



Addressing Clinician Burden through Usability

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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

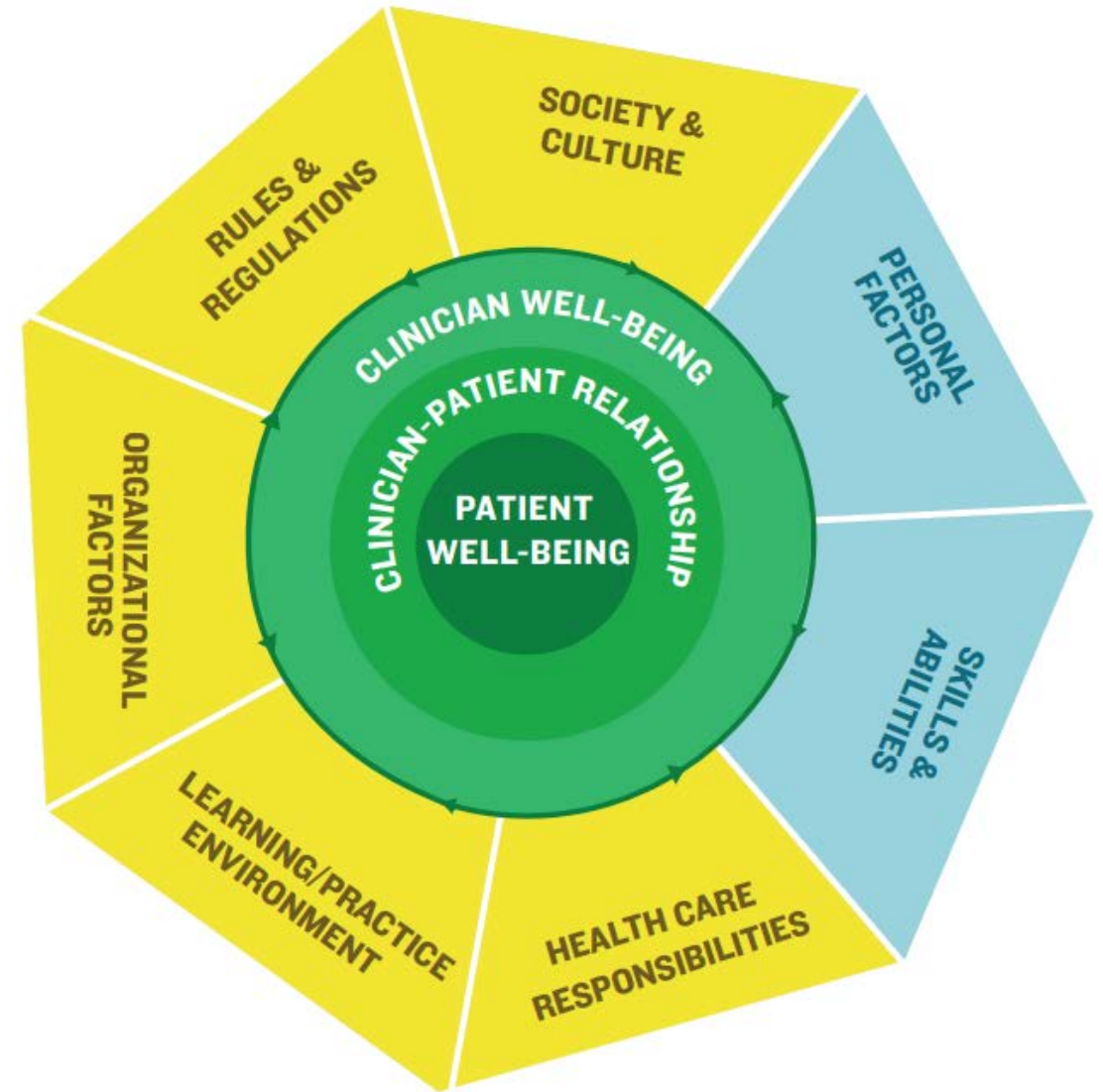
Causes of Burden

