



Addressing Clinician Burden through Usability

Ross Teague, Ph.D.

Director of User Experience

Allscripts



We Believe

Clinician burden is not a new phenomenon

Burden impact is not limited to clinicians

Clinician burden requires a system approach to solve the problem

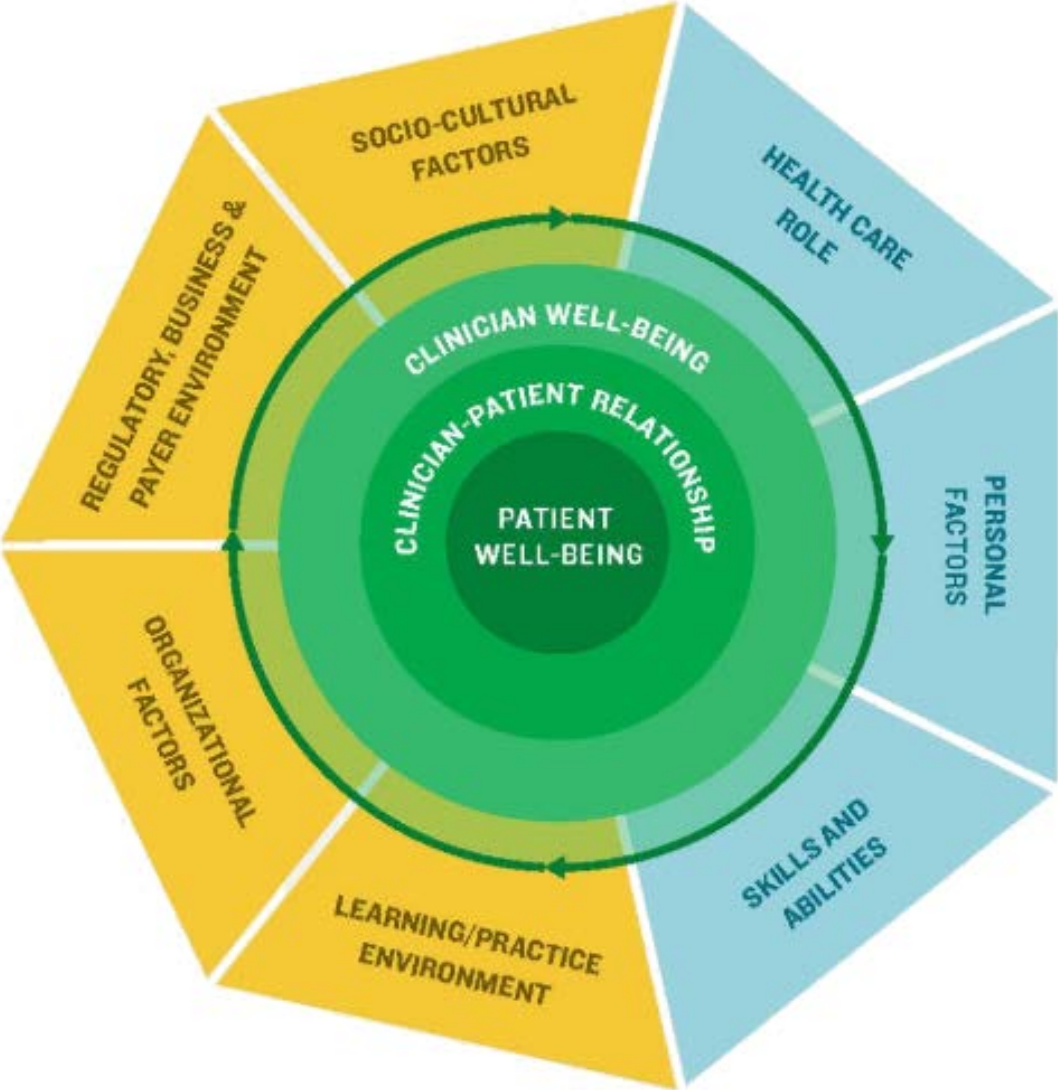
Causes of Burden

External Factors

- Socio-cultural
- Regulatory, Business, & Payer
- Organizational factors
- Learning/Practice Environment

