

Customizing an Open Source Electronic Health Record System

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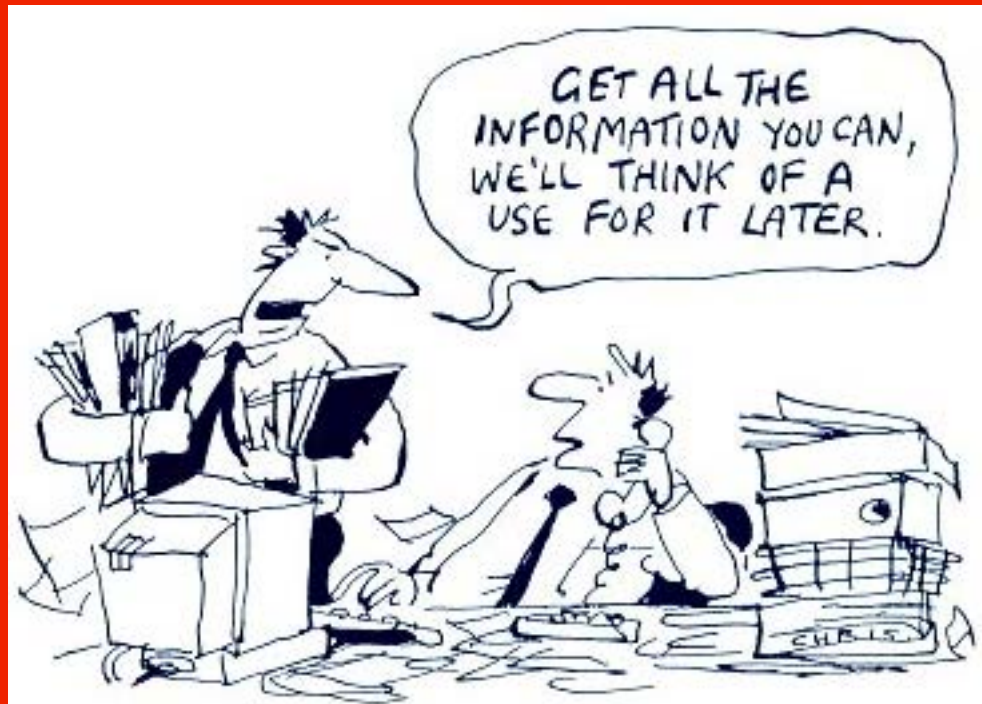


Objectives

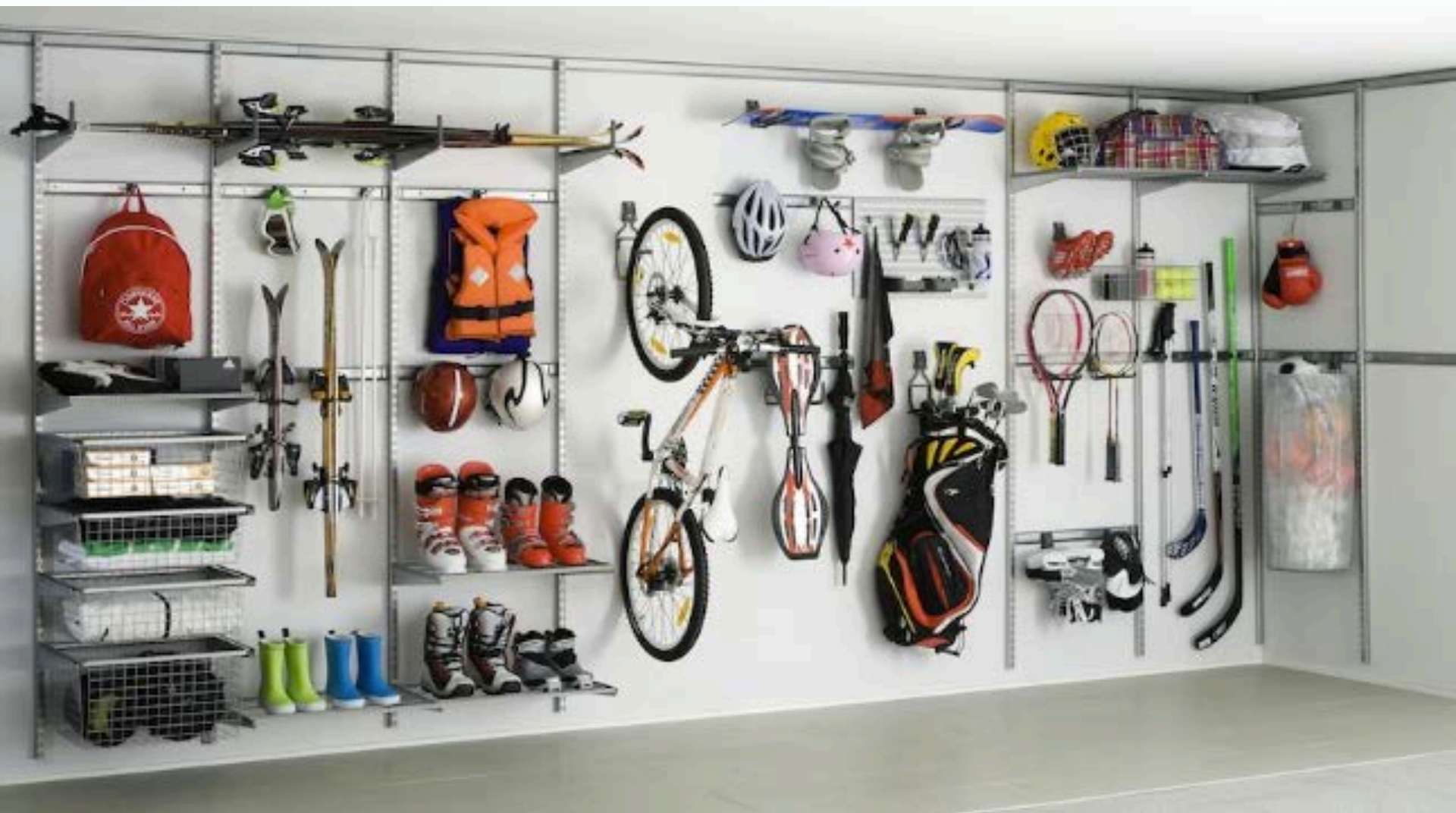
Participants will be able to...

