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TWELVE TIPS

Twelve tips to make successful medical infographics

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ABSTRACT

In the health sciences, professionals must keep up to date to conduct their evidence-based practise. Hence, there is a growing need to share medical knowledge efficiently among healthcare professionals, patients, and undergraduate health science students. Infographics (text and image) are a hybrid element that serves to represent information in an attractive and meaningful visual format. Actually, with the use of the Internet and social networks, infographics have become a popular format for sharing medical information around the world.

On the basis of a published literature review, we provide 12 tips in this article to make a successfully health-related infographic with the aim of assisting clinicians, educators, and researchers in their task of communicating and transforming complex information into a visual, attractive, didactic and shareable format.

By following these basic recommendations, it is possible to improve the dissemination of scientific and health-related knowledge to different audiences who can benefit from infographics.

KEYWORDS

Teaching and learning; student support; communication skills

Introduction

Infographic is a visual communication tool for depicting information graphically by using visual elements to communicate data or concepts clearly and concisely to a targeted audience (Lankow et al. 2012). A data-visualisation combination of graphics and text makes information easy to understand and have become an excellent way to communicate complex concepts in an accessible and even entertaining manner (McCrorie et al. 2016).

Infographics are used to communicate key messages covering a wide range of topics, (demographics, socioeconomics, etc.) and increasingly, many aspects related to health care (Matrix and Hodson 2014). These are considered an attractive strategy for conveying health messages to patients and healthcare professionals (Scott et al. 2016; Stonbraker et al. 2019).

Infographics are increasingly being used as an active learning strategy in medical education and in research dissemination to complement and add value to scientific papers (Ibrahim et al. 2017; Shanks et al. 2017). As a teaching tool, infographics are an innovative and motivating strategy for undergraduate medical students, that is, to promote active and deep learning when created and to summarise complex information that minimises the cognitive load when viewed (Matrix and Hodson 2014; Shanks et al. 2017).

Information from infographics is more likely to be retained than that from text alone (Murray, Murray, Wordie, Oliver, Murray, et al. 2017), and for patient education has shown to be effective in improving adherence to medication regimens in the long term (Ebrahimabadi et al. 2019)

Infographics can show research findings in a concise and visually appealing manner. By so doing, they also increase awareness and dissemination of the research findings among clinicians (Ibrahim et al. 2017; Martin et al. 2019). An increasing number of scientific journals request that authors submit graphic summaries of their manuscripts. This medium for presenting information has been associated with a higher reader preference and a lower cognitive load during an abstract review (Martin et al. 2019). Moreover, research papers promoted through infographics on social media have been associated with increased 'Altmetric' scores and the number of abstract views (Huang et al. 2018). Some prestigious publishers, such as the British Medical Journal, already have an infographics section (https://www.bmj.com/infographics).

Different institutions and health organizations currently have an infographics section on their websites to disseminate content. Some relevant examples are the World Health Organization (https://www.who.int/mediacentre/infographic/en), the American Public Health Association (https://www.apha.org/news-and-media/multimedia/infographics) or the Centers for Disease Control and Prevention (https://www.cdc.gov/globalhealth/infographics/default.html).

Capturing the key message of a well-made infographic should take only a few seconds. However, the process of design takes much more time and effort (Murray, Murray, Wordie, Oliver, Simpson, et al. 2017). So, what makes a good infographic? Knowing the key elements in its

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preparation is essential for achieving the objective with which it is conceived and for disseminating it successfully. For this reason, the aim of this work is to show by 12 tips those fundamental elements in its creation, design, and dissemination. To perform these 12 tips we look for information of papers included in the Pubmed database using the words *health or medical* and *infographics or infography*. Besides, we consult other sources as book and blogs and we provide twelve tips based on this literature review and our experience.

Tip 1

Define the target audience: Know their preferences, and gain impact

A first step towards proposing an infographic is to be clear whom it is intended to reach (Murray, Murray, Wordie, Oliver, Murray, et al. 2017). The approach of the infographic will vary, depending on factors, such as age (kids, young population, adult or elders), role (patients, professionals, caregivers, students), or educational level (Kibar and Akkoyunlu 2017) related to the target audience.

