



The development of medical infographics to raise symptom awareness and promote communication to patients with cancer: A co-creation study

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ABSTRACT

Objective: The study aims to develop medical infographics that have a potential to raise symptom awareness and promote symptom communication between patients diagnosed with cancer and healthcare professionals.

Methods: This study comprised four phases: 1) development of medical infographics, 2) user testing with healthcare professionals and patients, 3) selection of specific medical infographics, and 4) interviews on these specific medical infographics with patients using the think-aloud method.

Results: Design students created 22 medical infographics conveying information about six symptoms and concerns. Patients ($n = 28$) with cancer said that the colourful infographics evoked individual emotional responses and associations, and they facilitated their narratives of experiences with symptoms. Healthcare professionals ($n = 29$) thought the infographics were eye-catching and may promote dialogue on symptoms.

Conclusions: The design of medical infographics must target a specific population. When introduced, the use of medical infographics may be influenced by the physical surroundings. Medical infographics can facilitate symptom communication by creating symptom awareness and providing patients with the vocabulary to describe their symptoms and concerns.

Innovation: Medical infographics are engaging visual messages with the potential to help prepare cancer patients to communicate their symptom experiences and reduce the feeling of being alone in experiencing certain symptoms.

1. Introduction

Chemotherapy is often the primary form of treatment for patients with cancer but may be used prior to or in combination with other treatments, such as immunotherapy, radiation therapy and surgery. Various chemotherapeutic drugs can effectively comprise part of a treatment protocol, though each drug can potentially lead to side effects, which may differ from person to person, depending on the type of cancer, its location, medicine, dose, and the patient's general health. Thus, patients experience a wide range of symptoms and concerns. Since prognosis and survival have improved in recent decades, more patients are burdened by treatment-related symptoms [1]. Patients with cancer often describe how a high symptom burden reduces their well-being and overall health-related

quality of life. Moreover, symptoms are interrelated as clusters, making it difficult to treat symptoms and reduce their severity [2,3], just as they are complex, fluctuate over the cancer trajectory and interfere with daily living.

Effective communication is vital for proper symptom management [4]. In this study, we seek to improve the dissemination of health-related knowledge to patients using infographics. Symptom communication can be inhibited for several reasons. Patients may have difficulty finding the right vocabulary to describe their symptom experiences. At the same time, various myths exist about symptoms and symptom management. Stigma among patients with cancer may also affect communication about symptoms, e.g. in terms of discussing sensitive issues like changes in one's sexuality [5]. Accordingly, not all patients can relate to certain feelings or changes as part of their symptomatology when seeking appropriate

Abbreviations: (MI), Medical infographics; (HCPs), Healthcare professionals.

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symptom management. Healthcare professionals (HCPs) often find it challenging to explain symptoms and their management simply and precisely [6]. People with language issues or limited education can have difficulty following complex explanations and therapeutic instructions [7]. Research shows that disparities exist in the assessment and treatment of symptoms [8-10]. Moreover HCP tend to overestimate patients' health literacy, hampering patients ability to comprehend the explanations and instructions provided [11]. Well-informed patients, on the other hand, are more motivated to adhere to their therapy [12]. Overall, unidentified and untreated symptoms are highly distressing for patients and their relatives and may interrupt or prevent optimal treatment of cancer.

Consequently, proper symptom management that relies on valuable symptom communication is of utmost importance. To fully ascertain and understand a patient's situation and identify appropriate symptom management, symptom communication must thoroughly be based on individual's medical history. Moreover, to achieve optimal management of symptoms collaboration between patients, relatives and specialists must involve patient-centred care that embraces the individual's needs, preferences and ability to assimilate information [13]. Hence, information and communication are key components in setting goals for a well-managed symptom strategy. Finally, the patient's ability to communicate symptoms and symptom concerns to HCPs and relatives is fundamental to symptom relief [14]. Targeted interventions are therefore needed to improve communication on symptoms between HCP and patients [4].

