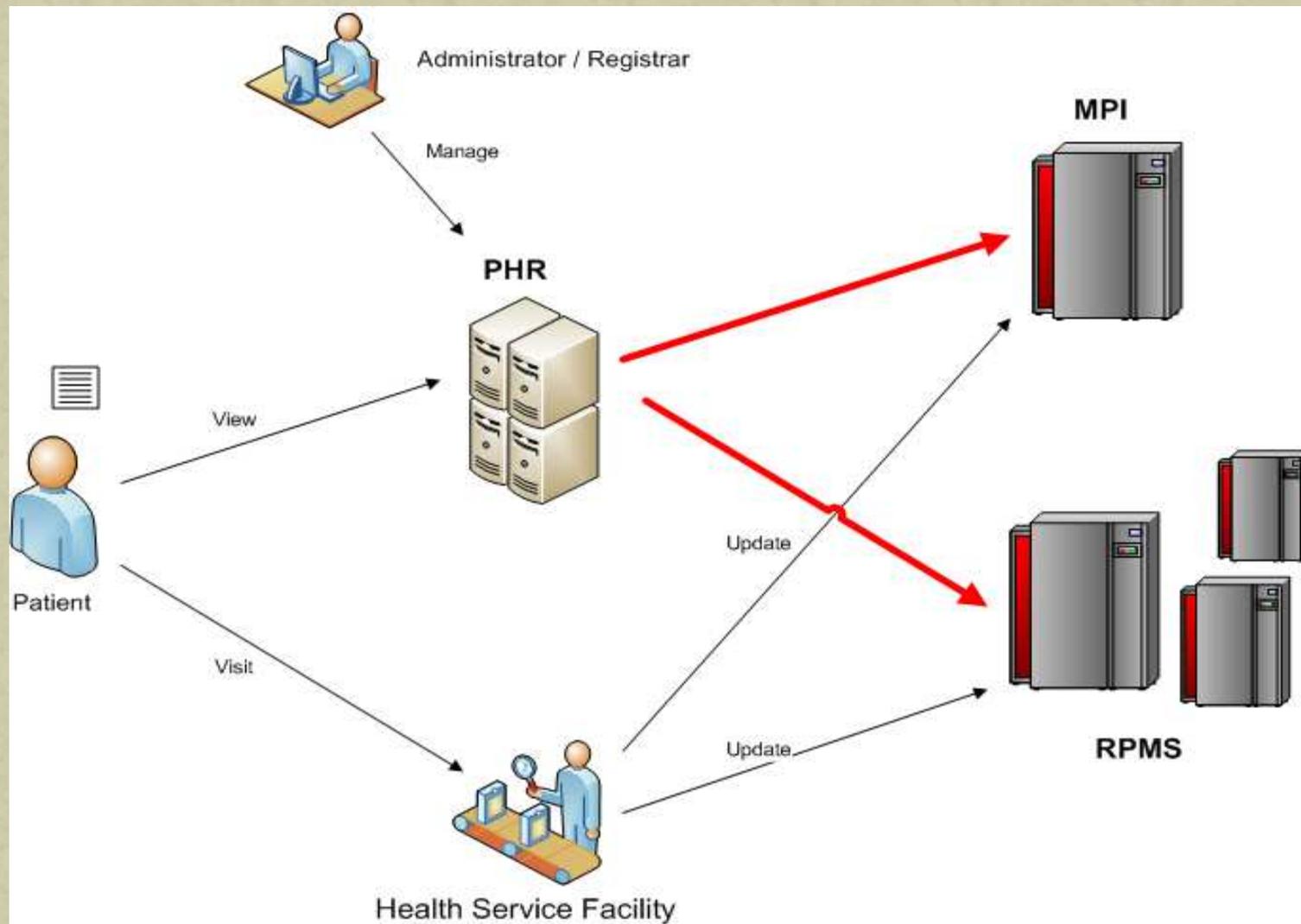
Patient Laboratory Results

Below is a list of laboratory test results that we have in our files for you. Please let your healthcare provider know if this list is not complete. Click on the rows to view information for each laboratory result.

