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REVIEW

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The use of comics to promote health awareness: A template using nonalcoholic fatty liver disease

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Abstract

Nonalcoholic fatty liver disease (NAFLD) constitutes a major threat to public health systems worldwide on account of its widespread prevalence and increasing incidence. More effective tools to raise awareness and increase health communication are therefore needed. Comics may constitute an effective language for this purpose, given the permanence, adaptability and ability of this form of communication to convey complex information, using both visual components and the creation of narrative involvement, thus promoting both awareness and health-conscious behaviours. Importantly, this process requires careful preparation in terms of selecting both the key biomedical concepts to be conveyed, as well as a graphical style and appropriate characters and a narrative arc with which a target audience can identify with. Here we provide a brief introduction to the use of comics in health communication and propose a possible roadmap for the development of comic-based tools for diverse conditions, using the context of NAFLD.

KEYWORDS

biomedical knowledge, comics, health communication, NAFLD

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1 | INTRODUCTION

Health promotion initiatives geared towards the general public, or targeted to specific at-risk segments of the population, are an important aspect related to biomedical research, notably in its more translational aspects of eliciting health-conscious behavioural changes. These are important endeavours that must, however, be rationally built and carefully monitored for efficacy and impact, unlike what is the case for most outreach activities normally carried out in this field. This involves the need for appropriate strategies and methodologies, including, for example, appropriate focus groups representing the intended audience, participatory research, structured interviews (evaluated from both qualitative and quantitative standpoints), or structured questionnaires, both to determine the best way to convey a message, and if that message is indeed conveyed and/or elicits change.

While these strategies and methodologies may seem foreign to most biomedical researchers, they have been proven robust in different contexts, from sociology to psychology,[1,2] and any difficulty merely stresses the importance of interdisciplinary collaborations. In this paper, we describe the reasoning and strategies involved in building a comic-book narrative tailored to both raise awareness for nonalcoholic fatty liver disease (NAFLD), and elicit health-promoting lifestyle changes in at-risk individuals. We believe that comics, in conjunction with other tools, have the potential of providing an excellent platform towards advancing health promotion and effecting behavioural change in different situations.

2 | NAFLD AS A PUBLIC HEALTH THREAT

NAFLD constitutes a major threat to public health systems worldwide on account of its widespread prevalence, its increasing incidence, the pervasive nature of its etiological drivers and the serious hepatic and extra-hepatic consequences it can unfold in both children and adults.[3-5] The clinical construct of NAFLD (Figure 1), encompassing the diagnostic entities of nonalcoholic fatty liver (NAFL) and nonalcoholic steatohepatitis (NASH) with and without fibrosis, is estimated to affect 25% of the global adult population and has an incidence of 3.62 million cases per year.[3,6] As the more severe form of the disease and with a prevalence of 1%-3%, NASH constitutes a risk factor for the development of end-stage liver disease (ESLD), namely, decompensated cirrhosis and hepatocellular carcinoma (HCC), and is expected to become the most common indication for liver transplantation.[4,7,8] In fact, although cardiovascular diseases (CVDs) are currently the primary cause of death for NAFLD patients, an increase in liver-related mortality is expected in upcoming years.[3,5,7,8,9]

Sharing the same underlying aetiology with other behaviourally driven metabolic conditions including obesity and type 2 diabetes mellitus (T2DM), NAFLD is caused by an energy imbalance via hypercaloric diets and sedentary lifestyles, leading to the ectopic accumulation of fat in the liver. The most effective and comprehensive therapy for the management of NAFLD is the implementation of a lifestyle intervention through calorie-restricted diets (Figure 2) and regular physical activity.[10] Although those with comorbidities can profit from the NAFLD-related benefits of therapeutic options available for their respective pathologies, for instance bariatric surgery in obese patients or medical drugs for the treatment of diabetes and hyperlipidaemia, there are no pharmacological agents approved for the treatment of NAFLD,[11] and although clinical trials testing the effectivity of a myriad of drugs are underway, any therapy will likely still require an adjuvant lifestyle intervention.[11,12] Nonetheless, despite its proven efficacy and similar to the case of other cardiometabolic conditions, the success of lifestyle interventions for the treatment of NAFLD is low. Weight loss is difficult to achieve and specially to maintain long-term.[13] In fact, after one year, only 10% of patients seem to successfully achieve the 7%-10% weight loss required for histological improvement of NAFLD including steatosis, inflammation and fibrosis.[14] Similarly, more broadly at a population level, health promotion campaigns in the past few decades have also attempted to tackle the metabolic epidemic, but transitioning

