

Appendix

Appendix A: Visualization designs

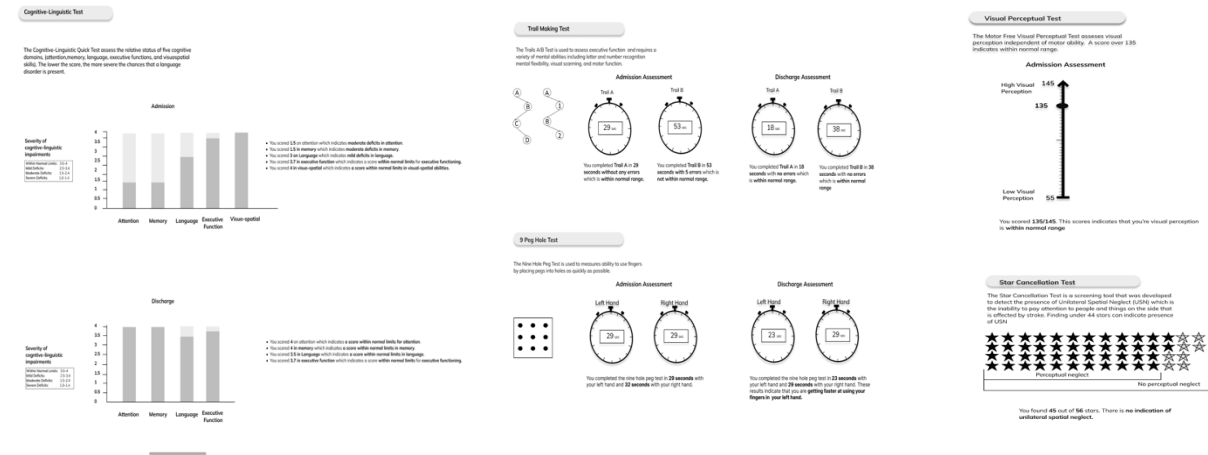


Figure 1: Visualization designs representing rehabilitation progress in cognition.

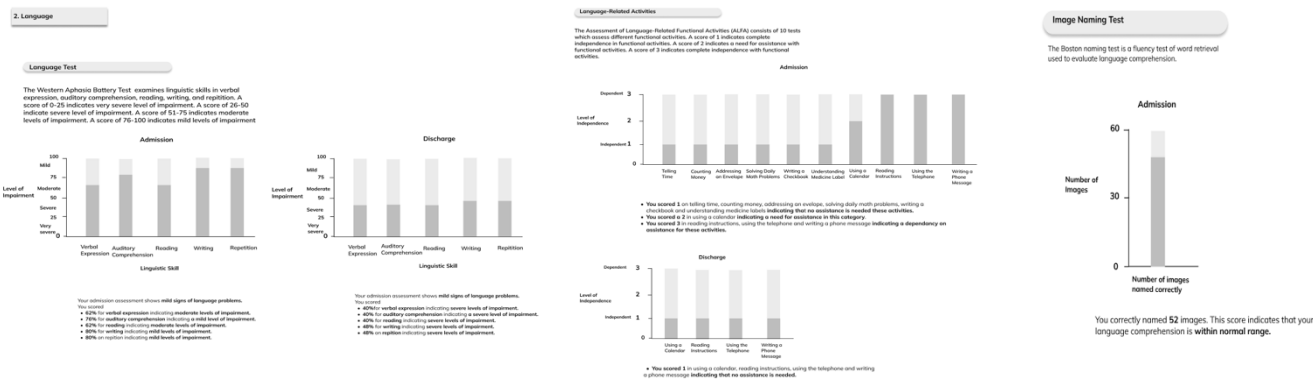


Figure 2: Visualization designs representing rehabilitation progress in language.

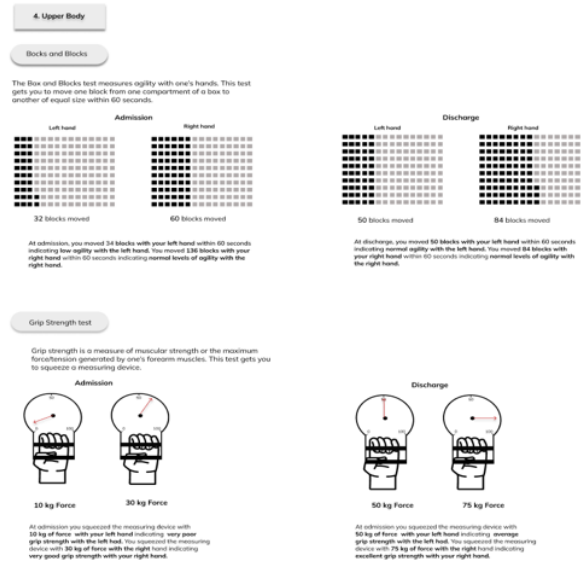


Figure 3: Visualization designs representing rehabilitation progress in the upper body.

