

Identifying and Developing AI for Primary Care; a user centered/participatory design approach

AUGUST 15, 2024

**CASFM Health Informatics Technology Workgroup
Authored by: Ian Bennett, Arya Rahgozar, Nahid Rihanon for the CASFM HIT Workgroup**



Executive Summary

The field of artificial intelligence (AI) is transforming the way our world works on a daily basis. AI and associated neural network computing methodologies are now becoming ubiquitous in the contemporary world including primary care health settings with impacts on the health informatics technology used to care for patients and manage a range of key components of the primary care enterprise. However, most developers of AI (and other HIT tools), are not intimately familiar with primary care and risk creating tools that are not useful or even undermine the enterprise which values continuity of care and generalism. User centered and participatory design methodologies aim to reduce the risk of such outcomes through bringing in the voice of members of the primary care clinical context to the process of technology development; they provide an opportunity to empower local clinics to identify topics of highest priority for AI development and implementation. In this toolkit the members of the CASFM HIT Workgroup bring together a set of materials to support the involvement of the primary care team and patients, health system decision makers and developers in determining priorities and co-designing implementation of AI tools for primary care. The primary aim of this document is to prepare the members of a primary care team to engage with their local clinical setting and empower them to manage AI deployment. Another aim is to support this engagement in a manner that aligns with the Quintuple Aim of improving patient and provider satisfaction while reducing unnecessary costs, improving outcomes, and addressing equity in care delivery. User centered and participatory design/development is used to identify topics of interest to the group and then prioritize the topics as well as co-manage the development and deployment of this technology. This methodology has been developed by the CASFM HIT workgroup for use across primary care. Diverse members of the clinical setting including a range of clinicians, support staff, schedulers, clinic managers, and clinical directors are needed to fully reflect the needs of this setting and are all targeted by this methodology. This rigorous scientific methodology can be used by participants to elicit and manage AI development and implementation in their settings to ensure that the primary care voice is heard.

Contents

Executive Summary2

Background.....4

Goal Driven Design.....4

Participatory Technology Design5

Iterative User Centered Design6

Discover.....8

Design.....11

Build13

Test14

References.....15

Appendix i18

STEP 1: Preparation19

STEP 2: Silent idea generation.....20

STEP 3: Round-robin recording of ideas21

STEP 4: Serial discussion of ideas21

STEP 5: Preliminary voting21

STEP 6: Discussion of preliminary voting.....24

STEP 7: Final voting.....25

Learnings from the pilots27

Background

Goal Driven Design

While there is no question that artificial intelligence (AI), based health informatics tools will become common elements of a primary care clinical team in years to come there are many directions that this process can go. A range of priorities for where resources should be directed have been identified and will continue to be a source of tension based on the points of view of particular constituencies.¹ We call out to all those involved with the development and deployment of these AI innovations in primary care to align this work with the needs of the setting as identified by those who work in primary care.² As a central framework for innovations and practice change efforts we outline the benefits of the Quintuple Aim which calls for attending to improving patient experience and outcomes as well as the well being of the health care professional while reducing unnecessary cost and addressing the needs of equity in health care delivery.³ It is with this guiding spirit that we propose that the diverse members of primary care clinical teams and their patients have a role in the development and/or deployment of AI tools within that setting. While not necessarily adequate to achieve the Quintuple Aim we posit that this approach will reduce the risk that these guiding principles are overlooked or even subverted.

Why is the voice of primary care needed for AI deployment in medicine?

A wide range of AI tools have been developed or are in development to take advantage of this technology to reduce the many struggles faced by healthcare delivery systems. These include radiologic interpretation, clinical decision support, patient self management, and ambient scribe systems.⁴⁻¹⁰ A very large number of other investments are currently being explored by developers and health systems. As with other moments in major healthcare technology transitions, such as the move to electronic health records, there is a high risk that investments will be made without consideration of the needs of primary care. This has the potential to slow the potential transformational effect of this technology on the foundation of the healthcare system and exacerbate a crisis in provider and patient dissatisfaction, cost, patient outcomes, and equity (the five elements of the quintuple aim).³ In contrast, bringing in the voices

of primary care clinical and operations workforce has the potential to move our health system forward using the promise of AI to facilitate what are the drags on our care systems.

