The Journal of Rheumatology 2020;47:xxxx
doi:10.3899/jrheum.191245
First Release October 1 2020

The Journal of Rheumatology

Not Every Picture Tells a Story: A Content Analysis of Visual Images in Patient Educational Resources About Gout

Alina Krasnoryadtseva[1], Christina Derksen[2], Nicola Dalbeth[3], and Keith J. Petrie[1]

ABSTRACT. ***Objective***. The aim of this study was to evaluate which concepts about gout and its treatment are reflected in images in online educational resources about gout.

Methods. A Google search was performed to identify English-language patient resources from medical and health organizations and health education websites in 7 countries: Australia, Canada, Ireland, New Zealand, South Africa, UK, and USA. Two raters independently coded the images in the resources into 5 main categories: clinical presentations of gout, urate/monosodium urate (MSU) crystals, medicines, food/healthy lifestyle, and other advice for people with gout.

Results. In total, 103 resources were identified; 28 resources without images were excluded. Seventy-one educational resources with a total of 310 images were included in the study sample. Of the 310 images, clinical presentations of gout were depicted in 92 images (30%), food/healthy lifestyle in 73 images (24%), urate/MSU crystals in 50 (16%), medicines in 14 (5%). Urate-lowering medication was shown only in 1 image (0.3%) and just 6 images (2%) depicted a serum urate target. Ninety-one images (29%) did not convey specific information about gout.

Conclusion. Key concepts about gout and treatment are underrepresented in the images used in educational resources for patients. A large proportion of the images do not convey useful information about gout or its management.

Key Indexing Terms: gout, gouty arthritis, health education, patient education as topic

Gout presents as a painful inflammatory arthritis caused by chronic deposition of monosodium urate (MSU) crystals in joints and soft tissues. This disease affects 3.9% of the population in the United States[1]. The guidelines of all major international rheumatology societies recommend the long-term use of urate-lowering therapy (ULT) to achieve the dissolution of MSU crystals[2,3,4].

Long-term adherence to medication can be challenging for patients with gout, especially if they have not been provided with accurate and comprehensive information about the cause of the illness and the importance of consistent daily ULT[5,6]. Management programs that focus on patient education about gout have been shown to improve adherence to ULT and lead to better health outcomes[7,8].

Several prior analyses of the text in gout educational resources have reported the use of complicated language and lack of accurate information about ULT[9,10,11]. However, the content of images in these resources has not been assessed in any detail. The addition of visual images to textual information can improve the comprehension of health information, recall, and compliance with medical advice[12,13,14,15,16]. People with gout also highlight the importance of visual aids in materials about gout[17]. Despite the well-recognized benefits of including images within patient educational resources, we were able to identify only 1 study that briefly mentioned the poor quality of images in gout educational resources[18].

Therefore, the objective of our study was to evaluate (1) which images are used in educational resources for people with gout, and (2) which concepts about gout and treatment for gout are reflected in these images.

MATERIALS AND METHODS

Inclusion and exclusion criteria. The content of images in patient resources for gout from medical and health organizations and health education websites was analyzed. Medical and health organizations included health governing agencies, nongovernmental organizations, professional medical associations, hospitals, and universities. Health education websites included sites and health education blogs that explicitly stated in their mission statements that providing quality health information for patients was one of their goals.

Resources were included if they were in English, communicated information about gout, were aimed at people with gout or the general public,

N. Dalbeth has received research grant funding from Amgen and AstraZeneca; speaker fees from Pfizer, Horizon, Janssen; and Abbvie, and consulting fees from Horizon, AstraZeneca, Hengrui, and Dyve Bio, outside the submitted work.

[1]A. Krasnoryadtseva, MSc, K.J. Petrie, PhD, Department of Psychological Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand; [2]C. Derksen, MSc, Department of Health Psychology and Behavioural Medicine, Faculty of Psychology and Methods, Jacobs University Bremen, Bremen, Germany; [3]N. Dalbeth, MD, FRACP, Department of Rheumatology, Auckland District Health Board, Auckland, and Department of Medicine, Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand.

