

# Animating patient stories for medical education: the power of personified storytelling

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**Abstract.** Medical animations are widely used in public health education. However, this paper posits that incorporating narrative-based patient stories can be more persuasive than didactic infographics, making them particularly effective in eliciting attitudinal, judgmental, and behavioural changes. Cultural representation in patient education is still not fully explored, especially in Southeast Asia, specifically Singapore, where communities of different ethnic backgrounds coexist. More research is needed on how culturally relevant patient stories can be delivered in an informative yet engaging and entertaining manner in a medical context. This project explores how we can devise strategies utilising narrative animation to increase engagement and memory retention in viewers. We discuss creating two short, animated films that aim to entertain whilst communicating the concepts of genetic conditions and hereditary cancer. By documenting the films' creation and highlighting the iterative processes, we show how it was possible to achieve information accuracy with engaging visual storytelling incorporating visual cues for a culturally diverse audience. The paper illustrates the study design and creative decision-making to ascertain how animation and visual storytelling can raise the public's genetic literacy by educating them about hereditary genetic conditions.

**Keywords:** Medical Animation, Patient Stories, Visual storytelling, Medical Education

## 1 Introduction

The COVID-19 outbreak demonstrated the critical role of health communication in mitigating the devastating impact of a pandemic and how effective health communication is vital in disseminating accurate information and dispelling misinformation. Properly designed media and creative storytelling can reduce uncertainty, address fears, and promote adherence to behavioural changes such as social distancing [1]. The ability of animation to transcend cultural and verbal boundaries is compelling once we look at how animated graphical informatics have become ubiquitous in science and medicine disciplines. Learning and teaching research confirms that the information an animated character presents promotes viewer retention. [2] The process of graphical simplification, spoken narrative and onscreen symbols and text contributes to a reinforced learning process, cited as a 'spatial contiguity effect', a 'multimedia effect', and

a ‘personalisation effect’ [3]. Starting with how animations are used in medical education, we highlight the research supporting the role of patient stories in health education. Patient stories are personal accounts of individuals detailing their experiences with illness, medical treatments, or healthcare encounters [4], providing unique perspectives and insights into the emotional, physical, and social impacts. They also enhance communication, promote cultural competency, and foster patient-centred approaches to care, which are efficacious in public health education. The narrative nature fosters a heightened persuasive power compared to didactic information, making them more likely to elicit attitudinal, judgmental, and behavioural changes [5]. We show how animated patient stories can be designed, conceived, and tested under this framework, arguing that animated patient stories can enhance medical communication to optimise patient and associated carer education and subsequent decision-making by targeting cognitive and affective aspects in the viewer. As the team operated in a particular geographical setting, the research also proposes tailoring the animation content to address the targeted community's specific needs and cultural background.

Therefore, the goals arising from these animated films are several-fold:

To create an accessible and educational resource to empower carriers in their choices regarding genetic disease management, especially in a local Asian context.

To understand the process and limitations of creating an animation featuring an Asian individual, where studies in this field have primarily involved Caucasian participants.

To establish animation authorship in creating patient stories for medical communication.

## 2 Context

### 2.1 Affordances in Animation

Animation has the potential to contextualise and disseminate ideas and abstract knowledge, delivering complicated topics in ways that are easier to understand; both these aspects have been well documented by scholarly research. Roe (2013) writes, "factual information is communicated more efficiently via animation than the spoken word" and "animated segments are still used in a non-fictional context to clarify, explain, illustrate and emphasise" [6]. Animation is a way of visualising the invisible. It is regarded as an effective communication tool because it can provide complicated information in a short amount of time.

In *Understanding Animation (2008)*, Paul Wells defines the many affordances of animation to communicate effectively [7]. Narrative strategies include condensation and ellipsis (compressed or edited continuity); synecdoche (a small image or idea that represents the whole or more complex picture); symbolism or metaphor (recognisable signs); sound and choreography (movement, pattern, and rhythm); and penetration (ability to ‘see inside’ and depict inner workings). As it is not reliant on linguistic comprehension or ability, animation can have narratives that are neither linear nor rational. It effectively communicates information to audiences through associative recognition of appealing characters that represent “every person”. Jayne Pilling echoes Wells’s list of affordances: “Unrestricted by the dictates of photographic realism and traditional narrative, animation can make ... experience palpable via visual imagination, metaphor, metamorphosis and highly creative use of sound.” [8] Animation helps show

elements of psychological vulnerability; as Wells comments, “animation has become a vehicle by which inarticulate emotions and experiences may be expressed” [7]. It can also portray issues that cannot be shown as real-life images, whether elements of stories or testimonies are too painful or impossible to photograph or real-life events that haven't been caught on film and are incapable of adequately being recreated in live action. The penetration quality is an important aspect of animated biographies, autobiographies, and documentaries, particularly those focusing on mental states of mind [9].