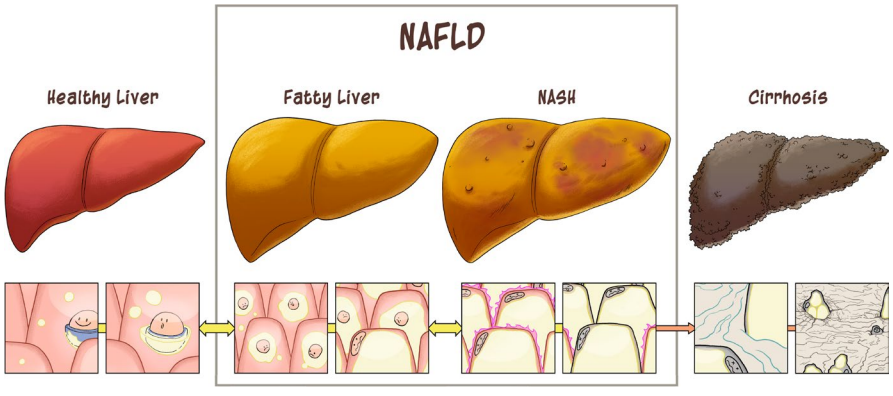

FIGURE 1 Schematic representation of the stages of liver disease discussed in the text, including both gross liver morphology (above), as well as cellular damage (below), including fat deposition, inflammation and fibrosis. Adapted from the comic 'A Healthy Liver Will Always Deliver!' illustrated by Rui Tavares

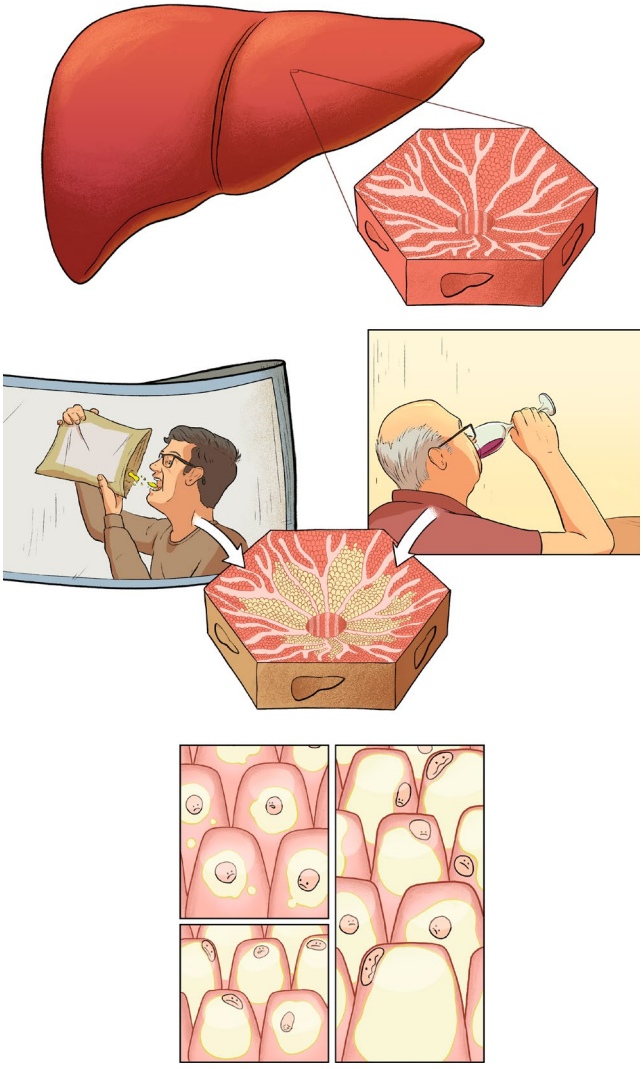

FIGURE 2 Link between fat depositions in the liver and human behaviour, in both NAFLD (symbolically represented on the left) and alcohol consumption-triggered alcoholic fatty liver disease—AFLD (right). The idea behind this type of representations is to connect well-known and relatable human behaviour with consequences at the cellular/physiological level, that most patients are unaware of. Excerpt from the comic 'A Healthy Liver Will Always Deliver!' illustrated by Rui Tavares

from an obesogenic lifestyle into calorie-restricted diets and regular physical activity is not an easy task.[15-17]

