

7.1 Clinical Workflow Analysis and Redesign

10x10 – Introduction to Biomedical Informatics & Artificial Intelligence
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Clinical workflow analysis and redesign

Problem and definitions

Workflow analysis

Usability

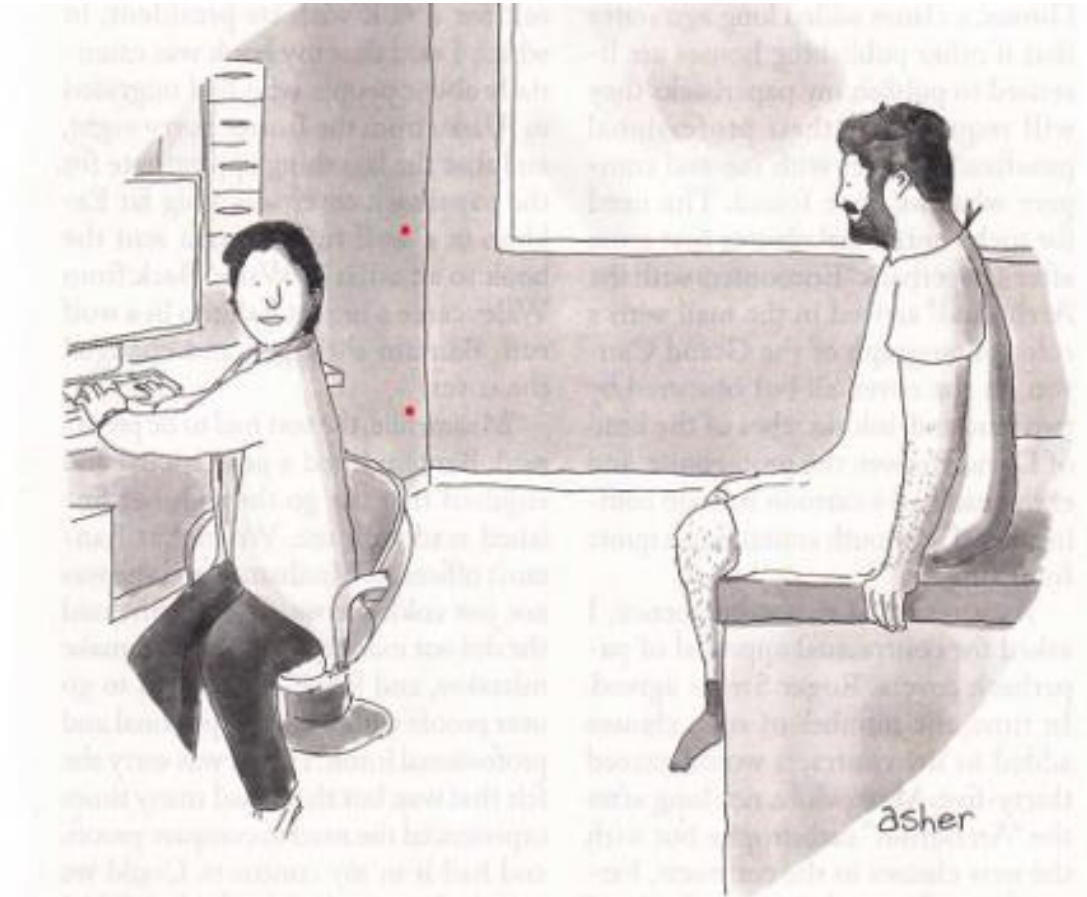
Voice-related interventions

Managing communications

Workflow impacts not only clinicians but also patients and staff



"Please fill out these medical forms, which are identical to the ones you filled out earlier online, and have the exact same questions your doctor will ask you later in the exam room."



"I got into medicine because I have a passion for confirming people's birthdays."