- Assess data needs and level of data control
- Explain the power of Open Source EHRs
- Evaluate the importance of optimizing EHR use

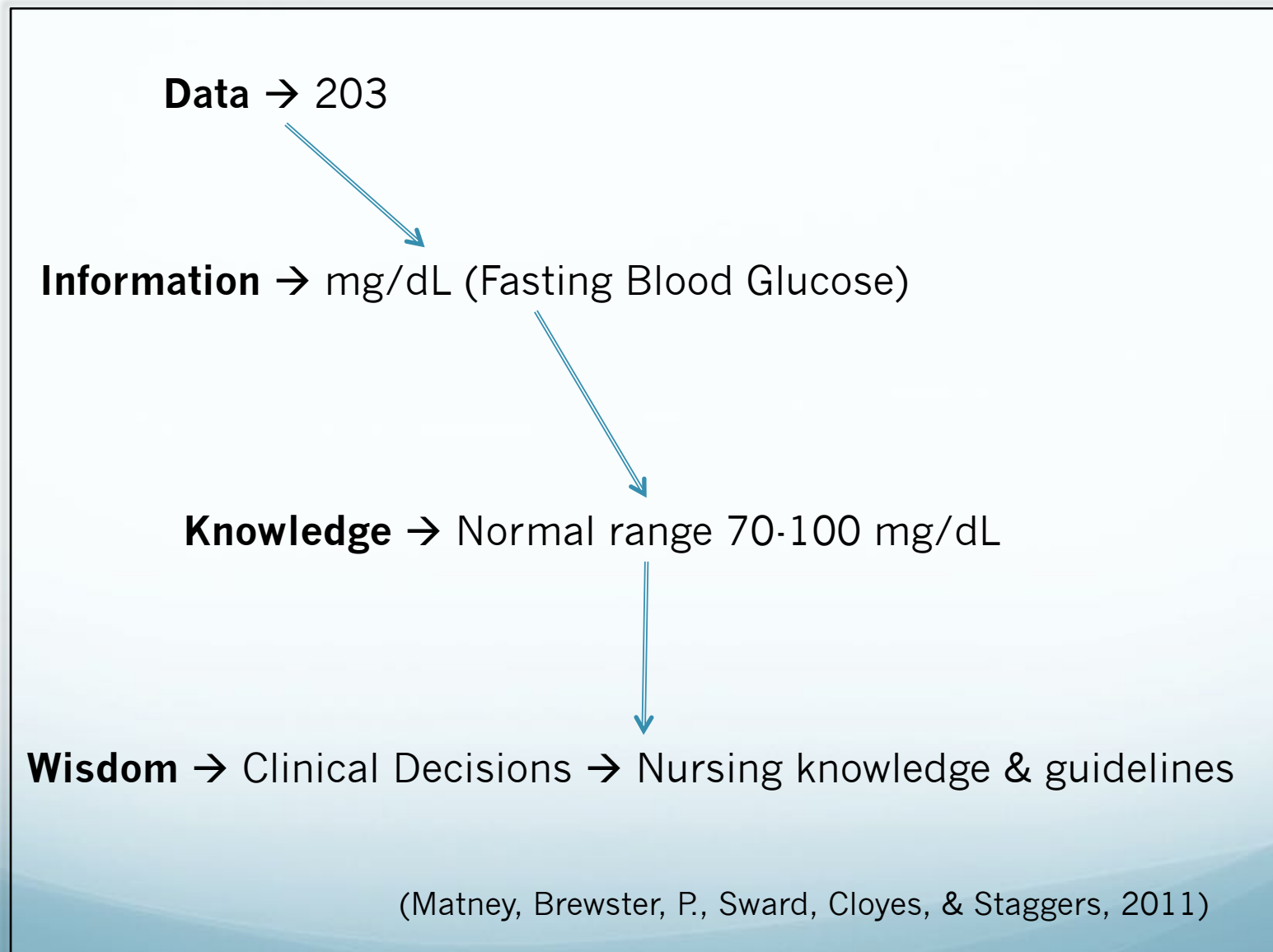
BEWARE!!!