Participatory Technology Design

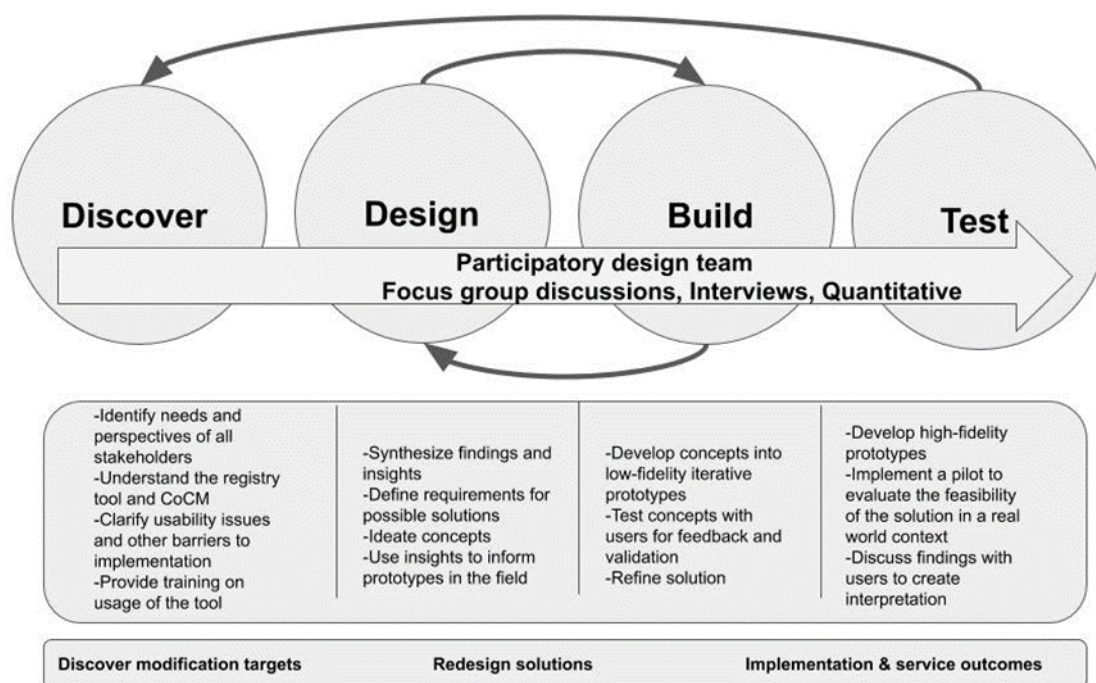
The field of technology development now places a high value on gathering input of potential users of the envisioned tools and products. This “user centered design” or UCD approach is felt to reduce the risk that features and even layout issues will be rejected by users as not useful or difficult.¹¹⁻¹⁴ This approach follows many decades of top down design approaches that resulted in failed products and those that were unnecessarily difficult to manage – think of early HIT tools like electronic health records.¹⁵ In that case, the creation of tools that addressed billing needs rather than focused on supporting clinician teams resulted in significant distress in primary care and has been linked to burnout and early retirement.¹⁶⁻¹⁸

While user centered design is an important advance in aligning the needs of the users with the efforts of the developers these strategies often maintain a hierarchical relationship between programmers and designers and the targeted users; the developers and designers represent the final decision makers and primary source of intellectual input while the users are often limited to “user testing” procedures for observation and interviewing.¹¹ Participatory design, a type of user centered design, goes further along the spectrum and is very much aligned with approaches in public health such as community based participatory research (CBPR).¹⁹ In this model members of the user community (patients and members of the primary care team), are partnered in the design approach rather than subjects of it. In this model individuals from user groups work together with the research and development teams throughout the full process of creating a product or, in CBPR, creating solutions to public health concerns identified and prioritized by the community members. A key difference of participatory design from other user centered design approaches is that the user co-designers have longitudinal input from initial envisioning of problems and possible solutions to the full design, development, and testing as well as final implementation. It is this participatory element that we aim to support in primary care practices receiving AI tools.

Iterative User Centered Design

Another standard approach to building technology tools and creating solutions to specific challenges is an iterative approach to a series of stages of development from initial investigation of potential challenges through the full development and deployment process. We chose to make use of the Discover, Design, Build, and Test (DDBT) model developed by colleagues exploring technology interventions to support behavioral health implementation in primary care sites.²⁰ As illustrated in Figure __ and described in more detail in later sections of this toolkit the DDBT model lays out elements of the design process which are widely used in technology development.

Figure 1. The DDBT Framework for User Centered Design



As might be imagined there are a range of approaches that can be used to achieve these goals through the process of identifying problems of interest and then building potential solutions to them. Design professionals with skills in eliciting information regarding the stages are key to this process and the use of methodologies to reduce bias is critical to the success of the efforts. While details may differ the development team will generally work in a tempo of monthly “design sprints” punctuated by co-

design sessions with the full team over the course of the project. This allows the clinical and patient user teams a chance to focus their input in monthly sessions of 90-180 minute sessions which is generally manageable. The rest of the development team is engaged in taking the results of a co-design session in the interim to present to the user teams for input, feedback and other generative input.

Discover

The *Discover* stage involves investigation of specific issues that represent important targets of potential intervention by the team – in all of its facets. Important elements of this stage include the systematic assessment of what aspects of the primary care operation are of interest for this exercise and what longer term outcomes are of greatest priority. As examples, not meant to be exhaustive, the development team may decide that reduction in burden for the primary care professional related to a specific set of tasks, or increased efficiency for the larger team, or reduced cost so that additional resources can be affordable for the practice.

Initial assessment of potential targets of AI interventions or tools will be most likely to generate useful outputs if there is a conscious effort to have a broad assessment of needs and priorities of the primary care team written broadly. With the goals of the Quintuple Aim in mind, employing methodologies that can elicit input from diverse corners of the primary care clinic allows for opportunities to identify potentially novel and impactful areas of struggle that may be amenable to the particular strengths of AI tools. A number of methods for eliciting and prioritizing areas of concern for a group have been well described and are appropriate for the Discover Phase of the DDBT process.

In Appendix i we provide a protocol for carrying out a group consensus exercise, or *Discover Workshop*, to elicit and prioritize targets for AI implementation in the primary care setting. We make use of the Nominal Group Technique (NGT), which is a simple and effective way of bringing in the voices of diverse team members. Briefly, a time is

Figure 2. Discover Workshop Participants



identified in which a diverse set of members of the clinical setting (not just clinicians but importantly support staff of a range of roles) are brought together in a comfortable setting and without pressures of conflicting obligations. A series of idea generating exercises are carried out for individuals in the room

and then each provides their suggestions. The priority of these ideas is then voted on (anonymously) for a consensus list to be generated. As shown in Figure __ it is important to support these co-designers in comfortable spaces and with food – particularly if you ask them to take a lunch hour for the activity.