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

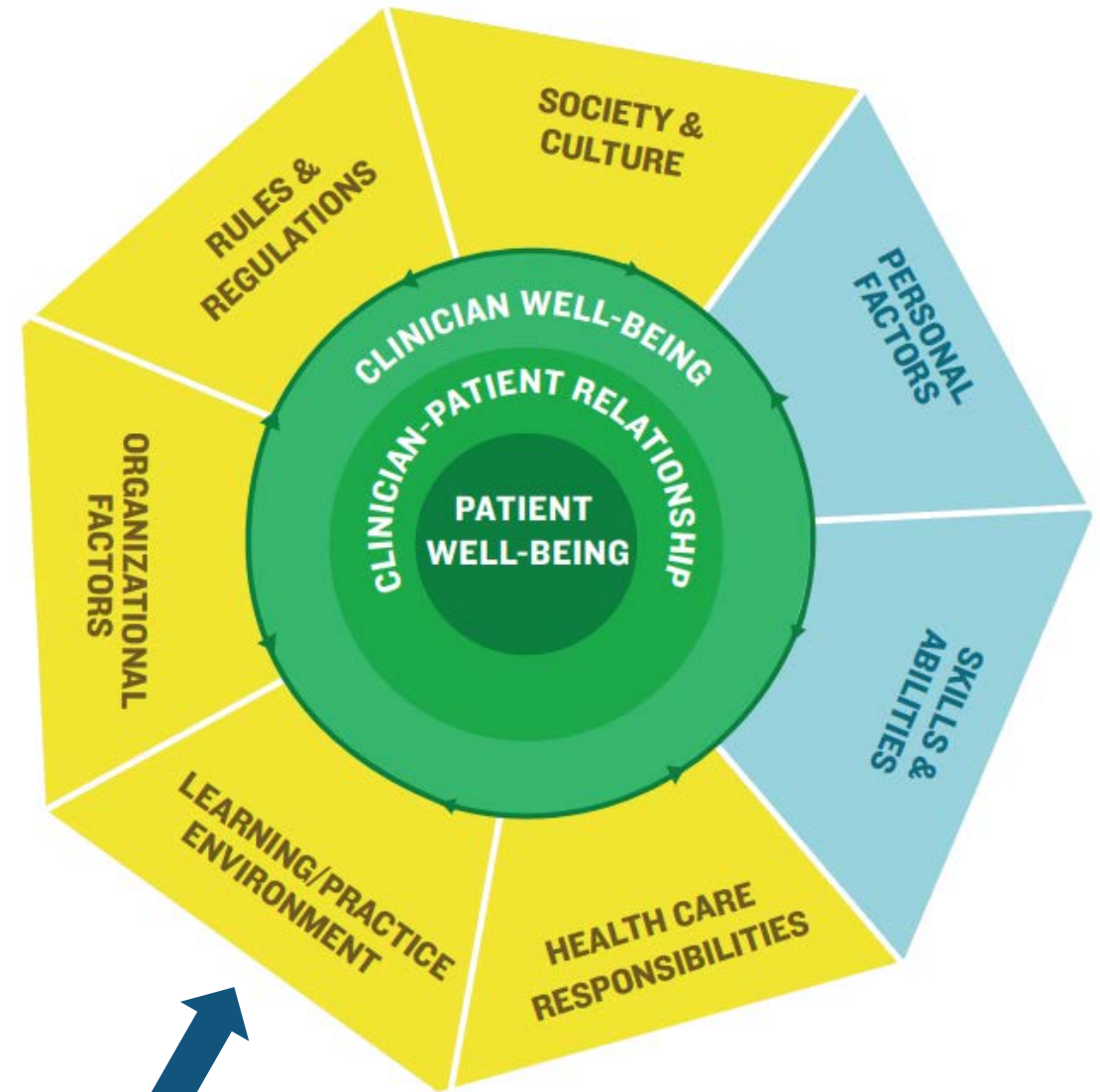
Professional relationships

Student affairs policies

Student-centered and patient-centered focus

Team structures and functionality