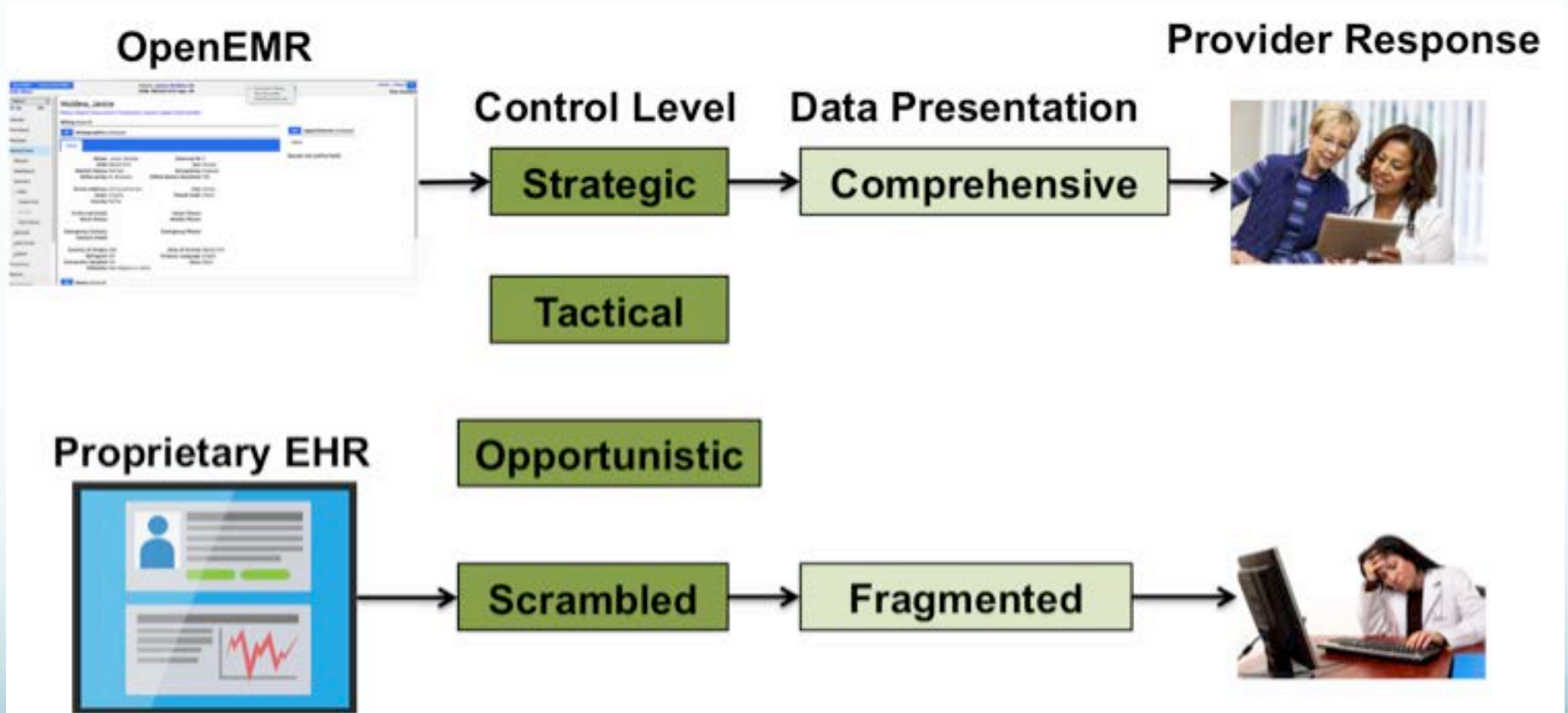




DIKW Framework



Contextual Control Model



(original modified from Brewster, R., 2014, p. 12)

EHR Basics

- Appointments & Scheduling
- Electronic Medical Records
- Computer Physician Order Entry (CPOE)
- Clinical Decision Rules & Alerts
- HIPAA Compliant & Secure Database
- Data Exchange
 - External providers, labs, pharmacies, etc.

EHR Options

- eRX (usually 3rd party subscription)
- Practice Management
- Patient Portal
- Clearinghouse

What is an Open Source EHR?