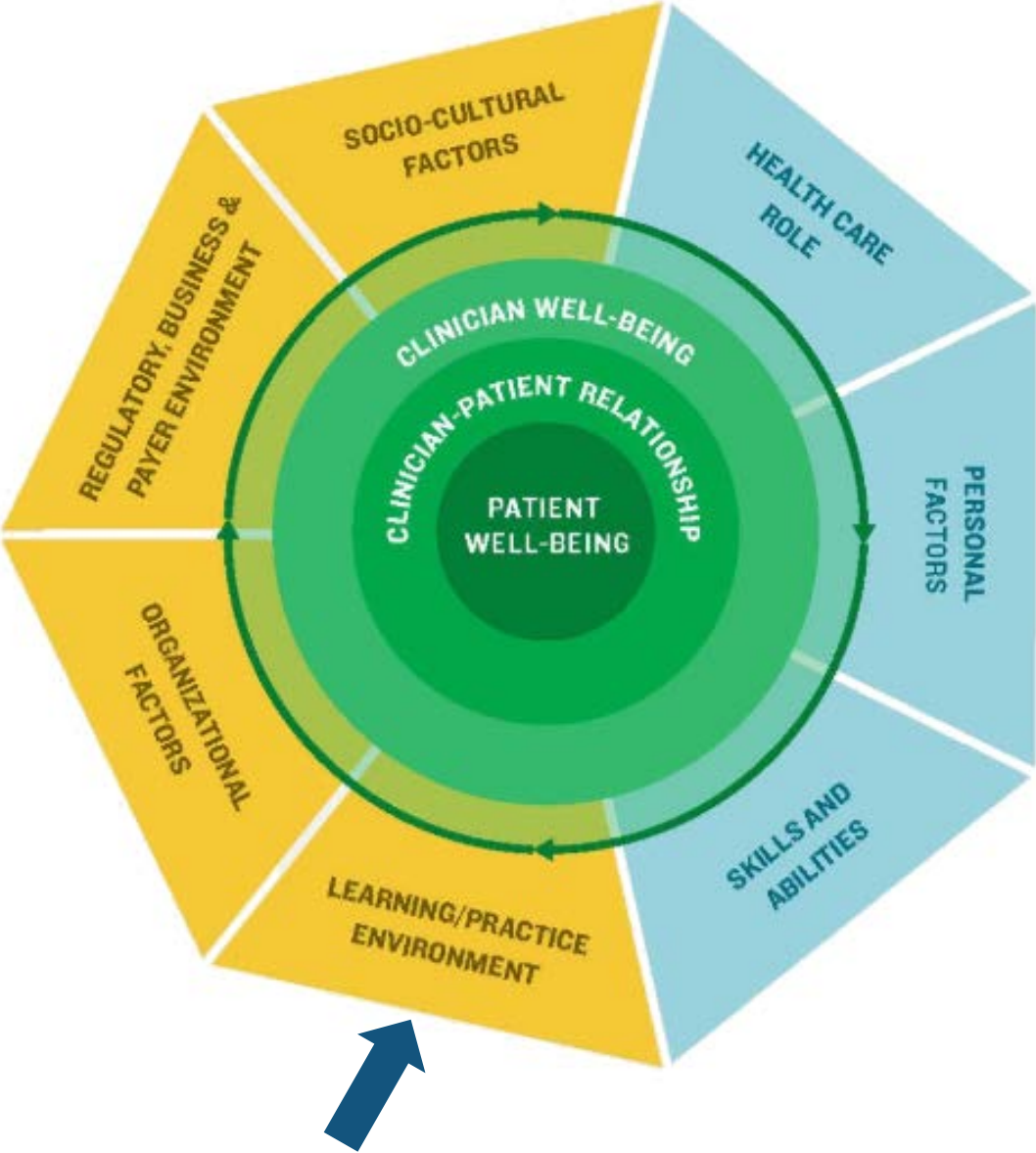
Individual Factors

- Health Care role
- Personal Factors
- Skills and Abilities



Causes of Burden

- Autonomy
- Collaborative vs. competitive environment
- Curriculum
- Health IT Interoperability and Usability of Electronic Health Records**
- Learning and practice setting
- Mentorship
- Physical learning and practice conditions
- Professional relationships
- Student affairs policies
- Student-centered and patient-centered focus
- Team structures and functionality
- Workplace safety and violence