3 | THE DEFICIT IN NAFLD AWARENESS

While the preventive and therapeutic approaches of most cardiometabolic conditions are similar, the management of NAFLD faces the additional challenge posed by the generalized lack of disease awareness. Indeed, the scarce literature documenting NAFLD awareness reports that less than 2%-17% of the general population or cardiometabolic patients are familiar with this form of liver disease.[18,19] Awareness of any condition alone is unlikely to result in overt lifestyle modifications, and it could be argued that NAFLD awareness efforts would be equally liable to the constraints responsible for the low effectivity of initiatives targeting better-known metabolic disorders.[15-17] Undeniably, public awareness of the consequences of overconsumption lifestyle choices needs to accompany policy changes and infrastructure investments for the promotion of healthy habits able to redirect the fate of this epidemic.[20] Yet, according to models of behaviour change, disease unawareness prevents the adoption of precautionary action against the development of the disease, and as such represents a major barrier for NAFLD health promotion, disease prevention and therapeutic adherence. In fact, becoming cognizant of the disease and its health consequences is envisioned as the first step within the trajectorial sequence of an individual's readiness for change.[21] Thus, the provision of NAFLD knowledge to increase public awareness about the disease should set the process of individual behaviour change in motion and promote the adoption of healthier lifestyles.

Following this rationale, the specific case of NAFLD requires a customized strategy, with communication tools that take this into account when attempting to address this health threat and its dragging clinical, economic and societal burdens.[20,22] The design of NAFLD awareness campaigns or communication tools should be specifically tailored to induce the formation of health-conductive beliefs and attitudes through the provision of NAFLD-related knowledge.

4 | ONGOING EFFORTS IN NAFLD AWARENESS

The last decade has witnessed the development of formal and informal initiatives seeking to rise NAFLD awareness, ranging from videos on YouTube developed by freelancers to explanatory guides by nonprofit organizations and an increased NAFLD media coverage. Several institutions, such as the Fatty Liver Foundation (FLF), The British Liver Trust (BLT), the Global Liver Institute (GLI) and the American Liver Foundation (ALF), have an education section on their websites offering information in brochures, videos and infographics as well as patient stories and hold periodical outreach campaigns and programmes to raise NAFLD awareness. Similarly, nonprofit organizations such as NASH kNOWledge and the NASH Education Program™ also provide a broad range of education and communication resources including videos, a documentary and brochures for the general public, at-risk individuals and NAFLD patients.

Moreover, since 2018, many of these institutions join forces on June 12th for the annual International NASH day, with online materials, text messaging initiatives, social media awareness campaigns and outreach activities throughout

the world. With the support of the EASL, the American Association for the Study of the Liver (AASD), the European Liver Patient's Association (ELPA) and Liver Patients International (LPI) among many other institutions, the 2020 edition included virtual education panels, radio tours, press releases and social media coverage by over 80 partners in 26 countries. These local, national and internationally organized events and advocate institutions do not only target the general public, at-risk individuals and liver disease patients, but also to the medical community, public health authorities and the media.[23,24]

Contributing to the advocacy of these initiatives, the FOIE GRAS Project, as a European Training Network focused on the bioenergetic remodelling in the pathophysiology and treatment of nonalcoholic fatty liver disease, has been deeply committed to raise NAFLD awareness and promote healthy lifestyles. Using NAFLD biomedical knowledge as the basis to raise awareness about the disease, the consortium developed a science communication multimodal campaign for the 2018 edition of the European University Games (EUG), the largest university multisport event in Europe. Combining an on-site outreach booth with a multimodal media campaign including illustrated chronicles, radio clips, flyers, videos and a comic strip, the initiative reached over 100.000 members of the local and the international community.[25] Furthermore, the network developed a comic book designed to convey the more relevant issues of NAFLD to a general population. This was a layered approach that first determined the appropriateness of the comic medium for this purpose and that strove to methodically identify both the themes that would be addressed, as well as the way in which they were addressed. These aspects are briefly described in the following sections, and while specifically tailored to NAFLD, we hope they may serve as a template for similar efforts addressing different clinical conditions.