Infographics, a long-established way of making information more accessible and easier to understand [15], use simple wording, graphic elements, pictures and graphic symbols such as pictograms to enhance visual understanding. There is a general consensus that pictures are valuable for health communication and education [7,16]. They can enhance the patient's ability to pay attention to, understand, remember and adhere to information [7]. Although pictures are known to improve our ability to remember information [17,18], research on the use of infographics for communicating symptoms to cancer patients, more specifically, is limited [4]. We know little about pictures' informativeness and persuasiveness, and there is a lack of approaches to assess these features [16]. Assessment methods like the Perceived Visual Informativeness (PVI) have been employed to different visual health messages engaging people to understand decisions and improve health behaviors in relation to breast cancer screening [16]. Once the potential of medical infographics (MI) for cancer patients has been explored, PVI would be suitable to assess the communicative quality of MI. Preliminary findings suggest that infographics can motivate health-promoting behaviors [6,19,20], which indicates that MI can play a greater role in symptom communication than is currently the case. Information design research has explored the unique partnership between designers and clinicians in hospital settings and, based on years of collaborative work, demonstrated the benefits of collaboration [21].

1.1. Aim

We have strived to improve the dissemination of scientific and health-related knowledge to patients using infographics, as we hypothesize that the combination of pictures and text in MI can facilitate and enhance awareness of a specific symptom and communication on symptoms and concerns.

This study aimed to develop medical infographics that have a potential to raise symptom awareness and promote symptom communication between patients diagnosed with cancer and healthcare professionals to enhance the patients' ability to self-manage and react pro-actively for the benefit of their health and safety during the cancer trajectory.

2. Methods

This study involved multidisciplinary collaboration in the development of MI using posters, and a participatory design for feedback. We chose posters rather than pamphlets because posters are a good medium to catch the attention of the reader, whereas a pamphlet is better to provide more detailed information about a subject. Optimally posters should be

supported by other media such as pamphlets, motions graphics or apps to completely convey the necessary information [20].

User testing was done in stages to assess the effects of MI.

2.1. Study design

This study comprised four phases: 1) development of MI 2) user testing of MI with HCPs and patients, 3) selection of specific MI based on phase 2, and 4) interview on these specific MI with patients using the think-aloud method.

2.2. Cancer symptoms

To get a broad sense of how MI performs in creating awareness and facilitating communication, six of the most prevalent cancer-related symptoms (constipation, pain, fatigue), and concerns (nutrition, sexuality and intimacy, and sleep disturbances) were the topics to be disseminated to patients [2,3,22].

2.3. Phase 1: development of MI

First-year undergraduate design students were informed that the aim of the study was to develop MI in the form of posters to help patients understand and talk about one of the six cancer-related symptoms and concerns. Thereby MI has the potential to raise symptom awareness and encourage communication between patients and HCPs to help patients manage symptoms by reminding them of selected few key messages important to symptom management. The HCPs being oncologists, researchers and clinical nurse specialists (KP, HHG, AMJ, HP) drew up a short text comprising a maximum of 400 words for each of the six symptoms and concerns in easily understandable language with a low level of difficulty that was given to the design students [11].

The MI had to be designed for adults in an aesthetically appropriate way taking into account both patients and the hospital surroundings. The students were asked to include MI visual features such as pictograms to support the text and present the information hierarchically. Applying information design methods to organise and visualize the information effectively, the students began with what to communicate, which involved understanding the symptom, collaborating with the clinicians on the symptoms and selecting key aspects. Together they then decided what to say by using clear texts, creating familiar associations and using easily readable typography and graphics [23].

Best-practices in information design concerning the use of imagery and decorative features are often subject to debate. Some emphasise using humour and visual embellishment in infographics to attract users, for example graphic artist Nigel Holmes [24], while others favour simplicity and the absence of distracting decorations, e.g. statistician Edward Tufte [25]. Since research does not show that visual embellishment is inherently a poor choice [26], and due to the whiteness of the hospital hallways displaying the posters, the aim was to make them both eye-catching yet easily understandable and memorable [27].