- Open Source is code base which can be
 - Shared
 - Modified
 - Distributed
- Customizable from base system
- Most managed/supported within a community
- Supported by experienced developers

Who can use an Open Source EHR?

- Primary Care
- Acute Care
- Specialty Care
- Occupational Health
- Behavioral Health
- Surgical Centers
- Community Health Centers
- Home Based Care
- Long Term Care
- Correctional Facilities
- School Clinics
- Clinical Research
- Academia
- Safety Net Clinics
- Simulation Labs
- VA/Military Medical Centers

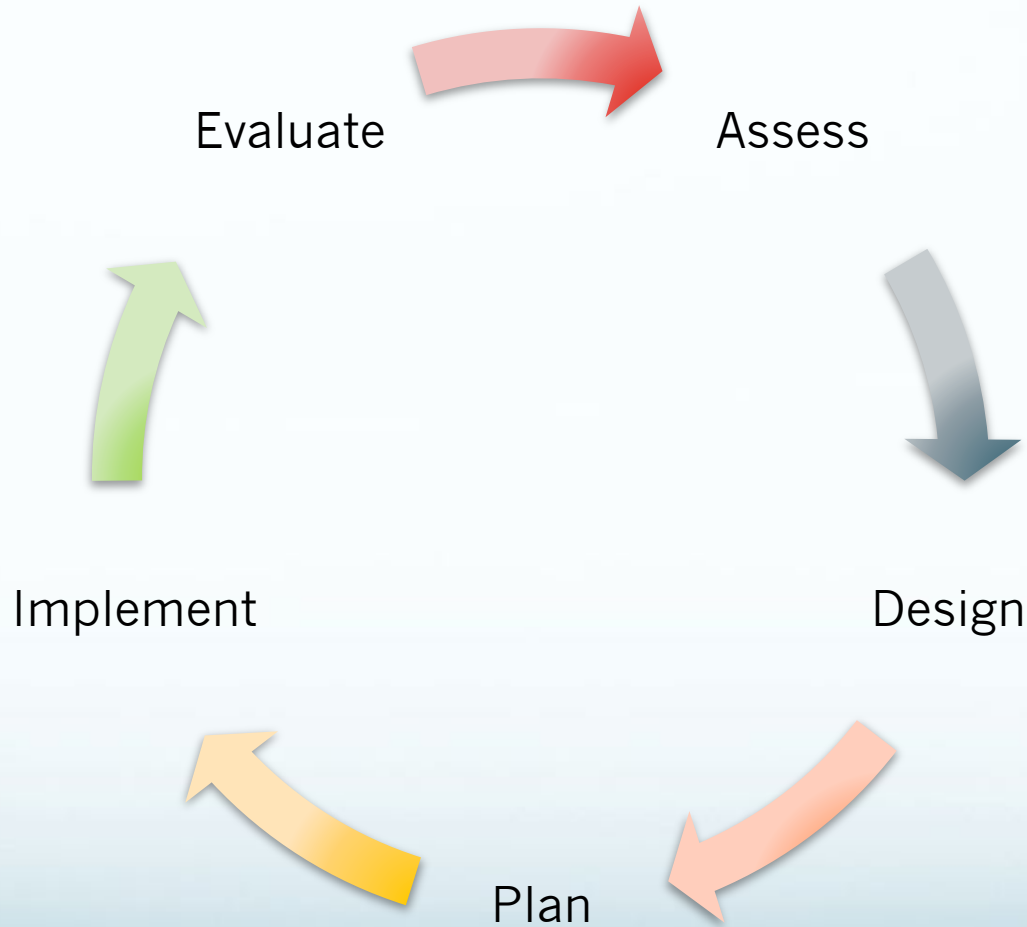
Why Clinic Chose OpenEMR?

- Affordable...
 - No license fee
 - Free installation on Mac OsX, Linux, Windows
- Achieved ONC Meaningful Use Certification
- Allows free database access and control
- Global network actively supporting users & developers
- Leader in available features, customization, user satisfaction, learnability, and efficiency (Zaidan et al., 2015)

Why Clinic Chose OpenEMR?

- Modular design, flexible, and fully customizable
- Self- or remote-hosted installation
- Global network of certified vendors
- Potential for Informatics & Simulation Lab training
- Supports HIPAA compliance and security
- Capable of HIE

Optimizing EHR Utilization



Assess Practice

- Why change?
- Are you ready to change?
- When do you start?
- Resources
- Technology/IT Capabilities
- Budget
- Current processes and work flow
- Future outlook?

Data Assessment

Data Needs

- Why is data needed?
- What data is required?
- Who captures the data?
- Disseminate where?
- How will it be used?
- When is it needed?

Data Control

- Where/how is data stored?
- Data collection rules?
- Field types/data structures?
- How is data disseminated?
- Who controls the data?