We suggest that these activities be carried out in smaller clinical settings that have shared procedures and protocols for everything from patient communication and scheduling to rooming, follow up of medications, and other population health procedures. While sessions like this can be done in multiple clinics, they should share a set of leaders and administrative structure so that suggestions in one site will be understandable to those in another. While the goal of this exercise is to bring specific recommendations from the clinical setting this can be done in multiple clinics tied together in a network and then in an iterative manner create a network-wide set of prioritized targets for resources to be deployed in implementing AI tools.

Obstacles:

There are many different obstacles that make it hard to organize a discover workshop. In our experience these obstacles can run from the practical - like “we can’t ask people to work during lunch” to the territorial such as having IT development teams in health systems feel threatened by activities that might seem that they should lead. While every situation is different it is critical to advocate for the importance of the voice of primary care teams to be part of the conversation. We have found that with persistence and patience this line of reasoning is persuasive and ultimately will allow the workshops to proceed. Using the evidence of benefits of this work such as citing the references we have included here as well as published examples of similar work can be helpful. Engaging influential champions in your organization to help you strategize and develop a strategy to move forward is very useful. Using the continuous quality improvement (CQI) example may also be helpful because this has become so much a central part of our clinical operations – just make clear that this procedure is a framework for supporting the effective implementation of AI tools for clinical work. This will help enlist the right people in your clinics to carry out these workshops and support the actual implementation work moving forward.

Reviewing existing solutions:

Once particular topics and prioritization has been identified through the process above it will be necessary to systematically review existing products present in the health system: 1) who should be working on getting this organized/who are you partnered with, 3) how do you move forward with actually pitching this to your organization , 4) cost benefits of the particular solutions, 5) showing that the productivity of the team may improve is important to setting priorities and getting buy in.

Design

Once a particular target has been selected for development or deployment the primary care team has a critical role to play in co-designing the tool itself and/or the means by which this tool will be implemented in the clinical setting. It's important to recognize that most primary care settings will not have the capacity or partners that can create specific AI tools, however building a tool is only part of the process of making them usable in a particular clinical context. Designing the manner in which the tool will interface with data inputs or outputs and how the flow of information will affect the primary care clinic team is equally critical for the ultimate utility of this tool (and impact on the Quintuple Aim).

Procedures for designing both the user interfaces and workflows for these tools are well developed and diverse. This is where the design and implementation members of the development team are critical to elicit input and manage modifications of prototypes as they are developed. As illustrated in Figure __ there is a bidirectional as well as iterative process that can occur between the DDBT stages. Build steps may result in moving back to the design or even discover stages.

A second role for users in the design phase is the assessment of prototypes through a user testing process. Common approaches such as “think aloud” procedures where user testers interact with the prototype and say out loud what is going through their minds are very useful to identify problems that must be addressed.^{21,22}

Build

Moving forward from design to build of the tool itself and/or the means by which it will be deployed comes next. In this phase of HIT tool creation or deployment it will be necessary to have programmers and information systems developers involved in providing input directly in the implementation of an AI tool within the existing infrastructure of a primary care system. Because of the limited time and cost of these specialized members of the team it is generally best to delay this stage until the design procedures are as developed as possible. It may also be necessary to move back to the design stage if the proposed designs are not feasible. At this stage there is a relative shift from the emphasis on primary care team co-design to time spent on building the tool into the existing system. It is critical, however, to maintain accountability to the primary care co-design team for any modifications in the design that are created for reasons of practicality or necessity. These changes are expected and must be reviewed with the user co-design team to ensure that critical problems are not introduced into the process.

Test

Once an AI tool has been built and/or built into the existing HIT infrastructure and workflows it is necessary to test the system before fully implementing it. A number of approaches to this can be very effective in a clinical setting. The least burdensome and risky way to go forward is to identify a specific set of clinical team members affected by the tool to test it, initially with synthetic data and ultimately with real clinical procedures. The timing of the switch to true clinical settings will depend on the criticality of the procedures affected by the tool. Using a continuous quality improvement (CQI), approach to the test phase has the benefit of allowing the existing procedures for CQI to be utilized – as they are ubiquitous in clinical settings now. As with the rest of the DDBT process it is critical to have user co-design team members carry out the test and/or review the results of the testing along with the developers and other partners in the development process.