There are more targeted guidelines towards health information [20,28]. Lonsdale et al. [20] for instance, have formulated easy-to-apply guidelines with visual examples of a booklet targeted at health care instructions. These guidelines match with the tutoring of the students, for instance regarding proper wording, balance between text and image, clear hierarchy, use of pictograms and friendly and positive design.

The development phase, which lasted one week, began with an introductory day, where clinical specialists and researchers from the hospital and the Royal Danish Academy gave the students a general introduction to the topic. The class was then divided into six groups, each group covering one symptom or concern and comprising about four students. Detailed lectures on the appropriate symptom and associated symptoms were given to each group. In addition to providing additional reading materials, the clinical specialists gave the name of a clinical specialist that each group could contact regarding questions about their symptom and MI. To aid in the

process of transforming the written and oral information into a visual presentation, a professional news graphics designer gave a talk on design tools and specific advice on how to select and organise the information for the poster.

The remainder of the week, which focused on sketching, comprised three stages: 1) understanding the information and underlying ideas for the visual universe, 2) transforming the written and oral information into a visual presentation, and 3) completing the artwork. Subsequently, in stage 2 clinical specialists held an online session to provide students with preliminary feedback on the direction of their visualisations.

At the end of the week, final presentations were made and involved a silent, in-person feedback session with written comments by students and instructors to test whether the MI spoke for themselves without any oral explanation. Then a second feedback session with the HCP was carried out as a design critique to discuss how to proceed with each MI.

2.4. Phase 2: user testing with patients and healthcare professionals

Since designing for patients requires knowledge and collaboration with end-users, we strived to embrace patient and HCP perspectives to gain a differentiated perspective (patients versus clinical specialists) on which MI was perceived as the most appealing and beneficial for facilitating symptom communication.

2.4.1. Patient sample

Patients were eligible if they were ≥ 18 years of age, were undergoing curative or palliative oncological treatment and were able to understand and speak Danish. We excluded patients with severe cognitive impairment, such as clinically diagnosed dementia, and patients with major psychiatric illnesses, e.g. active psychosis.

2.4.2. Recruitment procedures

Patients were recruited consecutively on a daily basis from six diagnosis-specific teams at the Department of Oncology at the University Hospital of Copenhagen, which comprises both out-patient clinics and wards. Nurses who were not part of the present study did the recruitment for user testing. A sample size was estimated to include 15–20 patients following recommendations for feasibility studies [29]. Thus, we aimed to receive feed-back from about 20 patients for each MI.

2.4.3. Poster presentation for user testing of patients

Each participant attended individually and only one session or interview. The 22 MI produced by the students were divided into 6 packages with 3 to 4 MI. Each day the clinics received a new package to do the user test. The packages were circulated for a week allowing the clinics (representing all cancer diagnosis) to carry out daily tests. To test the MI, patients were asked to simultaneously respond to a brief study-specific questionnaire (see 2.7.1 for presentation) while the interviewer presented the MI one at the time in random order.

2.4.4. Healthcare professional sample

Physicians and nurses at the Department of Oncology were invited to take part in the user testing. Hence, a convenience sampling of clinicians who attended the meetings during a five-day period were invited. The MI were hung up in a highly frequented conference room for five working days. The MI were hanging next to each other on a neutral background. The individual user test was presented at previously scheduled multidisciplinary meetings and people were asked to complete an anonymous study-specific questionnaire available in the room.

2.5. Phase 3: selection of specific medical infographics

Among the twenty-two MI produced, twelve were selected for further tested among another sample of patients. An MI was excluded if $\geq 10\%$ of either patients or HCPs felt that it would not promote dialogue (criteria

1) or if $\leq 30\%$ of either patients or HCPs felt it was highly eye-catching (criteria 2).

2.6. Phase 4: testing of specific medical infographics using the think-aloud method with patients

Phase 4 comprised individual exploratory patient interviews using the think-aloud method [30], which involved patients spontaneously sharing their thoughts while viewing an MI poster. We chose the think-aloud method to get a diversity of answers as a steppingstone for further directions rather than more formalised assessment methods like the Perceived Visual Informativeness (PVI) with yes and no answers in a 5-point scale system [16]. PVI is a construct customized to evaluate the quality of written and visual information in relation to health communication and forms a very reliable approach for the more concrete assessment of MI.

