



Didactical characteristics of Dutch websites about kidney transplantation targeted for kidney patients and living donors: An exploratory study

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ABSTRACT

Objective: The aim was to explore the origin, content topics, teaching modes (instruction, interaction, and assessment), and corresponding social-epistemological dimensions (choices in knowledge transfer vs. knowledge building, and individual vs. group learning) of web-based information on kidney transplantation targeted for patients and living donors. **Methods:** Dutch websites on kidney transplantation were retrieved using the search engine *Google.nl*. From 24 websites, 250 webpages were examined on origin, content topics, teaching modes, and corresponding social-epistemological dimensions.

Results: The majority of the websites had a professional organization as origin (20/24). The number and distribution of content topics varied among the websites. Of the 16 different teaching modes found, 11 were instructional, 4 were interactive, and 1 assessment mode was found. The websites offered almost exclusively teaching modes on individual and passive learning, whereas group learning and interactive knowledge building was hardly encountered.

Conclusion: The diversity in teaching modes and social-epistemological dimensions of Dutch websites on kidney transplantation targeted for patients and living donors is limited. The websites only provided a partial view on kidney transplantation; information regarding contact with others, e.g. support, was limited. A more balanced availability of teaching approaches and content topics is desirable to fit with the didactical goals to make well-considered health decisions.

1. Introduction

The Internet is a popular information resource, since it is available at seeker's own convenience: around the clock [1], independent of location [2], and anonymous [1,3]. Worldwide, the Internet is often used as complementary resource for health-related information [4-7]. As an example, previous studies demonstrated that, in the last decade, 59% of American, 33% of Chinese, and 75% of Dutch adults searched online for health-related information at least once per year [5-7]. Also a majority of kidney (transplant) patients search the Internet regularly to acquire information about e.g. their disease, treatment, and lifestyle [8].

Although kidney (transplant) patients often use the Internet as resource to obtain disease and treatment related information, health literacy among these patients still seems to be limited [9]. Health literacy is generally described as to which degree someone can make appropriate health decisions by accessing, processing, and understanding of health-related information [10]. Health literacy has been focussed around traditional sources of information (e.g. leaflets), whereas, with the addition of

electronic sources, the theoretical framework eHealth literacy has been created [11]. Both patient's eHealth and health literacy influence indirectly, among other things, patient's disease management (e.g. medication adherence) [12-14]. According to the Lily Model by Norman & Skinner (2006), patient's eHealth literacy is influenced by six literacy skills which can be organized within two components: a component focussing on patient's analytical skills, which include traditional, media, and information literacy, and a component focussing on context-specific skills, which include computer, scientific and health literacy [11]. Examples of these six literacy skills are e.g. patient's Internet use, reading skill and language, health beliefs, self-efficacy, participation in decision making, critical evaluation of online information, and motivation [11,15-17]. To the best of our knowledge, kidney transplant patients' eHealth literacy level has not been investigated yet.

As the characteristics of the term health literacy suggest (appropriate accessing, processing, and understanding of health information), the offered online health information should reflect these characteristics [10,11,18]. Therefore, for appropriate (e)health literacy, the offered online health

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information should be accessible, credible, reliable, and accurate to contribute to patient's understanding of this information [16,19-21]. The way online information is presented is called teaching mode. Various teaching modes can be used for instruction, interaction and assessment purposes [22]. Teaching modes that are aimed at passively transferring mainly factual information to the user (e.g. via text, video) are called objectivistic modes. Constructivist modes, on the other hand, follow 'an approach to learning that holds that people actively construct or make their own knowledge and that reality is determined by the experiences of the learner' (Elliott et al. 2000, p.256), and promote knowledge building, problem-solving thinking, and interaction of the user with the content (e.g. via quizzes and discussion forums) [23-25]. Constructivist learning stimulates more actively processing and personalizing of information compared to objectivist learning, resulting in more in-depth understanding and embedding of the information [24-27]. Besides this so-called epistemological dimension (objectivist and constructivist approaches), it is also of importance whether teaching modes are focused on individual or group learning (social dimension) [28]. Learning both individually and collaboratively favours knowledge constructing compared to only individual learning. In addition, difficulty of the content can direct towards group learning [29]. Arbaugh and Benbunan-Fich developed a Teaching Approach Framework that typifies four possible combinations of these social and epistemological approaches: Objectivist-Individual, Objectivist-Group, Constructivist-Individual, and Constructivist-Group (Fig. 1) [28].

