PROPOSAL IDEAS AND ITERATIONS

November 24, 2025

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Contents

Chapter 1

Idea 1: AI-Generated Visual Summarization of Patient-Provider Communication (Discarded)

1.1 Idea 1: Use Scenarios for Future Research Ideas

Summary: This project proposes a multimodal system that uses generative AI to summarize longitudinal patient-provider communication into visual narratives or animated scenes. It aims to improve patient understanding, recall, and continuity of care—especially in chronic disease contexts—by combining clinical NLP, narrative modeling, and visual communication.

Use Scenario: A patient managing Type 2 diabetes has exchanged numerous secure messages with their care team over the past six months. These include updates on blood sugar levels, medication adjustments, and dietary concerns. Before their upcoming appointment, the patient receives a visual summary: a timeline highlighting key interventions (e.g., insulin changes), visual metaphors such as a narrowing river to represent better glucose control, and characters representing each provider. The summary is replayable and interactive, helping the patient review their progress and improving their preparedness for shared decision-making.

Chapter 2

Idea 2: GoalViz — Generative AI for Goal-Driven Narrative Health Education (In Proposal)

2.1 Idea 2: Use Scenarios for Future Research Ideas

Summary: GoalViz is a generative AI system that transforms patient-defined goals into interactive, metaphor-driven narrative experiences. It integrates large language models (LLMs), vision-language models (VLMs), and symbolic storytelling structures to create adaptive learning tools that align medical knowledge with each patient's personal context.
Use Scenario: A breast cancer patient writes in a secure message, "I just want enough energy to play with my child again." GoalViz extracts this personal goal ("reduce fatigue") and generates an interactive visual novel. The story depicts a character navigating a symbolic journey toward a "Playground on the Hill." Along the way, the character faces challenges like fog (fatigue) and heavy backpacks (treatment side effects). Interactive choices—such as taking rest or discussing energy-saving strategies—affect the visual metaphor (e.g., fog clears). Through dialogue and visual cues, evidence-based information about fatigue management is conveyed, creating a motivating and emotionally resonant educational experience.

Chapter 3

Idea 3: Visual Narratives for Enhancing Goal Communication and Provider Training (Developing Idea)

3.1 Idea 3: Use Scenarios for Future Research Ideas

Summary: This idea investigates how interactive visual storytelling can support clearer articulation and interpretation of patient goals. It includes two directions: (1) narrative interfaces that help patients express goals using visuals and stories; and (2) training tools that help providers infer goals from vague or emotional patient messages.

Use Scenario 1 (Patient-side): A patient with chronic pain struggles to describe their personal goal in a clinical message. Instead of typing, they select visual scenes from a comic-style interface—e.g., a person attempting to garden but experiencing pain. The system helps them formulate the goal "I want to be able to garden again without pain." This clearer expression improves how their care team responds.

Use Scenario 2 (Provider-side): A medical resident uses an AI-driven training platform that presents real patient messages like "I just want to feel like myself again." The resident explores associated narrative scenes and selects likely interpretations (e.g., emotional fatigue, depression, role loss). The system provides feedback, teaching the resident to recognize implicit goals and improving communication training for ambiguous or emotionally

charged cases.

Chapter 4

Prototype Idea Survey 1:

4.1 Visual Storytelling and Narrative in Health and Medicine

This section reviews representative works that employ visual storytelling and narrative media in healthcare communication. These studies illustrate how visual narratives—ranging from comics and digital stories to data-driven visualizations—can enhance understanding, empathy, and engagement among patients, clinicians, and the public.

4.1.1 Visual Narratives in Medicine

Duong et al. (2024) surveyed the use of comics, illustrated narratives, and other visual storytelling forms within the emerging field of graphic medicine. Their work demonstrates how visual narratives can bridge communication gaps between clinicians and patients by depicting lived experiences of illness and care. The study highlights the pedagogical and empathetic potential of narrative visualization in medical education and patient engagement.

4.1.2 Digital Storytelling in Health Promotion

Briant et al. (2016) examined digital storytelling as a culturally relevant health promotion tool. Their study involved community members creating short multimedia stories that integrate personal narration, imagery, and audio to share health-related experiences. The results showed increased engagement and health literacy among participants, demonstrating that narrative and cultural framing can effectively enhance the impact of health

communication.