Address correspondence to A. Krasnoryadtseva, Department of Psychological Medicine, Faculty of Medical and Health Sciences, University of Auckland, Private Bag 92019, Auckland, New Zealand.
Email: a.krasnoryadtseva@auckland.ac.nz.

Accepted for publication February 14, 2020.

and were publicly accessible online in 1 of 7 English-speaking countries: Australia, Canada, Ireland, New Zealand, South Africa, the United States, or the United Kingdom. Six English-speaking countries were selected based on previous research that assessed texts in educational materials about gout[11]. South Africa was included because it has a population of English-speakers comparable in size to Ireland and New Zealand[19].

Resources were excluded from the content analysis if they had no still images, consisted solely of videos, targeted health professionals, included no information about gout or treatment for gout (e.g., provided insurance advice for patients), required a paid subscription, or came from neither a medical/health organization nor a dedicated health educational resource (e.g., newspapers, social media, general knowledge websites).

Data sources. The resources were identified using a Google search in an "incognito window" to avoid personalization of search results based on the computer's browsing history. The term "gout" was used to perform a separate search for each of the 7 geographical regions using the Google advanced search tool. For example, all resources shown for the search term "gout" in the region "Australia" that met the inclusion criteria were listed for further consideration. This procedure was then repeated for each of the remaining 6 countries.

The first 50 search outcomes in each country were reviewed to identify resources from medical and health organizations. Additionally, a bibliographical search through these resources was performed to identify extra materials. Information from health education websites was included if such websites were encountered within the first 20 search outcomes.

Content analysis. Web pages with associated image galleries as well as PDF files were analyzed by 2 raters (AK and CD). Images in each resource were numbered. The 2 raters independently coded every image using a set of categorical scales (e.g., Does the image show any clinical presentations of gout? 1: yes, 0: no; If yes, does the image show tophi? 1: yes, 0: no). The images were reviewed with their labels and captions, and the main body of the text was disregarded. Each image within the resource was coded for content using descriptors within 5 main content categories that we identified in published recommendations for gout educational materials[9,10]: clinical presentations of gout, MSU crystals and/or urate, medication, dietary and lifestyle factors, and other advice (Table 1).

Images that could not be coded into the 5 main categories above were labeled as "non–gout-specific" and analyzed further using an additional set of descriptors. These descriptors included a range of questions about who or what was shown in the image, such as: "Does the image show people?" (yes/no); "Does the image show anatomical structures?" (yes/no); "Does the image show areas of the body?" (yes/no). If people were present in the image, their identity and sex were described (e.g., a health professional and a patient; male/female patient).

As images often contain multiple concepts, the coding scheme allowed descriptions of the same image using more than 1 category. For example, if a radiograph showed tophi, it would be coded into the single category of "clinical presentations of gout." However, if the radiograph showing tophi was used in a collage, for example, with a microscopy image showing MSU crystals, then this image would be coded into 2 categories: "clinical presentations of gout" and "MSU crystals and/or urate."

A training sample was used to achieve the initial calibration and refinement of the coding scheme. Following training, Cohen κ (standard error) for interrater agreement for all scales ranged from 0.62 (0.123) to 0.99 (0.008) with an average of 0.85 (0.044). Disagreements were resolved through discussion and consultation with an independent reviewer (ND) when necessary.

Table 1. Main content categories used for coding images in patient resources about gout.