Previous studies already investigated modalities to deliver online health information. However, the classification of these modalities was limited to verbal, visual and audio-visual modes [30]. To the best of our knowledge, the classification of teaching modes available on health-related websites as instruction, interaction, or assessment, and the categorization of these teaching modes into a social and an epistemological dimension was not performed before. Therefore, the aim of the current qualitative study was to give an impression of the didactical characteristics of Dutch websites about kidney transplantation targeted for patients and living donors. Didactical characteristics are the practical implications of teaching and learning methods, and thus the instructional, interactional and assessing functions of informational websites. The aim of this study was to get an impression of: 1) the origin of Dutch websites on kidney transplantation targeted for patients and living donors (e.g. the distributor of the information); 2) the content topics these websites discuss; 3) the available instruction, interaction and assessment teaching modes on websites on kidney transplantation targeted for patients and living donors; and 4) the corresponding social-epistemological dimensions. The practical implications derived from this study can be used to improve the available online kidney transplant education for patients and living donors.

2. Methods

Websites on kidney transplantation were identified by using the most popular search engine in the Netherlands: www.google.nl [31]. To get a clearer picture of potential relevant available websites on kidney

		Epistemological dimension	
		Objectivist	Constructivist
Social dimension	Individual	Objectivist - Individual	Constructivist - Individual
	Group	Objectivist - Group	Constructivist - Group

Fig. 1. Teaching Approach Framework of Arbaugh and Benbunan-Fich (2006), containing the four combinations of social and epistemological dimensions: Objectivist-Individual, Objectivist-Group, Constructivist-Individual, and Constructivist-Group [28].

transplantation targeted for patients and living donors in a broad manner, the general key term "niertransplantatie" (direct translation of kidney transplantation) was used. To obtain clean and objective search results, researcher's browsing history, cookies, saved site and plug-in data, cached data and files, download history, data from hosted apps, saved autofill form data, and saved passwords and login codes were deleted. Additionally, researcher's Google account, pre-rendering and location sharing were turned off and Google Chrome Incognito web browser was used. Websites were obtained on 15th October 2019, from a Dutch IP-address.

Since previous comparable studies show that it is unlikely that people read beyond the first 50 search results from search engines [32,33], the top 50 uniform resource locators (URLs) were included for detailed examination (Fig. 2). Google advertisements and front page news were not counted, but noted separately. We excluded: 1) duplicated websites; 2) URLs no longer available; 3) URLs under construction; 4) written language other than Dutch; 5) content not related to kidney transplantation; 6) charges for content; 7) websites that has no search function. Additionally, similar to methods of Yeung et al. (2015), selected URLs that did not objectively inform patients and/or living donors about kidney transplantation were not further examined (e.g. news articles, advertising webpages with goal to sell products to patients, blogs, discussion forums, scientific articles, resources for clinicians) [34].

For each included website, the separate webpages related to kidney transplantation were identified by using the key term "niertransplantatie" (direct translation of "kidney transplantation") in the website search function. Exclusion criteria for webpage selection were the same as for the previously described website selection. From a total number of 1071 webpages within the 24 selected websites, 250 webpages were included in the study. The selected webpages of each website were examined on origin, discussed content topics, available teaching modes, and corresponding social-epistemological dimensions, following methods similar to Van Klaveren et al. (2020) and Hendriks et al. (2019), as described below [35,36].

Three randomly selected websites (with a total number of 76 webpages of which 12 included and 64 excluded) were individually examined by two authors on origin, discussed content topics, available teaching modes, and corresponding social-epistemological dimensions (template analysis). Every inconsistency between both authors was discussed extensively and calibrated until complete conformity between the authors was reached. When needed a third researcher was consulted. As an example of a tackled inconsistency: when multiple links on a single webpage refer to the same external URL, we counted these links only once. Then, the first author re-examined these three websites and the remaining websites. A calibration diary was maintained during examination, and the second author was consulted when uncertainty arose.

All websites were classified based on origin, namely professional organizations, such as hospitals; support groups, such as patient associations; governments, such as the Ministry of Health; individual practices, such as personal websites; or commercial organizations, such as independent dietitians. The website was labelled as "other" if the organizational source of a website did not match any of these categories. The classification of organizational sources was based on a study by Childs (2004) [37].