We Believe

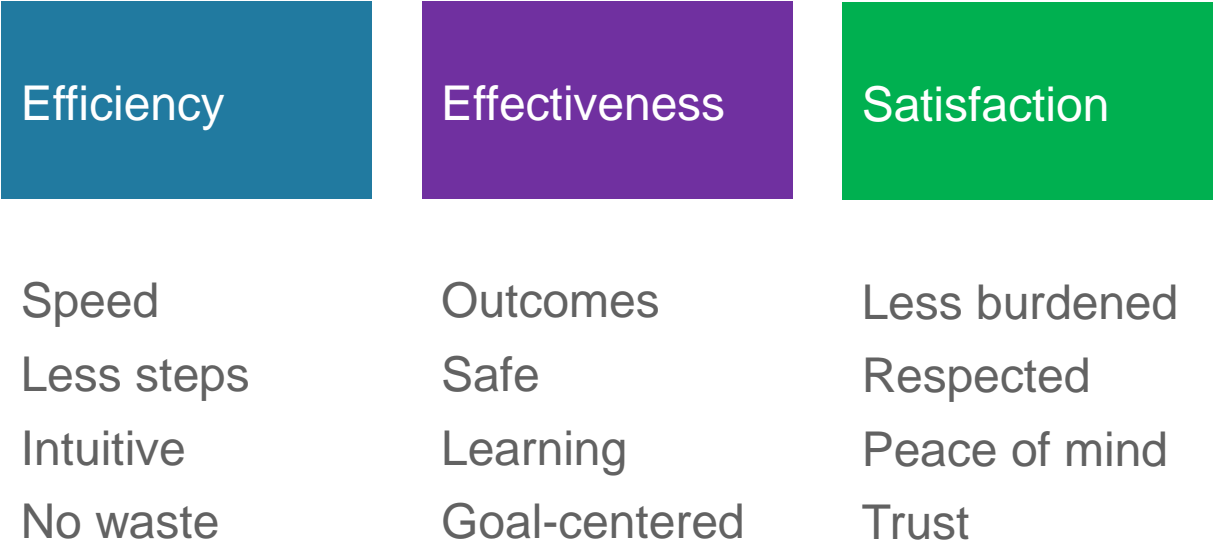
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Clinician burden requires a system approach to solve the problem

HIT vendors have a great opportunity to address

Usability Reduces Burden

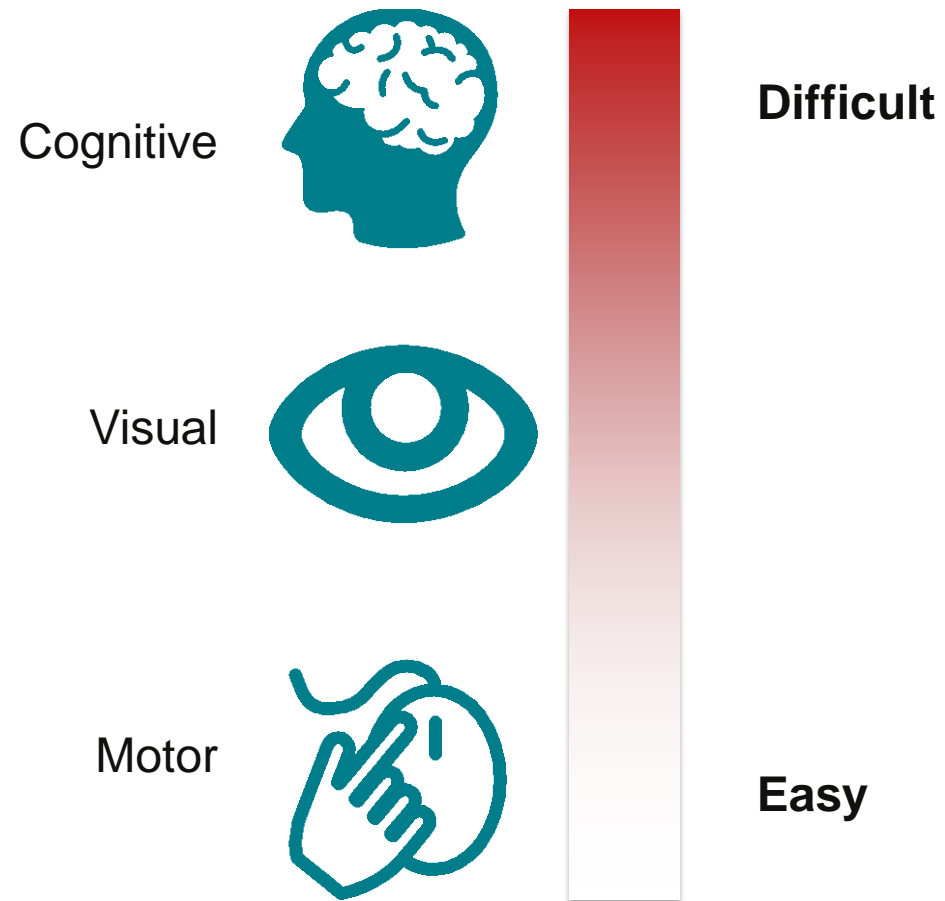


User Profiles

Create



**Should we do
everything possible to
reduce clicks?**



Cognitive Friction and the Science of Usability

LET'S
MAKE
A
DEAL



$$P(A_r|B) = \frac{P(B|A_r)P(A_r)}{P(B)} = \frac{\frac{1}{2} \cdot \frac{1}{3}}{\frac{1}{2}} = \frac{1}{3}$$

