DynAIRx: Visual summaries to assist structured medication reviews

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Lightening talk

- The DynAIRx research project
- Structured Medication Reviews (SMR)
- The challenge of Electronic Health Records (EHR) visualization
- Current vendor systems (case of EMIS)
- Present design study work







DynAlRx

- Read the DynAIRx protocol
 - <u>https://www.ncbi.nlm.nih.gov/pmc/article</u>
 <u>s/PMC9761229/</u>
- Aims:
 - "...and develop visualisations that overlay these combined data to enable easier review of medications"



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Structured Medication Reviews

- The NHS guide states: "A SMR is a structured, holistic and personalised review of an individual who is at risk of harm or medicines-related problems because of their current medicine regimen." [5]
- It also states: "From 1 October 2020, each PCN must use appropriate tools to identify and prioritise patients who would benefit from a SMR" [5]







The challenge of EHR visualization

- Navigating data protection and privacy laws
- We cannot access real or anonymized "full" records (free form text such as letters)
- Complex nature and volume of patient records [7] to visualize.
- CPRD contains:
 - conditions and diagnoses, medications, treatments, symptoms, hospital referrals and more









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State of vendor systems (EMIS)

- List (not table) and tab-based text display.
- One of our domain experts said working with EMIS means doing "Long List Text Detective Work"
- These systems were not built with visualization in mind.











Relevant EHR visualization literature

• LifeLines [7] by Plaisant et al 1996.





EHR visualization literature

• LifeLines2 [8]





DynAlRx visualization design study

- We are following the methodology outlined by SedImair et al 2012 [4].
- Generating design choices.
- Working with domain experts.









The DynAIRx design approach

- Linked views of visual summaries of required data only
- Construct a journey for condition(s), medication(s) and investigations.
- Start with the most important data then add more data
- Work with the GPs/Pharmacists to find best design choice

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DynAIRx (AI for dynamic prescribing optimisation and care integration in multimorbidity) brings together a multidisciplinary team of experts in multiple long-term conditions and AI, including those with lived and caring experience, clinicians, data scientists & informaticians, and public engagement specialists from the Universities of Liverpool, Manchester, Glasgow and Leeds. It is co-led by Professor Iain Buchan and Dr Lauren Walker of Liverpool University Hospitals NHS Foundation Trust and Mersey Care NHS Foundation Trust. The partnership was formed in 2020 in response to the Overprescribing Review and NIHR's AI for Multiple long-term conditions call.

Principal Investigators: Professor Iain Buchan and Dr Lauren Walker

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Website: https://www.liverpool.ac.uk/dynairx/

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References (i)

- [1] Wang, Qiru, and Robert S. Laramee. "EHR STAR: the state-of-the-art in interactive EHR visualization." *Computer Graphics Forum*. Vol. 41. No. 1. 2022.
- [2] Dowding, Dawn, et al. "Dashboards for improving patient care: review of the literature." *International journal of medical informatics* 84.2 (2015): 87-100.
- [3] Koopman, Richelle J., et al. "A diabetes dashboard and physician efficiency and accuracy in accessing data needed for high-quality diabetes care." *The Annals of Family Medicine* 9.5 (2011): 398-405.
- [4] SedImair, Michael, Miriah Meyer, and Tamara Munzner. "Design study methodology: Reflections from the trenches and the stacks." *IEEE transactions on visualization and computer* graphics 18.12 (2012): 2431-2440.
- [5] NHS England. Network Contract Directed Enhanced Service: structured medication reviews and medicines optimisation: guidance.2021. <u>https://www.england.nhs.uk/wpcontent/uploads/2021/03/B0431-network-contract-des-smr-and-mo-guidance-21-22.pdf</u> (accessed 6 Jun 2022)
- [6] Munzner, Tamara. "Process and pitfalls in writing information visualization research papers." Information Visualization: Human-Centered Issues and Perspectives (2008): 134-153.

References (ii)

- [7] Plaisant, Catherine, et al. "LifeLines: visualizing personal histories." Proceedings of the SIGCHI conference on Human factors in computing systems. 1996.
- [8] Plaisant, Catherine, et al. "LifeLines: using visualization to enhance navigation and analysis of patient records." *The craft of information visualization*. Morgan Kaufmann, 2003. 308-312.