Workplace safety and violence



servicenow

We Believe

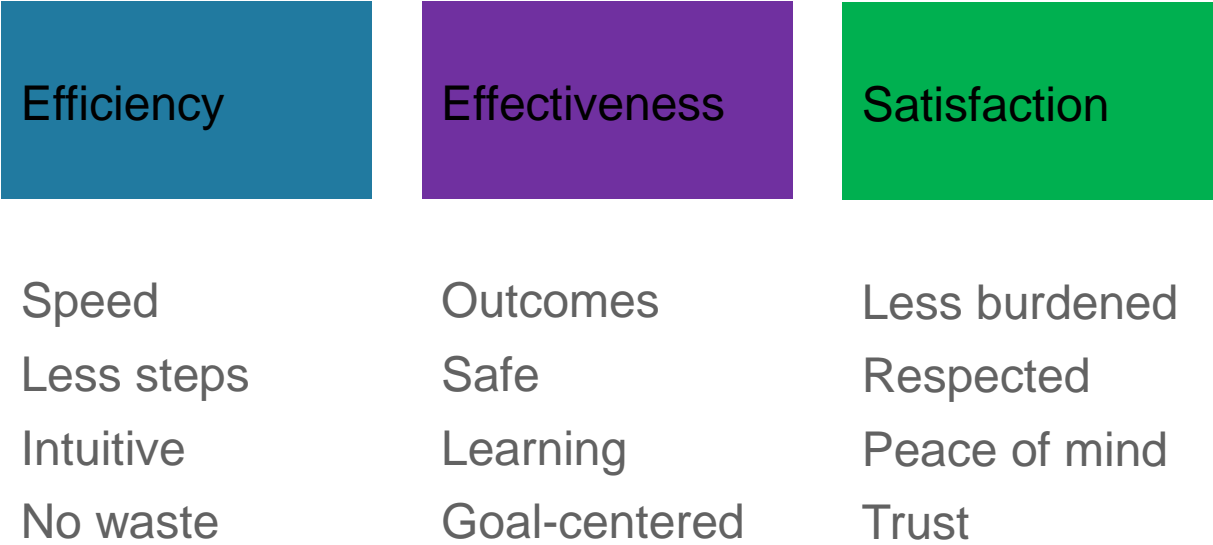
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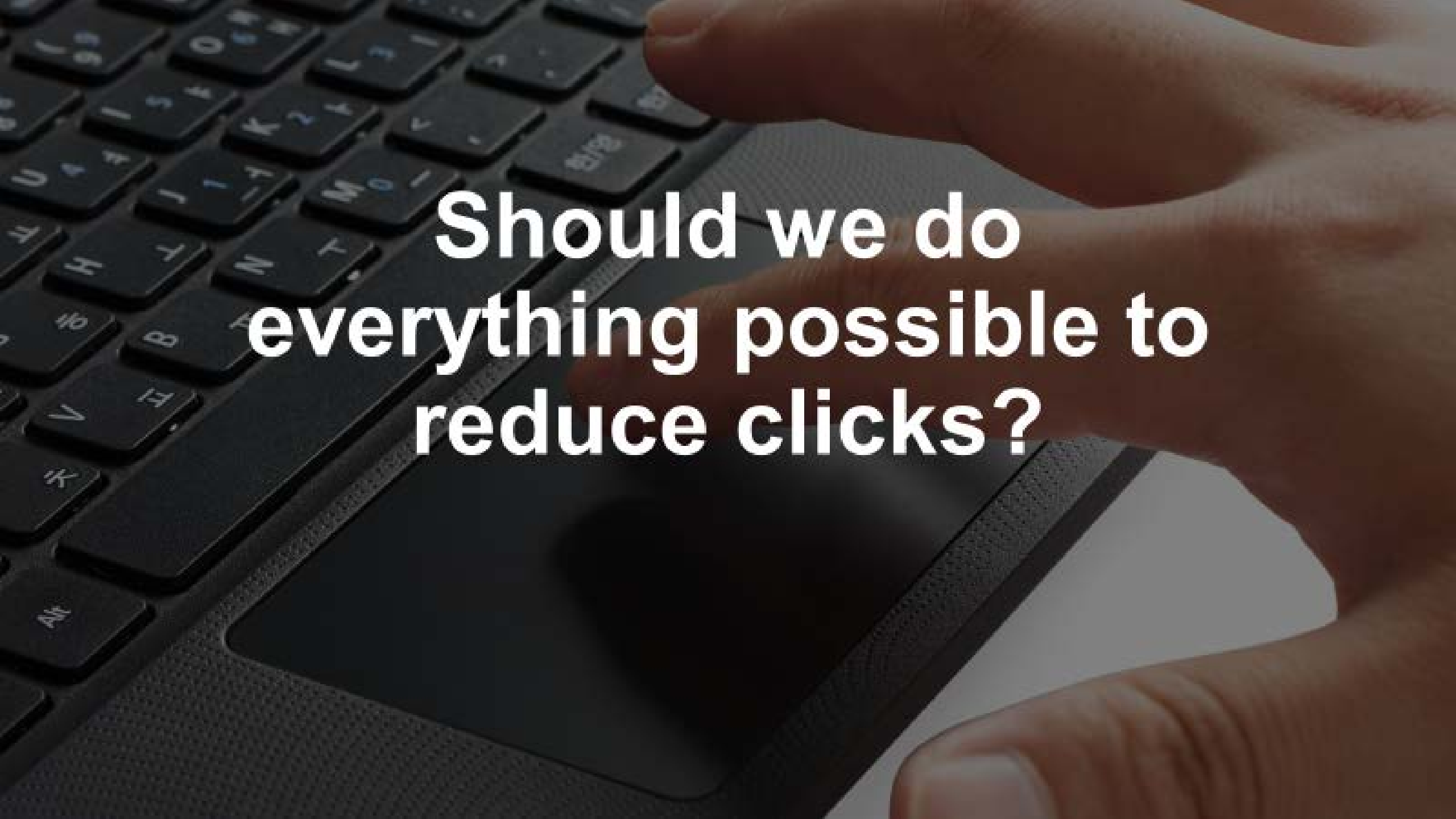
HIT vendors have a great opportunity to address