$$P(A_g|B) = \frac{P(B|A_g)P(A_g)}{P(B)} = \frac{1 \cdot \frac{1}{3}}{\frac{1}{2}} = \frac{2}{3}$$

$$P(A_b|B) = \frac{P(B|A_b)P(A_b)}{P(B)} = \frac{0 \cdot \frac{1}{3}}{\frac{1}{2}} = 0.$$

Form with two input fields and a date label.

e (DD/MM/YYYY)

Form with three input fields and a date label.

Date (DD/MM/YYYY)

More time
More cognitive burden
Increased risk of mistakes

Feb-12-2016
Nov-01-2013
Nov-11-2010
Jun-28-2015
Aug-04-1998
May-19-2017
Sep-10-2014
July-09-2014

2/12/2016
11/01/2013
11/11/2010
06/28/2015
08/04/1998
05/19/2017
09/10/2014
07/09/2014

More time
More cognitive burden
Increased risk of mistakes

Feb-12-2016
Nov-01-2013
Nov-11-2010
Jun-28-2015
Aug-04-1998
May-19-2017
Sep-10-2014
July-09-2014

8-10 sec.

2/12/2016
11/01/2013
11/11/2010
06/28/2015
08/04/1998
05/19/2017
09/10/2014
07/09/2014

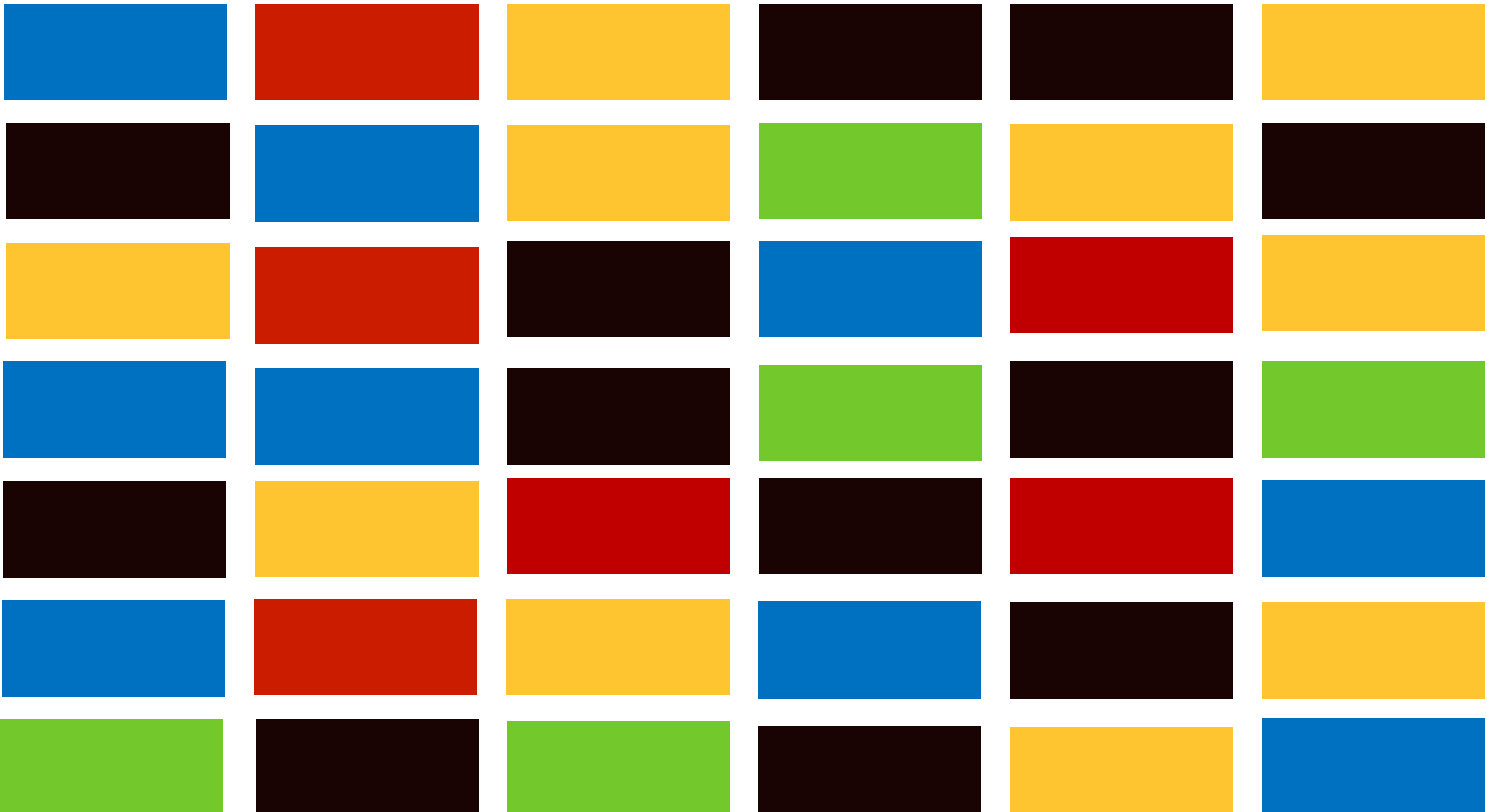
14-18 sec. + more errors

10/12/2016



October





BLUE

BLUE

YELLOW