Each webpage was classified based on available content topics and teaching modes. Prior to data collection, three nephrologists, who do daily consultations with kidney transplant patients, iteratively predetermined a template consisting of five overarching topics to classify immediately available content on each webpage. The three nephrologists discussed the overarching content topics and accessory topics extensively and calibrated until complete conformity between the nephrologists was reached. The final overarching topics were 1) cause of and treatment options for kidney patients; 2) kidney transplant options and preparatory examination; 3) operation and hospital stay; 4) life after transplantation, including life style, complications and medication; 5) contact with others like fellow patients, caretakers and relatives. For inclusion, the main target audience of a website had to be patients and/or (living) donors. However, we did not mapped whether each content topic was focused on kidney transplant patients or (living) donors. Webpages reporting more than a

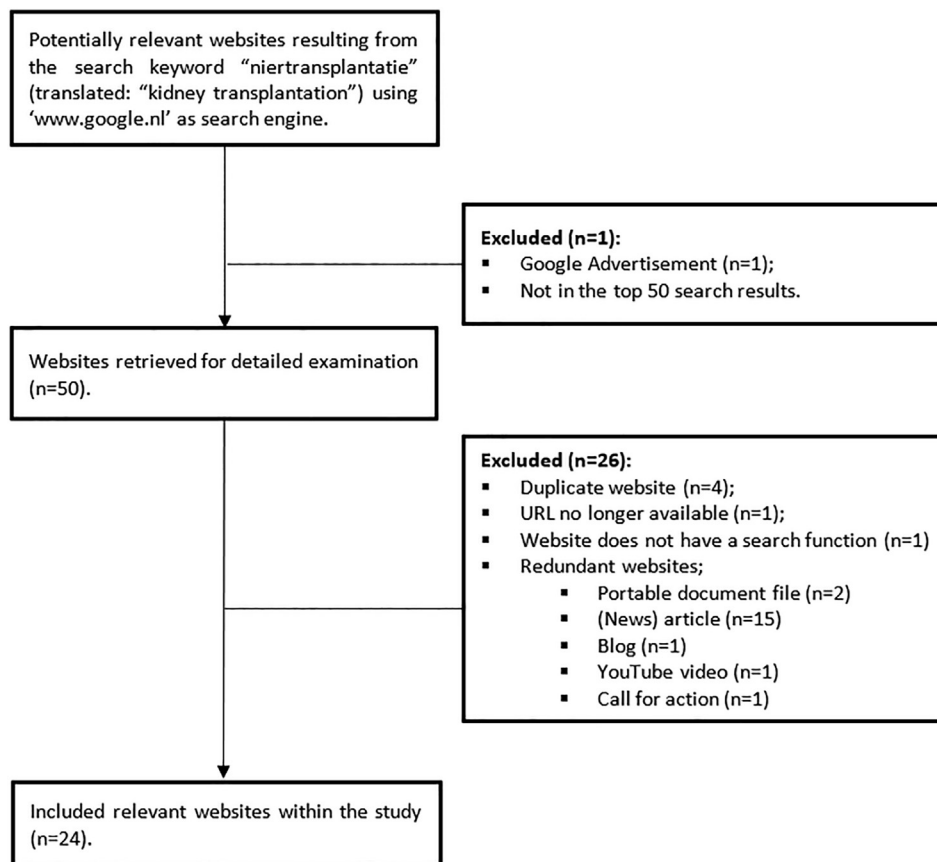


Fig. 2. Website exclusion flowchart.

single topic were classified into multiple topics. The available teaching modes on each webpage were classified as instruction, interaction, or assessment, based on the studies of Toven-Lindsey et al. (2015) and Hendriks et al. (2019) [22,36]. Teaching modes that were not predetermined were categorized individually by two authors, followed by discussion and calibration until agreement was reached.