Content Category	Category Definition	Category Descriptors (Yes/No)
Clinical presentations of gout	What clinical presentations of gout are shown in the images	· Shows subcutaneous tophus? · Shows redness and/or swelling of a joint? · Shows joint pain?
MSU crystals and/or urate	What information about MSU crystals and urate images convey	· Shows MSU crystals and/or urate? · Shows that MSU crystals can be dissolved (e.g., "before and after" treatment comparisons)? · Links MSU crystals and urate (e.g., MSU crystals and urate are present in the image)? · Shows target serum urate either numerically or graphically? · Shows causes of high serum urate (e.g., depiction of kidneys and high urate in 1 image)? · Shows how to test for serum urate?
Medications	How images depict medicines and their purpose	· Shows medicines? · Conveys information about the purpose of medication (i.e., ULT and urate/MSU crystals are shown in 1 image)? · Depicts side effects of medicines?
Dietary and lifestyle factors	What information images convey about diet and lifestyle	· Shows food/drinks? · Is it clear from the image and captions if the depicted food/drink should be avoided or consumed by people with gout? · Shows a healthy lifestyle? · Promotes physical activity and/or exercise?
Other advice for people with gout	Advice not related to pharmacological treatment, healthy lifestyle, or dietary modification	· Conveys information about foot care? · Contains footwear recommendations for people with gout?

MSU: monosodium urate. ULT: urate-lowering therapy.

Statistical analysis. The data was analyzed in IBM SPSS Statistics (v 25.0; IBM Corp.) and Microsoft Excel. Frequencies and percentages were calculated to examine the proportion of images in each content category.

RESULTS

Search results. We identified 103 unique educational resources about gout. Four resources were excluded as they included videos but no still images. A further 28 (27%) educational resources were excluded as they did not include any visual images. The final dataset for analysis comprised 71 unique educational resources: 53 webpages and 18 PDF files (Supplementary Material, available from the authors on request). The resources were from the USA (n = 34), New Zealand (n = 10), UK (n = 9), Canada (n = 8), Australia (n = 4), Ireland (n = 3), and South Africa (n = 3). The number of images per resource ranged from 1 to 25 images, the mean (SD) was 4.37 (4.7), and 27 (38%) resources contained a single image. In total, 310 images were analyzed.

Content categories. Of the 310 images, the most common single content category was "clinical presentations of gout," and was depicted in 92 (30%) of the images (Table 2). The second most common category was "non–gout-specific" content, which was present in 91 (29%) images. "Food and health lifestyle" content was present in 73 (24%) images, whereas content about medicines was present in 14 (5%) of images. "MSU crystals and/or urate" were depicted in 50 (16%) of images. One hundred eighty images (58%) were coded into a single main content category, 28 images (9%) into 2 categories, and 1 image (0.3%) into 3 categories.

Areas of the body affected by gout were shown in 106 images (34%) that included the clinical presentations of gout and MSU crystals/urate content. Of these 106 images, feet were shown in 71 (67%) images, hands in 23 (22%), knees in 9 (8%), ears in 7 (7%), and elbows in 6 (6%).

Clinical presentations of gout. Of the 92 images with content featuring clinical presentations of gout, 48 (52%) showed redness and/or swelling, 37 (40%) showed subcutaneous tophi, and 22 (24%) depicted joint pain. Examples are shown in Figure 1. Severe consequences of untreated gout, such as skin ulcers, infected tophi, or amputation, were shown in 5 (5%) of the 92 images in this category. Seventy-two images (78%) were coded using a single coding descriptor and 20 (22%) images were coded using 2 coding descriptors.

Table 2. Content categories depicted in patient educational resources about gout.

Content Category*	Frequency	%, N = 310
Clinical presentations of gout	92	30
MSU crystals and/or urate	50	16
Medicines	14	5
Food and/or healthy lifestyle	73	24
Other advice for people with gout	9	3
Non–gout-specific images	91	29

* If an image fell into 2 categories, then it would appear in 2 categories. MSU: monosodium urate.

MSU crystals and urate. Of the 50 images with content featuring MSU crystals and/or urate, 20 (40%) depicted the link between MSU crystals and clinical presentations of gout, 12 (24%) linked serum urate to clinical presentations, and 5 (10%) depicted the link between serum urate levels and MSU crystals. Examples are shown in Figure 2. No image showed that MSU crystals can be dissolved. Only 6 (12%) of these images depicted target serum urate levels, 1 (2%) portrayed how to check for serum urate levels, and 3 (6%) depicted the causes of high serum urate levels. Twenty-six images (52%) were coded using a single coding descriptor, 9 (18%) using 2 descriptors, and 1 (2%) using 3 descriptors.