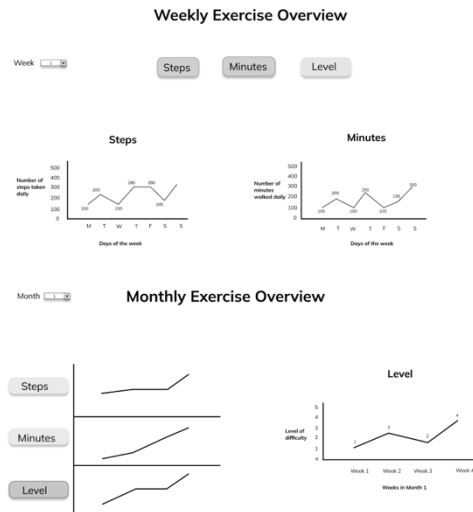


Figure 4: Visualization designs representing rehabilitation progress in the exercise.

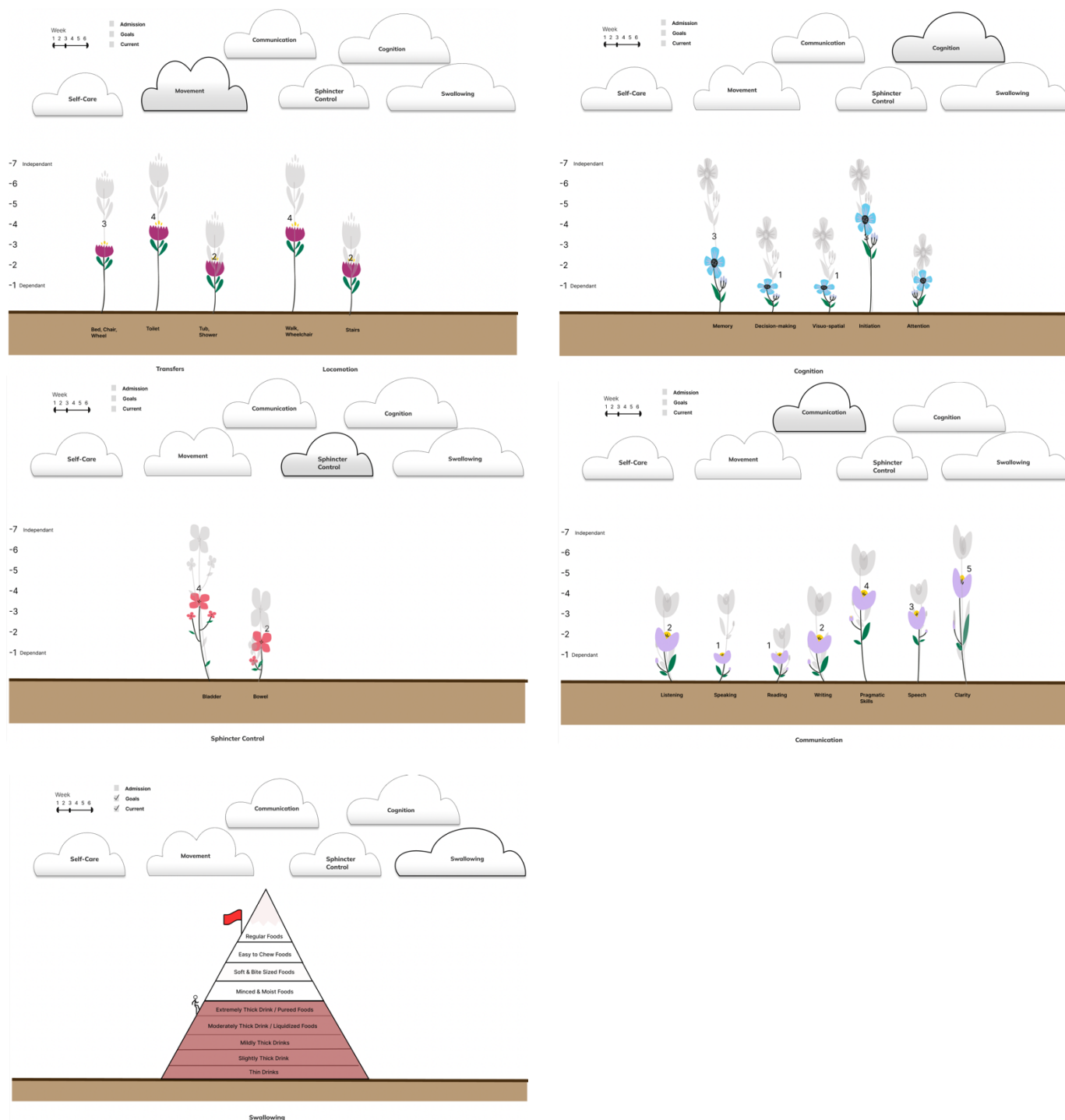


Figure 5: Visualization designs representing an overview of patient goals.

Appendix B: Codebooks

Codebook 1: Interviews with Healthcare Providers

Code	Description
1 Mediums to communicate health progress to patients	Codes in this category relate to ways in which healthcare providers (HPs) communicate rehabilitation results and progress to patients.
1.1 Communication board	Communication boards in every room display patient names, discharge dates, mobility, and transfer abilities.
1.2 Verbal communication (synchronous)	HPs use verbal communication to discuss rehabilitation progress with patients.
1.3 Written notes (asynchronous)	HPs share handwritten notes with patients to show their progress.
2 Types of content communicated to patient	Codes in this category relate to types of content that HPs communicate to patients recovering from a stroke.
2.1 Baseline test results	HPs communicate baseline test results with patients.
2.2 Goals of rehabilitation	HPs discuss the goals of rehabilitation services with patients.
2.3 Health scores	HPs use objective data like health scores to remind patients of their rehabilitation status.
2.4 Discharge summaries	HPs provide patients with written updates of discharge summaries.
2.5 Comparisons between initial health assessment and final assessment	HPs provide patients with a written document that compares the initial health assessment to the final assessment to show progress.
2.6 Weekly rounds report	HPs discuss weekly rounds with patients.
3 information provided in a patients' weekly progress report	Codes in this category are related to information in a weekly progress report that HPs complete together.
3.1 Weekly goal setting	HPs discuss rehabilitation goal setting for patients.
3.2 Discuss the patients' level of function at admission and changes in function over time	Healthcare providers discuss the level of function in a patient at admission and progress in the level of function over time.
3.3 Categories in weekly progress report based on the Functional Independence Measure (FIM) categories	Healthcare providers discuss categories of patients' health similar to categories found in the FIM test.
3.3 Physiotherapist (PT) discusses patients' physical function	PT fills out sections in weekly report related to physical function like mobility, lower limb function, upper limb function transfer, walking ability, if the patient can do stairs, bed mobility, balance
3.4 Speech-Language Pathologist (SLP) discusses patient's communication, language, and swallowing abilities	SLP fills out sections in weekly rounds report related to patient's communication language, and swallowing abilities.