Design

- Determine needs vs. wants
- Brainstorming/Mind Maps
 - Establish/understand workflow
 - Develop data collection and reporting guidelines
- Research which EHR features enhance your practice
- Determine what technology must be outsourced
- Determine SMART goals

Establish Data Collection Guidelines

- Collect only necessary data
- Minimize free text
- Minimize required fields
- Share data across forms/tables
- Use common units and terminology
- Simplify data structures for usability
- Use change management best practices

Design

- What system is best?
- How will you use the EHR?
 - What features?
 - How will you collect, store, and retrieve data?
- Who will use it?
- Is (additional) hardware required?
- Equipment Interfaces?
- Costs within budget?

Clinical Workflow Design/Redesign

- Document Current Workflow
- Identify bottlenecks
- Ensure workflow is compatible w/ EHR
 - Is EHR customizable or will workflow change?
 - Cost of change
- PDSA Workflow
 - User feedback
 - Practical?
 - Efficient and robust?

Do we differentiate?

Practice INFO

MAP
SIM

Schedule
Calendar
Appnts

INTAKE

Emergency Contact
PT CONTACT INFO
ZIP CODE?

Demographics
LANGUAGE
Age
Gender
COO
RACE
Ethnicity
Refugee
Risks
Homeless
Zika
Depression
SBIRT

Ht
Wt

Vitals

BP
HR
RR
O2 sat
Pain
LMP?

POCT LABS

UA/CS?
UHG
A1C
Hgb
B6

Notes to other Providers

ENCOUNTER

SOAP

SUBJECTIVE (FREE TEXT/TEMPLATES)
OBJECTIVE (FREE TEXT/TEMPLATES?)
ASSESSMENT (DX, CPT, ICD)
PLAN - (FREE TEXT/TEMPLATES)

SCRIPTS

REFERRALS

OpenEMR

Logins

User Types

ADMIN/STAFF
BSN STUDENTS
MSN/DNP STUDENTS
MA/INTERPRETERS
FACULTY/PROVIDERS
PSYCH
SW
PHARMACY

Privileges

Read
Write
Add Only

Referrals

REPORTS
(VIEW
OUTPUT
PRINT)