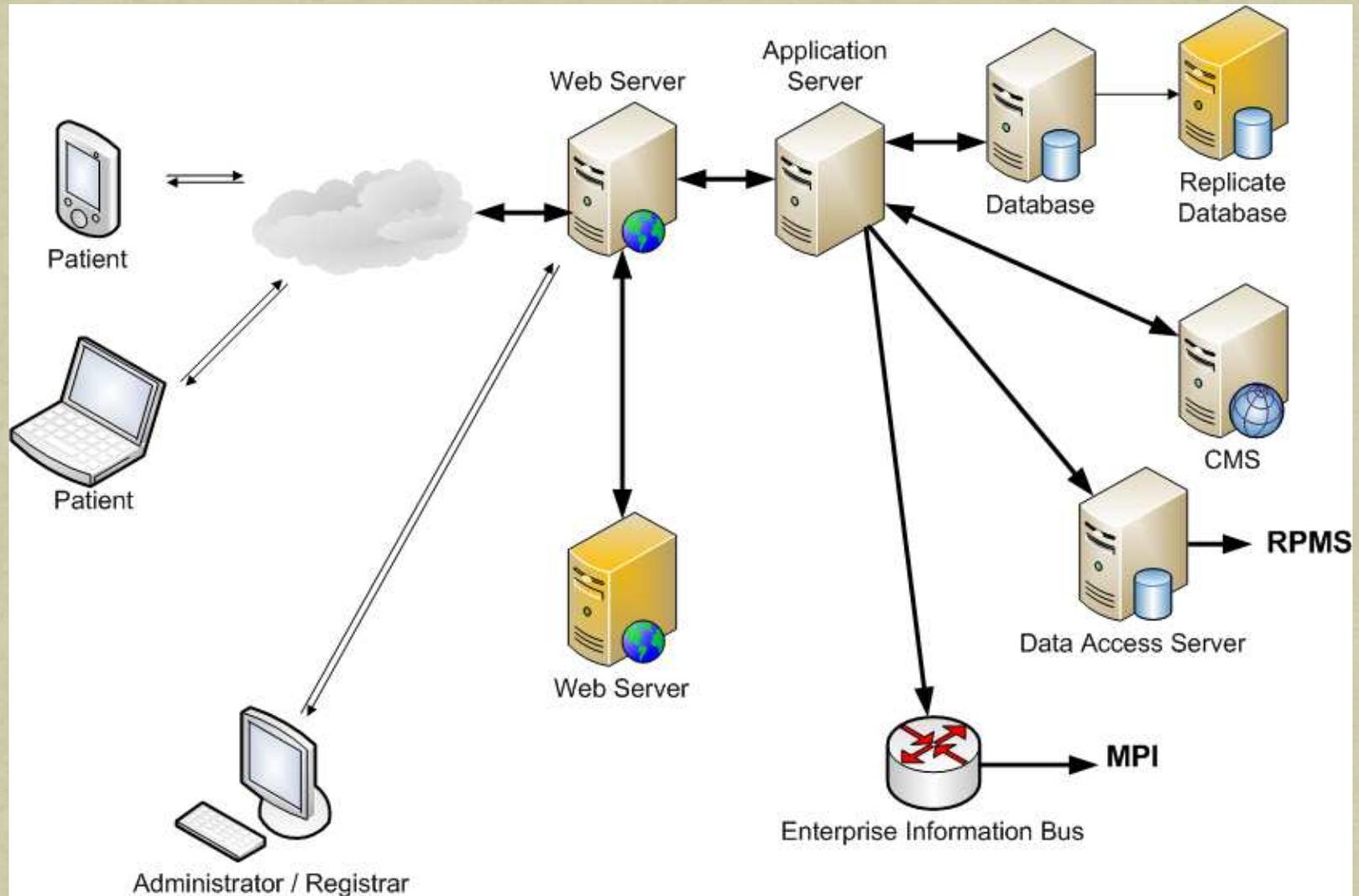
Laboratory Test Name	Test Date	Result	Unusual Result?
LIPID PROFILE DEMO	12/20/2004		No
LIPID PROFILE DEMO - CHOLESTEROL	12/20/2004	135 mg/dL	No
LIPID PROFILE DEMO - TRIGLYCERIDE	12/20/2004	150 mg/dL	No
LIPID PROFILE DEMO - HDL	12/20/2004	40 mg/dL	No
LIPID PROFILE DEMO - calculated:	12/20/2004		No
LIPID PROFILE DEMO - LDL	12/20/2004	65 mg/dL	No
LIPID PROFILE DEMO - CHOL/HDL RATIO	12/20/2004	1.0	No
METABOLIC PROFILE	12/20/2004		No
METABOLIC PROFILE - RANDOM GLUCOSE	12/20/2004	90 mg/dl	No
METABOLIC PROFILE - UREA NITROGEN	12/20/2004	20 mg/dL	Yes
LIPID PROFILE DEMO - CHOL/HDL RATIO	12/20/2004	3.4 mg/dL	Yes
METABOLIC PROFILE - SODIUM	12/20/2004	140 mmol/L	Yes
METABOLIC PROFILE - POTASSIUM	12/20/2004	5 mmol/L	Yes