References

1. Fisher S, Rosella LC. Priorities for successful use of artificial intelligence by public health organizations: a literature review. Review. *Bmc Public Health*. Nov 2022;22(1):14. 2146. doi:10.1186/s12889-022-14422-z
2. Upshaw TL, Craig-Neil A, Macklin J, et al. Priorities for Artificial Intelligence Applications in Primary Care: A Canadian Deliberative Dialogue with Patients, Providers, and Health System Leaders. Article. *Journal of the American Board of Family Medicine*. Mar-Apr 2023;36(2):210-+. doi:10.3122/jabfm.2022.220171R1
3. Nundy S, Cooper LA, Mate KS. The Quintuple Aim for Health Care Improvement A New Imperative to Advance Health Equity. *Jama-Journal of the American Medical Association*. Feb 2022;327(6):521-522. doi:10.1001/jama.2021.25181
4. Bernaert A AE. Four ways AI can make healthcare more efficient and affordable. World Economic Forum. Accessed July 26, 2024. <https://www.weforum.org/agenda/2018/05/four-ways-ai-is-bringing-down-the-cost-of-healthcare/>
5. Çelik L. Role of Artificial Intelligence in Imaging: From A Radiologist's Point of View with A Focus on Breast Imaging. *Anatolian Journal of Cardiology*. Oct 2019;22:13-14. Pmid 31670714. doi:10.14744/AnatolJCardiol.2019.35625
6. Kheradvar A, Jafarkhani H, Guy TS, Finn JP. Prospect of artificial intelligence for the assessment of cardiac function and treatment of cardiovascular disease. *Future Cardiology*. Aug 2020;17(2):183-188. doi:10.2217/fca-2020-0128
7. Fletcher AJ, Lapidaire W, Leeson P. Machine Learning Augmented Echocardiography for Diastolic Function Assessment. *Frontiers in Cardiovascular Medicine*. Aug 2021;8711611. doi:10.3389/fcvm.2021.711611
8. Gleichgerrcht E, Munsell BC, Alhusaini S, et al. Artificial intelligence for classification of temporal lobe epilepsy with ROI-level MRI data: A worldwide ENIGMA-Epilepsy study. *Neuroimage-Clinical*. 2021;31102765. doi:10.1016/j.nicl.2021.102765
9. Montanaro VVA, Hora TF, Guerra AA, et al. Artificial Intelligence-Based Decision for the Prediction of Cardioembolism in Patients with Chagas Disease and Ischemic Stroke. *Journal of Stroke & Cerebrovascular Diseases*. Oct 2021;30(10)106034. doi:10.1016/j.jstrokecerebrovasdis.2021.106034
10. Jacisko J, Vesely V, Chang KV, Özçakar L. (How) ChatGPT-Artificial Intelligence Thinks It Can Help/Harm Psychiatry. *American Journal of Physical Medicine & Rehabilitation*. Apr 2024;103(4):346-349. doi:10.1097/phm.0000000000002370

-
11. Bate P RG. *Bringing User Experience to Healthcare Improvement: The Concepts, Methods and Practices of Experience-based Design*. . Radcliffe Publishing; 2007.
 12. Krug S. *Don't make me think: A common sense approach to the web usability*. 2nd ed. New Riders Publishing; 2006.
 13. van Bruinessen IR, van Weel-Baumgarten EM, Snippe HW, Gouw H, Zijlstra JM, van Dulmen S. Active Patient Participation in the Development of an Online Intervention. *Journal of Medical Internet Research*. Nov 2014;16(11)e59. doi:10.2196/resprot.3695
 14. Gordon M HR, Holmes JH, Wolters MK, Bennett IM. Participatory design of ehealth solutions for women from vulnerable populations with perinatal depression. *Journal of the American Medical Informatics Association*. 2016;23:105-109. doi:10.1093/jamia/ocv109
 15. Skeff KM, Brown-Johnson CG, Asch SM, Zionts DL, Winget M, Kerem Y. Professional Behavior and Value Erosion: A Qualitative Study of Physicians and the Electronic Health Record. Article. *J Healthc Manag*. Sep-Oct 2022;67(5):339-352. doi:10.1097/jhm-d-21-00070
 16. Alami H, Lehoux P, Gagnon MP, Fortin JP, Fleet R, Ahmed MAA. Rethinking the electronic health record through the quadruple aim: time to align its value with the health system. *Bmc Medical Informatics and Decision Making*. Feb 2020;20(1)32. doi:10.1186/s12911-020-1048-9
 17. Rittenberg E, Liebman JB, Rexrode KM. Primary Care Physician Gender and Electronic Health Record Workload. *Journal of General Internal Medicine*. Oct 2022;37(13):3295-3301. doi:10.1007/s11606-021-07298-z
 18. Budd J. Burnout Related to Electronic Health Record Use in Primary Care. *Journal of Primary Care and Community Health*. 2023;1421501319231166921. doi:10.1177/21501319231166921
 19. Jones L, Wells K. Strategies for academic and clinician engagement in community-participatory partnered research. *Jama-Journal of the American Medical Association*. Jan 2007;297(4):407-410. doi:10.1001/jama.297.4.407
 20. Lyon AR, Munson SA, Renn BN, et al. Use of Human-Centered Design to Improve Implementation of Evidence-Based Psychotherapies in Low-Resource Communities: Protocol for Studies Applying a Framework to Assess Usability. *Jmir Research Protocols*. Oct 2019;8(10)e14990. doi:10.2196/14990
 21. Pierce RP, Eskridge BR, Ross B, Day MA, Dean B, Belden JL. Improving the User Experience with Discount Site-Specific User Testing. Article. *Appl Clin Inform*. Oct 2022;13(05):1040-1052. doi:10.1055/s-0042-1758222

-
22. Sylvain F, Chaniaud N. Multi-user centered design: acceptance, user experience, user research and user testing. Article. *Theor Iss Ergon Sci*. Mar 2024;25(2):209-224. doi:10.1080/1463922x.2023.2166623

Appendix i

Implementing the Nominal Group Technique to Brainstorm AI Solutions in Primary Care

Nominal Group Technique is a simple methodology and procedure used to generate ideas and find consensus among diverse teams; it is designed to facilitate broad idea generation and prioritization. It is a first step in the “Discover” step of a robust user centered design approach to identifying and implementing technology solutions to problems in primary care that obstruct achieving the Quintuple Aim of improved: 1) clinical outcomes, 2) patient satisfaction, 3) efficiency, 4) provider satisfaction (reduced burnout), and equity. This technique has been employed in a range of settings and to address diverse topics in health care from adolescent patient preferences about their care¹ to forensic mental health² to nocturia management in primary care³ and the prevention of resident burnout⁴. The structure of Nominal Group Technique ensures that all opinions are represented to determine the preferred solutions to the target topic within a group of individuals.