After data collection was completed, the Teaching Approach Framework described in 2006 by Arbaugh and Benbunan-Fich was used to categorize the identified teaching modes into a social and an epistemological dimension: objectivist-individual; objectivist-group; constructivist-individual; and constructivist-group (Fig. 1) [28]. Previously implemented categorizations by Toven-Lindsey et al. (2015) and Hendriks et al. (2019) were taken into account [22,36]. However, in contrast to these studies, links to external web-based resources were categorized as objectivist-individual instead of constructivist-individual because external links available on websites transmit knowledge and do not actively build knowledge as designed for massive open online courses (MOOCs), which was the context of the prior studies. Newly found teaching modes were categorized into a social and an epistemological dimension individually by two authors and discussed and calibrated until concurrence was reached.

To get an impression of the didactical characteristics of Dutch websites about kidney transplantation, the origin, available content topics, teaching modes, and social-epistemological dimensions were summed (n, %).

3. Results

A total of 24 websites, which included a total of 250 relevant webpages, were analysed. The origin of 20 (83.3%) websites was a professional organization (e.g. hospitals), 3 (12.5%) websites had a support group as origin, and 1 (4.2%) website (<http://www.wikipedia.nl/>) did not match with any of the predetermined categories and was therefore classified as 'other'.

As shown in Table 1A-C, 250 different webpages divided over 24 websites were included. The number of listed content topics varied among the websites (Fig. 3). A total of 9 out of 24 websites (37.5%) discussed all 5 topics. The topic 'kidney transplant options and preparatory examination' was found on all 24 websites. The mostly discussed topic on the total of 250 webpages was 'life after kidney transplantation' (118 webpages, 47.2%) followed by 'cause and treatment options for kidney patients' (105 webpages, 42.0%), 'kidney transplant options and preparatory examination' (88 webpages, 35.2%), 'contact with others' (50 webpages, 20.0%) and 'operation and hospital stay' (39 webpages, 15.6%). Most of the included webpages did cover more information than the five predetermined topics. However, that information was not part of this study.

As shown in Table 1A-C, we found a total of 16 different teaching modes.

Of these, 11 modes (68.8%) were instructional (Table 1A). Text was offered on all 24 investigated websites. Recorded traditional lectures, videos of an instructor talking to the camera, logbook applications for self-measurements (e.g. blood pressure, weight), and whiteboard drawings with voice over were all found on only a single website. Logbook applications for self-measurements, text-to-speech functions, and documentaries were not previously described and categorized as teaching modes before in literature.

As shown in Table 1B, of the total of 16 different identified teaching modes, 4 modes (25%) were interactional. On a single website, 25 discussion boards for dialogue and an one-to-one chat for interpatient contact were offered. A total of 10 comment boxes which serve as open platform for both question and answer sessions (Q&A) and discussion were found on 2 websites. As shown in Table 1B, 4 question submission forms for Q&A with health professionals were available on 1 website. These latter three different interaction modes were not previously described as interaction modes and categorized in social-epistemological dimensions before in literature.

Table 1

Numbers of available teaching modes classified per website as A) instruction, B) interaction or C) assessment.

A. Instruction modes												
Website number	Number of webpages	Text	Recorded traditional lecture	Link to external online resources	Video of instructor talking to camera	Animation	Illustration or simulation	Whiteboard drawings with voice over	Digital textbook	Documentary	Logbook application	Text-to-speech
1	1	1		5			1					
2	5	5	1	12	1	1			4			
3	80	80		289		3	9		26	3		
4	13	13		19			5					
5	25	25		69			8		1	20		
6	25	17		50			7	1	11			18
7	7	4		14			1		6			
8	5	5		12					6			
9	4	4		13			1					4
10	21	21		38			10		6	1		20
11	5	4		10			4		16			
12	2	2		1								
13	4	4		24								
14	6	4		27			3		29	2		6
15	1	1		16			1			2		
16	5	5		7					2			
17	3	3		15					18	1		3
18	13	2		5			12		11	1	2	1
19	4	4		35		1	2					
20	7	7		72					1			
21	8	8		2			8					
22	3	2		1					3			
23	2	2		12					9	1		
24	1	1					1					
Total	250	224	1	748	1	5	73	1	149	31	2	52
B. Interaction modes												
Website number	Number of webpages	Comment box	Question submission form	Discussion board for dialogue	One-on-one chat							
1	1											
2	5											
3	80			25	1							
4	13											
5	25											
6	25											
7	7											
8	5											
9	4											
10	21	8	4									
11	5											
12	2											
13	4											
14	6	2										
15	1											
16	5											
17	3											
18	13											
19	4											
20	7											
21	8											
22	3											
23	2											
24	1											
Total	250	10	4	25	1							
C. Assessment modes												
Website number	Number of webpages	Open ended question with long answer										
1	1											
2	5											
3	80											
4	13											
5	25											
6	25											
7	7											
8	5											
9	4											
10	21											
11	5											
12	2											
13	4											

