Example of UI Design Problem/Barrier Analysis For Asthma CDS Application

Item	Design problem/Barrier	Recommendation
IIIB3	Room layout	Layout must allow patients / parents to sit next to the physician at the computer. Putting a larger computer monitor on an adjustable swivel arm would also facilitate showing the patient / parent data on the screen. Having a large monitor
		by the physicians during physical examinations. Having a keyboard accessible at the exam table with which to enter data during a physical exam would further facilitate real time documentation and use of GLIDES.
IIIC2	Primary care physicians must wait to access current patient EHRs until the nurse has entered the vital signs	By pressing the refresh button, and at present refresh intervals, any relevant data entered by another clinician should import into the physician notes and a message should be provided at that moment to the physician stating which data have been imported. For example, "Vitals have been imported."
IIIC12	Lack of location feedback in the forms and lack of matching form titles	Users of the EHR and GLIDES forms must have an easy way to know where they are in the myriad of forms needed for documentation. A simple form map, designed to match the order of the forms, would suffice. Forms that are embedded into other forms must also be mapped so that users can see where they are.
		Form titles and titles on the maps must match or at least be meaningfully close.
IIIC13	Disorienting form navigation systems	Form maps must always be viewable and consistently arranged.
IIIC14	Lack of feedback regarding form completion	Users should be provided with a simple, unambiguous, visual indication of whether they have completed all of the forms. A simple status bar embedded into the form navigation map would likely suffice. It might be useful to also have a "complete" button on each form that could simultaneously move you to the next form and indicate to the system that a user is done with the form. The advantage of this is that a user could then "complete" a form with only partial data. This way the status bar could be conceptually accurate even when a form is not technically completed, but completed to the satisfaction of the user. This way, at a glance, a user could see how much was left to complete. This is especially helpful given that often times physicians had to return to documentation many times, in brief spurts.
IIIC19	Providers could not trigger CDS therapy recommendations in the asthma clinic	It is unclear if this is a bug. This should be explored.

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IIIC23	Poor conversion of structured notes into letters	More readable letters should be automatically generated by the EHR
IIIC24	Need for shadow charts / not all forms are available in the EHR	All forms should be scanned or entered into the EHR.
IIIC27	ED visits do not populate the visit history list visible to primary care physicians	All visits to YNHH clinics or hospital must populate in the past visit list.
IIIC28	Changes to the note after finalizing the note require the user to manually edit the letter that is automatically generated.	Design a message that would at least ask "do you want to update the letter" when any changes to the chart were made after "finalizing" the letter. Alternatively, the EHR could either automatically update the letter or ask if the user wanted the letter update and do so. It is not clear which is the preferred option as there was no time to explore whether and when one does not want to update the letter with new charted information. It is conceivable that there are instances that new information is intentionally not passed on to other physicians.
IIIC29	The list of Medications on several pages, such as the Asthma Medications form, is in no discernable order.	Because no cognitive task analysis was conducted it is not clear what the preferable order for medications or other lists should be. It is clear that an arbitrary order that is confusing to the providers is a problem. It is also clear that to find medications quickly, in long lists, will require the ability to sort at least alphabetically and chronologically. It is preferable to be able to see the full medication information and date it was ordered without scrolling. It is also probably a good idea to be able to view and sort by the ordering physician.
IIIC25	Brittle NHLBI response scales	No recommendation.
IIIC26	Brittle NHLBI algorithms	No recommendation
IIID1	Workflow does not support of real time documentation (hand written or electronic), which leads to a heavy reliance on memory and subsequent forgetting.	See specific recommendations below
IIID1a	Clinical workflow is unpredictable and is emergent	This cannot be changed. But, health IT can be better designed to support this reality. The principle to follow is to make more data visible more of the time during the visit. See recommendation and discussion IIIC10. Having only a key-hole view into a large store of data is the wrong design for unpredictable and emergent workflows.
IIID1b	Patient communication is not supportive of real time documentation	Consider training physicians to proactively manage dialogue with patients to support real time documentation.
IIID1c	Dialogue flow and pace does not support real time documentation.	Consider training physicians to proactively manage dialogue with patients to support real time documentation.
IIID1d	Exam tables does not support	See recommendation and discussion IIIB3.