Usability Reduces Burden

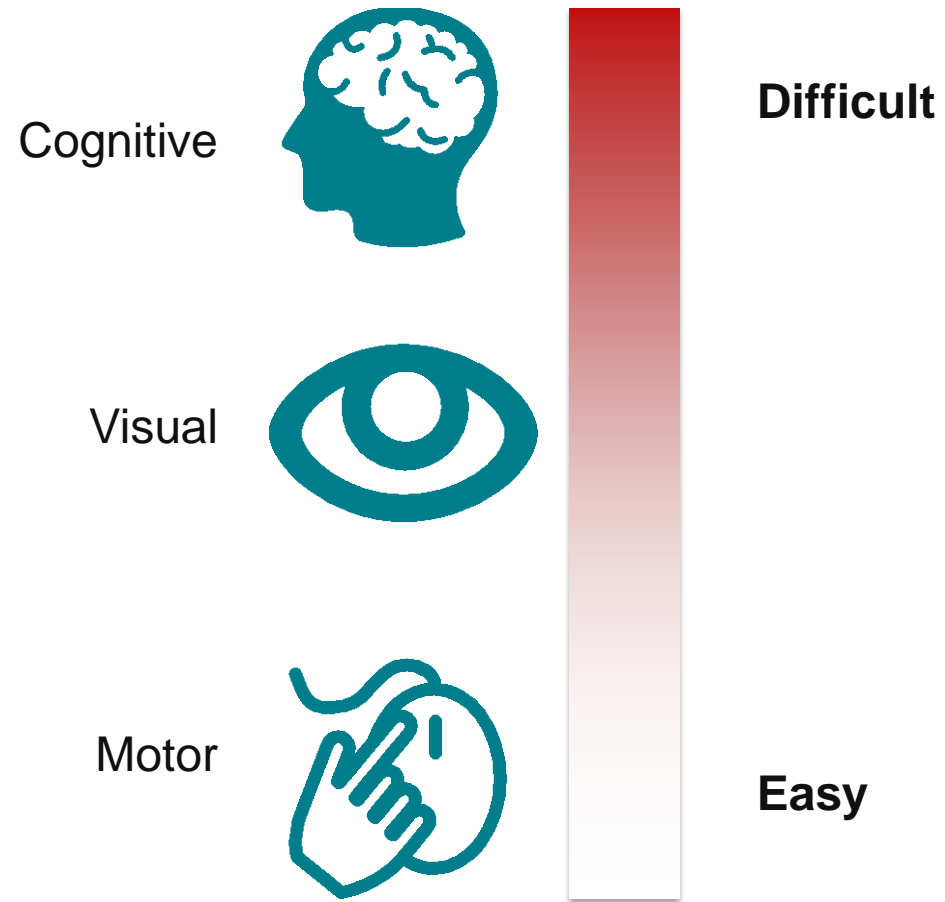


User Profiles

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 two 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

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servicenow

Feb-12-2016

Nov-01-2013

Nov-11-2010

Jun-28-2015

Aug-04-1998

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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

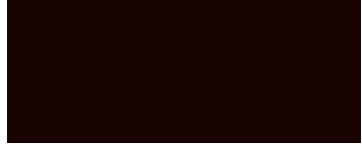