PATIENT SUMMARY
DATA QUERIES (CSV, EXCEL?)
GRAPHS/TRENDS

mention computers
wifi

Backup Process

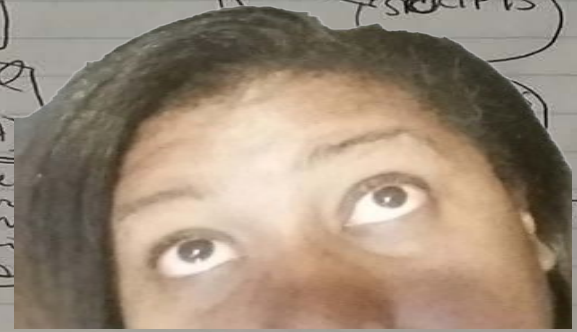
Add Pharmacies

Installation Process

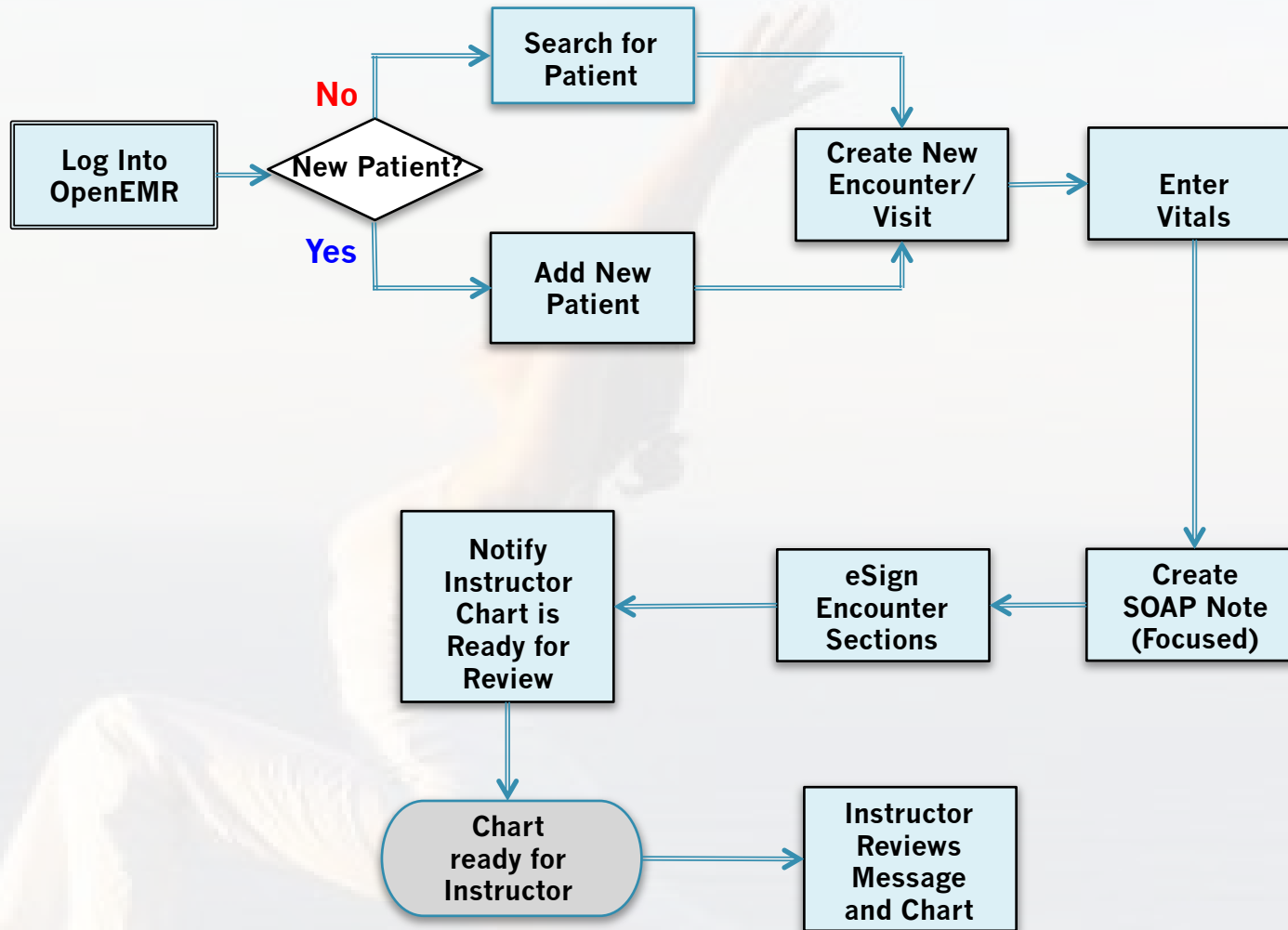
Add Personal List
DATE EXT

Add Plugin Process

Remove Feature
- Billing
- Insur
- Fees



Simulation Lab Workflow



Plan

- How and when will you make changes?
- What are you going to Stop, Start, Sustain, Change?
- How paperless will you go?
 - Will there be chart migration?
 - Will paper documents be scanned?
- Data collection, presentation, & dissemination
- SWOT Analysis
- 'Go live' date

Standard Demographics Entry Form

NEW PATIENT | Home | Manual | Logout | Billy Smith

Hide Menu

Default | Top | Bot

10 Calendar | Messages | Patient/Client | Patients | New/Search | Summary | Visits | Create Visit | Current | Visit History | Records | Visit Forms | Import | Fees | Procedures | Administration | Reports | Miscellaneous

Search or Add Patient

Who

Name: External ID:
DOB: Sex:
S.S.: License/ID:
Marital Status:
User Defined:

Contact

Address: City:
State: Add Postal Code:
Country: Add Mother's Name:
Guardian's Name: Emergency Contact:
Emergency Phone: Home Phone:
Work Phone: Mobile Phone:
Contact Email:

Choices
 Employer
 Stats

Language: Add Ethnicity:
Race: Financial Review Date:
Family Size: Monthly Income:
Homeless, etc.: Interpreter:
Migrant/Seasonal: Referral Source: Add
VFC:

Popups

Demographics Entry/Display Layout Customization

Edit layout: Demographics

Who

Order	ID (?)	Label (?)	UOR	Data Type	Size	Max Size	List	Backup List	Label Cols	Data Cols	Options	Description
1	title	Name	Optional	List box		0	titles		1	1	N	Title
2	fname		Required	Textbox	1	63			0	0	CD	First Name
3	mname		Optional	Textbox	2	63			0	0	C	Middle Name
4	lname		Required	Textbox	1	63			0	0	CD	Last Name
5	pubpid	External ID	Required	Textbox	1	15			1	1	ND	External identifier
6	DOB	DOB	Required	Text-date		10			1	1	D	Date of Birth
7	sex	Gender	Required	List box		0	sex		1	1	N	Gender
10	status	Marital Status	Optional	List box		0	marital		1	1		Marital Status
11	occupation	Occupation	Optional	List box w/add		0	Occupation		1	3		Occupation
12	referral_source	Referred by	Required	List box w/add		0	refsource		1	1		How did the client hear about us
13	hipaa_notice	HIPAA Notice Received	Required	List box		0	yesno		1	3		Did client receive a copy of the HIPAA Notice?
14	empty_line1		Optional	Static Text		150			1	6		
15	addr_label	Address	Unused	Static Text		63			0	0		
20	street	Street Address	Optional	Textbox	2	63			1	1	C	Street and Number
21	city	City	Optional	Textbox	1	63			1	1	C	City Name
22	state	State	Optional	List box w/add		0	state		1	1		State/Locality
23	postal_code	Postal Code	Optional	Textbox	6	63			1	1		Postal Code