Workflow problem and definitions

A key challenge of EHR implementation and usage is workflow

- How do we balance keeping existing workflow vs. adapting to new systems?
- EHR should not duplicate (often inefficient) paper-based workflow but instead be implemented to achieve new efficiencies as well as quality and safety of care (Kilo, 2005)

Definitions – According to now-defunct Workflow Management Coalition (WFMC), workflow is

- “Concerned with the automation of procedures where documents, information or tasks are passed between participants according to a defined set of rules to achieve, or contribute to, an overall business goal.”
- “In practice most workflow is normally organized within the context of an IT system to provide computerized support for the procedural automation.”

Workflow considerations in healthcare (Pugh, 2019)



Reviews past history, chief complaint, allergies and over-the-counter and prescribed medications

Information Review



Performs physical exam, orders additional lab work & diagnostic tests, X-rays, referrals

Patient Assessment



Completes electronic chart manually or via dictation

EHR Documentation



Spends time with patient, patient's family and healthcare team members

Care Delivery

Components of EHR that can facilitate workflow (Samuels, 2008)

Messaging and information sharing – enhance communications; allow routing of information

Task completion – system can aid user through required steps for a process; provide decision support

Scheduling and resource management – not only personnel but rooms, equipment, etc.

Documentation support – help clinical personnel capture required documentation

Steps in workflow analysis (Samuels, 2008)

Context review – need to understand

- Job description and change authority
- Regulatory environment
- Care management/quality reporting
- Resource allocation and budgeting

Identify processes to redesign – select goals and opportunities

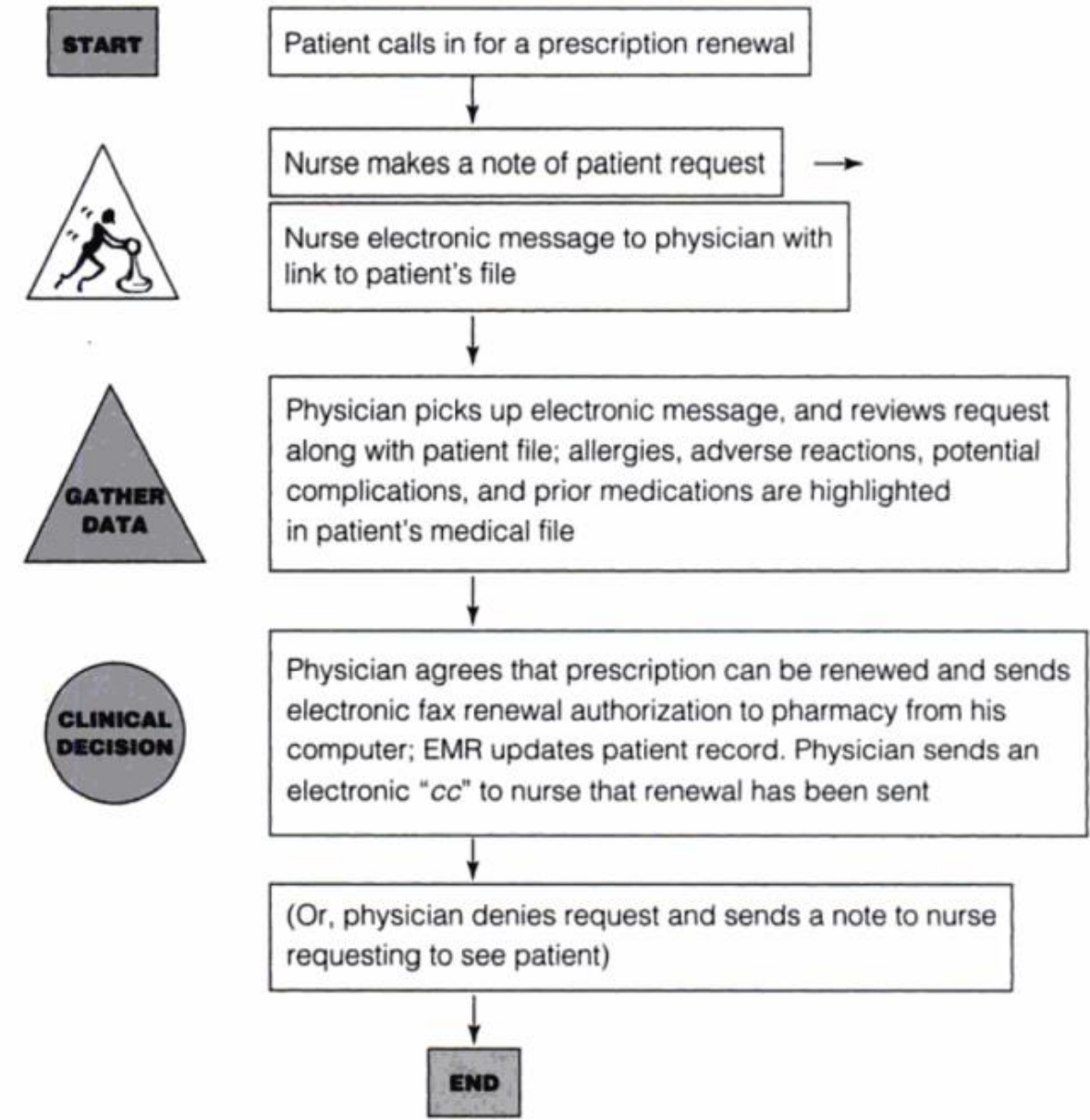
Information and process flows – consider other aspects that must be assessed in workflow