* This laboratory result information was last updated on 08/30/2010. Changes to your laboratory results (such as a new laboratory result) occurring after this date will NOT be visible in the table above. Check again in 1-2 days.

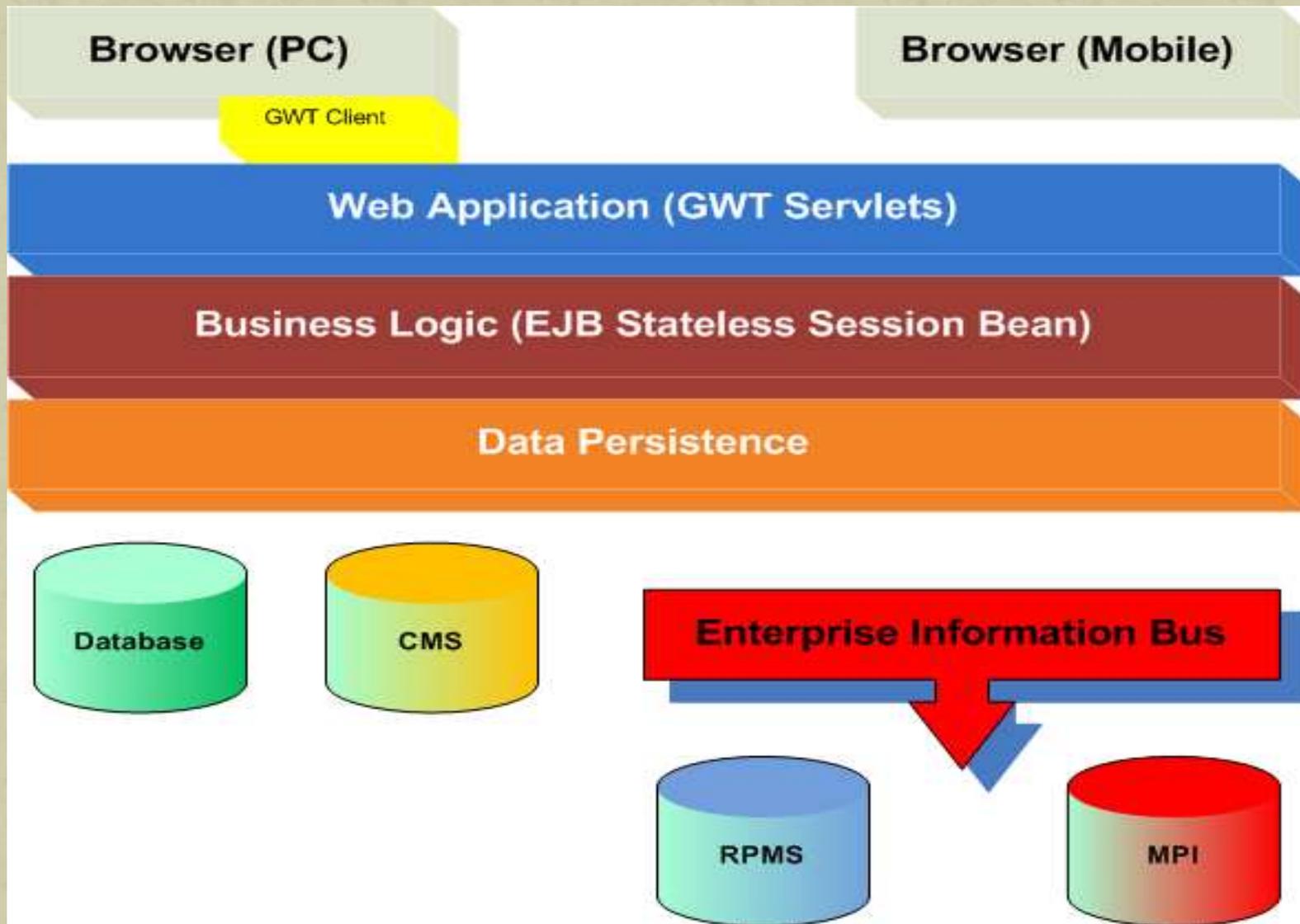
PHR Conceptual Model



PHR Deployment Model



PHR Application Layer



Still Client - Server

Patient Registration-Main View

RPMS Patient Registration - TOWNSEND, GAIL - INDIAN HEALTH HOSPITAL ()

Patient Registration

New Patient...
Mini Registration...
Add/Edit Registration Data

Management
Face Sheet
Reports

Display Error Checks
View Application Log
Refresh Tab Display

Tools

Patient Registration Help
About Patient Registration

Help

Patient Lookup

Patient Workspace

4 errors/warnings found

DEMO.PATIENT H 89987
Sex: M
DOB: Aug 17, 1999

DEMO.PATIENT R 89995
Sex: F
DOB: Feb 13, 1970

DEMO.PATIENT X 89998
Sex: M
DOB: May 18, 1967

DEMO.PATIENT Z 888883
Sex: M
DOB: May 14, 1980

DEMO.PATIENT N 888123
Sex: F
DOB: Jan 4, 1930

NAME: DEMO.PATIENT H (HRN: 89987) LAST UPDATED: Sep 30, 2010 (GT)

DOB: Aug 17, 1999 11 YRS Eligibility: DIRECT ONLY RHI:
SEX: MALE Classification/Beneficiary: NON-INDIAN ELECTIVE NPP: NO
SSN: Alt. Resources: YES ROI:
Current Community: ALBUQUERQUE Veteran: NO AOB:

Demographics/ER Contact Family/Tribal/NOK Alt. Resources Veteran/Documents Other Patient Data Reg Notes

Personal Detail Shortcut Key: Alt + S **Edit**

HRN: 89987 Social Security #:
Name: DEMO.PATIENT H Reason for NO SSN: NOT AVAILABLE
Sex: M Place of Birth [City]:
Date of Birth: Aug 17, 1999 11 YRS Place of Birth [State]:
Marital Status: SINGLE Employment Status:
Employer: Religious Preference:

Address Shortcut Key: Alt + A **Edit**

Street Address [1]: PO BOX 333 Residence Phone:
Street Address [2]: Work Phone:
Street Address [3]: Other Phone:
City, State, Zip: ALBUQUERQUE, NEW MEXICO, 87510 Location of Home:
Current Community: ALBUQUERQUE (BERNALILLO)
Date Moved: AUG 17, 1999

Emergency Contact Shortcut Key: Alt + C **Edit**

Name: Street Address:
Phone: Work Phone:
Relationship: City, State, Zip:
Other Relation:

Add New patient screen

New Patient Registration [Close] [Maximize] [Minimize]

Patient Identifiers

Last Name:* , First Name:* Middle: Suffix:

Date of Birth: Social Security No: Sex:*

Identify Relationship

Health Record Number:* Reason for no SSN: Marital Status:

Classification/Beneficiary:* Eligibility Status:* Veteran:

Tribal Information

Indian Blood Quantum: Tribe of Membership: Tribe Quantum: Tribal Enrollment Number:

Address

Street Address (Line 1): Residence Phone: Work Phone:

City: State: Zip Code: Place of Birth (City): Place of Birth (State):

Location of Home:

Present Residence Community:* Date Moved:*

Demographics/ER contact Tab

RPMS Patient Registration - TOWNSEND, GAIL - INDIAN HEALTH HOSPITAL ()

Patient Registration

New Patient...
Mini Registration...
Add/Edit Registration Data

Management
Face Sheet
Reports

Display Error Checks
View Application Log
Refresh Tab Display
Tools

Patient Registration Help
About Patient Registration
Help

Patient Lookup

Patient Workspace

4 errors/warnings found

NAME: DEMO.PATIENT Z (HRN: 888883) LAST UPDATED: Dec 08, 2010 (GT)

DOB: May 14, 1980 30YRS Eligibility: DIRECT ONLY RHI:
SEX: MALE Classification/Beneficiary: INDIAN/ALASKA NATIVE NPP: NO
SSN: XXX-XX-5984 Alt. Resources: NO ROI:
Current Community: ISLETA PUEBL Veteran: YES AOB:

Demographics/ER Contact Family/Tribal/NOK Alt. Resources Veteran/Documents Other Patient Data Reg Notes

Personal Detail Shortcut Key: Alt + S Edit

HRN: 888883 Social Security #: XXX-XX-5984
Name: DEMO.PATIENT Z Reason for NO SSN:
Sex: M Place of Birth (City):
Date of Birth: May 14, 1980 30YRS Place of Birth (State):
Marital Status: SINGLE Employment Status:
Employer: Religious Preference:

Address Shortcut Key: Alt + A Edit

Street Address [1]: Residence Phone:
Street Address [2]: Work Phone:
Street Address [3]: Other Phone:
City, State, Zip: Location of Home:
Current Community: ISLETA PUEBL (BERNALILLO)
Date Moved: MAY 14 1980

Emergency Contact Shortcut Key: Alt + C Edit

Name: Street Address:
Phone:
Work Phone:
Relationship: City, State, Zip:
Other Relation:

DEMO.PATIENT H
89987
Sex: M
DOB: Aug 17, 1999

DEMO.PATIENT R
89995
Sex: F
DOB: Feb 13, 1970

DEMO.PATIENT X
89998
Sex:
DOB: May 18, 1967

DEMO.PATIENT Z
888883
Sex: M
DOB: May 14, 1980

Registration Notes Tab

RPMS Patient Registration - TOWNSEND, GAIL - INDIAN HEALTH HOSPITAL ()

Patient Registration

New Patient...
Mini Registration
Add/Edit Registration Data

Management
Face Sheet
Reports

Display Error Checks
View Application Log
Refresh Tab Display
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Patient Registration Help
About Patient Registration
Help

Patient Lookup

Patient Workspace

3 errors/warnings found

DEMO PATIENT E
888881
Sex: M
DOB: Aug 4, 2010

DEMO PATIENT D
88887
Sex: M
DOB: Jul 10, 2009

DEMO PATIENT V
89980
Sex: F
DOB: Sep 21, 2009

DEMO PATIENT G
Sex:
DOB: Jun 14, 2005

**CHAVEZ, HENRIETTA
1072
Sex: F
DOB: Jan 15, 1911**

NAME: **CHAVEZ, HENRIETTA (HRN: 1072)** LAST UPDATED: **Jul 29, 2010 (TJ)**

DOB: **Jan 15, 1911 99YRS** Eligibility: **CHS DIRECT** RHI:

SEX: **FEMALE** Classification/Beneficiary: **INDIAN/ALASKA NATIVE** NPP: **YES**

SSN: **XXX-XX-1107** Alt. Resources: **YES** ROI: **May 08, 2010**

Community: **ALBUQUERQUE** Veteran: **YES** AOB: **Jul 26, 2010**

Demographics/ER Contact Family/Tribal/NOK Alt. Resources Veteran/Documents Other Patient Data **Reg Notes**

Notes Shortcut Key: R **Edit**

GAIL T 7/29/2010 9:30:47 AM
OBTAINED MEDICARE CARD

FRANCISCO F 7/7/2010 12:54:10 PM
PT BROUGHT BACK MA APP.