Therefore, understanding the target audience is a factor that is crucial for choosing the subsequent design elements, such as the colours, images, spatial organisation, or the communication channel to disseminate the infographics (Arcia et al. 2016; Wansink and Robbins 2016). For this reason, it would be desirable to take into account, from the beginning of the design, the opinion of the infographics end users as this can increase the subsequent receptivity of the infographics (Atenstaedt 2019).

In addition, infographics need to cater to specific preferences and needs of their target audiences (Hamaguchi et al. 2020; Stonbraker 2020). For the presentation of research results, Crick and Hartling (2015) found that infographics were considered aesthetically appealing for summarising scientific results for an audience, but critical appraisal formats were considered to be more comprehensible. Therefore, an infographic does appeal to the target population and begins with an understanding of who it is for (Harrison et al. 2015).

Tip 2

Set the purpose of the infographics

To develop a successful infographic, the author must be clear about what he or she wants to communicate (Murray, Murray, Wordie, Oliver, Murray, et al. 2017). It is recommended that the focus be a single clear learning objective (Dunlap and Lowenthal 2016). Depending on the objective, the type of infographic should be considered: narrative, explorative, or mixed (Lankow 2012). An explorative infographic is frequently used for educational and research purposes, clearly providing objective information. A minimalistic design with only elements that represent data is characteristic. Narrative infographic seeks to sway the opinion of the viewer by using engaging visuals that inform and entertain, and even by trying to evoke emotion.

For example, 'how-to' infographics are usually well received by users who are searching for information about how to perform some procedure (Arcia et al. 2019). In research and clinical settings, it may help explain and share specific methodologies, technical procedures, or therapeutic interventions in a visual way (Ibrahim et al. 2017; Hsiao et al. 2019).

Tip 3

Think of a compelling title to attract and sustain the audience's attention

The first few seconds of viewing an infographic are essential to attract the attention of the audience (Murray, Murray, Wordie, Oliver, Murray, et al. 2017). In this process, one objective of the reader's gaze is usually the title of the infographic (Majooni et al. 2018). Action-oriented titles, described as one of the most robust predictors of recall, seem to make infographics memorable and compelling (Wansink and Robbins 2016). It is recommended that a few powerful and impactful words be used in the title to arouse the audience's interest quickly (Quispel et al. 2018). It is not necessary to have an elaborate title because a more suggestive subtitle can be used to explain the objective and stimulate the audience's curiosity.

In scientific research, for example, this could be the most impactful finding or practical application of the study (Murray, Murray, Wordie, Oliver, Murray, et al. 2017; Balkac and Ergun 2018; Huang et al. 2018) or of patient education, an ability to self-manage or prevent a disease (Arcia et al. 2019; Stonbraker et al. 2019).

Tip 4

'Get straight to the point': Be transparent

An infographic aims to transform complex ideas or data into simple graphic stories to inform and educate the audience (Martin et al. 2019). For this reason, it is essential to use simple and visually powerful messages. (Arcia et al. 2016). A minimalistic approach in the design of the content is preferred to avoid scattered attention (Quispel et al. 2018).

To be clear, infographics should include adapted language, utilise short sentences, and avoid long paragraphs (Royal and Erdmann 2018). It is advisable to avoid technical and medical jargon in the infographics for patient education because such language tends to raise the readability level out of the range of the average reader (Oliffe et al. 2019).

Tip 5

Storytelling is key

Making an infographic involves more than a mere compilation of images and text (McCrorie et al. 2016). It is important to incorporate a narrative into the infographics to sustain the reader's attention on a predefined script. Having a clear start and end ensures that the reader processes the information in the order in which the author intends, thus helping the audience understand the key messages (Botsis et al. 2020). In the case of communicating research results, Murray, Murray, Wordie, Oliver, Murray, et al. (2017) recommended considering the use of 'nodes'

of information, lines, arrows, or other visual elements to guide the audience through the infographic and to relate different sections in the research story.

In the case of educational infographics for patients, the existence of a central storyline is especially important since it facilitates inducing them to take action or even to change their health-related behaviour (Arcia et al. 2019).