4.1.3 The Creation and Impact of Visual Narratives for Science and Health Communication

A curated research collection published in *Frontiers in Communication* explored how visual narratives, such as comics, infographics, and animated videos, support science and health communication. The studies collectively show that well-designed visual storytelling improves comprehension, memorability, and emotional engagement compared with text-based materials, underscoring the importance of combining narrative framing with visual media for public outreach.

4.1.4 Humane Visual AI: Telling the Stories Behind a Medical Condition

So et al. (2020) proposed a data-driven visualization framework that constructs layered narrative representations of medical conditions. Using large-scale social media and prescription data, their "Martini-glass" visualization model integrates biological, psychological, and social dimensions to contextualize patient experiences. This approach exemplifies how computational visualization can humanize large-scale data and reveal health-related stories at multiple levels of abstraction.

4.2 Visual Narratives and Media for Communication and Education

Beyond healthcare, visual narratives have been widely applied in education, science communication, and social research. These examples show how sequential imagery, storytelling structure, and multimodal design can facilitate learning, reflection, and engagement.

4.2.1 Comics as a Medium for Educational Communication

Boucher et al. (2023) introduced the concept of *educational data comics* to explore how sequential storytelling can be used to teach visualization principles. Their work discusses

how comics combine narrative context with data representations to explain abstract visualization concepts such as encoding and transformation. The study emphasizes how metaphor, pacing, and visual continuity help learners grasp complex information.

4.2.2 Digital Storytelling and Comic Authoring Tools for Learning

Azman et al. (2015) analyzed several comic authoring environments, including *Comic Life*, *Pixton*, and *MakeBeliefsComix*, which allow learners to create digital stories for educational purposes. Their comparative study identified usability, creative flexibility, and narrative coherence as key factors in designing such tools. The authors argue that learner-generated comics foster creativity, reflection, and engagement, particularly when learners construct narratives around academic or personal topics.

4.2.3 Personalized Comics for Communication

Waseem et al. (2024) investigated how personalized comics can be used to communicate healthcare information to patients undergoing hemodialysis. Although situated in a medical context, their findings have broader implications for personalization and empathy in visual communication. The study found that tailored comics improved users' emotional connection and understanding of complex procedures, illustrating how personalization can enhance narrative relevance and impact.

4.2.4 Visual Narratives in Participatory and Social Research

Carrington et al. (2007) employed visual narratives, drawings, and sequential stories created by secondary school students, to explore issues of inclusion and social justice in educational settings. These participant-generated narratives allowed students to express experiences and emotions that are often omitted from written reflections. The study highlights the role of visual storytelling as both a research and pedagogical method for amplifying underrepresented voices.

4.2.5 Science Communication Through Visual Narratives

Farinella (2018) reviewed a wide range of science comics and illustrated narratives designed to communicate scientific concepts to the public. Through examples from physics,

biology, and environmental science, the author showed that comics can combine accuracy with engagement by employing metaphor, character-driven explanations, and humor. The paper emphasizes that visual storytelling serves not only to simplify information but also to create memorable emotional resonance.

4.2.6 Emerging AI-Based Visual Narrative Generation

Zhang et al. (2025) proposed *LEARN*, a story-driven layout-to-image generation framework for educational storytelling. The system uses AI to automatically generate coherent image sequences aligned with narrative scripts, supporting the creation of instructional visual materials in STEM domains. This line of research points toward scalable and adaptive systems for personalized, data-driven visual storytelling.

4.2.7 Summary of Observations

Across these diverse domains, visual narratives serve three primary functions: (1) simplifying complex or abstract knowledge through visual metaphor and sequential structure; (2) enhancing engagement and empathy by situating content within relatable story contexts; and (3) facilitating communication between experts, learners, and the public. Recent advances in computational and generative approaches further extend these applications, opening new possibilities for adaptive, interactive, and real-time narrative visualization systems.