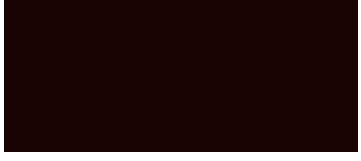
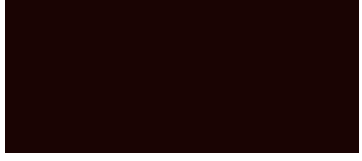
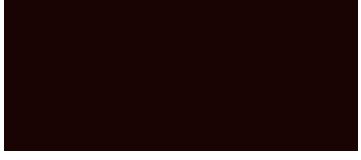
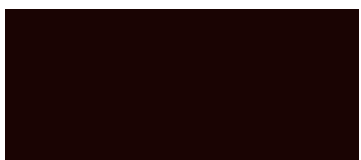
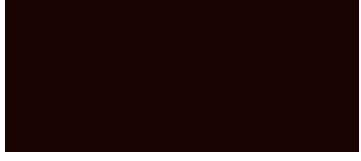
14-18 sec. + more errors

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

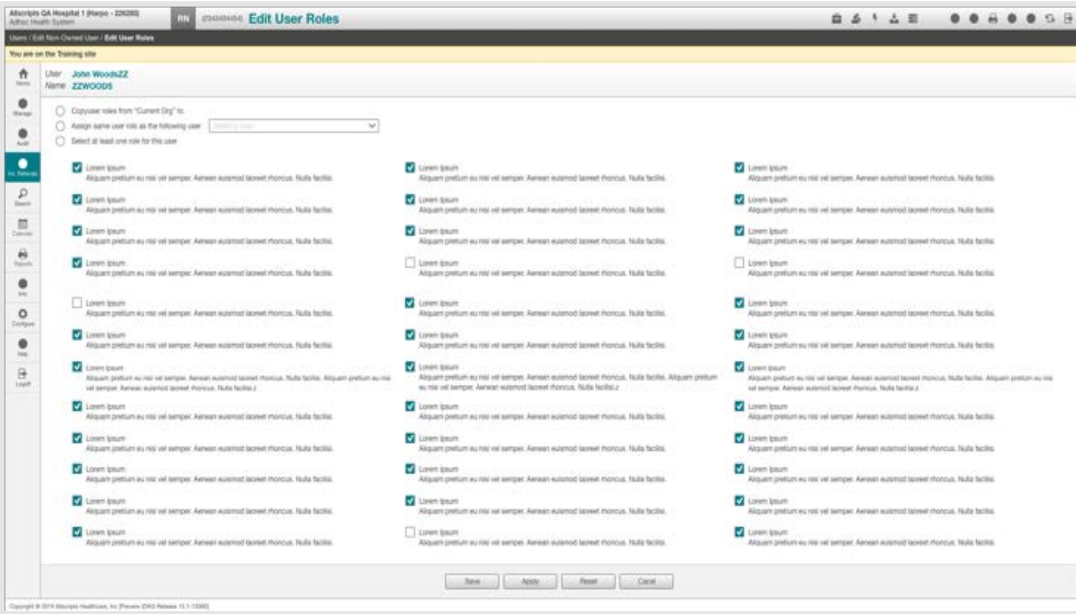
RED

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 ↘

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> ↗
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Other	15	10	10 ↘