FRANCISCO F 7/7/2010 11:52:49 AM
PATIENT GIVEN MA APPLICATION.

FRANCISCO F 6/8/2010 3:29:15 PM

7/12/01 UPDATED PATIENT ADDRESS INFORMATION FROM PO BOX 933//AL
4/10/01 CARD COPY/SIGS ON FILE/SL
4/29/04|TAB|PATIENT CAME IN--GROUCHY

Training Access: USER##
Training Verify: RPMS O##

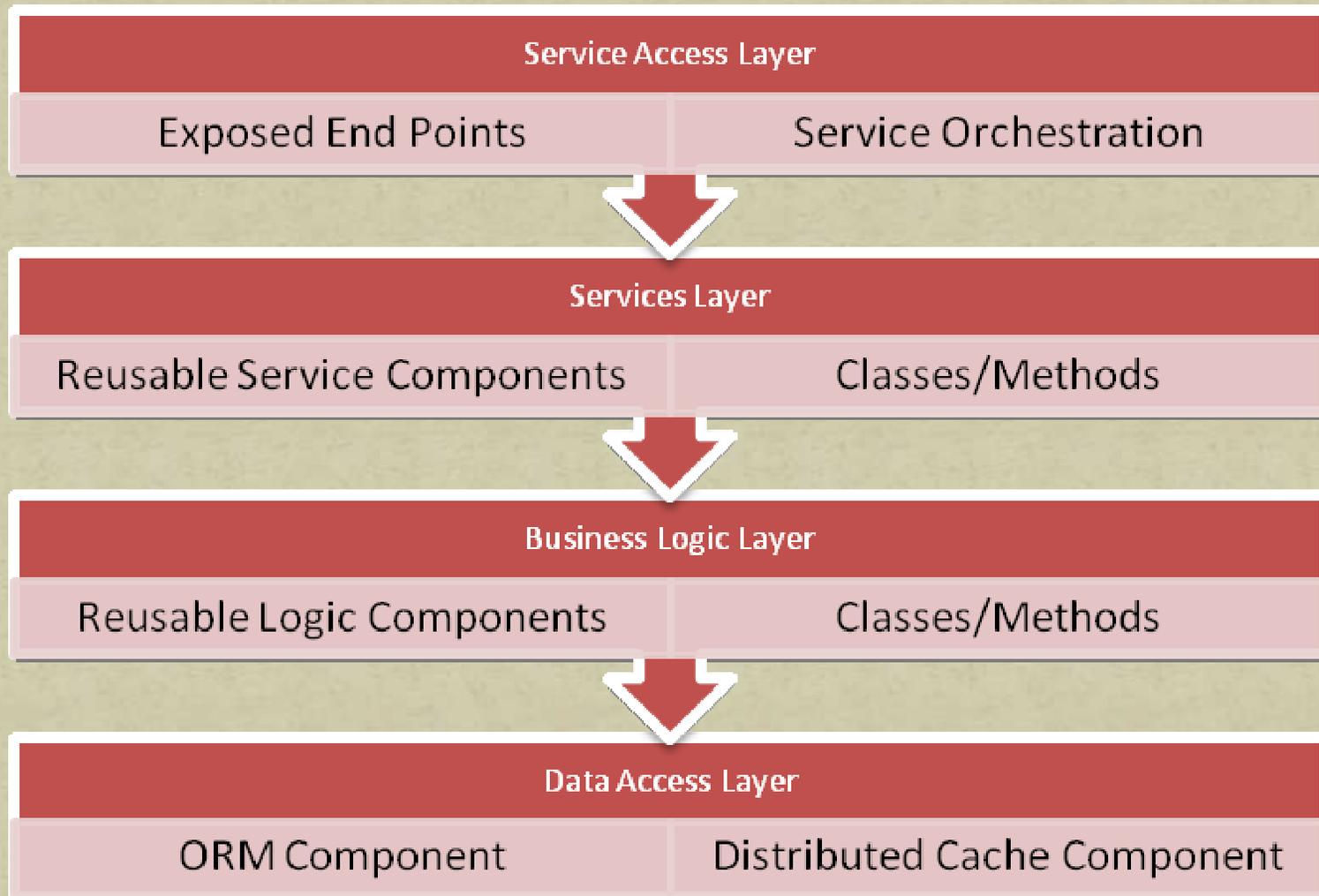
The ## is the number assigned to you as a user.
Please be sure to enter a space between 'RPMS' and 'O' on VERIFY.