## **2.2 Animation in Medical Context**

Until recently, animation used in medical education was primarily limited to visualising complex diagnostic concepts and scientific data in infographics. Yet, based on evidence around the importance of human experience and emotive connection, animated visual storytelling could be understood as a crucial component in health education. Patient narratives could help in "building trust between healthcare practitioners and the people they serve", and the use of storytelling in communicating serves "human experiences and emotions across disciplines, ages, and cultures" [10].

There is an emphasis that health communication “must capture the public's attention” to convey reliable messages to be accessible "across languages, ages, cultural affiliations, and education levels” [11]. Yet, the message should not be packaged didactically nor rely mainly on the technical presentation of information, which runs the risk of missing the target audiences, where "framing health messages as informational arguments have proven to be less effective for changing behaviours" [12].

There is value in highlighting the emotional aspect of patient stories, particularly for viewers to understand the ‘genetic discrimination’ that carriers are subjected to. Discriminatory action is defined as unfair treatment by employers, insurers, and other institutions towards those at risk of hereditary conditions. In Asians, this is coupled with the stigma of having ‘bad genes’ [13], where cancer or hereditary conditions have been regarded as taboo and something that should be left unspoken and would negatively affect marriage prospects [14]. Such beliefs within Asian communities have been significant barriers in the creation of filmed patient stories, as carriers were concerned about being singled out and identified as tainted.

Prior research has identified that effective health communication involves the integration of "pictures, narratives, and entertainment education, where the health message... is embedded” and that "the effectiveness and long-term impact of health messages... depend on how well the end users can identify with the content that is presented"[12]. Thus, we aimed to prove that compelling storytelling for healthcare is best mediated via a culturally sensitive animated narrative. We show how artistic presentations can impact healthcare decisions that arise from new knowledge of a genetic diagnosis whilst addressing concerns of discrimination and marginalisation in an Asian context.

## **2.3 Animation and Genomics**

Specifically, information within the field of genomics is often complex, posing informational challenges for the afflicted. Individuals diagnosed with cancer predisposition syndromes are frequently faced with the task of communicating their genetic test results and diagnosis to at-risk relatives. Those relatives are then

recommended to consider genetic testing to clarify their at-risk status. The disclosure process can be challenging due to factors like age, gender, life stage, and cultural differences, compounded by poor genetic literacy [15].

In a meeting held at the National Human Genome Research Institute in 2011, patient narratives and storytelling were emphasised, illustrating the relevancy of genomic concepts in real people and highlighting the need to raise genetic and genomic literacy.<sup>1</sup> This triggered several projects studying how to engage the public on genomics and genetic health issues. Namely, *My Genome Sequence* (Lewis et al., 2020) and *Whole Genome Sequencing and You* (Sanderson et al., 2016) were projects that used animation to explain the necessity for genomic sequencing. Both films used characters as graphical elements and achieved their goal of communicating with and educating the public. Still, they did not feature specific patient narratives or platforms for viewers' emotional engagement, making the information less personal and potentially less relatable.

Numerous examples of narrative storytelling in animation cover genetic-related stories, favouring entertainment versus the accuracy or factuality of the information. In Stephen Spielberg's *Jurassic Park* (1993), the short-animated *Mr. DNA* sequence conveys a complex fictional yet plausible narrative quickly and efficiently. Interspersing the lively and cutesy caricatured narrator and cartoon-style diagrammatic infographics with what appear to be real scientists in a lab, the scene communicates plausibly to an audience exposed to this form of graphical documentary media. In the mini-movie, the not-so-easy-to-grasp concepts seem uncomplicated through the affordances of 'condensation', clever editing and visual storytelling, and character animation.<sup>2</sup> The hybrid movie *Osmosis Jones* (2001) follows the adventure of the titular character, a white blood cell depicted as a policeman who works to protect his host against a deadly infectious disease, Thrax. Using a heavily caricatured style and primarily focused as a family entertainment piece, it nevertheless contains medical science fundamentals via the affordances of 'penetration' – being able to see inside the workings of the body.