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

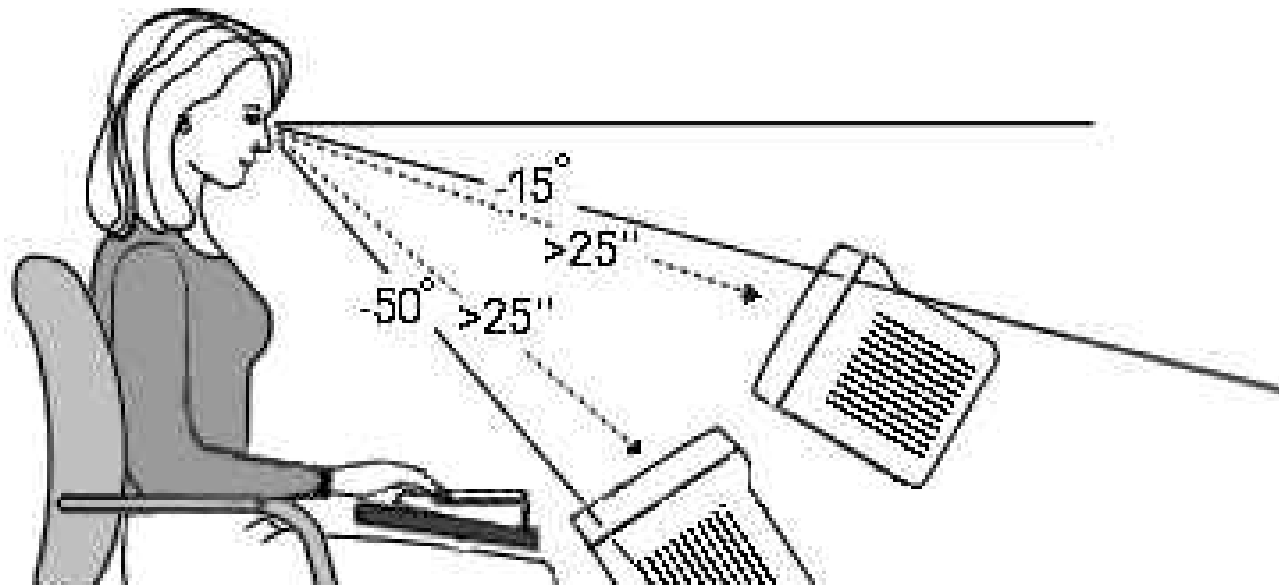
3.0:1

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
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- ...



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...I get into the car and I start getting ready for the next day.

Translate
Assure **Hide** **Status**
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 prepare making sure the things I will need are easy to get to.

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 web-based medical application interface. At the top, there is a navigation bar with 'Patient List' and a menu with 'File', 'Registration', 'View', 'GoTo', 'Actions', 'Preferences', and 'Tools'. Below this is a 'Prescriptions' header with a toolbar containing various icons for tasks and notifications. A filter bar allows users to view 'Active Tasks' based on 'Due Date' from '21-Jan-2019' to '04-Feb-2019'. The main content area is divided into a left sidebar with a list of tasks, a central task detail pane, and a right pane for medication and prescriber information.