Table 1 (continued)

C. Assessment modes		
Website number	Number of webpages	Open ended question with long answer
14	6	
15	1	
16	5	
17	3	
18	13	4
19	4	
20	7	
21	8	
22	3	
23	2	
24	1	
Total	250	4

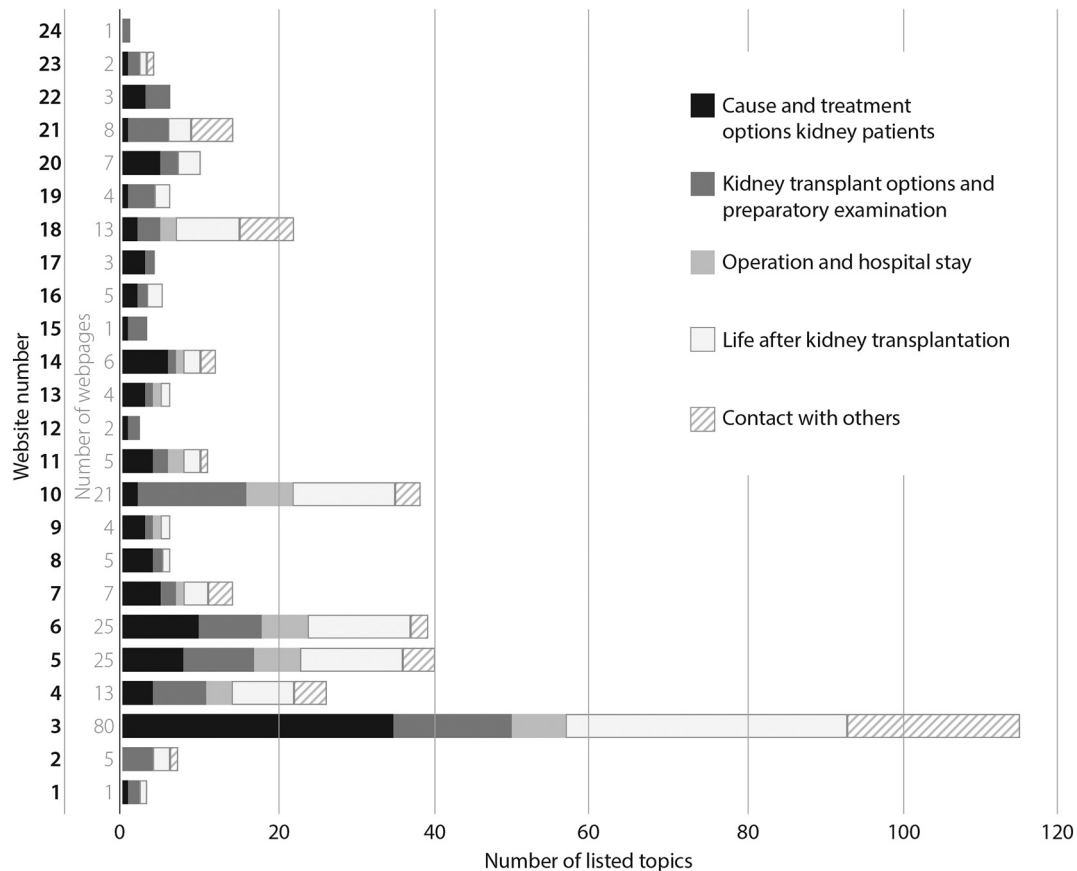


Fig. 3. Number of listed content topics per websites, classified as ‘cause and treatment options for kidney patients’, ‘kidney transplant options and preparatory examination’, ‘operation and hospital stay’, ‘life after kidney transplantation’, and ‘contact with others’.

As shown in Table 1C, of the total of 16 different teaching modes, only one type of assessment mode (6.3%) was observed: 4 open ended questions for longer answers focusing on self-reflection, and self-assessment were available on a single website.