2.6.1. Sample and procedures

Participants were purposively sampled and grouped by age (18–30, 31–60, > 60). The level of health literacy was measured based on their response (never, sometimes, always) to the question: “How often do you have difficulty learning about your medical condition due to difficulties understanding written information?”. A clinical nurse specialist purposively recruited patients ($n = 15$) from each of the six diagnosis-specific teams. A specific symptom or concern category was randomly assigned to a team, e.g. five patients explored fatigue (one poster) at the outpatient clinic for breast cancer.

2.7. Data collection and analysis

For patients, we collected demographic data on age, sex, and diagnosis. For HCP, we collected demographic data on age, sex, profession and years of experience.

2.7.1. Poster exhibition for patients and healthcare professionals

Inspired by similar studies [26,28,31,32], the study-specific questionnaire was used for user testing with patients and HCPs and comprised two questions and the option to add comments. The first question was: “Which MI catches your eye first?”, and the second: “To what extent do you think the MI will promote dialogue between you and the HCP or the patient?” The answers were divided into four categories: to a very high degree, to a high degree, to a low degree, and not at all. Responses were submitted anonymously in a sealed box.

2.7.2. Think-aloud method

The goal with the think-aloud method was evaluating the real time individual interpretation of the MI. The interviewer asked the patient *what* they were thinking of, not *why*. The interviewer began by providing an example of how to think aloud before asking specific questions inspired by similar research [26], with participants only interrupted in the event of a prolonged silence [30]. The questions covered: accuracy of the interpretation (What is the MI about? What does the MI tell you? What does it communicate? Please describe the MI's underlying subject); the values exhibited (Do you think that you learn something new? What did it remind you to do? What relevant values do you see?); and symptom communication (Do you think seeing the MI motivates you to speak with a nurse or physician (or others) about the symptoms? Why?/why not?).

2.7.3. Analysis

The interviews were transcribed and a thematic analysis according to Braun and Clarke was carried out [33]. Thematic analysis comprised six phases: familiarisation with the data based on repeated.

readings, generating initial codes, searching for themes, reviewing themes, defining identified themes, and producing the report. Interview quotes were aggregated according to key categories and themes. To ensure trustworthiness and research integrity, the entire research team were involved in the analysis and discussions.

2.7.4. Ethical considerations

This was a quality development study conducted in accordance with the General Data Protection Regulation and approved by the Department of Oncology management.

3. Results

3.1. Phase 1: development of twenty-two medical infographics

Twenty-two design students created each one MI conveying information about six different cancer symptoms and concerns. (Table A1) Each poster approached the use of visual features differently, e.g. type of picture, composition, shape, colour, texture, contrasts, point of view and typography. The MI used a variety of visual features ranging from hand-drawn illustrations, manipulated photographs, abstract forms and concrete pictures to few or many colours, pictures of people, objects or food, shadows, flat graphics, or perspective to create a sense of depth. The result was a broad variety of aesthetics, graphic styles, and ideas for approaching symptom communication through MI.

The silent feedback session with the students resulted in digital post-it notes with a variety of positive comments, critique, and hands-on recommendations. The evaluation process involving HCP produced several valuable discussions on how to communicate with patients using visual features and the simplification of information and subject matter. On top being visual communicators, the design students are trained to be curious and ask questions about everything, (content, context etc), for as a famous saying claims: you cannot visualize content without understanding it. The HCP, on the other hand, are experts on the symptoms and the cancer trajectory, and thereby have a deep understanding, but may be blinded to visual communication.

3.2. Phase 2: user test results with patients and healthcare professionals

Patients representing the six diagnostic teams rated the MI for each of the following symptoms and concerns: constipation ($n = 21$), nutrition ($n = 22$), pain ($n = 20$), sexuality and Intimacy, ($n = 20$), fatigue ($n = 21$), and sleep disturbances ($n = 23$). Patients had various cancer diseases (lung, breast, head and neck, and gastrointestinal). Patients ($n = 17$ females, $n = 11$ males) were < 35 ($n = 3$), 35–50 ($n = 6$), and > 50 ($n = 19$) years of age.