Outline new processes and steps needed

Example:

Office workflow for prescription refill (Hartley, 2011)

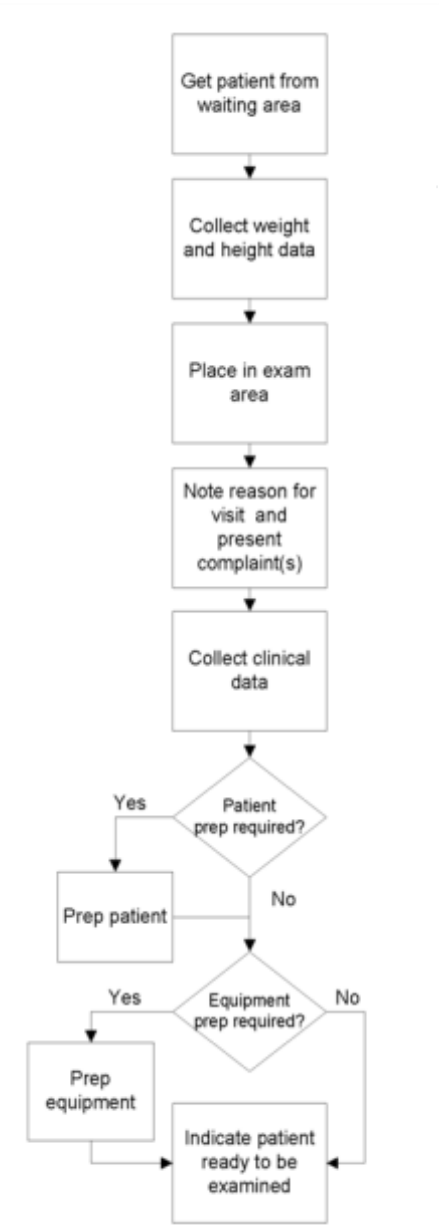
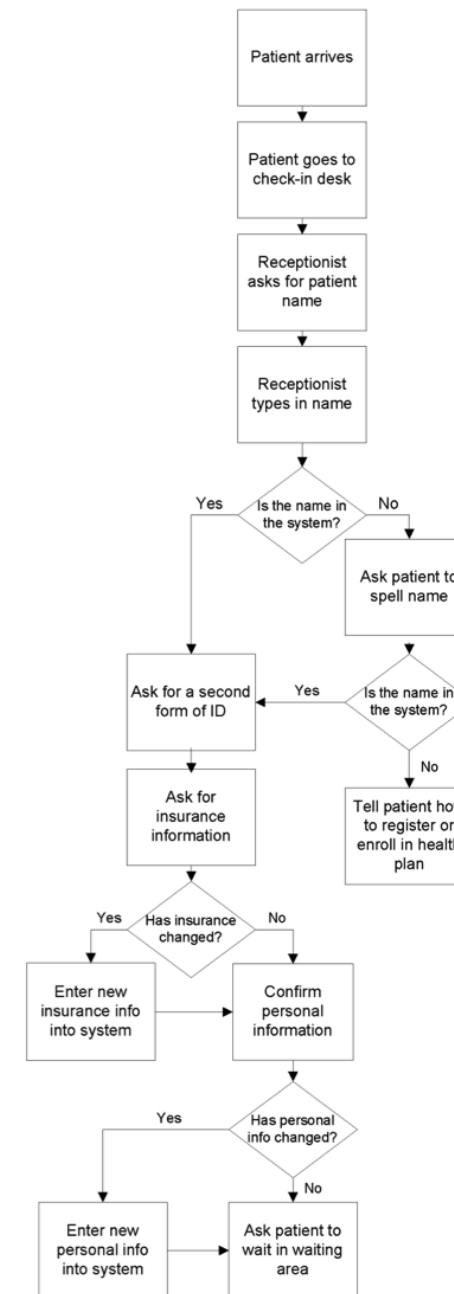
Workflow to Refill a Prescription: EMR