Overall, a small diversity of available teaching modes was found between all websites: 96.7% of all available teaching modes were categorized as instructional (data not shown).

The available teaching modes were categorized into social-epistemological dimensions according to the Teaching Approach Framework of Arbaugh and Benbunan-Fich [28]. As shown in Fig. 4, of the total of 16 different offered teaching modes on the 24 websites, 10 modes (62.5%) were objectivist-individual, 3 (18.8%) were constructivist-individual, and 3 (18.8%) were constructivist-group. None of the offered teaching modes were objectivist-group.

Of the found teaching modes ($N = 16$), 6 (37.5%) were not previously classified into social-epistemological dimensions by Arbaugh and

Benbunan-Fich (2006), Toven-Lindsey et al. (2015), and Hendriks et al. (2019) [22,28,36]. The newly found teaching modes include documentaries, text-to-speech function, logbook applications for self-measurements, comment boxes, one-on-one chats, and question submission forms. Along with the predetermined teaching modes [22,36], documentaries, text-to-speech, and logbook applications for self-measurements were categorized as objectivist-individual, comment boxes and one-on-one chats were classified as constructivist-group, and question submission forms were labelled as constructivist-individual.

4. Discussion and conclusion

4.1. Discussion

Our study gives an impression of the variety of the available teaching modes and corresponding social-epistemological dimensions of Dutch

		Epistemological dimension	
		Objectivist	Constructivist
Social dimension	Individual	Text Recorded traditional lecture Link to external online resource Video of instructor talking to camera Animation Illustration or simulation White board images with voice over Digital textbook	Logbook application Question submission form Open ended question with long answer
	Group		Comment box Discussion box for dialogue One-on-one chat

Fig. 4. Categorization of teaching modes ($N = 16$) into social-epistemological dimensions according to the Teaching Approach Framework of Arbaugh and Benbunan-Fich [28].

websites on kidney transplantation targeted for patients and living donors. This variety is limited, and mostly focused on objectivistic and individual learning. In addition, we found that of most websites the origin is a professional organization, and most websites mainly discussed information on 'life after a kidney transplantation' and 'cause of and treatment options for kidney patients'.

In our study, a limited variety of available teaching modes was observed. Most modes found were instructional, mainly text and links to external webpages. Only some interaction modes were encountered, mainly discussion boards for dialogue and comment boxes at the end of webpages. Some webpages offered substantively the same information via multiple teaching modes, e.g. via written text and text-to-speech, or via written text and video, which can help consolidate information [38]. More importantly, assessment modes were scarce. Only a single website provided open ended questions for long answers, although it is known that frequent assessment of what was learned will help the learner to consolidate new knowledge. Therefore we can state that the limited variety of teaching modes we investigated did not contribute to a desirable learning effect to set patients up for successful disease management. To increase a learning effect, adding assessment modes to online resources will help patients by evaluating their knowledge and by providing insight into their personal goals [22,39]. Examples of assessment modes which could be incorporated are quizzes and teach-back methods whereby patients have to rephrase the offered health information in their own words [15].

Regarding social-epistemological dimensions, the included websites in this study offered almost exclusively objectivist teaching modes, whereas constructivist teaching modes were hardly encountered. All 24 websites offered objectivist-individual teaching modes, whereas constructivist-individual as well as constructivist-group teaching modes were only available on 3 websites. Individual-oriented teaching modes (mainly text and links to external webpages) were mostly found, with a minimum of 75% and a maximum of 100% per website. From the literature it is known that actively combining and constructing information during constructivist learning (e.g. via discussion forums) results in better understanding and embedding of information, compared to passively receiving information during objectivist learning (e.g. via text) [24-27]. Constructivist learning, such as reflecting on symptoms and therapeutic actions, is essential to maintain behavioural change [40]. Additionally, patients who learn both individually and collaboratively can construct knowledge about their personal health status better compared to learners who only learn individually

[29]. Now that shared decision making is the norm in most clinics [41], it is important that patients are able to understand and apply what they have learned, but they also have to analyse and evaluate the information when decisions are to be made or treatments have to be adhered. Analysing and evaluating demand higher order learning [42], and thus constructive learning in addition to transfer of information. Since active learning, cooperation, and problem-solving increase effective learning and indirectly (e) Health literacy, we recommend to offer more interactive and constructive teaching modes, such as discussion forums, webinars, and open-ended questions.