The French educational television series. *Il était une fois... la Vie* (*Once upon a time...the Life*) (1987), directed by Albert Barillé, is also dedicated to the structures and functioning of the human body. Primarily targeting a young audience, it illustrates, with the help of animated characters and anthropomorphic figures, its microscopic components, from white blood cells to vitamins through to components of DNA.<sup>3</sup>

The dichotomy between animated popular media and animation used in other disciplines presents a ground for structured research. Infographic or 'explainer' videos often use appealing characters as an engaging hook. However, they are neither embodied nor told from a patient's perspective. There is an opportunity to marry narrative content in the context of patient stories with medical information, where elements of sophisticated visual storytelling, character design, and unconventional animated narrative can be employed to not only convey information in a non-didactic manner but to engage viewers using strategies derived from a discipline other than medical science or cognitive science.

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<sup>1</sup> <https://pubmed.ncbi.nlm.nih.gov/23448722/>

<sup>2</sup> It is interesting to add that the idea has given rise to literature that debunks and explains the science behind the popular franchise, guiding the reader through theoretically recreating a dinosaur through real-life genetic engineering. DeSalle, R., & Lindley, D. (1997). *The science of Jurassic Park and the Lost World, or How to build a dinosaur*.

<sup>3</sup> <https://www.france.tv/france-4/il-etait-une-fois-la-vie/>

## 3 Approach

### 3.1 Project Design

The animation design is intended as a prototyping methodology that can be generalised across other medical topics; in this case, the three-year project is designed to create animated patient stories to communicate complex medical genetics concepts to patients and their at-risk relatives.<sup>4</sup> The evaluative focus is how an Asian adult audience with differing gender, age, race, and literacy levels can receive the animations, understand the information, and potentially be influenced in redirecting behaviour. The project design also considers the visual storytelling of animated patient stories to foster an authorship discourse in an interdisciplinary field of digital humanities and global health studies. The framework includes variables such as content, structure, design, and artistic approach [16]. Two visually distinct short films featuring a specific genetic disorder told through a fictional story based on a real patient experience were created iteratively, with input from the Cancer Genetics Service (CGS) and the National Cancer Centre of Singapore (NCCS).

### 3.2 Patient Stories & Cultural Representation

Cultural representation in the healthcare system refers to acknowledging, recognising, and including diverse cultural backgrounds, beliefs, values, contexts and practices [17]. It is crucial in healthcare for several reasons: promoting equity and access, devising interventions, treatment plans, and preventive measures to improve patient engagement, adherence to treatment, overall health outcomes and patient satisfaction [18].

Various approaches can achieve cultural sensitivity, including language adaptation, incorporating cultural beliefs and practices, and utilising appropriate communication styles such as storytelling, metaphors, or visual presentations.

First-person storytelling or patient stories are particularly compelling for addressing racial/ethnic minority groups [19]. However, animated patient stories specific to certain ethnic groups are scarcely available.

## 4 The Films

After preliminary discussions, three conditions were chosen: Familial Adenomatous Polyposis (FAP)<sup>5</sup>, featuring a young Malay girl; Lynch Syndrome<sup>6</sup>, involving an Indian individual discovering a possible inherited genetic condition; and Neurofibromatosis Type1 (NF1)<sup>7</sup>, a story of a young Chinese man learning and understanding how to cope with its symptoms and deal with the self-confidence issues caused by the specific nature

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<sup>4</sup> Selected participants were asked to share their experiences receiving their genetic test results, the journey of navigating their healthcare decisions, and their considerations related to communication with their at-risk family members. Each animation features one carrier story with varying formats.

<sup>5</sup> <https://my.clevelandclinic.org/health/diseases/16993-familial-adenomatous-polyposis-fap>

<sup>6</sup> <https://www.nccs.com.sg/patient-care/specialties-services/lynch-syndrome>

<sup>7</sup> <https://www.singhealth.com.sg/patient-care/conditions-treatments/neurofibromatosis-type-1>

of his illness. All three conditions have common traits but different symptoms and presentations. They vary from individual to individual, affect carriers at different stages of life, and require carriers to undergo genetic testing for proper diagnosis and targeted intervention.

After discussion and re-evaluation of the scope and aim of the project, it was decided to focus on just two conditions, FAP and NF1. Creating two distinctively different storytelling modes aligned with one of the established research questions, which asked whether one visual storytelling approach is more effective than another in overcoming language and cultural barriers to communicating medical information.

#### 4.1 “Fatirah”

The first film explores Familial Adenomatous Polyposis (FAP), a genetic condition associated with hereditary colorectal cancer. The current treatment requires patients to undergo surgery at a relatively young age to avoid the development of colon cancer. The narrative design required that information delivery be tactful, and appropriate terms must be used to encourage patients to undergo early genetic testing.

