Step 1. Research and Problem Selection:

- Identify a Problem: Choose a real-world problem that interests you: patient compliance for chemotherapy intake combating brain cancer
    - Patient compliance research:
        - Effective treatments for amblyopia exist but **compliance is a barrier to optimal outcomes**
            - Le, Tinh, Talia Burstein, Basak Can, Maryo Kohen, and Faruk Örge. “Patient Compliance Rates with a Novel, Online Platform for Tracking Amblyopia Treatment.” *Journal of AAPOS* 26, no. 4 (2022): e49–e49. doi:10.1016/j.jaapos.2022.08.184.
        - Important to monitor compliance in some manner because that can improve health outcomes (i.e. prevent adverse events clinically or structurally)
            - Simakova, E, I Zborovskaya, B Zavodovsky, L Seewordova, J Polyakova, E Papichev, and Y Akhverdyan. “AB1226 CLINICAL SIGNIFICANCE OF A PATIENT COMPLIANCE IN PREVENTION OF SECONDARY FRACTURES.” Annals of the Rheumatic Diseases 82, no. Suppl 1 (2023): 1840–1840. doi:10.1136/annrheumdis-2023-eular.5857.
                - “26.51% fragility fractures were registered in patients who refused monitoring and treatment. In the group of low compliance patients, 8.79% of new fractures were detected. While in the group of highly compliant patients, only 1.4% of new fractures were registered”
        - Thummak, Saowaluk, Wassana Uppor, and La-Ongdao Wannarit. “Patient Compliance: A Concept Analysis.” Belitung Nursing Journal 9, no. 5 (2023): 421–27. doi:10.33546/bnj.2807.
            - Patient compliance with medications and health recommendations contributes to disease control (Ekinci et al., 2017; Muliyil et al., 2017) and better clinical outcomes in chronic illnesses (Aremu et al., 2022).
            - Non-compliance can lead to ineffective treatment outcomes, higher hospitalization rates, reduced discharge rates, complications, increased healthcare costs, and death (Desai et al., 2019).
            - Following health recommendations means conformity to the advice on routine treatments in terms of the timing, dosage, and frequency, and the patients’ action that is in line with a dosage regimen’s specified interval and dose (Cramer et al., 2008).
            - Patients participate in their treatments with the medical professional and define their behavior through their willingness to confront their long-term illness (Costa et al., 2021).
        - Brain cancer basics

- Standard of care treatment
    - Landmark study: 42 days of radiotherapy plus daily temozolomide followed by 6 28-day cycles of adjuvant temozolomide taken days 1-5 extended median survival and two-year survival rate compared to radiotherapy on its own
        - Stupp R, Mason WP, van den Bent MJ, Weller M, Fisher B, Taphoorn MJ, Belanger K, Brandes AA, Marosi C, Bogdahn U, Curschmann J, Janzer RC, Ludwin SK, Gorlia T, Allgeier A, Lacombe D, Cairncross JG, Eisenhauer E, Mirimanoff RO; European Organisation for Research and Treatment of Cancer Brain Tumor and Radiotherapy Groups; National Cancer Institute of Canada Clinical Trials Group. Radiotherapy plus concomitant and adjuvant temozolomide for glioblastoma. N Engl J Med. 2005 Mar 10;352(10):987-96. doi: 10.1056/NEJMoa043330. PMID: 15758009.
    - Concurrent and adjuvant TMZ associated with improved survival compared to adjuvant TMZ by itself
        - Sher DJ, Henson JW, Avutu B, Hochberg FH, Batchelor TT, Martuza RL, Barker FG 2nd, Loeffler JS, Chakravarti A. The added value of concurrently administered temozolomide versus adjuvant temozolomide alone in newly diagnosed glioblastoma. J Neurooncol. 2008 May;88(1):43-50. doi: 10.1007/s11060-008-9530-8. Epub 2008 Jan 30. PMID: 18231723; PMCID: PMC2658810.
    - 6-12 Cycles total now though
        - Fernandes C, Costa A, Osório L, et al. Current Standards of Care in Glioblastoma Therapy. In: De Vleeschouwer S, editor. Glioblastoma [Internet]. Brisbane (AU): Codon Publications; 2017 Sep 27. Chapter 11. Available from: https://www.ncbi.nlm.nih.gov/books/NBK469987/ doi: 10.15586/codon.glioblastoma.2017.ch11
- Important timelines and dates (this would be a great flow-chart)
    - Day 1 of the adjuvant cycle
    - Days 1-5 are active TMZ treatment days
    - Day 21 and Day 28 as lab dates to monitor chemotherapy toxicity