Finally, the story and messages behind the infographics must be credible. Therefore, citing the used references and resources is mandatory (Shanks et al. 2017). The audience must know the origin of the presented data (text, charts, and figures), which has been related to greater confinement to the information presented (Wilkinson et al. 2016).

Tip 6

Find a way to highlight the main ideas

Infographic works if the audience understands the information presented (Lankow et al. 2012). Therefore, key messages must be emphasised, for example, by increasing the size of the relevant components of the infographics, by using striking colours and by giving the infographic a compelling title as mentioned before (Murray, Murray, Wordie, Oliver, Murray, et al. 2017; Wansink and Robbins 2016).

When the author seeks to disseminate scientific data, infographics should be used to provide a visual summary of the research rather than as a canvas on which to dump the full research paper (Hsiao et al. 2019). The text should be brief and serve to provide clarity as well as to reinforce the aspects that are presented visually (Balkac and Ergun 2018).

One way to assess whether the key messages are properly represented graphically is to apply the '*no text test*', that is, remove the text from the infographic and assess whether the story is understood. It is, therefore, a test of the relevance of the visual elements (Burgio and Moretti 2017).

When starting the design of a new infographic it is useful to remember the quotation from painter Hans Hoffman: 'Eliminate the unnecessary so the necessary can speak'.

Tip 7

Draft the infographic

It is recommended that a draft of the infographic be made with a pen on a sheet of paper, allowing creativity flow (Khoury et al. 2019). Different design configurations, concepts, and their relationships may be considered, and the use of visual elements (type, position, sizes, etc.) may be planned before working with a digital copy (Shanks et al. 2017). Every item on an infographic should convey meaningful information (Stones and Gent 2015). It is possible to get ideas by looking at other successful infographics.

During the drafting, the appearance does not matter. The priority is to outline the ideas and organise the themes and topics that will be presented. However, it is worth remembering Tufte (2006) who emphasised that 'cosmetic decoration will never salvage an underlying lack of content'. The 'less is more' concept is ideal for making any design shareable. For a large amount of information in a small container, strategic white spaces are mandatory since they can be used to represent breaks during a conversation (15 November 2018 posting by K Tombok to Easy.ly: White space in Infographics Design and Data Vizualization: Yay or Nay?).

Tip 8

Follow the basic principles of graphic design

Although designing an infographic is an enjoyable and creative process, some basic design recommendations should be followed to achieve a good final result (Abilock and Williams 2014). To achieve a good first impression with visuals is essential to catch and keep the attention of the audience (Harrison et al. 2015). We strongly recommend reading the guide titled 'Principles of Public Health Infographic Design Manual' published by Stones and Gent (2015).

When the infographic draft is ready, there are available several user-friendly online tools (Piktochart, Canva, Venggage, Genial.ly, Easel.ly, Visual.ly, among others) that may be used to transform it into a formal infographic template (Wright 2016). The collaboration with a professional graphic designer who can optimize the result should always be considered (Burgio and Moretti 2017; Khoury et al. 2019). The following are some fundamental design aspects to consider when designing an infographic:

Fonts. It is recommended that not more than two or three different types of fonts be used (Kibar and Akkoyunlu 2017). Choose a font colour based on the background colour being used and be consistent throughout the design.

Graphics and charts. Desimone and Duncan (1995) stated that people can only pay attention to one part of the visuals at a time, and having multiple elements considerably reduces the attention span. The graphics should be carefully chosen based on what is intended to be communicated (Stonbraker et al. 2020). For example, timeline for the chronological sequence of events; cluster (e.g. a Venn diagram) to show grouping relationships, or a bar chart when comparison and contrast is the author's intention. Stonbraker et al. (2019) found that patients who received health statistics in infographic form were 2.84 times more likely to estimate the risk of their conditions accurately and make important decisions about their next steps.

Images and figures. Images are a fundamental element of infographics (Khoury et al. 2019). Visual elements can grab an audience's attention and even increase comprehension and memorisation (Brigham 2016).

It has been reported that scientific articles associated with a visual abstract are three times more likely to be viewed than are articles published with text-only abstracts, and have even been associated with increased Altmetric scores and abstract views of the journal in which they are published (Thoma et al. 2018). All visual elements must contribute information to the infographics. Decorative visuals that distract the audience should be avoided (Dunlap and Lowenthal 2016).