Within primary care, new artificial intelligence (AI)-based tools show promise to transform care models and improve access to and quality of care for patients. However, the most helpful tools may vary depending on patient population, setting, and provider characteristics. Through this workshop, we aim to employ and teach the nominal group technique to empower primary care clinics to brainstorm AI solutions to problems faced in their specific settings.

The following protocol has been adapted from University of Wisconsin’s program NIATx⁵ to improve access to addiction and mental health treatment.

¹ [Adolescents' perceptions of factors affecting their decisions to seek health care - PubMed \(nih.gov\)](https://pubmed.ncbi.nlm.nih.gov/35591773/)

² <https://pubmed.ncbi.nlm.nih.gov/35591773/>

³ <https://pubmed.ncbi.nlm.nih.gov/35027331/>

⁴ <https://pubmed.ncbi.nlm.nih.gov/35303009/>

⁵ <https://chess.wisc.edu/niatx/content/contentpage.aspx?NID=147>

STEP 1: Preparation

Prior to using the Nominal Group Process, it is necessary for the meeting facilitator to complete a set of sequential preparatory tasks that set the stage for a successful meeting:

- **Participant selection and recruitment**
 - Discuss the goals of the project with diverse members of both the clinical and operations sides of your clinical practice – the success of this effort will depend largely on how diverse a group you can include. Examples of people to approach include: 1) clinicians (medical and behavioral), 2) medical assistants, 3) front desk staff (PSRs or check in staff), 4) health care navigators, 5) triage clinical staff (often on phone banks), 6) clinic managers, 7) chronic disease managers (care managers, chronic disease nurses), and 8) population health managers.
 - Both leaders/managers and front line clinic members should be included to broaden the set of ideas that are generated.
 - Be sure to describe the importance of each individual's unique value in participation to ensure that their work and needs are reflected in the results.
 - If possible set aside a time and place that is convenient – often a lunch hour or a time immediately before or following clinic hours can work – if you are planning more than one session make sure to have them at different times of the day and week.
 - Provide lunch if it is in the lunch hour or other snacks if it is in a different time (I would budget about \$75 per session).
- **Design preparation**
 - Prepare a preamble or description of the goal of the session. This can include some information about AI and what works best for that technology.
 - Prepare the NGT question that clarifies the objective of the meeting and illustrates the desired responses in terms the level of abstraction and scope. Often the leader will pilot test the question prior to the meeting.
 - Print the question on worksheets for each participant.
 - Select the desired voting method (e.g., ranking vs. rating).
- **Room preparation**
 - Secure a room large enough to comfortably seat group participants (five to nine persons) at individual U-shaped tables. Note: if the NGT process involves

a large number of persons, please provide adequate separation between the tables for each group.

- Bring the following supplies: flip charts, masking tape, markers, pens and paper for each participant and either 3" x 5" index cards or post-it notes.
- Meeting preparation
 - Prepare a welcome statement that explains the purpose of the meeting, outlines individual roles, and describes how the output will be used.
 - Conduct the meeting following the NGT process.

[\[Back to top\]](#)

STEP 2: Silent idea generation

Prior to starting, the group leader should prepare and present, in writing and verbally: 1) a preamble regarding the goals of the session and 2) the question that the group will consider during their meeting. A sample of the preamble is: "We will be trying to make a list of problems in our clinic and its operations that make it hard to achieve our goal of good and fair care for our patients while making our work more enjoyable and satisfying. You are all experts in the particular work that you do so we would like you to focus on the areas of your work that you don't look forward to but are really important. This particular session is trying to find good targets of artificial intelligence or AI which is in the news a lot these days. AI is particularly helpful for activities that require a lot of sorting through information, repetitive tasks, or things that take a lot of time. Don't worry too much about whether it is appropriate to AI though – this will still be helpful in uncovering areas that should be addressed through some kind of change. Those decisions will come later"

A [well-thought-out question](#) will help generate a wealth of potential ideas. The leader will encourage participants to silently and independently write ideas in brief phrases. An example of this questions could be "Think about stuff you do that you don't look forward to but know you have to do it. These are tasks that take you a lot of time and you have to be paying attention but are repetitive and you wish there was an app for it. You might also have some ideas about things you see in the clinic that aren't a part of what you do directly but you think would be good for this activity." Other possible questions include: 1) What areas of your work are most draining even if critical, 2) Do you have routine tasks that if are not done well create stress for you and your coworkers; how about patients, 3) If there was one thing you would like to have artificial intelligence help you do, what would it be, 4) What are the biggest tasks that take your time or cause you to have to work late?