5 | COMICS AS A TOOL IN SUCCESSFUL HEALTH-BASED COMMUNICATION

5.1 | An introduction to biomedical comics

In a quest to optimize the impact of advocated health messages on the knowledge, beliefs, attitudes, intentions and practices carving people's health status and well-being, health communication research has developed a series of strategies and approaches that maximize the potential effectivity of such efforts. Visual design and narrative storytelling have been consistently appointed as successful tools in the construction of persuasive health communication. As a medium combining visual and narrative attributes, comics embody a particularly suited format to effectively convey biomedical knowledge and exert a health-promoting influence on covert and overt behaviours of individuals and populations.[26]

The visual dimension of comics makes scientific concepts more concrete through their capacity to represent and portray structures and phenomena that lay beyond our sensory experiences. Besides the use of colour to highlight/stress different aspects (see Figure 1), the visual properties of comics are able to modify scalar proportions and relational perspectives, providing a perceptual experience for abstract concepts or entities, for instance biological processes.[26,27] Moreover, resources such as visual metaphors and anthropomorphism are easily used in comics to make the unfamiliar familiar (see Figures 1 and 2, bottom panels, showing 'happy' and 'unhappy' cells related to fat deposits). The attribution of human-like properties to inert or abstract entities creates a framework to approach new concepts, allowing for the transference of human behaviour knowledge to these concepts and facilitating comprehension.[28] Additionally, unlike other entertainment formats able to promote knowledge acquisition and influence beliefs, attitudes and behaviours, the medium of comics is distinguished by its permanence. Other media, such as TV, film or animations, have a determined speed at which the viewer is expected to acquire the information provided. Conversely, comics have a self-determined reading pace and its fixed visual component allows the reader to dwell in the details of the imagery and explore the different meanings conveyed by the semiotic interplay offered by the layout of the page.[29] In fact, although some evidence contradicts these findings, this permanence of comics seem to be an advantage over animations in terms of information processing and, furthermore, their nature lends them to adaptation to different formats, including printed leaflets, websites or social networks.[30,31]

While the visual attributes of comics are important, the persuasive and communicative potential of the medium is largely attributed to its narrative format, conveyed both by its visual and verbal dimensions.[29,31] Rather than the close association between words and images, the distinctive feature of comics is the format of sequential art or the capacity to create a story or narrative through the particular semiotic interplay between imagery and text.[32] When used as a tool for health or science communication, and alongside well-designed characters and biomedical visual representations, the narrative contextualizes the scientific or health-related knowledge and engages the reader at a personal level.[26,33] As graphic narratives, comics have the power of turning the factual, emotional and social contexts of disease and illness more visible. Narrative is a mode of discourse that can intertwine factual or plausible statements with fictional representations of the world and has the potential to portray beliefs, goals and experiences of fictional or nonfictional characters that closely resemble real-life experiences of the interactor.[34,35] In fact, narrative experience is a participatory process in which the

interactor is not just a passive agent but engages with the narrative characters in similar fashion to conversational interactions. As the story unfolds, the audience witnesses the characters' experiences, becomes familiar with their traits and establishes an affective connection with them. Through these phenomena of *transportation* and *identification*, the visual and verbal narrative dimensions of comics can support the creation of situational models and reduce cognitive resistance, promoting the extension or modification of mental models and facilitating the adoption of healthier lifestyles through covert and overt changes in health-related beliefs, attitudes and practices.[26,36,37]