RED

GREEN

BLACK

YELLOW

BLUE

BLACK

RED

BLUE

RED

YELLOW

GREEN

YELLOW

BLACK

YELLOW

BLACK

YELLOW

BLUE

BLUE

GREEN

RED

YELLOW

BLACK

GREEN

YELLOW

BLUE

GREEN

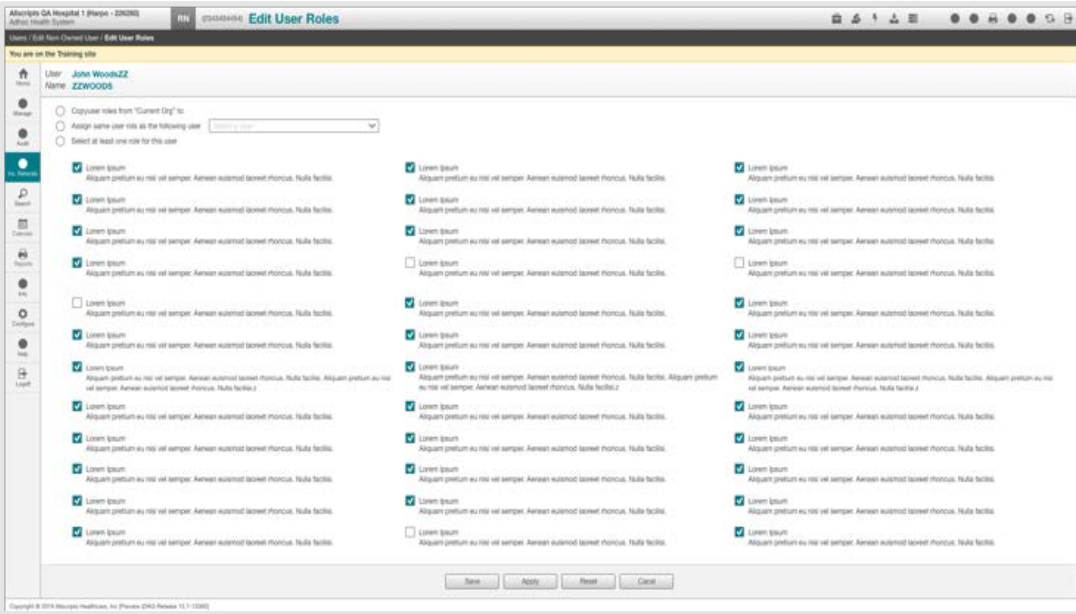
RED

YELLOW



Green means “everything is fine” (and it doesn’t mean that here)

Poor contrast reduces readability



More time, more cognitive burden, and increase the risk of mistakes?

The color green draws our attention. In this case, away from the data that is most important

| Location | # of Patients | Target | Trend |
|-----------|---------------|--------|-------------|
| ICU | 43 | 35 | <u>43</u> ↗ |
| Pediatric | 12 | 10 | 10 ↘ |
| Cardio | 27 | 25 | 25 ↘ |
| Surgery | 22 | 20 | <u>22</u> ↗ |
| Other | 15 | 10 | 10 ↘ |

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Contrast is
important

because it
has a HUGE

impact on
fluency and

adds to the
cognitive tax

that our users
have to pay.