Medication for gout. Of the 14 images with content about medications, 12 (86%) were images of an unidentified, nonspecific medication, 1 was an image of ULT medication (allopurinol and probenecid), and 1 was an image of colchicine. Examples are shown in Figure 3. One image was coded as showing the purpose of medication (ULT for lowering serum urate), and 1 image showed both the purpose of medication and what the medicine does in the body. One image depicted side effects of gout medicines. No images portrayed the recommended duration of therapy (e.g., short-term when in pain, for a long time, lifelong).

Dietary and lifestyle factors. Fifty-nine images were coded as showing food or healthy lifestyle, while 14 images showed both. Of the 73 images with content about food and/or healthy lifestyle, 52 (71%) depicted food and/or drink. Of these 52 images, 44 (85%) depicted food and/or drink that people with gout can consume and 23 (44%) depicted food and/or drink discouraged in rheumatology guidelines. Although the images were reviewed with captions, 28 of the 52 (54%) images that depicted food and/or drink did not clearly communicate whether the depicted food or drink should be consumed, limited, or avoided by people with gout.

Of the 73 images with content about food and/or healthy lifestyle, 35 (48%) were also coded as promoting healthy lifestyle. Of these 35 images, 16 (46%) portrayed exercise and physical activity, 12 (34%) portrayed general healthy eating, and 5 (14%) portrayed weight loss. Three images promoted smoking cessation and/or limiting alcohol and 1 image promoted blood pressure control.

Other advice for people with gout. Of the 9 images with content depicting other advice, there were 4 different images related to foot care and/or footwear recommendations for people with gout, as well as 5 images with unique messages: "seek social support;" "see a rheumatologist;" "look for more information about gout;" "use a walking stick to assist walking;" and "use grippy cutlery."

Non–gout-specific images. Of the 91 images that did not fall into any of the 5 main categories, 63 (69%) were depictions of people, 8 (9%) showed anatomical structures or bodily processes with no information about gout, 6 (7%) included infographics not classified elsewhere, and 14 (15%) were generic images such as photographs of healthy feet or abstract art. Examples are shown in Figure 4.

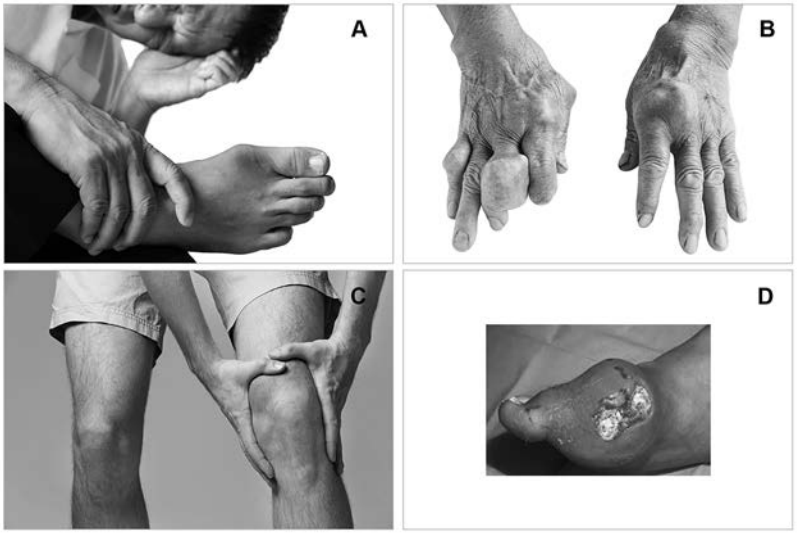

Figure 1. Examples of images showing clinical presentations of gout. (A) An image showing redness and swelling. (B) An image showing subcutaneous tophi in the hand. (C) An image showing joint pain. (D) An image showing severe consequences of gout (ulcerating tophus). The image was published with permission from Pharmac, New Zealand.