Looking to the Future

- IHS is looking at the next version of EHR
 - Reviewing policies and procedures to enable and sustain SOA
 - Reviewing middleware needs to enable SOA
 - Reducing duplicative coding in various modules
 - Centralized APIs (does that work?)
 - Plan to use Cache objects to make RPMS SQL compliant with associated web services to support interoperability initiatives and application interfaces
 - Integrate SOA into the Master Patient Index, the Nationwide Health Information Network gateway, and Practice Management applications
- More requirements for meaningful use and health information exchange



One Option for the Future



SOA Pilot - Practice Management

Moonwalk.Client - Windows Internet Explorer
 http://173.203.71.97:8081/

Search Patient Advance Search

USER: UIH-S @ Hospital 1
 Upload Statistics

Patient Workspace

DEMO, JAMES
 345-34-5345 345345
 11/27/1988 MALE

DEMO, PATEINT MIDD JR
 223-19-9008 T66774
 12/09/1981 MALE

Home
 Scheduling
 Patient Workspace

Alternate Resources Load: 2231 ms

DEMO, PATEINT MIDD JR SSN: 223-19-9008 Eligibility Status: **DIRECT ONLY** RHI: **NO**
 HRN: T66774 :tive Alternate Resource: **YES** Sensitive: **NO**
 12/09/1981 (29y) MALE Veteran: **NO** Last Updated Date: 04/28/2010

Facsheet
 Reports

Demographics Family/NOK/Tribal Veteran/Documents Notes Alternate Resources Medication

HRN T66774 DEMO HOSPITAL 123121 NAVAJO MOUNTAIN HEALTH CENTER 23423 Add

Aliases DEMO,PATIENT KID TEST,ALIAS Add

Personal Detail DEMO,PATEINT MIDD JR - MALE - 12/9/1981 - 223-19-9008(Not yet verified by SSA) Edit

Marital Status	MARRIED	Race	AMERICAN INDIAN OR ALASKA NATI
Employment Status		Religious Preference	
Employer		Place Of Birth [City]	
Classification/Beneficiary	EMERGENCY CASE (NON-INDIAN)	Place Of Birth [State]	
Eligibility Status	DIRECT ONLY	Ethnicity	
		Ethnicity Collection Method	

Address Edit

12 WOODCREEK	Residence	5565665655
ABC	Work	5465454655
XYZ NEW YORK, NEW YORK, 12345	Other	
	Email	test@test.com

Location of Home
 Present Community NEW CAMPO AREA
 Date Moved 12/25/2009
 Has Internet Access NO
 Where

Emergency Contact Edit

DEMO, EC MID JR	Relationship	PARENT
PO BOX 106	Phone	2323232323
BANK SQUARE		
LONG STREET NYC, MISSISSIPPI, 23234		

Done Internet | Protected Mode: On 100%

Moonwalk.Client - Windows Internet Explorer

http://173.203.71.97:8081/

Moonwalk.Client

Search Patient demo Advance Search

USER,UIH-S @ Hospital 1 Upload Statistics

Patient Workspace

DEMO,JAMES X
345-34-5345 345345
11/27/1988 MALE

DEMO,PATEINT MIDD JR X
223-19-9008 T66774
12/09/1981 MALE
Editing

DEMO,PATEINT MIDD JR SSN: 223-19-9008 Eligibility Status: DIRECT ONLY RHI: NO
 -IRN: T66774 Active Alternate Resource: YES Sensitive: NO
 12/09/1981 (29y) MALE Veteran: NO Last Updated Date: 04/28/2010