Patients said the most eye-catching MI were: constipation (CMI1: 48%), nutrition (NMI2 and NMI4: both 41%), pain (PMI1: 40%), sexuality and intimacy (SMI3: 45%), fatigue (FMI2: 38%), and sleep disturbances (SDMI4: 57%). They also said that the MI that would promote dialogue with HCPs to a very high or high extent were: constipation (CMI1: 48%), nutrition (NMI2: 45%), pain (PMI4: 50%), sexuality and Intimacy (SMI1 and SMI3: both 40%), fatigue (FMI2: 39%), and sleep disturbances (SDMI4: 48%) (Supplementary Material, Table A1). For an English version of PMI4 see Supplementary Material, Fig. B1.

A five-day user test among HCP had twenty-nine individual respondents ($n = 22$ females, $n = 7$ males) with <5 ($n = 8$), 5–10 ($n = 5$) and > 10 ($n = 16$) years of experience, aged <35 years ($n = 6$), 35–50 ($n = 10$) and > 50 years ($n = 13$). HCPs rated the following MI as the most eye catching: constipation (CMI3: 67%), nutrition (NMI2: 53%), pain (PMI4: 41%), sexuality and intimacy (SMI4: 55%), fatigue (FMI2: 44%), and sleep disturbances (SDMI2: 53%). They also said that the following MI may promote dialogue between HCPs and patients to a very high or high extent: constipation (CMI1: 62%), nutrition (NMI2: 68%), pain (PMI4: 50%), sexuality and intimacy (SDMI3: 80%), fatigue (FMI2: 71%), and sleep disturbances (SDMI2: 74%).

3.3. Phase 3: selection of specific medical infographics

The research team reviewed twenty-two MI, ten of which were excluded as they did not meet criteria 1 and 2 (Supplementary Material, Table A1). The remaining twelve MI were then further explored in phase 3 (Fig. B 1) and distributed across symptoms or concerns as follows: one

MI on fatigue, two each for constipation, nutrition, pain (two MI) and sleep disturbances, and three on sexuality and intimacy.

3.4. Phase 4: testing of specific medical infographics using the think-aloud method with patients

All the patients who were approached agreed to participate. The think-aloud method was used to discuss each of the 12 MI among 2–3 patients with a research assistant (author MDS). Interviews ($n = 34$) lasted 7–10 min (8 on average). The patients were grouped by age: 31–60 ($n = 11$) and > 60 ($n = 4$). Their level of health literacy indicated that they sometimes had difficulty understanding written information (never ($n = 7$), sometimes ($n = 8$), or always ($n = 0$)).

Three main themes were identified I) visual impression and individual interpretation, with two subthemes: i) colour creates emotions and associations and ii) pictures and graphics facilitate narratives and interpretation; II) MI must be designed to target a specific population, with two subthemes: i) ability to relate to the symptom increases awareness and ii) influence of the context; and III) effect of MI on communication and information, with two sub themes: i) you are not alone and ii) MI acts as a heads up. Table B1 presents patient quotes for each theme.

4. Discussion and conclusion

4.1. Discussion

In general, the results of the participatory design of the MI posters indicate that MI can have a positive effect on symptom communication. The aesthetics, graphic styles and ideas in the MI vary widely, making it impossible to pinpoint one as predominant, but this diversity does not hinder patients from generally having a positive attitude towards using MI for symptom communication. This supports our hypothesis that MI can positively affect specific symptom awareness in patients and their ability to express their symptom experience. When it comes to the development of MI for cancer patients specifically, this study points to the impact of interdisciplinary collaboration, patient involvement and considering patients' emotions. Our study confirms the importance of close collaboration between HCPs, patients, and designers [6] which in this case proved to produce fruitful results that were impossible to predict beforehand.