5.2 | Examples of health-promoting comics

Indeed, public health professionals have actively adopted the comics medium and have capitalized on this persuasive potential for health communication purposes throughout the domains of healthcare, disease prevention and health promotion.[38-42] Besides its capacity to influence behaviours, comics have been reported to be approachable and promote more engagement and motivation than regular text-based materials while garnering the same knowledge acquisition, which is particularly advantageous in engaging noninterested and new audiences while demonstrating that entertainment and education are not mutually exclusive.[43-46] Comics have been used to raise awareness about diseases and their symptoms among the general public, to assist patients and their families better understand their illness, to promote the self-management of chronic conditions, to improve therapeutic adherence in children,[47] to support informed decision-making in clinical procedures and therapeutic options,[48,49] to facilitate or ameliorate patients' healthcare experience,[50] to promote surgical procedures and organ donation[51,52] and to increase follow-up rates in primary care provider transitions.[45,53]

The appropriation of comics in the domains of disease prevention and health promotion began with efforts directed at communicable diseases, mostly targeting children and often as part of multimodal campaigns, alongside other media formats. Seeking to increase awareness about risk of infection and transmission of schistosomiasis, taeniasis, cysticercosis, soil-transmitted helminth infections, filariasis, tuberculosis, malaria and acquired immunodeficiency syndrome (AIDS), these programmes promoted preventive practices focusing on water sanitation, diarrhoea prevention and immunization.[54-60] Beginning in the late 1980s and through the 1990s, efforts dedicated to human immunodeficiency virus (HIV)/AIDS prevention programmes in developing countries, recognized the use of participatory research for the development of culturally relevant health promotion media in effectively appealing for behaviour change.[61,62]

From the 1980s and through the 2000s, the use of public health comics was extended to noncommunicable diseases (NCDs) and researchers began to evaluate the impact of comics on knowledge, beliefs, attitudes, intentions and behaviours. Comic interventions through these decades have demonstrated their capacity to raise awareness on routes of exposure or risk behaviours, reduce stigma and promote self-efficacy and preventive, detection, adherence and self-management practices in both infectious and NCDs. Although not always informed by formative research, these efforts targeted environmental and behavioural hazards,[63-68] sexual health education,[69,70] rheumatoid disease,[71] cancer,[72,73] mental health[74-76] or metabolic disorders.[77-79] In the 2010s, following the rise of the metabolic epidemic and undergoing a transition from hard copies to digital media, many comic interventions, some sponsored by relevant Medical and Scientific Associations, have successfully used the medium to promote healthier diets, increase physical activity and weight loss as preventive and therapeutic practices for obesity, diabetes and cardiovascular diseases, using scientifically rigorous, but understandable, messages.[80-83]

Most recently, the effectivity of public health comics in inducing knowledge acquisition and the promotion of belief, attitude and behaviour change has been further curated through the development of characters and storylines not only informed by formative research with target audiences, but also designed based on principles of behaviour change research.[26,29] Crafting character interactions and story events to portray disease severity and susceptibility beliefs through realistic and relatable experiences, these graphic narratives model the overcoming of behavioural barriers and the benefits of taking precautionary action, ultimately constituting a persuasive and informative health communication tool.[41,84,85,86,87]

6 | DEVELOPING COMICS FOR HEALTH COMMUNICATION

6.1 | Curating available information and setting the stage

The planning of an effective communication tool starts with the main issues of who the comic is designed for, and what previous knowledge should be assumed. In ours, we decided to target potential NAFLD patients with little or no knowledge of the disease or its underlying mechanisms. We sought to inform potential patients on the nature and progression of the disease (from a cellular to a societal level) and to offer concrete, simple, implementable and effective guidelines that might lead to better disease prevention or self-management (Figure 3). Then one has to be aware that there are two distinct dimensions that ultimately determine