Address: DEMO,PATEINT MIDD JR - MALE - 12/9/1981 - 223-19-9008

Address

Street Address [Line 1] City State Zip Code
 12 WOODCREEK NEW YORK NEW YORK 12345

Street Address [Line 2] Street Address [Line 3]
 ABC XYZ

Location of Home

Present Residence Community **Joining Date**
 NEW CAMPO AREA 12/25/2009

Residence Phone Work Phone Other Phone
 5565665655 5465454655

Has Internet Access? From Email Address
 test@test.com

Save Cancel

Present Community NEW CAMPO AREA Has Internet Access NO
 Date Moved 12/25/2009 Where

Emergency Contact Edit

DEMO,EC MID JR Relationship PARENT
 PO BOX 106 Phone 2323232323
 BANK SQUARE
 LONG STREET NYC, MISSISSIPPI, 23234

Home
 Scheduling
 Patient Workspace

Alternate Resources Load: 2231 ms

Done Internet | Protected Mode: On 100%

Moonwalk.Client - Windows Internet Explorer

http://173.203.71.97:8081/

Search Patient demo Advance Search

USER,UIH-S @ Hospital 1 Upload Statistics

Patient Workspace

DEMO,JAMES X
345-34-5345 345345
11/27/1988 MALE

DEMO,PATEINT MIDD JR X
223-19-9008 T66774
12/09/1981 MALE
Editing

DEMO,PATEINT MIDD JR SSN: 223-19-9008 Eligibility Status: DIRECT ONLY RHI: NO
IRN: T66774 tive Alternate Resource: YES Sensitive: NO

Private Insurance: DEMO,PATEINT MIDD JR - MALE - 12/9/1981 - 223-19-9008

Private Insurance Set Patient as Policy Holder

Policy Holder **Policy Number** **Primary Care Provider**

Eligibility Date **End Date** **Card Name**

Holder's Employer Information

Status **Employer**

Insurer Information

COMPREHENSIVE CARE SVCS, INC
PO BOX 64668
ST. PAUL, MINNESOTA 55164

Group Name **Group Number**

Coverage Type **Relation**

Card Copy On File **Date Obtained**

Policy Members

Policy Member	Person Code	Member Number	Relation	From	To
ADAKAI,REBECCA J		41353-476507121	SELF	01/01/1994	01/31/2000
ADAKAI,REBECCA J		476507121	SELF	01/01/2004	10/28/2010
DEMO,PATEINT MIDD JR			BROTHER	01/01/1994	06/14/2011

Last Edited By: ADAM,ADAM on 4/26/2010

Home

Scheduling

Patient Workspace

Private Insurance Load: 1233 ms

Done Internet | Protected Mode: On 100%

Open Source at IHS

- IHS has committed to open source
 - RPMS continues to collaborate with the VA on software development
 - RPMS used by the Community Health Network of West Virginia in ambulatory clinics and facilities supported by the University of Hawaii
 - RPMS is available for download, although the MUMPS used requires a license
 - Discussions of enhancements to RPMS consider impacts to users of the open source RPMS
 - Integrating open source technologies is a priority





Questions?

Contact:

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Meaningful Use of an EHR

- Incentives for the “meaningful use” of an EHR
 - Functional/HIT measures such as:
 - health information exchange
 - patient access to electronic health information
 - computer-based provider order entry
 - Clinical measures such as:
 - Hypertension: Blood Pressure Measurement
 - Preventive Care and Screening Measure Pair: a) Tobacco Use Assessment, b) Tobacco Cessation Intervention
 - Adult Weight Screening and Follow-up
 - IHS is currently certifying RPMS EHR for meaningful use



Interoperability of EHRs

- Meaningful Use and Certification Standards require health information exchange (HIE) from the certified EHR
 - Must have standards for interoperability
 - Nationwide Health Information Network (NHIN - collection of standards, protocols, legal agreements, specifications and services to enable secure HIE)
 - The IHS is creating an NHIN interface using the Federal Health Architecture CONNECT gateway
 - The IHS is in the process of creating an HL7 CCD that will be extracted from RPMS