The benefits of silent generation include:

- Allows adequate time for thinking and reflection through recall

-
- Promotes social facilitation (e.g., seeing others hard at work)
 - Avoids interruptions, undue focus on one idea, and competition, as well as status and conformance pressures or choosing prematurely between ideas
 - Promotes a problem-centered focus

[Back to top](#)

STEP 3: Round-robin recording of ideas

In this step, the group leader goes around the table and records one idea from each participant on the flip chart. The ideas should be recorded verbatim with little to no paraphrasing by the leader. However, leaders are allowed to ask questions for clarification of the idea. The process continues until all ideas have been recorded. When a participant is out of ideas, they should indicate by passing.

The benefits of the round-robin recording are that it:

- Promotes equal participation in the presentation of ideas
- Increases problem-mindedness and the ability to deal with a large number of ideas
- Separates the ideas from the person
- Allows for the tolerance of conflicting ideas
- Encourages hitchhiking on ideas
- Provides written records of the ideas

In the NGT process, hitchhiking refers to a process that may stimulate other participants to think of an idea not recorded during silent generation and allows them to record and offer it during their turn.

STEP 4: Serial discussion of ideas

This involves taking each idea, one at a time (serially) and discussing or clarifying the idea prior to the preliminary vote. The benefits of this step are that it:

- Avoids unduly focusing on any one idea or a subset of ideas
- Provides an opportunity for clarification and the elimination of any misunderstanding
- Outlines the arguments and disagreements over ideas
- Records differences of opinion without undue augmentation

STEP 5: Preliminary voting

During this stage, the group participants will begin to narrow the list of potential ideas. Building on the discussion of ideas, each member will make an independent judgment about those ideas that they consider most likely to represent the problem to be solved or the potential solution to address it.

The two voting methods, typically used, are ranking and rating.

Rating method: When rating the ideas, each participant distributes a set number of points (e.g., 100) across the ideas, as seen in the example table below:

Rating Method					
Idea #	Joe	Sue	Kelly	Jim	Total
1				50	50
2	40		30		70
3	20	100		32	152
4					0
5			30		30
6	20		30		50
7					0
8					0
9	20		5	18	43
10			5		5
Total	100	100	100	100	400

As seen in the table above, each of the four team members distributed their points across the ten ideas they generated during [Step 2](#). Note that participants have the option of assigning all of their points to one idea if they feel strongly that it is truly the best (i.e., Sue). From the table, it can be seen that Idea 3 has the highest point total, and the team can end the NGT process at this point, and choose this option.

In another variation of this method, participants assign colored dots to ideas, using the same process.

Ranking method: When ranking items, each participant is asked to choose roughly half of the total number of ideas generated, and to rank these from most important to least important. This process will place emphasis on fewer ideas. In preparation for recording the vote, the leader should list the number of each idea on a separate piece of paper. When the actual votes are recorded, she/he will record the rank assigned by each participant to the idea, as seen in the example below.

Ranking Method					
Idea #	Joe	Sue	Kelly	Jim	Total
1	1			5	6
2	5		5		10
3	4	5		4	13
4					0
5		3	4	1	8
6	2	4	3	2	11
7					0
8		2			2
9	3	1	2	3	9
10			1		1

As seen from the table above, Idea 3 has the highest score. In many instances, the NGT process will end after this step. If greater accuracy is desired, and especially if the group has generated a large number of ideas, the group may chose to engage in the following two additional steps ([Step 6 and 7](#)), and iterate as many times as needed.

[Back to top](#)

STEP 6: Discussion of preliminary voting

This brief step in the NGT process is designed to examine items with inconsistent voting patterns and provide an opportunity for a discussion of ideas perceived as receiving too many or too few votes. While this step seldom results in radical changes in how the groups perceives an idea, it can result in a more accurate final vote.

[Back to top](#)

STEP 7: Final voting

In this final step, individual judgments on the ideas are combined into a group decision. While the leader may choose to follow the same voting technique used in [Step 5](#), they also may choose to use a more refined voting technique such as rating.

The final vote helps:

- Determine the outcome of the meeting
- Provides a sense of closure and accomplishment
- Records the final group judgment in relation the initial question

STEP 6:

STEP 7: Final Voting:

During this step, individual voting on the ideas is used to finalize a group decision. This last vote allows a consensus to be reached using a democratic process.

Here are some additional videos that explain the Nominal Group Technique:

<https://www.youtube.com/watch?v=JqhVhHvVtYY>

https://www.youtube.com/watch?v=jzXCXrV_nmA

<https://www.youtube.com/watch?v=LbXktAO3lml>

Appendix ii

RESOURCES FOR USER CENTERED DESIGN (UX)

User centered design or UX is a field of technology development that has become central to the development of all of the products that we so commonly use. There are significant overlaps with this approach and the participatory methods that are commonly used in primary care research and program development such as Participatory Action Research (PAR) and Community Based Participatory Research (CBPR). At the University of Washington Alacrity Center (UWAC), funded by the National Institute of Mental Health (NIMH), this approach has been used to create a formalized framework to systematically identify issues of priority and support the development and/or implementation of solutions to these issues. The Discover, Design, Build, Test (DDBT) model is a merging of user centered and participatory design approaches with elements of CBPR and so providing an accessible and useful approach to technology assessment, implementation, and or development. A number of introductory videos on this methodology are linked below for ease of review.