3.5 Occupational Therapists (OT) discusses patient's activities of daily living (ADL), instrumental activities of daily living (IADL), cognition-perceptual functions and visual-spatial functions	OT fills out sections in weekly rounds related to patient's ADL, IADL, cognition-perceptual and visual-spatial functions.
4 Attempts to increase patient engagement	Codes in this category relate to ways in which HPs attempt to increase patient engagement in rehabilitation process.
4.1 Giving patients handwritten summary notes	HPs give patients handwritten summary notes, to keep patients engaged.
4.2 Communicating test scores to patients	Providing patients with test scores is fundamental for engagement.
4.3 Positive reinforcement	HPs use positive reinforcement to motivate patients in their recovery process.
4.4 Scoring health status in front of patients	HPs will score and explain patient's assessment results right in front of the patient so that the patient better understands their results.
4.5 Educating patients about stroke	Healthcare providers focus on increasing education and awareness about stroke to increase patient understanding and engagement.
4.6 Using simple language to describe progress to patients	Healthcare providers use simple language to communicate scores to patients to increase patient understanding.
4.7 Virtual Reality (VR) for engagement in physical rehabilitation	PT uses VR games to promote engagement in rehabilitation exercise.
4.8 Patients can see physician reports through Electronic Medical Records (EMR)	Patients can stay informed on reports from physicians by seeing them through an online portal.
5 Issues with technology to store and access patient health data	Codes in this category relate to challenges that HPs face regarding issues with technology storage and accessing patient health data.
5.1 Difficulty accessing patient information from other healthcare providers	Accessing EMR between OT, PT, SLP can sometimes be difficult if they have not uploaded documents or if they are uploaded in unfamiliar places.
5.2 EMR system is not organized cohesively making it difficult to find patient information	EMR are stored in different places and are sometimes fragmented.
5.3 No overview of patient data	There is no overview of patient health data in EMR.
5.4 No standard template for summarizing patient health progress	HPs do not have an automated template for patient results.
5.5 Patient information is not readily accessible	HPs think it would be beneficial to have a screen in every room to have information readily accessible.
5.6 Tracking exercise and cardiovascular health is limited without fitness tracker	PT think that every patient should have a Fitbit to track their cardiovascular health and exercise.
6 Inpatient treatment protocol and therapies	Codes in this category relate to inpatient treatment protocol and types of therapy that patients receive.