Whether owned by the author or by digital repositories (Flicker, Pixabay, Freepick, etc.), all images must meet quality and resolution standards to add value to the infographic. As far as possible, photos with the same lighting effects, backdrops, and the number of dark areas are recommended (Burgio and Moretti 2017).

Regarding the location of images in the infographic, Mayer (2009) reported that students learn better when corresponding words and pictures are presented near each other rather than far from each other. In the same way, Borgo et al. (2012) found that embellishment aided both the speed and accuracy of information recalled from long-term memory when 'to-be-remembered' information was located closely to the image that represented it.

Remember that blank space surrounding objects can be used to highlight the key message of the infographic. Finally, in the words of Dunlap and Lowenthal (2016) it is important to remember that the visual appeal of an infographic will not make up for bad content

Tip 9

Choose colours appropriately

When appropriate colours are used in the infographics, the audience can remember the content more easily (Quispel et al. 2018). The colours of infographics help clarify the embedded messages (Arslan and Toy 2015). Indeed, certain colour schemes can stir up emotions (red evokes a sense of urgency; green, connection with nature; blue can be used for its calming effect) and can be used to reinforce messages (Elliot 2015).

Colour and visual complexity have been identified as strong predictors of information evaluation in infographics (Park and Tang 2019). This means that colours should be chosen carefully. Existing recommendations for creating engaging infographics include using three to five complementary colours on a colour palette (Stones and Gent 2015). Additional aspects when using colours in the infographic designs are (i) the 60-30-10 rule: Use a primary colour for 60% of the area in the infographic; choose a secondary colour that covers 30% of the area, and finally, an accent colour, for the remaining 10%; (ii) Use dull and muted colours in the background. Dull colours can serve as your infographic's white space helping text and other visual elements in brighter colours stand out.

Some reasons why it is important to pay attention to this aspect: There is an 82% increase in readers' attention spans and recall through the use of colours in visuals (Chang and Xu 2019); 70% less time is spent finding the right data when colours are used properly (Dzulkifli and Mustafar 2013); learners who saw a message that utilised colours were 39% more likely to remember the message than those who read the same message in black and white (Shankar and Amir 2020), Also, 55% of readers preferred messaging that included the use of colours compared to messaging that used only black and white (Dzulkifli and Mustafar 2013). In a clinical setting, Park and Tang (2019) reported that infographics designed with relevant colours and appropriate visual complexity were effective in promoting skin cancer prevention.

Tip 10

Test the infographics and try to enrich it

Effective health communication with patients, caregivers, and the general public is critical. To verify that 'the soul of the infographic' reaches the target audience before publishing it, a recommended strategy is to pilot or evaluate it on people from the intended audience (Arcia et al. 2019; Stonbraker et al. 2019).

While visuals can offer a great deal of communicative value, failing to account for a well-targeted reading level can negatively impact the effectiveness of an infographic (Balkac and Ergun 2018). With respect to patients, given the high variability associated with health literacy, the National Institutes of Health and the American Medical Association recommend that the literature should be written between a fourth and sixth-grade level (US) to avoid disadvantaging individuals with inadequate literacy skills (Weiss 2003). This must be borne in mind as, occasionally, there are patient-target infographics that significantly exceed this recommendation (Royal and Erdmann 2018). Currently, a simple readability analysis can be performed using a free online calculator (i.e. Readabilityformulas.com).

Increasing user interaction while viewing infographic is positive (Balkac and Ergun 2018). One strategy to enrich an infographic is to introduce links to interactive elements or additional material to improve the engagement of the audience during data visualisation (Bellei et al. 2016). For example, the use of the Quick Response (QR) codes inserted in a printed infographic allows audiovisual material or website to be linked, allowing the audience to consult additional information.

Tip 11

Properly review the infographics to avoid misprints and errors

A wholehearted review process of the infographic content and double-checking for errors are mandatory because design errors negatively affect audience perception and author credibility (Wansink and Robbins 2016). This also includes performing careful quality control of figures, fonts, and text (Brigham 2016).