Even though HCP selected the information featured in each MI, some of the design students challenged the information and adjusted or rewrote the texts, indicating that their perspectives can differ on what to include and how. Since HCPs have medical expertise on the information, the main role of the designer, in this context, is to ensure that the information meets patient needs, as patients with cancer vary greatly demographically. Hence additional iterations would be useful for achieving more desirable results for each symptom or concern and should ideally involve close collaboration between HCPs, designers, and patients, in addition to the testing and refinement of the results. Patients most accurately interpret simple line graphs compared to simple bar charts or more complex graphs [34,35], and professionals prefer line graphs for presenting change over time [36]. Consequently, it may be appropriate to adapt the presentation of, e.g. patient-reported outcomes to individual preferences, which could be done when administering them and presenting them to patients and HCP electronically [37]. Nevertheless, the discussions between designers and HCPs, and between HCPs and patients, in the present study represent important initial steps towards co-developing and evaluating the MI [38]. The interviews indicate that including patients early in the design process is beneficial to ensuring that the specific outcome meets their needs. Participatory design in the development of infographics or other types of visualisations can address this gap, which may be particularly important for symptoms, as they are inherently affected by patient perceptions [4]. The key themes identified using the think-aloud method confirm the importance of tailoring the information and visuals to the needs of patients with cancer within their specific context and environment. They also suggest that MI can help prepare patients with cancer in terms of their symptoms

and concerns, as well as reduce the feeling of being alone in experiencing their symptoms.

Best practices of MI recommend a friendly and calm design using realistic illustrations with a positive tone [20]. This fits well with the results of our study, that indicates that it is particularly important to consider how the design, i.e. the graphics, images and text in chorus respond to cancer patients' emotions. One of our objectives was to draw patients to the information using an eye-catching design and memorable, aesthetically pleasing MI that evoke emotions. Patient responses were as diverse as the MI. Understandably, patients with cancer are in a different emotional state than HCPs (and people in good health). For instance, HCPs often liked the MI showing a lilac balloon symbolising the intestine, while some patients said the image and colour made them feel sicker. This indicates that it is important to study the emotions that MI may evoke in the patients, as well as the patients' emotional state in a specific context.

It is important to realise that first-year undergraduates with limited experience in this specific field of design produced the MI. Furthermore, they were presented with a challenging task, i.e. understanding and visualising a difficult subject within a brief time. From a design perspective, the infographic level of the MI was low because picture and text were not always well integrated. The MI were often stronger metaphorically and had more eye-catching illustrations than infographics in general. Although the students were successful, their designs should be perceived as an early prototype that, given more time, experienced information designers can further build on to attain a greater level of quality.

A limitation is the small sample size and further work should evaluate comprehension and validate this protocol on a larger scale seeking to include a broader variety of participant responses, particularly ones in which comprehension and health literacy is poor.

In a future study, with more developed and tailored MI where the purpose would be to assess the quality of the visual information, as well as the key features at stake for cancer patients specifically, PVI could be refined to be employed on cancer patients. This would also add to the refinement of the PVI construct as King et al., 2014 [16] focused on highly educated women as participants.

To increase the trustworthiness of this study and its processes, researcher triangulation was applied in all steps. The inclusion of patient statements and a solid description of the process increased the transparency of the study findings. Our study has inference transferability (external validity), which refers to whether the findings have applicability in other contexts, since our findings could be applied to patients with cancer in other settings in a similar culture. However, further exploration is required of how the visuals meet the emotional state of the patients, the effectiveness of the level of information, and the clarity of the visual information, in addition to the medium of presentation according to environment, context, and patient journey.

4.2. Innovation

Our findings show that an improved understanding of how MI have a potential for strengthen symptom awareness and communication between patients and HCP is an essential foundation for improved symptom management. Testing infographics has positive prospects in various areas, for example treatment modalities such as chemotherapy, immunotherapy, and radiotherapy. Our findings on MI demonstrate the potential of further

testing and implementation in a wider hospital and institutional context where symptom communication and symptom management are central to the well-being of patients and their symptom experience.