<https://www.uwalacrity.org/resources/portfolio-of-work/>

<https://www.youtube.com/watch?v=XGXB4y9p0-w>

Learnings from the pilots

UW Northgate Clinic Results

Participants: 5 – Front Desk scheduler, Medical Assistant, Health care navigator, Nurse, Primary care provider

Topics identified and prioritized

- 1) AI controlled patient scheduling tool
 - a. Incorporating need for continuity of care (priority of seeing same providers and panel provider)
 - b. Incorporate likelihood of no-show (balancing to optimize scheduled patients per session goldilocks number)
 - c. Determining length of session needed
 - i. Based on initial reason for visit but updated for acute needs
- 2) My chart messaging management tool
 - a. Optimizing triage to get messages to the right providers
 - b. Automating as much as possible
- 3) Clinical support tool for on call providers
 - a. Provide initial clinical tools in up to date or other resources based on the MyChart message and the conversation with patient
 - b. Can listen in and pull up a choice of information and resources
- 4) Tool to support patient self management for follow up – getting directed to the right care services
 - a. Help patient make the right choices for follow up scheduling

NAPCRG CASFM HIT Workshop Results – 2023 San Francisco

Participants: 43 – broken into 5 working tables

Topics identified and prioritized

Group 1

- 1) My chart messages (ex: need appointment, prior auth) are managed so that provider is not needing to when non-medical or doesn't require provider input. In a way that speeds up response to patient. [Mychat inbox management]
- 2) Identifying patients more likely to not adhere to medications

-
- 3) AI documents visit - speech to text
 - 4) Deprescribing assistance/guidance and medication reconciliation & AI medication optimization
 - 5) Triage patient request for appointment
 - 6) Precision medicine: personalized medicine based on EHR
 - 7) Matching patient's medical needs with the appropriate length of appointment

Group 2

- a. Msg from patients -triage requests
- b. Lack of knowledge of wait time
- c. Access to pt. Records outside org.
- d. Multiple unconnected systems
- e. Insurance comp coverage ← not know what is covered
- f. decentralized/uncoord. ref. to specialist/tests
- g. Lack of foreknowledge before visit (provider + patient)
- h. Patients not know where to go for health issue
- i. inappropriate/duplicate testing

Group 3

- a) Management of Chronic Disease that has lots of data influencing management decisions
- b) Meaningful summary of hospital stays for PCP
- c) Lack of training & accountability for EBM by mental health providers
- d) High no-show rate for clinic
- e) What is the highest ROI for intervention for prevention/management for any pt. documentation
- f) Community based resources

Group 4

- a) Patient portal message volumes
- i) Triage + suggested responses
- b) Provider notes in patient charts

-
- c) For patient, scheduling around work calendar
 - d) For patient, info on where to fulfill referrals (imaging, ER, etc.)
 - e) Consolidated diagnostic info for patient
 - f) Tailored prescribing decision support (including adherence data)
 - g) Capturing patient awareness and resource integration
 - h) Time go to through EMR/paper charts to get to important information
 - i) Duplicate tests/unnecessary duplication

Group 5

- a) Multiple queries for drug coverage/prior authorization
- b) Connecting patients with resources for addressing SDOH
- c) Medical decision support EKG analysis
- d) Automatic narrowing of ICD coding/ease job of coding
- e) Facilitate information sharing between pharmacy & clinic
- f) Reduce “no shows” & predict

Appendix iii

John Maier – More details on the build and test phases - details

Appendix iv

REQUIREMENTS ENGINEERING – Design Phase – Gathering Requirements

1-Requirement Engineering Definition

Requirement engineering (RE) is a systematic approach to defining, documenting, and maintaining the requirements for a software system or any other engineered product. It's essentially the process of understanding what the product needs to do to be successful. Here's a breakdown of the key aspects of RE:

Core Objectives:

- **Elicit Needs:** Identify the needs, expectations, and constraints of all stakeholders involved in the project, including users, developers, managers, and any other parties with a vested interest.
- **Define Requirements:** Translate the gathered needs into clear, concise, and unambiguous specifications for the product's functionalities, behavior, and performance.
- **Document Requirements:** Formally document the requirements in a way that is easy to understand, maintain, and reference throughout the development process.
- **Verify and Validate Requirements:** Ensure the documented requirements accurately reflect the stakeholders' needs and that the final product meets those requirements.

Importance of RE:

- **Clear Communication:** RE establishes a common ground for all stakeholders by clearly defining what the product should do. This reduces misunderstandings and mismatched expectations.
- **Reduced Errors:** By thoroughly defining requirements upfront, you can identify and address potential issues early on, avoiding costly rework and delays later in the development process.
- **Improved Quality:** Well-defined requirements lead to a product that is more likely to meet user needs and deliver value.
- **Project Management:** RE helps with project planning and estimation by providing a clear roadmap of what needs to be achieved.

Common RE Activities:

-
- Requirements Elicitation: Techniques like interviews, workshops, user observation, or document analysis are used to gather stakeholder needs.
 - Requirements Analysis: The collected needs are analyzed, prioritized, and refined to create a clear and consistent set of requirements.
 - Requirements Specification: The requirements are documented in a formal document using various techniques like use cases, user stories, or system specifications.
 - Requirements Verification and Validation: Checking if the requirements are complete, consistent, understandable, and meet the stakeholders' needs.

Benefits of Effective RE:

- Increased project success rates
- Reduced development costs
- Improved product quality and user satisfaction
- More efficient project management

Requirement engineering is a critical foundation for building successful software systems and other engineered products. By following a systematic approach to defining, documenting, and managing requirements, you can ensure that the final product meets the needs of all stakeholders and delivers the intended value.

