How does the on-screen design of electronic prescribing systems affect safe prescribing? A qualitative study using a think-aloud approach

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Why is this relevant?

- User interface design features such as screen layout, density of information, position of messages and use of colour may affect the usability of electronic prescribing (EP) systems, with usability problems previously associated with medication errors.[1]

- To improve existing EP systems it is therefore important to identify on-screen design features that may affect patient safety.

What was our aim?

- To explore users' perspectives of the on-screen design features of a commercially available EP system and how these are perceived to affect patient safety.

What did we do?

- Study conducted at a large London teaching hospital trust. Participants recruited via adverts on the trust's intranet; all prescribers with experience using the EP system were eligible to participate.

- We used a mixed qualitative approach:

  1. Prescribers asked to conduct a prescribing task for a simulated patient using a think-aloud approach to describe their thought processes.

  2. Semi-structured interview with each participant to explore their views in more detail, with a focus on patient safety.

- Transcripts analysed inductively using a thematic approach, using NVivo to aid text organisation and coding.

What did we find?

- Ten participants took part: three registrars, three foundation year 1 doctors, two foundation year 2 doctors and two pharmacist prescribers.

- Key themes included (1) EP design features and process flow; (2) benefits of EP systems; and (3) suggestions for improvement (table 1).

- Design features such as screen features and layout were discussed with regards to impact on workflow, as well as 'information overload'. Benefits of EP systems were expressed in terms of accessibility, a structured prescribing process, and other features supporting medication safety.

- Suggestions for improvement were made in relation to **embedding local treatment guidelines** and making changes to system design (e.g. **colour, fonts, customization**) to increase information visibility and enhance overall attention.

- A need was expressed for better support for **interacting with patients** while using the system, as well as making drug-drug interaction alerts **more targeted** to support medication safety while also **avoiding alert fatigue**.

Table 1: Example codes from themes, supported by quotes from prescribers.

Theme	Sub-theme	Example quote
Electronic prescribing (EP) system design features and process flow	Screen layout and design	.. I think it's quite clunky and it's not very clear from the screen, from the drug chart screen, you have to go into the fluid chart..
	Information overload (e.g. drug-drug interaction alerts)	.. I find, I think they, any on screen alert, you're in danger of getting alert fatigue and you, people tend to close them down and want to move on and not read the detail…
Benefits of EP systems	Accessibility	… It does make a lot of difference. It is readable and can be accessed anywhere. No need to fight for the paper drug chart or patient file ...
	Safety	.. It gives reassurance to the user that what you're doing is right and the pop alerts make you aware..
Suggestions for improvement	Guidelines	… I think the trust guidelines and policy should be more, have integrated to this system as I need minimise this section and go and open a new internet page, search for it and restart again, it's slow, it's a waste of time.
	Customisation	...I meant a prescriber can custom their prescribing screen according to the needs like how we do for our Outlook email. We can add different folders, basically, arranging and organising information makes life easier.

What does this mean?

- We have identified specific interface design factors that may improve the usability and/or safety of EP systems, which can be used to inform future experimental research in this area.

- Limitations include small sample size; further work should include similar studies on other EP systems.

References:
1) Kushniruk AW, Triola MM, Borycki EM, Stein B, Kannry JL. Technology induced error and usability: the relationship between usability problems and prescription errors when using a handheld application. Int J Med Inform. 2005;74 (7-8):519-26.