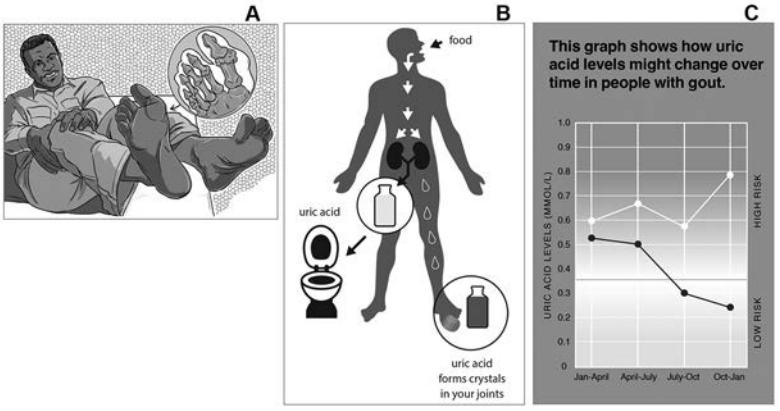

Figure 2. Examples of images showing MSU crystals and urate. (A) An image linking MSU crystals to clinical presentations of gout such as pain. The image was published with permission from Pharmac, New Zealand. (B) An image explaining the link between urate and MSU crystals. The image was published with permission from the Ministry of Health, New Zealand. MSU: monosodium urate. (C) An image communicating information about serum urate and urate target levels (the line at 0.36 mmol/L). The image was published with permission from Pharmac, New Zealand.

Of the 63 images depicting people, 20 (32%) showed a health professional alone or with a patient. Depictions of male patients were 3 times more common than female patients: of the 16 images showing patients, 10 (63%) represented men, 3 (19%) featured women, and sex was unclear in 3 (19%) images. Other depictions of people comprised 3 (5%) images of individuals in pain of an unclear etiology and 4 (6%) of researchers/scientists. However, the majority (36, 57%) showed people whose identity was unclear in the image; for example, a portrait of a happy couple, or a photograph of parents playing with children (Figure 4A). Such images showed posed people or social interactions.

DISCUSSION

Our content analysis has determined that visual images used in publicly available educational resources for gout do not depict central concepts about gout and its treatment. Despite the well-documented benefits of using images in patient education, about a third of the educational resources identified for the purpose of our study did not include any images and had to be excluded from the analysis. Further, the content analysis of the images that were included in the educational resources revealed a lack of visual representation for key messages about gout, such as serum urate targets, MSU crystals, and gout treatment. Almost a quarter of all images were related to diet and healthy lifestyle,

Figure 3. Examples of images showing unidentified drugs. The image was published with permission from Pharmac, New Zealand.

Figure 4. Examples of non–gout-specific images. (A) An example of a non–gout-specific image showing people. The image was published with permission from The Gout Education Society, USA. (B) An example of a non–gout-specific image showing a health professional. (C) A generic image of healthy feet.

whereas ULT was depicted in a single image. About a third of all images did not convey information on gout.

Our analysis of visual images in gout educational resources aligns with prior studies that assessed text in similar resources[9,10,18]. Present analysis of images showed that while gout flares and advanced gout were represented reasonably well, essential information about treatment was lacking. In line with the literature that revealed extensive coverage of food and healthy lifestyle topics in gout educational texts[9], diet and healthy lifestyle were reflected in a large proportion of the images. Further, even when viewed with captions, fewer than half of images depicting food or drink provided clear instructions on whether the items should be consumed, limited, or avoided by people with gout.