EMR indicates electronic medical record.

Examples from

AHRQ Workflow Assessment for Health IT Toolkit



Essential to good workflow redesign is usability

Most modern EHR systems are commercial systems, so ability to modify systems is limited

- Though many allow some degree of customization
- Simple customization can improve efficiency (Bennett, 2010)

[HIMSS usability reports and recommendations](#) define areas where usability can be maximized, e.g.,

- Simplicity
- Naturalness
- Consistency
- Forgiveness and feedback
- Effective use of language
- Efficient interactions
- Effective information presentation
- Preservation of context
- Minimize cognitive load

Usability (cont.)

American Medical Association (AMA) principles for usability (2014)

- Enhance physicians' ability to provide high-quality patient care
- Support team-based care
- Promote care coordination
- Offer product modularity and configurability
- Reduce cognitive workload
- Promote data liquidity
- Facilitate digital and mobile patient engagement
- Expedite user input into product design and post-implementation feedback

Reduce user workarounds (Zheng, 2020; Boonstra, 2021)

Category	Workaround	Identification	Benefits	Risks
In-system workflow sequence workarounds	Ignoring pop-ups	Interview (5x) NU, PH	Improved workflow (U), time savings (U)	Jeopardize patient safety (P), false sense of safety (P)
	Pre-starting a patient's visit	Observation (2x), interview (2x) PH	Improved workflow (U)	Incorrect billing (H)
In-system data entry workarounds	Copy-pasting	Observation (2x), interview (7x) PH, SS, MA	Improved workflow (U), time savings (U), better overview (U)	Extra work (U), loss of potential system support (S), hindering research (H)
	Using separate text fields	Interview (8x) NU, PH, SS	Better overview (U)	Hindering research (U), loss of overview (U)
	Leaving data fields empty	Observation (1x), interview (5x) PH	Improved workflow (U), time savings (U)	Loss of potential system support (S), cascading errors (P)
	Sharing login details	Interview (5x) SS	Improved workflow (U)	Abuse of details (U), jeopardize patient safety (P)
Out-system workaround	Entering incorrect data	Interview (2x) NU, PH	Improved workflow (U)	False sense of safety (P)
	Using paper	Observation (1x), interview (12x) NU, PH, SS, MA	Improved workflow (U), increased patient contact (P)	Extra work (U), loss of data (U), loss of overview (U), jeopardize patient safety (P)
	Using shadow systems	Interview (6x) PH, SS, MA	Better overview (U), improved workflow (P), improvements of the system (S)	Extra work (U), system not up-to-date (S)
	Giving verbal consent for dispensing medication	Interview (3x) NU, PH	Improved workflow (U), time savings (U), improved patient care (P)	System not up-to-date (S), cascading errors (P)
	Separating a scanner from its COW	Interview (1x) NU	Improved patient care (P)	Jeopardize patient safety (P)

Codes in identification column indicate who reported the workaround: NU = nurse; PH = physician; SS = support team member; MA = medical administrator. Codes attached to benefits and risks indicate to whom the users think these consequences apply: U = user; P = patient; S = system; H = hospital

How can EHR usability be improved?