Ratio:
4.5 to 1

WCAG 2.0 level AA requires a contrast ratio of **4.5:1**. Level AAA requires a contrast ratio of 7:1 for normal text and **4.5:1** for large text. (<http://webaim.org/resources/contrastchecker/>)

Contrast is
important

5:1

because it
has a HUGE

1.1:1

impact on
fluency and

7.21:1

adds to the
cognitive tax

1.6:1

that our users
have to pay.

3.71:1

Ratio:
4.5 to 1

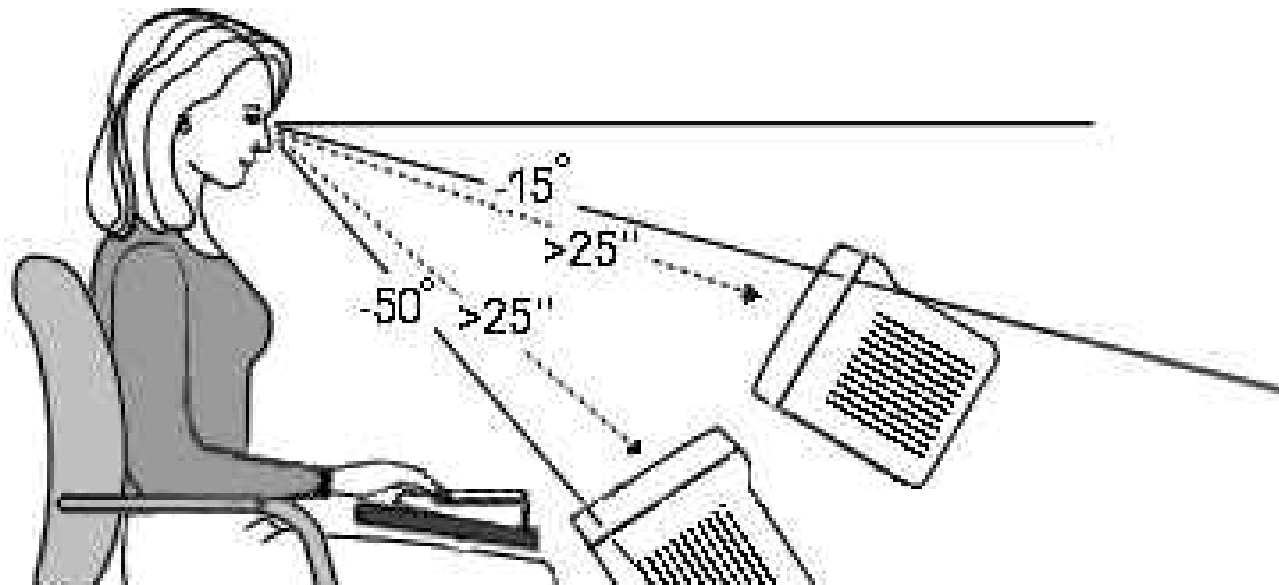
3.0:1

WCAG 2.0 level AA requires a contrast ratio of **4.5:1**. Level AAA requires a contrast ratio of 7:1 for normal text and **4.5:1** for large text. (<http://webaim.org/resources/contrastchecker/>)

007 Rule

Distance X .007 = Text Height

Distance from computer (~18 inches) X .007 = .126





The Science Tells Us...

- Larger fonts
- Less color
- Narrower columns
- Less information
- More white space
- Alignment and hierarchy
- ...

The Science Tells Us...

- Larger fonts
- Less color
- Narrower columns
- Less information
- More white space
- Alignment and hierarchy
- ...



Greater efficiency
More effective
Higher satisfaction
Safer
Better decisions

LET'S
MAKE
A
DEAL



Helper Philosophy









Ross: Tell me about your day.

Doctor: I work in the office and I work at home. After I put my kids to bed...around 9pm...I get onto my EHR and I start getting ready for the next day.

I go in and prep every note for the next day. I want to make sure that I'm aware of what's happening ahead of time. I'm looking through each client to know why they are coming in, what's happened since I last saw them, just getting ready. I figure out what these codes mean. I know that the information I need is here, I just have to find it that way I relieve my stress. I'm also getting things out of the way that I don't need to see and making sure the things I will need are easy to get to.