2-Requirement Engineering Role within DDBT

Requirement engineering methods play a crucial role throughout the entire development lifecycle, from the initial discovery phase to the final testing phase. Here's a breakdown of how these methods are applied in each stage:

Discovery Phase:

- Focus: This phase is about understanding the problem space, user needs, and project feasibility.
- Methods:
 - Stakeholder Interviews: Gather insights from various stakeholders (users, developers, managers) to understand their needs, expectations, and pain points.
 - User Research: Conduct usability studies, surveys, or focus groups to get a deeper understanding of user behavior and needs.
 - Competitor Analysis: Analyze existing solutions to identify potential gaps and opportunities for differentiation.

-
- Scenario Building: Develop hypothetical scenarios to understand how users might interact with the system and what functionalities would be valuable.

Design Phase:

- Focus: This phase involves translating the discovered requirements into a technical design for the system.
- Methods:
 - Use Case Diagrams: Create visual representations of the system's functionalities from the user's perspective.
 - User Story Mapping: Prioritize user stories based on value and complexity.
 - Functional and Non-Functional Requirements (FRS & NFRS) Documentation: Clearly define what the system should do (FRS) and how it should perform (NFRS) like security, usability, or performance.
 - Prototyping: Develop low-fidelity or high-fidelity prototypes to visualize the system's functionality and gather user feedback on the design.

Build Phase:

- Focus: This phase involves developing the system based on the finalized design and requirements.
- Methods:
 - Requirements Traceability Matrix: Maintain a link between the original requirements and the implemented functionalities in the code. This ensures all requirements are addressed during development.
 - Version Control Systems: Track changes made to the code and requirements documents, allowing for easier rollbacks or comparisons if needed.
 - Technical Reviews: Conduct peer reviews of the code to ensure it adheres to the documented requirements and coding standards.

Test Phase:

- Focus: This phase involves verifying if the developed system meets the defined requirements.
- Methods:
 - Black-Box Testing: Test the system from an external user's perspective without knowledge of the internal workings. This ensures the system delivers the expected functionalities as defined by the requirements.

-
- White-Box Testing: Test the internal logic and functionalities of the system based on the detailed design and code. This ensures the system functions as intended based on the technical specifications.
 - Acceptance Testing: Involve stakeholders in testing the system to ensure it meets their expectations and fulfills the originally identified needs.

Additional Considerations:

- Communication and Collaboration: Effective communication and collaboration between stakeholders (users, developers, testers) are crucial throughout all phases to ensure requirements are well-understood, translated accurately, and validated effectively.
- Change Management: Requirements might evolve during the development process based on new discoveries or user feedback. A defined change management process ensures updates are implemented smoothly while maintaining traceability and documentation.

By applying appropriate requirement engineering methods throughout the development lifecycle, you can increase the chances of building a system that meets user needs, delivers value, and avoids costly rework due to unclear or unaddressed requirements.

3- Process Mining and Requirement Engineering

Process mining and requirement engineering are two distinct yet potentially complementary fields that deal with understanding and improving systems. Here's a breakdown of each and how they can interact:

Process Mining:

- Focus: Analyzes event data recorded by information systems to discover, monitor, and optimize real-world business processes.
- Goal: Uncover how processes actually work, identify bottlenecks, and find opportunities for improvement.
- Techniques: Uses algorithms to analyze event logs (sequences of timestamps and activities) to reconstruct process models and identify patterns, deviations, and inefficiencies.

Requirement Engineering (RE):

-
- Focus: Defines, documents, and maintains the requirements for a software system or product.
 - Goal: Ensure the system meets the needs of stakeholders and delivers the intended value.
 - Activities: Involves eliciting stakeholder needs, translating them into clear specifications, documenting requirements, and verifying they are met.

How They Can Interact:

- Process Mining for RE:
 - Understanding Existing Processes: Process mining can be used to analyze how users currently interact with a system, providing valuable insights for defining new system requirements during RE.
 - Identifying Gaps: By uncovering deviations from the intended process flow through process mining, RE can focus on addressing these gaps in the new requirements.
 - Data-Driven Requirements: Process mining data can be used to quantify user behavior and interaction patterns, helping RE define more data-driven and user-centric requirements.
- RE for Process Improvement:
 - Refining Processes based on Requirements: Clear and well-defined requirements from RE can guide the optimization of existing processes identified through process mining.
 - Verifying Process Changes: After implementing changes based on RE, process mining can be used again to verify if the new process adheres to the defined requirements and delivers the expected outcomes.

Benefits of Combining RE and Process Mining:

- More Realistic Requirements: Process mining data can help RE define requirements that are grounded in reality and reflect actual user behavior.
- Improved Process Optimization: RE provides a clear direction for process improvement efforts identified through process mining.
- Data-Driven Decision Making: Both RE and process mining utilize data to inform decision making, leading to more objective and evidence-based approaches.

Challenges of Combining RE and Process Mining:

- Data Quality: Process mining relies on high-quality event data, and discrepancies can lead to misleading insights for RE.

-
- Focus on Existing Processes: Process mining primarily focuses on "as-is" processes, while RE needs to consider both current and future needs.
 - Integration Challenges: Integrating data and methodologies from both RE and process mining can require effort and expertise.

Overall, process mining and requirement engineering are valuable tools that can be used together to gain a deeper understanding of systems and processes. By leveraging both, you can define more realistic requirements, identify opportunities for improvement, and ultimately build better software systems and optimize business processes.

Glossary