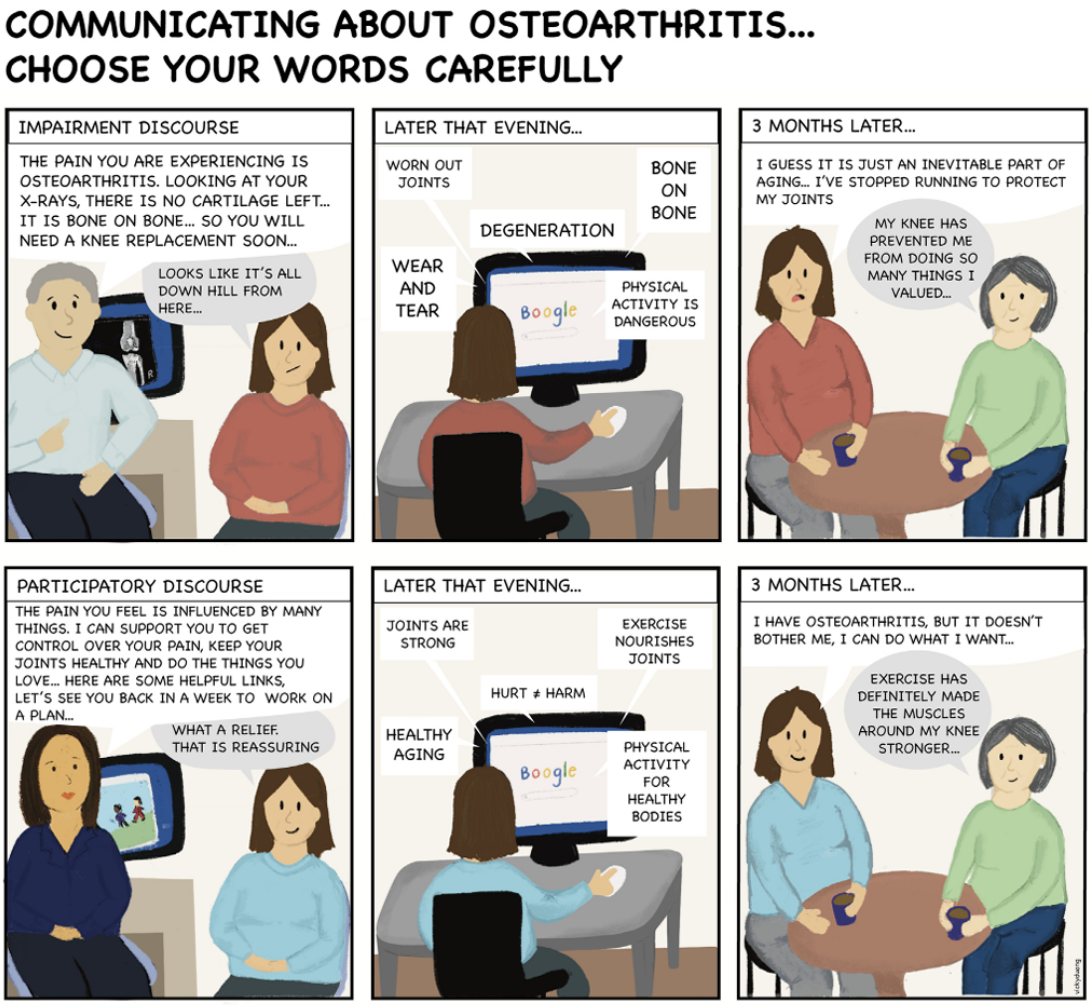

Fig. 1. A graphic medicine example of two different narratives for osteoarthritis.

Figure 4.1: Example of a graphic medicine narrative illustrating patient experience and clinical interaction, adapted from Duong et al. (2024).

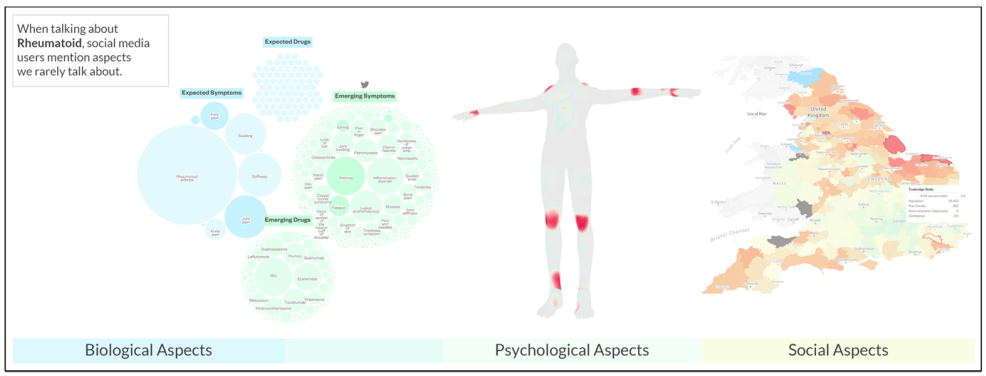

Fig. 1. Narrating the story behind a medical condition through biological, psychological, and socio-environmental lens (i.e., through the bio-psycho-social model).