Implementing charting, clinical ordering, billing/compliance and quality improvement in EHR has been a failure and attention should instead be paid to (Wachter, 2018)

- Telling patient story
- Developing non-type/click methods for data entry
- Making record smarter

Reducing clerical burden (Wright, 2018)

Adding features to make use more efficient, e.g., (Zwerling, 2016; Zwerling, 2016)

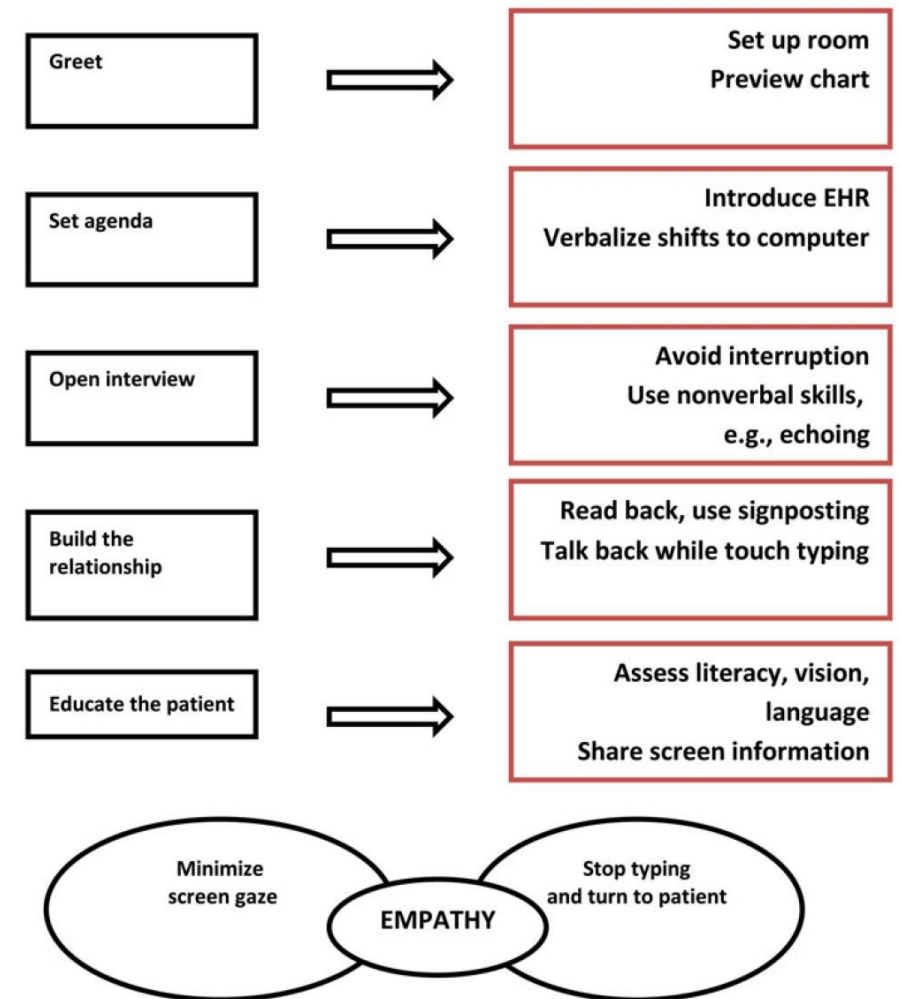
- Sort labs by those only abnormal or associated with a disease or treatment
- Integration of problem, medication, and allergy list

Important aspect of usability – computers in exam room

From patient-clinician dyad to patient-clinician-computer triad (Duke, 2013)

POISED model (Frankel, 2015)