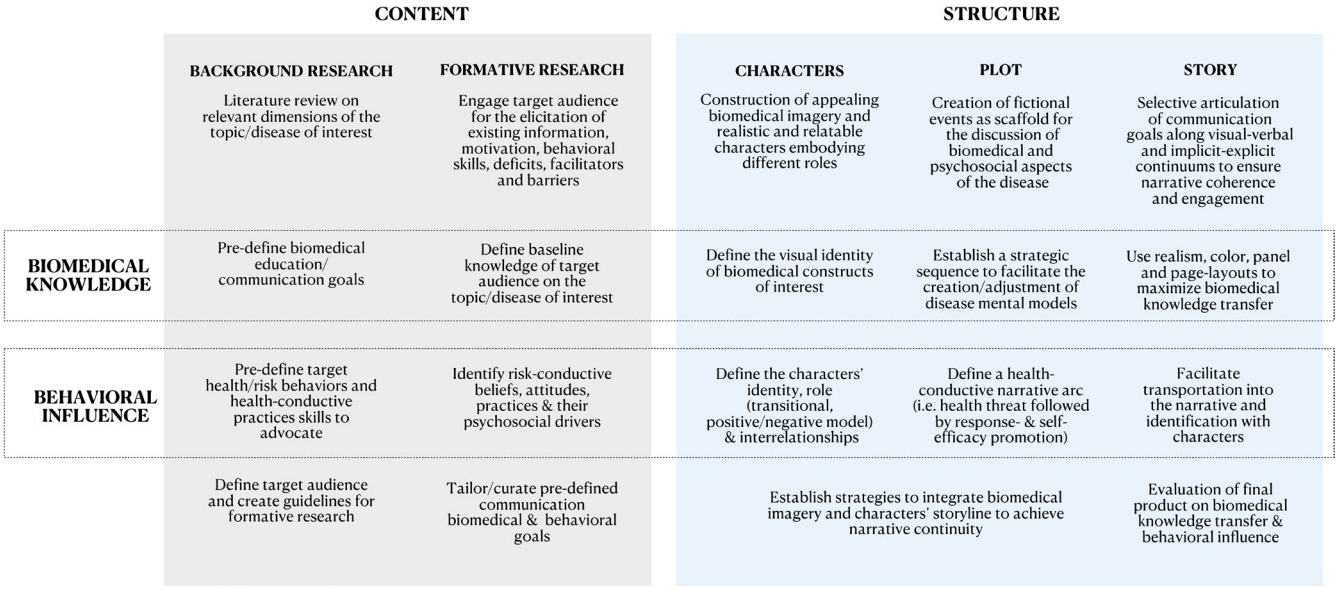

FIGURE 3 Flow chart of the steps involved in the development of a health communication comic. This table elaborates on the content selection and structure-building processes that we undertook for the creation of the narrative 'A Healthy Liver Will Always Deliver!' and that could serve as a possible roadmap for the development of comics-based tools for diverse conditions. See text for details

the structure of the comic: biomedical and narrative. In the first dimension, one must determine which concepts are to be discussed, and how to portray them, including both concepts that the readers should understand, and behaviours that are meant to be instilled. In the second, choices must be made in terms of how this information is conveyed, what characters are to be used and what they represent, as well as the narrative arc that hopefully will send an effective message across. The narrative should thus be relatable to potential patients and caregivers, focusing on their experience, knowledge and behaviours.

From a biomedical standpoint, it is therefore always necessary to extensively review the pathophysiology and treatment of any condition to identify adequate biomedical concepts to communicate, building a conceptual map of events from initial to later stages, in order to provide useful factual knowledge to inform and promote pro-active preventive decision-making via individual action. These concepts were related to key issues in NAFLD, such as basic metabolism, nutritional interconversion energy imbalance, liver function, lipid storage, inflammation and the lifestyle choices (sedentarism, poor eating habits) that exacerbate them,[6,10,11] linked to disease progression markers for which graphical representations had then to be defined (Figures 1 and 2). It is important to note that, as any other artform, comics have distinct styles and to appropriately convey biomedical information the choice of a clear legible style is preferrable.[88]

Ideally, and in order to build a relatable narrative, the biomedical concepts should then be validated/tested with actual patients/caregivers to whom the comic is destined, in order to acquire insights to curate the quantitative and qualitative nature of the factual knowledge to include in the construction of characters and storyline of the narrative approach, fleshing psychosocial contextual details crucial for persuasive intent, and relatedness to graphical representations. This includes not only whatever biomedical knowledge the individuals possess, but also lifestyle habits, how they were diagnosed and how they manage the disease, interactions with a particular socio-cultural environment so that these issues are taken into account as well, etc This can greatly inform the development of realistic, relatable characters, as well as a credible and engaging narrative. However, although this is an ideal approach, it may not always be possible for all conditions, given issues related to access, specific lack of patient population characterization in a given setting, or the fact that other outreach efforts may already be underway and it may be advantageous to join efforts. In this case, individuals with similar conditions could serve as a useful ersatz group.