A little Malay girl character, Fatirah, and her family visit the doctor when she is eight years old, where she first learns of her condition and of the procedure that would require her colon to be removed (usually post-puberty around 18 years old), thereby lowering her chances of having colorectal cancer. The story ends with the girl, now a grown-up, accepting and resolving her condition with the help of doctors and a support group. The instructive approach for this linear narrative is appropriate; however, it needs to explore the stress a young individual could experience to exploit dramatic engagement fully.

The family's attire and linguistic expressions signify their Malay ethnicity. Fatirah and her mother are depicted wearing headscarves, or "coverchiefs," honouring their Muslim identity [20]. This attire holds profound cultural significance in Singapore [21], where approximately 15.6% of the population identifies as Islamic Malay.<sup>8</sup> Incorporating this detail acknowledges the tapestry of cultural diversity inherent in Singapore but also ensures a portrayal that is both respectful and authentic.

At the hospital, the medical practitioner elucidates the diagnosis and the requisite steps for a favourable prognosis. However, Fatirah becomes increasingly terrified as she hears the information and the need to undergo surgery. Leveraging the premise that young individuals may engage in imaginative elaboration, the animation transits into a nightmarish portrayal wherein grotesque manifestations of the colon and stomach chase the young girl. In her state of fear, she encounters two personified entities: Doc (doctor marked by a cross on his chest for easy recognition) and Gen (genetics marked by the symbol of a strand of DNA). The two entities initiate an exorcism-style intervention to dispel the menacing ‘monsters’.

This reverently nods to the ‘Pink Elephants on Parade’ sequence in Disney's *Dumbo* (1941), using specific fluorescent-style chromatic selections and exaggerated animated

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<sup>8</sup> Singapore Department of Statistics. (2021, June 17). Singapore Department of Statistics | Census of population <https://www.singstat.gov.sg/-/media/files/publications/cop2020/sr1/findings.pdf>

movements. Evoking a nightmarish, surreal quality, the doctor is depicted here holding a chainsaw to vanquish the malignant tumours. (Fig.1a and Fig1b)

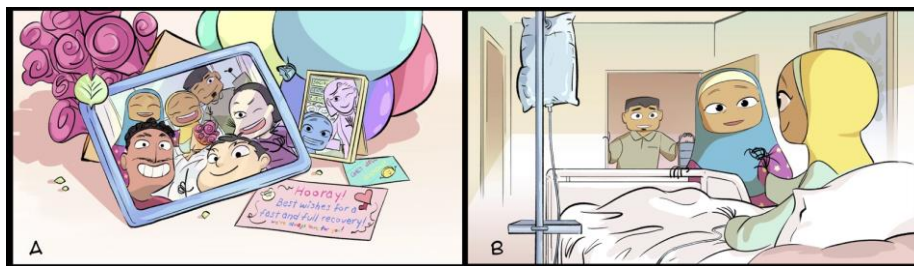


**Fig. 1.** A. Imaginary 'Stomach' and 'Colon' monsters. B. Imaginary Doctor with a chainsaw.

It is a deliberate stylistic choice to signal a break from the information-heavy reality of the doctor's surgery scenario and a moment to understand what might happen inside a patient's mind when given a scary or life-threatening diagnosis. The primary objective of the first segment is to engage the audience via a locally resonant tone while conveying detailed medical information about the disease. In the film's second phase, Fatirah steps to the forefront to deliver a self-introduction recounting her challenges and understanding of the diagnosis. By adopting a first-person narrative, reflecting a realistic portrayal of a child grappling with complex terminology, Fatirah delves into the genetic underpinnings of the disease, conveying intricate details through a combination of illustrations and simple schematic visuals rendered in a childlike style.

It is another deliberate stylistic device that uses symbolism plus quasi-direct documentation (she might have created this imagery) to enhance both audience comprehension and empathetic appeal.

In the third act, we witness Fatirah's evolution from a young child to a teenager through snapshot vignettes showing regular body screenings and preventative surgery. As the project design principle states, the video must conclude positively, so the final scenes in the hospital highlight her "I'll be Okay" attitude. Local culture references remain- the snapshot of her multi-ethnic friends and her parents coming through the door with food in a tingkat box keeps this specifically Singaporean. (Fig2a and Fig2b).



**Fig. 2.** A. Well-wishes from multi-ethnic friends in the hospital. B. Father brings 'tingkat' to hospital.

#### 4.1 “Alan”

The second film explores Neurofibromatosis type1 (NF1), also known as von Recklinghausen disease. The visible manifestation of the disease on the body presents physical challenges and psychological implications. Compared to unaffected children and adolescents of the general population, paediatric patients with NF1 have an increased risk of having social difficulties, mental health disorders, and behavioural and emotional problems [22]. Accordingly, developing and accessing psychosocial interventions for patients with NF1 is necessary. A uniform approach to diagnosing and managing NF1 and its complications is a significant concern for NF1 clinicians [23]. The narrative design is based on the premise that patients can embrace a positive alternative outlook to confront challenging situations.