Figure 4.2: Layered narrative visualization integrating biological, psychological, and social dimensions of medical data, adapted from So et al. (2020).

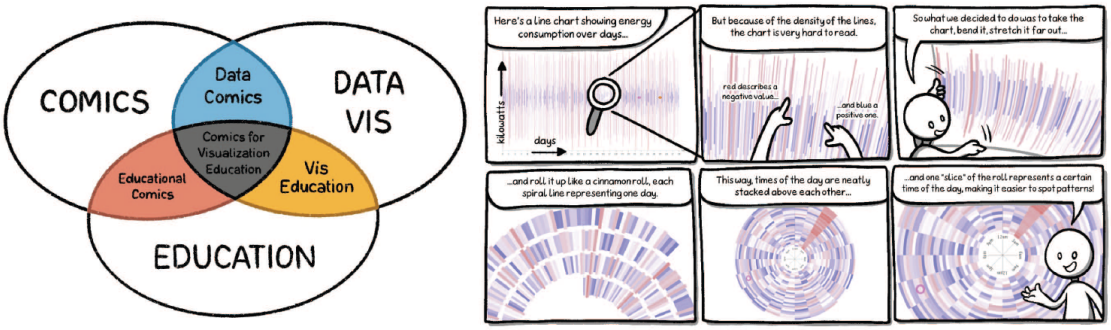

Fig. 1: *Left:* The related research areas and their overlaps form the research landscape we scoped in our initial literature research. *Right:* An example of a data comic explaining the visual mapping of a spiral chart based on a line graph.

Figure 4.3: Educational comic explaining visualization principles through a narrative sequence, adapted from Boucher et al. (2023).

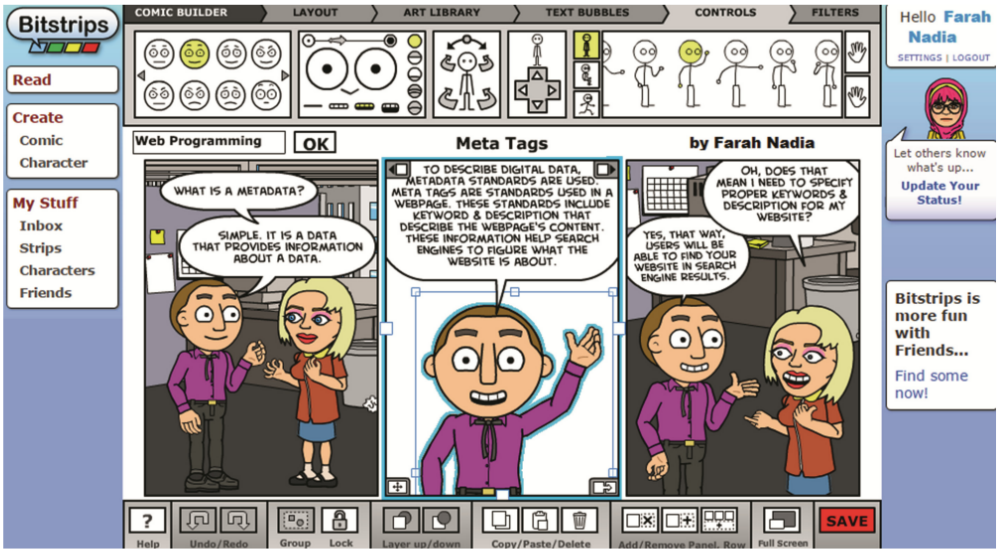

Fig. 1. Bitstrips Software

Figure 4.4: Interface of a comic authoring tool used in digital storytelling education, adapted from Azman et al. (2015).

Figure 1: Example panels from the Doctor Wants a Comic prototype.

Figure 4.5: Example of AI-generated educational illustrations produced by the *LEARN* framework (Zhang et al., 2025). The system translates narrative layouts into coherent image sequences, supporting story-driven instructional visualization in STEM education.

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