Task List (Left Sidebar):

- REGAN, Nancy (03-AUG-2016): oxyCODONE 10 mg oral tablet | 1 tab(s) orally once a day x 6 days
- REGAN, Nancy (03-AUG-2016): Vicodin 5 mg-300 mg oral tablet | 1 tab(s) orally once a day x 7 days
- DUCK, Daphne (15-MAY-2018): morphine 0.5 mg/mL preservative-free injectable solution | 1 milligram(s) injectable once a day
- WILLIAMS, Dog (27-SEP-2018): Lipitor 20 mg oral tablet | 1 tab(s) orally once a day x 5 days
- DWIGHT, Fanny (27-SEP-2018): amLODIPine 2.5 mg oral tablet | 1 tab(s) orally once a day x 6 days
- WILLIAMS, Cat (27-SEP-2018): Lipitor 20 mg oral tablet | 1 tab(s) orally once a day x 30 days
- ASCENSION, John1 (23-OCT-2018): Abilify 10 mg oral tablet | 1 tab(s) orally once a day x 5 days
- DEMO, Compass (18-JAN-2019): colchicine 0.6 mg oral capsule | 1 cap(s) orally once a day x 5 days

Task Detail (Center):

Task: **REGAN, Nancy** | 1 East-101-A S2V | Williams, John | 1001015 / 1000003363 | 30y (Aug-12-1968) | Female

Assigned to: Physician: Williams, John | Status: Active | Notes: Yes | View All

Task: Inbox_Rx to be Approved | From: Williams, John | Rx ID: 28222

Medication Prescribed:
Vicodin 5 mg-300 mg oral tablet
 1 tab(s) orally once a day x 7 days

Quantity: 7 tab(s) | Days Supply: 7 | Refills: None | Substitutions Allowed | Date Written: 03-Aug-2016

Pharmacy:
RITE AID-105 GOLDEN GATE PLZA
 CS RITE AID-105 GOLDEN GATE PLZA
 105 GOLDEN GATE PLAZA
 MAUMEE, OH 435372875
 419-893-5533
 419-893-5158

Prescriber:
Williams, John
 8529 Six Forks Road,
 Raleigh, North Carolina, 27615-1234,
 9198543686
 Submitted By: Williams, John

Task Actions (Left of Detail): Approve (Print) Rx, Deny Rx, Edit Rx, Print Rx Report, Rx Report, Open Rx Writer, Allergies Summary, Health Issue Manager, Create Letter for Result, Print Report, Preview Report, Create Phone Note, Create Referral, Run Called MLM, Order Reconciliation Manager, Outpatient Medication Review, Patient Education Log, InfoButton, View Details, Complete, Reassign.

- 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

Demographics

Registration... Display SSN

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
Privacy Level: Any Caregiver
Usual Caregiver Phone:

Home Address:
Home Address Start Date:
Home Address End Date:
Phone:
Email:

Contacts:

Family Charts:

Has web account: No

Work Address:
Phone:
Email:

Family Charts

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

Patient Search

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!”*

servicenow

Pharmacogenomic – Progressive Display

The screenshot displays a pharmacogenomics profile for a patient named Beth Allen. The profile is titled "Pharmacogenomics Profile" and includes a search bar for "Search for Medication with PGx Guideline". The patient's information is listed as "ALLEN, Beth", "17-Jun-1957 (60y)", "Female", and "MRN 2487655602261".

The profile is organized into sections: "Medications with Guidelines" and "Test Details". Under "Medications with Guidelines", there are three tabs: "Current Meds (7)", "Past Meds (2)", and "All Meds (9)". The "Current Meds (7)" tab is active, showing a list of medications with their respective guidelines:

- citalopram (Celexa)**: CYP2C19 *2/*48 - Significantly Reduced Response to Citalopram
- clopidogrel (Plavix)**: CYP2C19 *5/*5 - Significantly Reduced Response to Clopidogrel
- simvastatin (Zocor)**: SLC01B1 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

A large grey arrow points from the "citalopram (Celexa)" entry in the list to a detailed view of that medication's guideline. The detailed view shows the following information:

- Medication:** citalopram (Celexa)
- Genotype:** 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)

Below the detailed view, there is a section titled "ALTERNATIVE MEDICATIONS" with three expandable categories:

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

A note at the bottom states: "Note: This clinical annotation does not take into account other considerations beyond the specific genotype mentioned above." There is also a "READ MORE" link.

- 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?