6.2 | Creating characters and staging the story

With this information curated, characters and a narrative must be defined. Character development entails, not just the construction of identities, but also of interpersonal relationships able to elicit sympathy and empathy as well as to facilitate a scaffold for the discussion of biomedical, social and environmental aspects associated.[89,90] Furthermore, a realistic representation style can increase the persuasive potential of the comic, acting in combination with the realistic accounts of the plot, especially if they are inspired

in real-life stories.[91] In biomedical comics, characters are often patients, family members and caregivers, with different sorts of relationships, and representing different aspects, from purveyors of information, to roles in providing concrete experience as well as positive (or negative) reinforcements of behaviours that are to be conveyed to the reader. This is true even when the characters are not built with a persuasive intent in mind, for instance in comics produced by patients or caregivers in conditions ranging from cancer, infertility or neurodegenerative disorders. Often classified under the umbrella of 'narrative medicine', or 'graphic medicine' when comics are used, these narratives focus on personal stories, stressing (to both the general public, other patients, caregivers, clinicians, etc) how similar biomedical issues differently impact people with distinct backgrounds and life histories, thus constituting a humanities-based approach to precision/personalized medicine. Besides providing these different personal perspectives and allowing the reader to develop empathy, these narratives/comics also convey biomedical information, disease progression advice, possible roadblocks and difficulties, as well as resources that a reader may wish to explore.[92-99]

In terms of their specific roles *Transitional* characters, such as those recently diagnosed with a medical condition that must adapt to this novel reality, are particularly effective in promoting health-related behavioural changes, as throughout the course of the narrative, these characters discover new things, and display a shift in ideas, attitudes and behaviours in the advocated direction and their health is benefited as a result.[40] Another type of character is a *positive role model*, used as a source of information, for instance a character that, through a longer experience with the same (or similar) condition, has already obtained detailed self-management knowledge, being able, for example, to provide advice on basic sanitation procedures, adherence to medical advice, proper device management or drug administration, dietary or exercise practices. As a mirror image a *negative role model*, might also be useful, representing the life-threatening consequences of the natural course of the disease if no precautionary action is taken, prompting reflexivity on perceptions of severity of and vulnerability to whatever disease threat the transitional character is undergoing. In the development of our comic tailored to NAFLD patients, we decided to include two transitional characters, a main character with a recent NAFLD diagnosis, expected to represent individuals similarly recently diagnosed with the disease and in the process of adopting therapeutic recommendations, and a NAFLD *unaware* character, acting as a representation for individuals that transition towards NAFLD awareness and the potential adoption of advocated behaviours as a preventive strategy (Figure 4). Embodying an initially disease unaware character as a young child is often used in this type of comic as it allows for several additional features: the introduction of biomedical concepts in a didactic manner without condescendence, and the fact that these characters can both serve as an inspiration to their elders who are in a potential transitional role, and in terms of introducing health-related concepts and behaviours earlier in life, thus serving as a preventive measure.[100] On the other hand, positive and negative role models must be relatable enough so as to not be dismissed (by either transitional characters or readers). In particular, elders of the same family facilitate the formation of outcome expectations regarding disease severity for both *transitional* characters and the readers.[101,102]

Indeed, the potential interrelationships between characters can be crucial in the introduction of concepts regarding the association between their defining traits. Finally, construction of the plot should be such that it fosters the adoption of an intended behaviour, best accomplished by complementing disease threat information with appraisals of the efficacy and benefits of taking preventive action as well as the promotion of feelings of self-efficacy, when comparing with role models or other characters.[103] As such, much as the conflict-crisis-resolution arc common in other narrative artforms, the introduction of disease threat beliefs and attitudes as portrayed by the characters should ideally be followed by a narrative arc illustrating the characters' confidence and mutual encouragement to succeed in their attempts to change behaviour and their eventual success.[104,105] Given that there might be quite a bit of information involved in biomedical comics, to ensure narrative continuity an omniscient narrative style, voiced by a character, can be used in interdependent combination with other visual aspects, including biomedical imagery. This interplay allows for an overlap of biographic or personal illness narratives with biomedical constructs, integrating the biomedical conception of a pathology (ie disease) and the lived experience with such pathology (ie illness).[104,105] Finally, it is very important to note that any communication tool of this type should, as much as possible, be locally tailored, both in terms of text (expressions and speech habits) and image (local environment, clothing, etc) so that it presents itself as relatable to a particular audience.