5. Conclusion

As patients with cancer experience a variety of symptoms and concerns that result in reduced quality of life effective symptom communication tailored to the patient's needs is crucial. This co-creation study between designers and HCP suggests that MI can improve symptom communication by raising symptom awareness and providing patients with a language to better articulate their symptoms. The twelve created MI contained key aspects to consider when tailoring MI to patients with cancer: visual impression and interpretation; how and where the message is presented; and balancing the amount of information. We suggest that future studies also explore whether MI is beneficial to patient self-efficacy regarding improved symptom management.

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Competing interests statement

The authors have no competing interests to declare.

Contributorship statement

KP, PP, HHG, TK and HP designed the study, including the data collection instruments together with MDS. HHG, AJE, KP, HP and MDS recruited and consented participants. HHG and MSD conducted interviews and verified transcripts. MDS, HHG and KP conducted the main coding and data analysis. HP, AJE, ABS, TK and HP conducted the coding verification. KP and PP drafted the manuscript, and MDS, HP, AJE, ABS, TK and HP reviewed the manuscript and revised it for critical content. All authors commented on subsequent versions, as well as read and approved the final manuscript.

Data availability

The entire datasets underlying this article cannot be shared to protect the privacy of individuals that participated in the study, as they could be identifiable from the qualitative interview transcripts generated in this research. However, selected data underlying this article are available in the article and in its online supplementary material.

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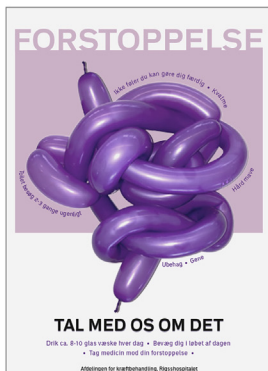
Appendix A. Appendix
Fig. A1 User-selected medical infographics.

Constipation

CMI1



CMI3



Nutrition

NMI2

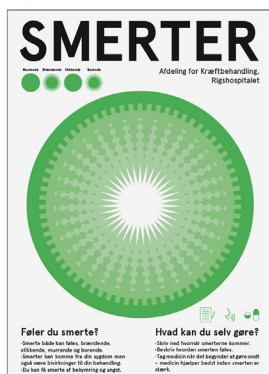


NMI4



Pain

PMI1



PMI4



Sleep disturbance

SDMI2



SDMI4



Sexuality & intimacy

SMI1



SMI2



SMI3



Fatigue

FMI2

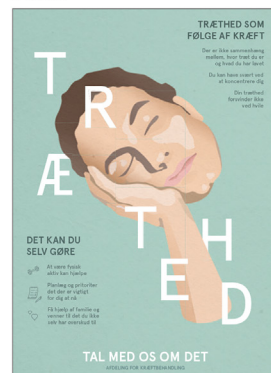


Table A1
The Research Process.

1. Development of MI	2. User testing of 22 MI	3. Selection of MI	4. Interviews of 12 MI
Participants 22 first year graduate design students	Participants 29 healthcare professionals	Participants 28 patients from six diagnose-specific teams (1–6)	Participants 15 patients from the Department of Oncology
Method Sketching (understanding, transforming and completing the artwork), lectures, reading materials and online sessions with clinician specialists, feedback and presentations	Method A five-day exhibition inclusive an anonymous study questionnaire for each of the 22 MI posters	Method Rotating poster presentation. Patients were asked to simultaneously respond to a brief study questionnaire while looking at the MI (3–4 posters) hanging next to each other	Method Among the 22 MI produced 12 were selected for further testing among another sample of patient. The posters were selected on the basis of criteria 1 and 2
Setting At the Danish Royal Academy and online sessions.	Setting Highly frequented conference room	Setting Wards and rooms for conversation	Setting Wards, rooms for conversation or in discrete waiting areas
Recruitment Part of a course at the Danish Royal Academy	Recruitment Presented for HCP at scheduled multidisciplinary meetings	Recruitment Nurses from each diagnose-specific team (1–6) who were not a part of the study	Recruitment Clinical nurse specialists recruited patients from each of the six diagnose-specific teams (1–6)
Result 22 MI posters of the most prevalent cancer symptoms (constipation, pain, fatigue) and concerns (nutrition, sexuality and intimacy, sleep disturbances)	Result 29 responses for each of the 22 MI posters	Result 28 responses for each of the 22 MI posters	Result 12 MI posters 34 interviews based on the 12 MI posters selected in phase 3

MI: Medical infographics.