Customized Demographics Entry Form

Search or Add Patient

Who

Name:	Unassigned	<input type="text"/>	<input type="text"/>	<input type="text"/>	External ID:	<input type="text"/>
DOB:	<input type="text"/>				Gender:	Unassigned
Marital Status:	Unassigned				Occupation:	Add Unassigned
Referred by:	Add	Unassigned			HIPAA Notice Received:	Unassigned
Street Address:	<input type="text"/>				City:	<input type="text"/>
State:	Add	Unassigned			Postal Code:	<input type="text"/>
County:	Add	Unassigned			Home Phone:	<input type="text"/>
Preferred Email:	<input type="text"/>				Mobile Phone:	<input type="text"/>
Work Phone:	<input type="text"/>				Emergency Phone:	<input type="text"/>
Emergency Contact:	<input type="text"/>					
Contact Email:	<input type="text"/>					
Country of Origin:	Add	Unassigned			Date of Arrival:	<input type="text"/>
Refugee?:	Unassigned				Primary Language:	Unassigned
Interpreter Needed:	Unassigned				Race:	Add Unassigned
Ethnicity:	Unassigned					

- Captures required clinic data.
- Fully customizable structured data fields.

Insurance

Required fields highlighted in red font reduce risk of missing data

Search

Create New Patient

Standard Demographics Display

NEW PATIENT CLEAR ACTIVE PATIENT Patient: **Phil Belford (1)** Encounter History Home | Manual Logout
Hide Menu Patient: **Phil Belford (1)** DOB: 1972-02-09 Age: 45 Billy Smith

Default Top Bot

Belford, Phil Delete Reset Onsite Portal Credentials Reset Offsite Portal Credentials
[History](#) | [Report](#) | [Documents](#) | [Transactions](#) | [Issues](#)

Billing (expand)

Edit **Demographics (collapse)**

Who Contact Choices Employer Stats Misc

Name: Phil Belford	External ID: 1
DOB: 1972-02-09	Sex: Male
S.S.: 333222333	License/ID:
Marital Status: Single	
User Defined:	

Edit **Insurance (expand)**

Edit **Notes (collapse)**

Inbox Sent Items

There are no notes on file for this patient. [To add notes, please click here.](#)

Edit **Clinical Reminders (collapse)**

Measurement: Blood Pressure (**Past Due**)
Assessment: Tobacco (**Past Due**)

Add **Appointments (collapse)**

None

Edit **Medical Problems (collapse)**

HTN
Chronic Renal Insuficiency

Edit **Allergies (collapse)**

penicillin

Edit **Medications (collapse)**

Norvasc
Lisinopril

Edit **Immunizations (collapse)**

None

Edit **Prescription (collapse)**

None

Calendar 10 Messages Patient/Client Patients New/Search Summary Visits Create Visit Current Visit History Records Visit Forms Import Fees Procedures Administration Reports Miscellaneous

Popups Find:

Customized Demographics Display

NEW PATIENT CLEAR ACTIVE PATIENT Patient: **Janice Muldew (4)** Home | About x
DOB: 08/26/1976 Age: 40 One Student

Hide Menu
Default
Top Bot

Calendar
Flow Board
Messages
Patient/Client
Patients
New/Search
Summary
Visits
Create Visit
Current
Visit History
Records
Visit Forms
Import
Procedures
Reports
Miscellaneous

Encounter History
New Encounter
Past Encounter List

Muldew, Janice

History | Report | Documents | Transactions | Issues | Ledger | External Data

Billing (expand)

Demographics (collapse) **Appointments** (collapse)

Who

None
(Issues not authorized)

Name: Janice Muldew	External ID: 4
DOB: 08/26/1976	Sex: Female
Marital Status: Married	Occupation: Engineer
Referred by: Dr. Brewster	HIPAA Notice Received: YES
Street Address: 523 Sunshine Ave	City: Fairfax
State: Virginia	Postal Code: 22033
County: Fairfax	
Preferred Email:	Home Phone:
Work Phone:	Mobile Phone:
Emergency Contact:	Emergency Phone:
Contact Email:	
Country of Origin: USA	Date of Arrival: 08/26/1976
Refugee?: NO	Primary Language: English
Interpreter Needed: NO	Race: Black
Ethnicity: Not Hispanic or Latino	

Notes (expand)

Paper vs. Customized Intake

Name _____ Date of Birth _____

Social Risk

Homelessness Risk:

Zika Screen

Country of Origin: Date of Arrival:

Int'l travel w/in 9 months?: If YES, where did you travel?:

Medication Screen

Have you been prescribed any medication to take daily? Daily Rx?:

In the past 2 weeks have you missed any medication doses? Missed dose(s)?:

Hospitalization Screen

Recent Hospitalization or ED visit: If yes, when were you discharged?:

If discharge date unknown enter estimate and interval:

YES

NO

Paper vs. Customized PHQ9

Over the last two weeks, how often have you been bothered by any of the following problems?