6.1 General protocol: Assess patient status and determine goals	First assessment starts with assessing the patient's status, then goals are created based on their rehabilitation status, health, mobility, ability to transfer, and ability to provide care for themselves.
6.2 Treatment amount depends on the severity of problem	The number of therapy sessions depends on the severity of the patients' problem.
6.3 Physiatrist's protocol	Physiatrist's treatment protocol for caring for patients after a stroke.
6.3.1 Assessment of patient's health status	Physiatrists assess patients' individual medical situations that could interfere with rehabilitation like a painful shoulder, a painful neck, or a painful back swelling.
6.3.2 Assessment of the comorbidities of patients	Physiatrists assess comorbidities like blood pressure, diabetes and lipids, fever, swelling, and complex regional pain syndrome.
6.3.3 Using SOAP (Subjective, Objective, Assessment, and Plan) method to document a medical situation	Physiatrists use the SOAP method as a standardized worldwide method for documenting a medical situation.
6.3.4 Monitoring patients daily	Physiatrists see patients daily to assess their health status.
6.4 PT protocol	PT treatment protocol for caring for patients after a stroke.
6.4.1 Assessment of patient's ability to transfer, stand and walk	PT assesses patients' ability to transfer in and out of bed, patients' ability to stand and walk.
6.4.2 Timeline of patient assessment after admission	Within the first 3 days of admission, PTs assess the patients' social and home environment, their mobility, occupation, what activities they enjoy, and muscular strength.
6.4.3 Using Virtual Reality (VR) to promote physical rehabilitation	PT leads a program in the VR therapy unit for patients recovering from stroke to promote exercise and engagement.
6.4.4 giving patients exercise programs	PT gives patients exercise programs to increase cardiovascular health.
6.4.5 assessments of patient's muscular strength	PT assesses a patient's muscular strength.
6.4.6 Asking patients to use fitness equipment	PT asks patients to use fitness equipment like a bike and treadmill for exercise.
6.4.7 Duration of treatment	Patients receive 5 therapy sessions a week with a PT.
6.5 SLP protocol	SLP treatment protocol for caring for patients after a stroke.
6.5.1 Assessing of difficulty with speech, language, and swallowing	Patients get access to a SLP if they have problems with language, speech or swallowing.
6.5.2 Duration of treatment	Patients receive 2-5 therapy sessions a week with a SLP.
6.6 OT Protocol	Occupational therapy treatment protocol for caring for patients after a stroke.
6.6.1. Assessing patient's capacity to perform everyday tasks	OT assesses patients' capacity to perform tasks (ADL and IADL) and compare it with their pre-stroke self-reported abilities.

6.6.2. Improving patient's functional capacity, ADL and IADL	OT focuses on improving patient's functional capacity in their ADL (personal hygiene or grooming, dressing, toileting, transferring, eating) and IADL (managing finances, medications, food preparation, house-keeping, and laundry).
6.6.3 Assessing cognitive functioning	OT assesses a patient's cognitive-perceptual functioning.
6.6.4 Helping patients learn strategies to manage cognitive, perceptual, and behavioural changes after a stroke	OT helps patients learn strategies to manage behavioural, cognitive, and perceptual changes associated with stroke.
6.6.5 Preparing the home and work environment for patient's return	OT prepares the home and work environment for patient's return after a stroke.
6.6.6 Improving patient's motor control and hand function	OT focuses on improving the patient's motor control and hand function in the stroke-affected upper limb.
6.6.7 Duration of treatment	Patients receive 3-5 therapy sessions a week with an OT.
6.7 Nurse's protocol	Nurse's treatment protocol caring for patients after a stroke.
6.7.1 Helping pain management, assistance with mobilization, assistance with medication administration, and ADL	Nurses help with a range of rehabilitation services including pain management, assistance with mobilization, assistance with medication administration, and ADL.
6.7.2 Role of Nurse	Nursing is a fundamental component. Inpatients get cared for by nurses every day.