The following are common mistakes that can appear in an infographic:

Grammar, spelling errata. It is possible that during the edition of the infographic, some spelling or grammar errors have been produced in the included text. Check it and remember that long, unstructured paragraphs create an overload of information and should be avoided

Distracting elements. The visuals of an infographic should add interest and emphasise the key messages of the infographic. Therefore, do not include 'distracting' elements.

Distorted scale. Charts, images, or other visuals that have been distorted or pixelated detract from the quality of the infographic.

Special organization and hierarchy. Visual hierarchy is important to guide the audience through presented information in an infographic. If elements are organised arbitrarily the message of the infographic can be difficult to understand.

Tip 12

Disseminate and share the infographics efficiently

The last essential step to achieve the success of any infographic is to draw up a dissemination plan (Murray, Murray, Wordie, Oliver, Murray, et al. 2017). For this, it is essential to choose the most appropriate communication channel to connect with the target audience. In health education, the author should even consider the media to which the audience does not have access or what channels cannot be used for various reasons (Giustini et al. 2018).

If the target audience covers a wide social spectrum or includes people of very different ages, the use of traditional channels, such as a printed press, is recommended (McCrorie et al. 2016). However, online resources, especially social networks, are preferred (Wang et al. 2012). These are the chosen media for gaining access to scientific information by one out of four people up to 24 years old, (Hargittai et al. 2018) and infographics are particularly suited to these platforms. In this context, to maximise the scope of the infographic, efforts must be made to make it go 'viral' (Thoma et al. 2018). In the form of an image, an infographic can easily be posted online (website, social media, and blog) and can be shared on the most popular social media platforms (Facebook, Pinterest, Twitter, Instagram, Google+, etc.). Infographics are shared eight times more on social media compared with text-only summaries (Ibrahim et al. 2017). On the other hand, research articles accompanied by an infographic are accessed more frequently than those that have none (Murray, Murray, Wordie, Oliver, Murray, et al. 2017).

Therefore, '*shareability*' has become a key element in virtual health communication. Inviting readers to share your infographics is useful for making the most of the potential of social networks (Ventola 2014). Besides, obtaining a free Creative Commons licence can also facilitate the dissemination and reuse of infographics by third parties (Hagedorn et al. 2011). This, helps creators to maintain their copyright while allowing others to copy, distribute, and make some non-commercially uses of their work.

Among health professionals, the availability of rapid and reliable high-quality information has been valuable for optimising global medical response in the current coronavirus disease 2019 (COVID-19) pandemic (Hamaguchi et al. 2020). A number of examples where infographics have had a wide impact, both in the scientific community and in users, can be found. One instance is an infographic about endotracheal intubation in critical patients with COVID-19, which was created by Chan et al. (2020). It was quickly shared by the scientific community resulting in 13 translated versions that were available for users within a 10-day express period. In just one month, it had 63,440 impressions on Twitter. In health education, Go et al. (2020) demonstrated the effective and safe combination of telemedicine and an infographic to educate and guide patients on drain removal at home, which can reduce hospital length of stay and the outpatient visits to the hospital after a surgical intervention, thus, contributing to reducing the possibilities of virus spread and contagion.

Finally, the use of social networks in the dissemination of scientific information requires responsible and rigorous use (Kind et al. 2014). An interesting recommendation is to consult the principles of Free Open Access Medical education (FOAM) networks, which can provide good examples of the effectiveness of making medical information freely available.

Conclusions

These practical tips will be useful to clinicians and medical educators looking to disseminate research contents, provide educational materials to the patients, and induce learning by doing in health science undergraduates. Two examples of infographics that illustrate the content of this article using different designs are provided (Supplementary Material, online version).

Finally, it should be remembered that designing a good infographic is not easy and requires time and practice, and collaboration with graphic designers is highly recommended. However, many benefits can be obtained in health communication with peers, patients, and students.

Albert Einstein was aware of the difficulties involved in communicating complex content, and said: 'If you can't explain it simply, you don't understand it well enough'. We encourage you to build an infographic with information that you are currently managing and are interested in communicating with an audience, through learning by doing the process.

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