Not at all

PHQ_9 Scoring

Over the last two weeks, how often have you been bothered by any of the following problems?

1. Little interest or pleasure in doing things?
2. Feeling down, depressed, or hopeless?
3. Trouble falling or staying asleep, or sleeping too much?
4. Feeling tired or having little energy?
5. Poor appetite or overeating?
6. Feeling bad about yourself - or that you are a failure or have let yourself or others down?
7. Trouble concentrating on things, such as reading the newspaper or watching television?
8. Moving or speaking so slowly that other people could have noticed?
-- Or the opposite --
Being so fidgety or restless that you have been moving around a lot more than usual?
9. Thoughts that you would be better off dead, or of hurting yourself in some way?
10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

1. Interest score:
2. Depression score:
3. Sleep score:
4. Low energy score:
5. Appetite score:
6. Esteem score:
7. Concentration score:
8. Psychomotor score:

- 1-Several days
- 1-Several days
- 2-More than half the days
- 2-More than half the days
- 2-More than half the days
- 1-Several days
- 0-Not at all
- 1-Several days

9. SI score:
10. Impact on daily life:

- 1-Several days
- Somewhat difficult

Click Total Score textbox to update Total Score, Severity, and whether Follow-up is needed

Total Score:

11

Depression Severity: 0-4 none, 5-9 mild, 10-14 moderate, 15-19 moderately severe, 20-27 severe.

Severity:

10-14: Moderate

A score greater than 9 requires follow-up with a provider.

Refer to Provider/Interprofessional partner-:

YES

Nearly every day

Feeling bad about yourself - or that you are a failure or have

Not at all
Several days

Paper vs. Customized AUDIT-C

SBIRT Universal Screen for Raymond Burr on 02/20/2017

AUDIT - C	Scoring system					Your score
	0	1	2	3	4	
In the last year, how often do you have a drink containing alcohol?	Never	Monthly or less	2 - 4 times per month	2 - 3 times per week	4+ times per week	
In the last year, when you drink alcohol, how many drinks do you typically have on a given day?	1 - 2	3 - 4	5 - 6	7 - 9	10+	
- Men: 5 or more drinks on one occasion?	Never	monthly	Monthly	Weekly	daily	

Scoring:

In men, a score of 4 or more is considered a positive screen.

In women, a score of 3 or more is considered a positive screen.

Total Score: _____

- SBIRT Drugs
- SBIRT Tobacco

Save **Cancel**

A misty forest scene with tall evergreen trees and a path leading into the distance. The text is overlaid on the image.

*Live as if you were to die
tomorrow. Learn as if you were
to live forever.*

Mahatma Gandhi



References

- Aminpour, F., Sadoughi, F., and Ahamdi, M. (2014). Utilization of open source electronic health record around the world: A systematic review. *Journal of Research in Medical Sciences*, 19, 57-64. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3963324/>
- Brewster, R. R. (2014). *The art of data visualization: A demonstration of possibility*. (Unpublished doctoral manuscript). George Mason University, Fairfax, VA.
- Coleman, N., Halas, G., Peeler, W., Casaclang, T., & Katz, A. (2015). From patient care to research: A validation study examining the factors contributing to data quality in a primary care electronic medical record database. *BMC Family Practice*, 16, 1-8. doi: 10.1186/s12875-015-0223-z
- HealthIT.gov (2013). How to implement EHRs. Retrieved from <https://www.healthit.gov/providers-professionals/ehr-implementation-steps>

References

- International Software Testing Qualifications Board. (n.d.). What is Agile model – advantages, disadvantages and when to use it? Retrieved from <http://istqbexamcertification.com/what-is-agile-model-advantages-disadvantages-and-when-to-use-it/>
- Matney, S., Brewster, P., Sward, K., Cloyes, K., & Stagers, N. (2011). Philosophical Approaches to the Nursing Informatics Data-Information-Knowledge-Wisdom Framework. *Advances in Nursing Science*, 34, 6–18. <https://doi.org/10.1097/ANS.0b013e3182071813>
- Muller, S. (2014) Electronic medical records: The way forward for primary care research? *Family Practice*, 31, 127-129. doi: 10.1093/fampra/cmu009
- OpenEMR. (2016). About OpenEMR. Retrieved from <http://www.open-emr.org>
- Zaidan, A. A., Zaidan, B. B., Al-Haiqi, A., Kiah, M. L. M., Hussain, M., & Abdulnabi, M. (2015). Evaluation and selection of open-source EMR software packages based on integrated AHP and TOPSIS. *Journal of Biomedical Informatics*, 53, 390–404. <https://doi.org/10.1016/j.jbi.2014.11.012>