Building on the work done in the field of public health comics, and using the principles outlined above, we sought to create a health communication tool in the form of a comic with the goal of rising NAFLD awareness. The comic book 'A Healthy Liver Will Always Deliver!' (Figures 1-3), was intended to convey health threat beliefs through biomedical imagery while modelling the beneficial health outcomes of adopting healthy nutrition and physical activity habits for NAFLD prevention and regression through the experiences of story characters. It is now available at the website www.fattylivercomics.com in 9 languages, including Portuguese, English[106], Czech, Italian, French, Spanish, Polish and German, the languages of all the MSCA-ITN FOIE_GRAS Network partners.

FIGURE 4 The self-management and prevention of NAFLD involve behaviour changes in lifestyle, that should be simple, easy to understand from both personal and scientific/clinical standpoints, and implementable. In this case, a *positive role model* T2DM patient (as both a benign authority figure and potential agent of change with personal experience in metabolic disorders) advises her *unaware* great-niece on nutritional issues, representing the importance of early-life commitment to a healthy lifestyle. Excerpt from the comic 'A Healthy Liver Will Always Deliver!' illustrated by Rui Tavares, see text for discussion on character roles

6.3 | Concluding remarks: tailoring a narrative and monitoring impact

It is important to note that translation of any comic-based narrative involves much more than language. In fact, if the target audience does not identify with the characters, their surroundings or situations it well be less relatable, and hinder the adoption of health promotion behaviours. This is important at many levels, including housing, clothing, character physiognomy, typical habits, expressions and type of language, specific food items and other aspects related to daily life. Thus, both text and drawing may need to be adapted according to socioeconomic and cultural background, ethnicity or age of intended audiences, so as to reach its full potential, especially in terms of reaching underserved and underprivileged segments of the population. This must always include an initial approach (focus groups, interviews), followed by validation with larger groups in appropriate

settings (communities, clinical facilities, schools, etc). The goal with the first part (as shown in Figure 3) is to determine what the audience already knows, what it may be more amenable to accept as a biomedical behaviour change message, and how it could be motivated to act upon it, as well as to identify types and themes that can serve as models for characters and situations. Finally, impact monitoring is crucial to determine the effect of any such strategy and is rarely carried out in normal biomedical outreach activities, with a few exceptions.[33,107] Impact monitoring is typically accomplished with structured and carefully designed questionnaires, filled out before and after reading a comic or encountering another health promotion tool. This allows researchers and clinicians to determine what messages were correctly transmitted, and, more importantly, where the comic was most and least effective. More long-term follow-up studies to determine the persistence of the message, as well as behavioural changes that it may impact should also be considered, for example in a context of regular clinical consultations.

In what concerns our NAFLD comic, although more data will have to be collected, a preliminary approach, reduced, in the current pandemic realm, to online questionnaires prior to and immediately following reading the comic, suggest that this approach was effective in increasing NAFLD threat perceptions and response efficacy and self-efficacy beliefs, normative and control beliefs and positive attitudes regarding healthy dietary and lifestyle practices, although this was done, due to pandemic constrictions, mostly using an educated audience with a high level of awareness, and access to information. This health communication tool hopes therefore to bring a comprehensive contribution to NAFLD awareness for the general public, at-risk individuals and NAFLD patients, suggesting that other efforts following the same rational development of both characters, plot and biomedical concepts may be useful, not only towards NAFLD awareness, but as a possible template to develop similar materials for other conditions where the same principles may apply. In fact, given previous examples showing the efficacy of comics in transmitting scientific and clinically relevant messages,[107] we believe that, together with other tools (other types of media or narrative medicine strategies), they may provide an excellent platform towards advancing health promotion and effecting behavioural change in different situations.

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CONFLICTS OF INTEREST

None of the authors have potential conflicts of interest to be disclosed.

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