Codebook 2: Types of Health assessments used by healthcare providers

Code	Description
Types of health assessments	Codes in this category relate to questionnaires that HPs use to assess function and rehabilitation progress in patients.
Assessment of Language related Functional Activities (ALFA) test	ALFA test is used to test cognitive linguistic problems related to functional activities.
Berg Balance test	Berg balance test is used to test balance.
Boston Naming test	Boston Naming test measures confrontational word retrieval.
Chedoke McMaster Stroke Assessment Tool	Chedoke McMaster Stroke Assessment tool is used to measure physical impairment and activity of an individual after stroke.
Cognitive Linguistic Quick test (CLQT)	CLQT is used to test cognitive-linguistic problems.
Functional Independence Measure (FIM)	FIM is used to test the functional status of a patient based on the level of assistance they require.
Gait Speed test	Gait speed test is used to measure gait speed.
Grip Strength test	Grip strength test is used to measure muscular strength.
International Dysphagia Diet Standardisation Initiative (IDDSI)	IDDSI is used to assess swallowing ability.
Montreal Cognitive Assessment test (MoCA)	MoCA test is used to assess cognitive impairment.
Motor Free Visual-Perceptual test	Motor Free Visual Perceptual test is used to assess visual perception independent of motor ability.
Ross Information Processing Assessment-2 (RIPA-2)	RIPA-2 is used to assess cognitive-linguistic deficits.
Star Cancellation test	Star cancellation test is used to assess unilateral spatial neglect.
Trail Making test	Trail making test is used to assess executive function.
Western Aphasia Battery (WAB) test	WAB is used to assess the linguistic skill and main non-linguistic skill in adults with aphasia.
2-Minute Walk test	2-minute walk tests are used to test endurance and gait speed.
9 Peg Hole test	9 Peg Hole test is used to assess finger dexterity.

Codebook 3: Design requirements for data visualization

Code	Description
Design Requirements for data visualization	Codes in this category relate to design requirements of the data visualization representing patient health progress mentioned by HPs.
Visualize weekly report	Visualizing weekly progress report would be useful since healthcare providers use it frequently.
Visualizing patient results	Healthcare providers believe that visualizing assessment results and showing patients would be beneficial.
User-Interface should have two views: patient and provider	Display weekly report visualization with two views, one for the health care workers and the second for the patient.
Compare levels of assistance in patients at intake and discharge	Display patients' level of assistance required at intake and discharge (minimum assistance, moderate assistance, maximum assistance).
Display section for patient goals, admission test results, discharge test results and check-in points in between	Display section for patient goals, admission test results, discharge test results and check-in points in between.
Simple to understand patient-centered results	Display results that are simple to understand are necessary for patients that may have lower levels of comprehension and cognition.

Codebook 4: Expert Evaluation

Code	Description
1 Clear categorization and labelling of health assessments	Codes in this category relate to the theme of clear categorization and labelling of health assessments in the visualization designs.
1.1 Categorize health assessments into their corresponding health domains	Health assessments should be placed in their corresponding health domains.
1.2 Add signposts to categories of health assessment in the overview	Health assessments should be signposted to their related categories.
2 Display informative scales and results	Codes in these categories relate to the theme of displaying informative scales and results in the visualization designs.
2.1 Display severity levels of scales	When applicable, tests should demonstrate severity levels in the scales to inform patients about the meaning of their results.
2.2 Display health sub-domains that are relevant to the patient's rehabilitation	The results should demonstrate sub-domains relevant to the patient rehabilitation so that results are more informative and meaningful to them.
2.3 Record and display additional text for results of tests as applicable	To support patients with diet planning, additional information about diet should be included in a comment box.
2.4 Display meaningful context of patients results	The progress findings from each health assessment tool should give meaningful context about the areas of rehabilitation that have improved or worsened.
3 Personalize the display of information for patients	Codes in this category relate to the theme of visualizing results that are personalized to the patient.
3.1 Display functional independence goals	Visualization of goals should demonstrate all levels of functional independence to patients to support them in reaching specific goals.
3.2 Enable patients to personalize their data view	Allow patients to select which elements display in the visualization to reduce cognitive burden.
4 Personalize healthcare providers choice of health assessments	Codes in this category relate to the theme of personalizing the healthcare providers choice of health assessments in the visualization designs.
4.1 Visualization should demonstrate the most common tests that are used by healthcare providers	Visualization should take out tests that are not used by the healthcare providers at the hospital and add tests that are most used.