All rheumatology society gout management guidelines recommend using ULT to achieve and maintain a target serum urate level, which is necessary for the dissolution of MSU crystals and long-term control of the illness[2,6]. In our study, we found that very few images in gout educational resources showed medicines, with only a single image of allopurinol, the most widely used urate-lowering drug. There was no visual information on the purpose of ULT, or any indication that this therapy can dissolve MSU crystals. Further, there was no depiction of treatment timelines, despite a previous survey that showed only a quarter of people with gout on ULT were aware of how long the medication should be taken[20]. Research has suggested only 14% of people with gout know their target serum urate level[21]. We identified only 6 images that depicted target urate levels in the entire dataset of 310 images, whereas there was only 1 image that explained how to test for serum urate.

About a third of the images did not convey gout-specific information. These were predominantly depictions of social interactions, posed photographs of people, and generic images of doctors with patients. The images showing male patients were 3 times more common than those showing female patients. Although gout prevalence is higher in men, the lack of information tailored to women and underrepresentation of female patients in images have been reported as issues in several previous qualitative studies of women's experience with gout[22,23].

The findings of our present study indicate that educational resources for people with gout could be significantly improved by better visual depictions of key points about gout and its management, including the underlying causes of gout, the role of MSU crystals, the effects of ULT, and serum urate targets. The images should depict both male and female patients to cater to

different patient populations. Finally, non–gout-specific images should be tailored to convey illness-related information.

Our study has several limitations. Only resources in English from 7 English-speaking countries were selected for our content analysis. Therefore, the findings may not be generalizable to materials in other languages or other geographical regions. Further, we did not include news articles, general knowledge websites, or social media resources. Information was obtained using only 1 search engine—Google. However, Google is the most widely used search platform[24], and the selected resources are likely to be representative of information that most patients can find online. At the time of data collection, there were no universal guidelines on what information patient resources about gout should or should not include. The criteria used for this content analysis were based on rheumatology society treatment guidelines[2,6]. Therefore, the findings of the present study should be interpreted alongside current gout management guidelines.

Finally, our study only provides an insight into how images in educational resources can be improved and did not investigate whether better educational resources could lead to a better understanding of the disease and better health outcomes. Patient education is emphasized as a core aspect of gout management in recommendations by the European League Against Rheumatism[6]. Patient reports suggest that people with gout want more information and better resources[18,23]. Moreover, it has been shown that a patient education intervention can help patients achieve the target serum urate level[7,8]. The causal relationships between better educational resources, understanding, and health outcomes needs to be investigated further in future research. However, if the educational resources for patients do not effectively convey essential information about gout, it is hard to expect any changes in people's understanding of the disease.

Our study revealed that essential information about gout and its treatment is not supported by the visual images used in current educational resources for gout. The content of visual images should be carefully considered when developing educational resources for gout to reinforce key educational messages and promote understanding about the condition.