1: Breast Cancer.

2: Lung cancer/Head and neck tumours.

3: Gastrointestinal (GI) tumours, both upper and lower GI-tumours.

4: Gynaecological tumours.

5: Urological tumours including testicular cancer/Rare tumours including adrenocortical carcinoma and thymoma/thymic carcinoma.

6: Radiation treatment.

Table B1
Patient perspective on medical infographics.

Theme	Subthemes	Patient quotes
I Visual impression and individual interpretation	i Colour creates emotions and associations	I think the colours are beautiful. Purple is an emotional colour. The intestines are very sensitive too. If your intestines don't work, then you are feeling really bad. (P3; CMI3) I think it's the colours that give me these thoughts. I think so because the colours aren't dark; they're happy. I even have a garden with colours everywhere. So, what is it asking? To get started on a new life. To think differently. (P13; SMI1)
	ii Pictures and graphics facilitate narratives and interpretation	I don't know if I should interpret this as immense pain [pointing]. I would probably interpret it ... Hmm, I'm trying to analyse what I'm seeing. I find the green one confusing. I can't figure out where the symbols are or how to position myself. (P4; PM11) I don't know if it's supposed to look like a butterfly, but it's a drawing of something bright and good in the future. Out in the clouds. So, you don't have to be so sad – it's over, you have to move on in life. (P13; SMI1)
II MI must be designed to target a specific population	i Ability to relate to the symptom increases awareness	It would encourage [having a dialogue]. Yes, absolutely. That's it - you have to be open; you have to talk about it, and that's not nonsense. You may want to acknowledge what makes you nervous and may cause pain. You must tell the doctor and the nurses. You need to open up. That's actually the most important thing ... Then there's no shame in starting to ask the doctor about something like that. (P6; PM14) I think it lacks more liquid nutrition options. At least with my situation, it's more realistic if there's something like soup or something easier to eat. (P15; NMI2)
	ii Influence of the context	There's nothing wrong with the amount of text and images, but like I said, if you're sitting in a waiting room and just waiting, it might make sense [with so much text]. But if you quickly walk past, I think it has to be visually strong. (P7; SMI2) When you have cancer, you might have a hard time concentrating on something that's smaller. And sometimes you can't read at all during that time. But if you have to stand up to read more, you won't get the message, I think. (P3; NMI4)
III Effect of MI on communication and information	i You are not alone	If you walk by and think: am I the only one? Then it might become easier to put into words, that these two things are also connected. (P7; SMI2) I think that for people who are quite shy you probably wouldn't talk about body changes because you have a deadly disease, and now they [HCP] do everything for you and then you can't say it. Then it's very important that you talk to your partner about it, not shut it in, or just a good friend or the kids, if they're adults. (P6; SMI2)
	ii MI acts as a heads up	I think this poster is nice. You'll be prepared to be asked the questions when you're with a nurse or a doctor. That's

(continued on next page)

Table B1 (continued)

Theme	Subthemes	Patient quotes
		<p>why I think, well, it might make sense to display a poster like this. You really get a heads up that you might just be the one who is asked about those things. I think it's fine. (P11; SM11)</p> <p>I think the worst thing about posters is that you try to communicate too much and then you end up obscuring the message. If this is the poster, then this is [text on what you can do yourself] the message that should be given either when talking with the nurse or in a brief leaflet, flyer or postcard. If it triggers some thoughts, it would be nice to be able to have something to keep. (P7; PMI4)</p>

Abbreviations: C = Constipation; HCP = Healthcare professional; MI = Medical infographics; N = Nutrition; P = Patient; PMI = Pain medical infographics; S = Sexuality and intimacy.

Appendix B. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pecinn.2023.100146>.

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