It takes a lot of time (and clicks) but it's worth it. It helps to make the patients feel confident and for me to get out of the office in time for dinner with my kids.

Ross: Tell me about your day.

Doctor: I work in the office and I work at home. After I put my kids to bed...around 9pm...I get onto my EHR and I start getting ready for the next day.

Note prep feature

Mobile

Care plan view

I go in and prep every note for the next day. I want to make sure that I'm aware of what's happening ahead of time. I'm looking through each client to know why they are coming in, what's happened since I last saw them, just getting ready. I figure out what these codes mean. I know that the information I need is here, I just have to find it that way I relieve my stress. I'm also getting things out of the way that I don't need to see and making sure the things I will need are easy to get to.

Schedule view

Code dictionary

More data

Less clicks

Another icon

It takes a lot of time (and clicks) but it's worth it. It helps to make the patients feel confident and for me to get out of the office in time for dinner with my kids.

Ross: Tell me about your day.

Warn **Compare**
Doctor: I work in the office and I work at home. After I put my kids to bed...around 9pm...and I start getting ready for the next day.

Assure **Translate**
I go in and prep every note for the next day. I want to make sure that I'm aware of what's happening ahead of time. I'm looking through each client to know why they are coming in, what's happened since I last saw them, just getting ready to figure out what these codes mean. I know that the information I need is here, I just have to find it that way I relieve my stress. Also getting things out of the way that do I need to present making sure the things I will need are easy to get to.

Hide **Status**
Highlight **Notify**
Complete **Trend** **Remove surprises**

Orient **Guide**
It takes a lot of time (and clicks) but it's worth it. It helps to make the patients feel confident and for me to get out of the office in time for dinner with my kids.

Design Science + Helpfulness

Acute - Tasking

The screenshot shows a medical software interface with a 'Prescriptions' tasking view. The top navigation bar includes 'File', 'Registration', 'View', 'GoTo', 'Actions', 'Preferences', and 'Tools'. The user is logged in as 'Williams, John 188'. The main view is titled 'Active Tasks | From: 21-Jan-2019 To: 04-Feb-2019' and shows a list of tasks for patient 'Regan, Nancy'. The selected task is 'Vicodin 5 mg-300 mg oral tablet | 1 tab(s) orally once a day x 7 days'. The task details pane shows the medication prescribed, quantity (7 tabs), and days supply (7). The prescriber information is 'Williams, John' at 'RITE AID-105 GOLDEN GATE PLZA'. The interface is designed to be task-centric, with reduced icons and colors to focus on the task details.

- Reduced icons and colors to focus on tasks
- Access relevant information without leaving the screen
- Tasking-centric view to reduce distractions
- Improved subjective usability by almost 200%

Acute – Smart Pump

Auto enter Smart Pump Data into Flowsheet - Barton, Jason Middle

3 Unacknowledged Alert(s): Smart pump data will not be auto-entered into the flowsheet for orders where the alert is not acknowledged

Dopamine
500mg / 250 ml (DSW)

Dose and Rate from the pump doesn't match the task

| Task Data | | Pump Data | |
|-----------------|---------------|-----------------|---------------|
| Dose | Rate | Dose | Rate |
| 2 mcg/kg/min | 3 units/hr | 3 mcg/kg/min | 4 units/hr |

Select reason

Acknowledge

Dopamine
500mg / 250 ml (DSW)

Dose and Rate from the pump doesn't match the task

Ordered View Order Pump Data

Need Help? Close

- Visual design to enhance readability and understanding
- System points out differences to the user instead of the user having to determine
- *“This is the best alert window I’ve ever seen by any of the vendors!” – smart pump vendor comment*

Ambulatory – Linking Family Members

The screenshot displays a medical software interface for patient management. The top navigation bar shows the patient name 'FAASER, Peanut' and the current date '12/21/2014'. The main window is titled 'Demographics' and contains a summary of patient information:

- Patient Name:** Peanut Faaser
- Patient #:** PFaas
- Social Security Number:** XXX-XX-XXXX
- Birth Date:** 12/21/2014 (5 months ago)
- Sex:** Male
- Race:** Undefined
- Ethnicity:** Undefined
- Language:** Undefined
- Marital Status:** Undefined
- Usual Caregiver:** Mark M. Childs MD
- Usual Caregiver Phone:** Any Caregiver
- Home Address:** (blank)
- Home Address Start Date:** (blank)
- Home Address End Date:** (blank)
- Phone:** (blank)
- Email:** (blank)