        - White blood cells must be greater than or equal to 3 AND platelets must be greater than or equal to 100 in order to continue therapy after day 28.
- Explore Existing Solutions: Investigate current solutions to your chosen problem. What software solutions exist, and how effective are they?
    - There is no widespread software to manage treatment for GBM. Potentially softwares/workflows to develop within Electronic Heath Record softwares but there are a variety of platforms used across sites.
- Justify Your Choice: Explain why this problem interests you and why it's important to find a solution.
    - I work with GBM patients for my job, and a pain point of my job is not having an easy way to track my patients and their treatment compliance within my EHR/EMR. Critical to track these patients so they don't fall through the cracks.

Step 2. Design a Solution:

- Propose a Software Solution: Create your own program idea! Outline a basic software solution that addresses the problem you are researching. Describe how your idea improves on or differs from existing solutions, feel free to build your ideas based on software that already exists.
    - There really is no existing solution (I really would not be creating this if my own EHR system already had a treatment tracking software)
    - Tracking compliance for temozolomide intake relies on dates and timelines
    - This software would be used by patients and their caretakers to help them stay on track with treatment
        - There would have to be two different programs for concurrent and adjuvant therapy of TMZ
- Pseudocode: Write pseudocode or code-like statements that outline the logic of the critical behavior of your software. Don't worry if you don't know exactly how it might be done in a programming language, stay general and think about the steps needed to complete the task. This helps visualize the programming logic without getting into syntax specifics. (Note: Actual coding is not required. Please focus on the conceptual design rather than specific syntax.)
    - My code would certainly utilize boolean operators, while loops, and if statements…actual pseudocode coming…
- User Interaction: Visualize how users would interact with your software. Describe user interactions or create mock-ups of the user interface. Your design should be informative and engaging.
    - The software would allow users to submit the start date for each cycle as a submission.
    - The healthcare professional would then verify that the information provided by the user is correct by cross-referencing the date with the day the medication was sent out

- **Upon healthcare professional approval, the timeline of treatment is created and displayed to the patient.**
- As the 28 day cycle progresses, notifications and reminders are pushed to the user to remind them of important dates.
- Once patients complete their day 21 and day 28 labs, either the results are automatically loaded into the software or the healthcare professional manually inputs the results
- The software checks if the WBCs and platelets from Day 28 are above the minimum amount
    - If TRUE, the healthcare professionals get a notification to send the next refill to the pharmacy so patient can start next cycle; patient is notified by software that their labs look good, and they should wait for the next cycle's prescription to be ready so they can start.
    - If FALSE, both professional and user get notification that labs must be repeated evey 3-5 days before starting next cycle
- Repeat

Presentation:

- Structure Your Presentation:

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    - Real-World Applications: Discuss how the concepts can be applied in real-world scenarios.
    - Describe Your Design Approach: Even though no actual software is being developed, describe your planning process while thinking through the potential software design.
    - Solution Design Proposal: Share the elements of your proposed software design in Step 2.
    - Open Questions: Highlight at least two unanswered questions from your research. What surprised you? What do you want to know more about?
    - Citations: List all resources you used, such as articles, journals, and websites.

Submission Guidelines:

- Final Presentation: Upload your presentation document as a .PDF to D2L assignment folder
- Design Documents: Include all research notes, design documents (flowcharts, pseudocode, user-facing design, code if any), and anything else developed while creating this final project.
- GitHub: Include your presentation document and all related design documents as a project in your GitHub repository. Organize the files and name them clearly. Include a link to your GitHub project in the comments of your submission.