REFERENCES

1. Chen-Xu M, Yokose C, Rai SK, Pillinger MH, Choi HK. Contemporary Prevalence of Gout and Hyperuricemia in the United States and Decadal Trends: The National Health and Nutrition Examination Survey, 2007–2016. Arthritis Rheumatol 2019;71:991-9.
2. Hui M, Carr A, Cameron S, Davenport G, Doherty M, Forrester H, et al. The British Society For Rheumatology guideline for the management of gout. Rheumatology 2017;56:e1-e20.
3. Khanna D, Fitzgerald JD, Khanna PP, Bae S, Singh MK, Neogi T, et al. 2012 American College of Rheumatology guidelines for management of gout. Part 1: Systematic nonpharmacologic and pharmacologic therapeutic approaches to hyperuricemia. Arthritis Care Res 2012;64:1431-46.
4. Sivera F, Andrés M, Carmona L, Kydd AS, Moi J, Seth R, et al. Multinational evidence-based recommendations for the diagnosis and management of gout: integrating systematic literature review and expert opinion of a broad panel of rheumatologists in the 3e initiative. Ann Rheum Dis 2014;73:328-35.
5. Spencer K, Carr A, Doherty M. Patient and provider barriers to effective management of gout in general practice: a qualitative study. Ann Rheum Dis 2012;71:1490-5.
6. Richette P, Doherty M, Pascual E, Barskova V, Becce F, Castañeda-Sanabria J, et al. 2016 updated EULAR evidence-based recommendations for the management of gout. Ann Rheum Dis 2017;76:29-42.
7. Rees F, Jenkins W, Doherty M. Patients with gout adhere to curative treatment if informed appropriately: proof-of-concept observational study. Ann Rheum Dis 2013;72:826-30.
8. Doherty M, Jenkins W, Richardson H, Sarmanova A, Abhishek A, Ashton D, et al. Efficacy and cost-effectiveness of nurse-led care involving education and engagement of patients and a treat-to-target urate-lowering strategy versus usual care for gout: a randomised controlled trial. Lancet 2018;392:1403-12.
9. Jimenez-Liñan LM, Edwards L, Abhishek A, Doherty M. Adequacy of Online Patient Information Resources on Gout and Potentially Curative Urate-Lowering Treatment. Arthritis Care Res 2017;69:748-52.
10. Robinson PC, Schumacher HR. A qualitative and quantitative analysis of the characteristics of gout patient education resources. Clin Rheumatol 2013;32:771-8.
11. Johnston ME, Treharne GJ, Chapman PT, Stamp LK. Patient information about gout: An international review of existing educational resources. J Rheumatol 2015;42:975-8.
12. Houts PS, Doak CC, Doak LG, Loscalzo MJ. The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. Patient Educ Couns 2006;61:173-90.
13. Williams B, Anderson AS, Barton K, McGhee J. Can theory be embedded in visual interventions to promote self-management? A proposed model and worked example. Int J Nurs Stud 2012;49:1598-609.
14. Hollands GJ, Hankins M, Marteau TM. Visual feedback of individuals' medical imaging results for changing health behaviour. Cochrane Database Syst Rev 2010:CD007434.
15. Hollands GJ, Marteau TM. The impact of using visual images of the body within a personalized health risk assessment: an experimental study. Br J Heal Psychol 2013;18:263-78.
16. Houts PS, Witmer JT, Egeth HE, Loscalzo MJ, Zabora JR. Using pictographs to enhance recall of spoken medical instructions II. Patient Educ Couns 2001;43:231-42.
17. Nguyen AD, Frensham LJ, Wong MX, Meslin SM, Martin P, Lau AY, et al. mHealth app patient testing and review of educational materials designed for self-management of gout patients: Descriptive qualitative studies. JMIR mHealth uHealth 2018;6:e182.
18. Anon. Ministry of Health. Review of health education resources on gout medication: summary of report to the Ministry of Health. Wellington: Ministry of Health. [Internet. Accessed September 2, 2020.] Available at: www.health.govt.nz/system/files/documents/publications/review-health-education-resources-on-gout-medication.pdf
19. Crystal D. English as a Global Language. New York, United States: Cambridge University Press; 2012.
20. Harrold LR, Mazor KM, Peterson D, Naz N, Firneno C, Yood RA. Patients' knowledge and beliefs concerning gout and its treatment: a population based study. BMC Musculoskelet Disord 2012;13:180.
21. Coburn BW, Bendlin KA, Sayles H, Hentzen KS, Hrdy MM, Mikuls TR. Target serum urate: do gout patients know their goal? Arthritis Care Res 2016;68:1028-35.

22. Liddle J, Roddy E, Mallen CD, Hider SL, Prinjha S, Ziebland S, et al. Mapping patients' experiences from initial symptoms to gout diagnosis: a qualitative exploration. BMJ Open 2015;5:e008323.
23. Richardson JC, Liddle J, Mallen CD, Roddy E, Prinjha S, Ziebland S, et al. "Why me? I don't fit the mould ... I am a freak of nature": A qualitative study of women's experience of gout. BMC Womens Health 2015;15:122.
24. Purcell K, Rainie L, Brenner J. Search engine use 2012. [Internet. Accessed September 2, 2020.] Available at: www.issuelab.org/resources/12470/12470.pdf