Below the demographics, there is a 'Family Charts' section with a 'Has web account' field set to 'No'. A dropdown menu is open, showing relationship options for linking family members:

- Sibling
- Half Sibling
- Non-biological Sibling
- Parent
- Ngn-biological Parent
- Child
- Non-biological Child
- Spouse
- Partner
- Other
- Undefined

At the bottom, a 'Patient Search' window is visible, showing search criteria and results:

Search Criteria:
Last Name: [] Date of Birth: [] Search [] Add... []
First Name: [] Phone: [] Clear []
Patient #: [] Address: 123 Anywhere Street
SSN (last 4 digits): [] Search Training Patients Recent []

Search Results:

| Last Name ^ | First Name | Patient # | SSN | Gender | Date of Birth | Phone | Address | Last Access | Usual Caregiver |
|-------------|------------|-----------|------|--------|---------------|----------------|---------------------|-------------------|---------------------|
| Cullens | Sarah | 36055 | XXXX | Female | 12/24/1965 | (919) 555-2323 | 123 Anywhere Street | 8/13/2015 6:01 PM | Solomon, Brian S NP |

- Family Charts provide the capability of linking family members and sharing pertinent history items
- Saves time and increases accuracy
- Search query pre-filled with most likely search terms
- *“I’ve got to go and tell everyone in the practice about this!”*

Pharmacogenomic – Progressive Display

The image shows a user interface for a pharmacogenomics profile. The main window displays a list of medications with their associated genetic findings. A large grey arrow points from the 'citalopram (Celexa)' entry in the list to a detailed view of that entry. The detailed view includes a genetic interpretation, dosing recommendation, and additional advice, along with a list of alternative medications categorized by their risk level.

Pharmacogenomics Profile
ALLEN, Beth
17-Jun-1957 (60y) | Female | MRN 2487655602261

Search for Medication with PGx Guideline X

Medications with Guidelines | Test Details

Current Meds (7) | Past Meds (2) | All Meds (9)

- citalopram (Celexa)**
CYP2C19 *2/*48 - Significantly Reduced Response to Citalopram
- clopidogrel (Plavix)**
CYP2C19 *5/*5 - Significantly Reduced Response to Clopidogrel
- simvastatin (Zocor)**
SLCO1B1 521T>C C/C - High Myopathy Risk
- ondansetron (Zofran)**
ABCB1 3435C>T C/C - Unfavorable Response to Standard Ondansetron Dosing
- hydrocodone / Ibuprofen (Vicoprofen)**
3 Guidelines Found ▲▲▲
- allopurinol (Allopurinol)**
ABCG2 421C>A C/C - Normal Response to Allopurinol
- warfarin (Coumadin)**
CYP2C9 *1/*1, VKORC11 - Normal Response to Warfarin

ALLEN, Beth
17-Jun-1957 (60y) | Female | MRN 2487655602261

citalopram (Celexa)
CYP2C19 *5/*5 - Significantly Increased Sensitivity to Citalopram

Genetic Interpretation: The genotype result predicts a "poor metabolizer" phenotype, which translates to a significantly reduced CYP2C19 function. Citalopram plasma concentrations are expected to be high, which may increase the risk of dose-dependent adverse events such as QT prolongation.

Dosing Recommendation: At standard label-recommended dosage, citalopram plasma concentrations levels are expected to be high and adverse events may occur. Consider a 50% reduction of the recommended starting dose to help prevent concentration-dependent adverse events. Dose escalations over 20 mg/day for CYP2C19 poor metabolizers are not recommended. An alternative medication may also be considered.

Additional Advice: For a full list of non-genetic factors that may affect citalopram response, including interacting drugs, refer to the prescribing label.

Strength of Evidence: **Moderate** | Source: CPIC | Last Updated: Jan 2017 | Reference: *Celexa Prescribing Label (label approved on 12/03/2012)*

ALTERNATIVE MEDICATIONS

- MEDICATIONS WITH STANDARD DOSING GUIDELINES (3)**
 - Desvenlafaxine (Pristiq, Khedezla)
 - Fluoxetine (Prozac, Symbyax, Sarafem)
 - Mirtazapine (Remeron)
- MEDICATIONS TO USE WITH CAUTION (9)**
- MEDICATIONS TO AVOID (10)**

Note: This clinical annotation does not take into account other considerations beyond the specific genotype mentioned above.

[READ MORE](#)

- Appropriate use of color and organization to reduce cognitive effort
- Organizes information by medication and alternatives to help those new to using pharmacogenomic information



Questions?