Adopting a non-dialogue-driven linear narrative style, we recount the story of 18-year-old Chinese patient Alan and his struggle with self-image during compulsory National Service. (Fig.3).

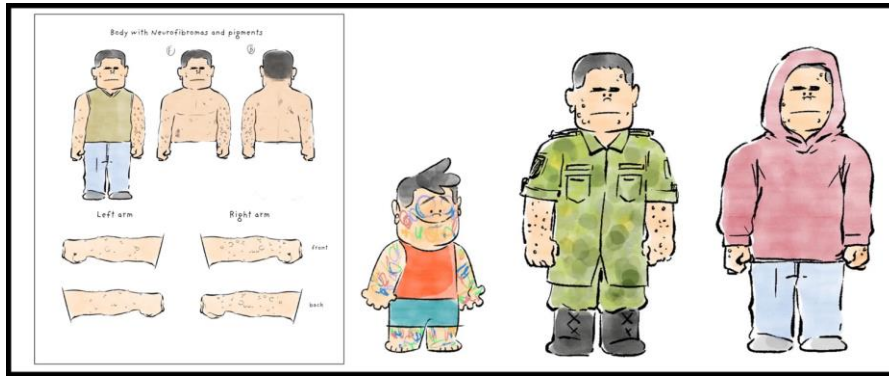


Fig. 3. Character designs by Yap Wei Ying.

The condition causes Alan to feel inadequate, shy, and uncomfortable with his self-image due to lumps and benign tumours on different parts of his body. One of the referenced patient stories spoke of a way to cope by covering some of his scars with tattoos. Tattoos can have negative connotations in Southeast Asia associated with crime syndicates and are not favourably received by some of the more traditional Chinese communities. In the film, a young Alan draws and paints himself like his favourite superhero. We follow him interacting with his Ah-ma (grandmother) at home, going from a carefree, spirited kid to a concerned, self-conscious young adult. The story resolves when Ah-ma benignly encourages Alan to pursue his desire to get cool tattoos that give him some confidence around his peers.

Aiming to be visually sophisticated with a more local intimate nature and to differentiate from the previous film (per research design), the team referenced Isao Takahata’s animated feature *My Neighbors the Yamadas* (1999). That film uniquely portrays a typical Japanese family using a delicate colour palette and watercolour background graphic style. It seemed appropriate to use a delicate undertone to depict an individual’s journey of dealing with a condition that can psychologically impair his social life. (Fig.4a.4b).

Again, the team used symbols and metaphors to enhance viewer attention, creating cartoon characters with hands for the infographic-style segment explaining the cause and symptoms. [24] With art direction loosely referencing Disney’s *Toot, Whistle, Plunk and Boom*, the 1953 Oscar-winning short film directed by Ward Kimball, we introduced the flat-colour ‘UPA’ design typical of many ‘edutainment’ films of the 1950s and 60s.<sup>9</sup>

The referenced film also contains embedded didactic information, yet utilising artistic license aligns with creating engaging content to facilitate retention. This more graphical interlude, bookended by the personal character’s story, draws attention to the technical information through contrast and surprise. (Fig.4c.)



**Fig. 4.** A. Grandmother showing signs of the condition. B. Confident Alan with a tattoo; delicate tonal palette. C. Infographic sequence design by Yap Wei Ying.

## 5 Conclusion

The project is currently in the final stage of evaluation. It is hypothesised that through exposure to the videos, participating individuals, the medical community, future patients, and the public may gain a heightened understanding of the importance of genetic testing and general knowledge of genomics and genetic health issues and the impact on their healthcare choices. The outcomes of this study will have broader implications for providing insights into the efficacy of narrative-based animation videos as educational tools for conveying complex medical information via an ongoing exploration of innovative and engaging methods in visual storytelling.

Indeed, illustrated patient stories, including formats such as comics and video games, have shown their effectiveness in evoking empathy and fostering greater understanding for individuals coping with various diseases. However, the approach proposed in this study demonstrates how animated patient stories go a step further in impacting communication, particularly in healthcare, where visual storytelling serves as a powerful medium for conveying non-tangible experiences and building empathy.

Cultural sensitivity, accessibility, tonal relevance, and representation, particularly in an Asian context, are essential to addressing concerns related to marginalisation and discrimination.

<sup>9</sup> <https://www.youtube.com/watch?v=8iVf0pPHvjc>

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