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	real time documentation	
IIID1e	Time pressure reduces the likelihood of real time documentation or visit preparation with the computer	It is unclear whether this is an issue of staffing, scheduling, training or something else. It is likely caused by a combination of factors. A recommendation is beyond the scope of this project. An EHR that better integrates important data into fewer screens will help, however.
IIIE1	GLIDES does not sufficiently support the information requirements of pulmonologists	The Asthma Control, Environmental Triggers, and other relevant GLIDES data questions could be designed into the Asthma Interval History form. This form could be made into software that the patient/family could complete prior to the visit, either in the waiting room or with the nurse in the exam room.
IIIB1	Slow and loud computers	Replace
IIIB2 IIIC1	Failing components Small monitors	Replace Replace with minimum 19-inch and preferably larger monitors, hung from swivels. Consider two per room for easy viewing from the exam table. See IIIB3.
IIIC3	There is a maximum number of allowable character in EHR text fields	There should be infinite space in all text boxes for documentation.
IIIC4	Contrast ratios for text on background are not acceptable	Increase the contrast ratios between text and background. Black text on a white background is preferred.
IIIC5	Non standardized and non standard use of font and text highlight color	Color should only be used as a secondary code, meaning color should not be the primary indicator of meaning. Size, shape, depth, and location are better primary codes. If colored font or highlights are used, they must always have a standard meaning. If color is only used to manage attention, use the same color in all cases to call attention and make sure the contrast ratios allow for good readability. The use of green should only be used to indicate "good" or "go" and the use of red should only be used to mean "bad" or "stop." Even then, neither green nor red color should be the primary indicator of meaning. If red means "stop" use a red stop sign or red highlight for "warning" or "danger". If green means that something is good, use a [©] and highlight it in green. That way people do not need to rely on the color. That also supports color blind users.
IIIC6	Insufficient visible text in lists	More space should be allocated to lists, such as medication, allergy and problem lists. Reduce the need to scroll to see entire lists.
IIIC7	Insufficient column widths to read lines of text in form tables and columns	The width of list columns must be sufficient to see all text in the column. Use wrapped text if necessary.
IIIC8	Insufficient text box height	Increase the size of text boxes so that more text can be viewed at any one time. Reduce the need to scroll.
IIIC9	Lack of line wrapping in the letters generated from	Use line wrapping so as to prevent any need to scroll to the right to read text.

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	documentation	
IIIC10 IIIC11	Inability to simultaneously view data that need to be viewed simultaneously Use of ALL CAPS	Forms must be designed to allow for simultaneous viewing of information that should be viewable simultaneously. For example, the previous note should be viewable alongside any other form. Medication and problem lists should probably be viewable alongside any other form. There may many other cases, but time was not available to conduct a complete cognitive task analysis. If there are types of data that need to be viewed over time, then they must all be viewable, over time, in the appropriate graph. Never use ALL CAPS. Mixed caps are always preferred. TALL man lettering for medications is currently recommended
		by ISMP, FDA, and the Joint Commission.
IIIC15	Lack of feedback regarding required amount of data to trigger GLIDES CDS	The Asthma Control form should be redesigned to unambiguously indicate what rows of data need to be completed to trigger the Classification CDS and the Therapy CDS. No warning message on this page is necessary if the form itself is designed to show the user what needs to be entered to trigger CDS.
IIIC16	Lack of feedback regarding date of CDS	There was not time to explore why previous CDS information was displayed during current use of the GLIDES forms. If severity, control and therapy trends or history are important to know, then trended data should be displayed in a way that clearly distinguishes previous CDS from any current CDS. Equally important - there must be a clear distinction between previous CDS and previous provider assessments. It appears that previous provider assessments are what are needed, not previous CDS recommendations. However there was no time to explore this.
IIIC17	CDS presence when no Asthma Control form data are entered	Provide unambiguous dates with all CDS. See also IIIC16
IIIC18	Lack of feedback regarding whether CDS should trigger	It is recommended that a clear indicator such as "insufficient data were inputted into the Asthma Control form to generate a recommended classification or therapy" appear on the Asthma Assessment and Asthma Steps and Plan forms. It is also recommended that the words "Asthma Control Form" in such a warning message be hyperlinked to take a user directly to that form. It is equally important that users be shown, while they are completing the Asthma Control form (if they enter any data at all), in an unambiguous manner, what data needs to be entered to generate CDS. (see IIIC15)
IIIC20	Lack of a date for data entered into the EHR	The source and date of data entry should be clear.
IIIC21	Lack of prospective memory support	User generated reminders should be easy to generate and automatically open upon logging in.
IIIC22	Manual entry of lab values and other previously documented	Lab values should be entered automatically into the EHR or by staff. There should be a simple way to pull data forward from

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	data	past notes into the current note.