- Prepare
- Orient
- Information gathering
- Share
- Educate
- Debrief



Another mnemonic

HUMAN LEVEL (Alkureishi, 2014)

HUMAN LEVEL ¹ - 10 Tips to Enhance Patient-Centered EMR Use		
[¹LEVEL mnemonic, 2004 The Physicians Federation]		
H	<u>H</u> onor the "Golden Minute"	Make the start of the visit completely technology free. Greet the patient, start with their concerns and establish an agenda for the visit before engaging technology.
U	Use the "Triangle of Trust" 	Create a triangle configuration that puts you, the patient and the computer screen at each of the three corners. This allows you to look at both the patient and screen without shifting your body.
M	<u>M</u> aximize patient interaction	Encourage patient interaction. Pause for questions and clarification. Allow time for questions and to verify understanding.
A	<u>A</u> cquaint yourself with chart	Review the chart before you enter the room to inform and contextualize your visit.
N	<u>N</u> ix the screen	When discussing sensitive information, completely disengage from the EMR (look at the patient, turn away from screen, take hands off keyboard, etc.)
L	<u>L</u> et the patient look on	Share things on the screen with your patients.
E	<u>E</u> ye contact	Maintain eye contact with patients as much as possible. Treat patient encounters as you would a conversation with friends or family members.
V	<u>V</u> alue the computer	Praise the benefits of the EMR and take advantage of opportunities to use technology as a tool to engage patients (pull up lab result to review together, utilize graphics, etc.)
E	<u>E</u> xplain what you're doing	Be transparent about everything you do. Avoid long silences and aim for conversational EMR use by explaining what you are doing as you are doing it.
L	<u>L</u> og off	At the end of the visit, log off the patient's chart while they are in the exam room. This reassures the patient that their medical information is secure.

Improving workflow with voice-related interventions

EHR navigation with voice assistance (Kumah-Crystal, 2023)

Clinician dictating in presence of patients

- Automated transcription and editing of note (Payne, 2018; Payne, 2023)
- Dictation of assessment and plan, with high patient satisfaction (Sippel, 2023)

Ambient listening of patient-physician interaction (Hassan, 2025; Kim, 2025)

May get (part of) the computer (keyboard) out of the exam room but also raise concerns about confidentiality

Managing communications – text messaging

Texting – essential part of care for

- Hospitalists (Donnelly, 2023)
- Large HMO using Epic Secure Chat (Small, 2023)
- Widely used but substantial variation by clinical role, clinical unit, and hospital or clinic location (Barrata, 2024)

Category	Count, No. (%) (N = 4 709 261) ^b
Medications	1 546 411 (32.8)
Skin conditions	438 631 (9.3)
Attachment	389 372 (8.3)
Emergent	359 144 (7.6)
Short done ^c	296 631 (6.3)
Letters	286 137 (6.1)
Laboratory order requests	285 350 (6.1)
Blood pressure	243 536 (5.2)
Respiratory symptoms	202 465 (4.3)
Controlled substances	148 569 (3.2)
Neck and back pain	145 577 (3.1)
Mental health	139 978 (3)
Immunizations and PPD	131 198 (2.8)
COVID-19 other	102 330 (2.2)
Urinary symptoms	96 718 (2.1)
Foot and ankle pain	91 334 (1.9)
Ear pain/ear wash	89 550 (1.9)
Sore throat	85 782 (1.8)
Knee pain	69 491 (1.5)
Diarrhea	54 090 (1.1)
Asthma	48 275 (1)
COVID-19 vaccine	46 219 (1)
COVID-19 therapeutics	36 142 (0.8)



Managing communications – inbox

Strategies for managing inbox (Lieu, 2019; Sinsky, 2022; Fogg, 2023)

- Reserving clinic time for inbox management
- Coverage systems for vacation and sick days
- Physician-to-physician training
- Interdisciplinary teams to share messaging work

Case study of process to reduce volume by 25% (Raths, 2023)

Need solutions at care organization, technical, and policy and communication levels (Rotenstein, 2023)