Regarding the credibility and reliability of the online health information, most Dutch websites had a professional organization (e.g. hospital) as origin. A previous international study on websites for chronic kidney disease patients showed a similar result [43]. In general, patients consider the quality of websites of personal doctors, medical universities, and the government to be the most trusted online resources of health information [44]. A previous study showed that eHealth literacy does not have a significant influence in the way patients evaluate website's credibility [45]. We consider our result as a positive finding, as trustworthiness is essential for effective online health information. The fact that patients have access to mostly trustworthy sources in their search means that efforts for improvement of online information on kidney transplantation can be directed on improvements in teaching modes on these websites, and will not have to focus on directing patients to websites that are trustworthy.

The available online information only provided a partial view on kidney transplantation; only 9 out of 24 websites discussed all 5 content topics. The included online resources mainly discussed the topics of 'life after a kidney transplantation' and 'cause of and treatment options for kidney patients'. Although information on disease and treatment related knowledge is of major importance for kidney transplant patients, since lack of this knowledge can be disastrous [46], it is also important to offer a complete picture to the patient, so that evaluations and decisions are based on all relevant information [1]. This can be done by expanding pages or by providing links to pages with complementary information. These results are in concordance with a previous study by Schmid-Mohler et al. (2014) who demonstrated that, after transplantation, the main focus of health care providers is often on how to deal with the disease and treatment [47].

Regarding accurate online health information, it is important to discern what information is in fact needed to provide a complete picture to the patient, especially because patient's selective attention promotes processing

and retrieval of online information [48]. Hanif et al. (2012) found that kidney transplant patients do not only search for disease and treatment related topics like transplant operation and rejection, but also lifestyle related topics [8]. Additionally, Schmid-Mohler et al. (2014) found that patients would prefer more information on social and emotional support [47,49]. Similarly to our study, other studies found that the availability of information regarding contact with others, e.g. support, was limited [47]. As a side note, in our study we only used the general Dutch key term 'niertransplantatie' (direct translation of 'kidney transplantation'), which probably does not cover the complete range of possible key terms patients and living donors use, however no synonyms exist in Dutch for this general term. It is possible that by using more specific key terms, such as support, in combination with this general term, more information on specific topics could be found.

The aim of this study was to give a first impression of the available didactical characteristics and content topics of Dutch websites about kidney transplantation. However, based on our design and data, no conclusions regarding associations between available didactical characteristics and content topics could be drawn. For future research, a more quantitative study could be performed to calculate associations by performing more descriptive statistics. Despite that, from our current study, we assume that the current available online information probably does not meet the information needs of kidney transplant patients and living donors. Therefore, an information needs assessment among kidney transplant patients and living donors should be performed, and online information about kidney transplantation should be matched with the outcomes of this needs assessment.

To our surprise, the results of this study reflect the findings of our previous study during the first wave of the COVID-19 pandemic (2020) [35]. In that study, we systemically evaluated the content topics and didactical characteristics of web-based information on COVID-19 for patients undergoing kidney transplantation and recipients. There, we also found a limited variety of available teaching modes, and constructivist and group learning was also scarcely encountered. We did not expect these same results for both studies. Time pressure due to urgently needed and often updated information was assumed to be a logical explanation for the limited variety of teaching modes and social-epistemological dimensions of web-based information on COVID-19 and kidney transplantation. Health professionals had to deliver this online information in a very short period of time. However, time pressure as an explanation for the limited variety of didactical characteristics is less convincing in the context of long established general online information resources on kidney transplantation. Another potential explanation could be that, according to our own experiences, education professionals are rarely involved in the development process of online information related to kidney transplantation. Involving education or science communication professionals while developing online health information could help to maintain a more balanced availability of teaching approaches that fit didactical goals to improve patients' (e)Health literacy.

In this study, we explored the didactical characteristics and not the didactical and content quality of online resources on kidney transplantation. However, both the didactical as well as the content quality influences patient's (e)Health literacy indirectly. Therefore, additional research should be done to map the didactical and content quality of online resources on kidney transplantation.

For their learning, patients depend on the off- and online information provided by others, like health care professionals and support groups [8,50]. Therefore, these providers should be aware of this responsibility and take teaching modes and corresponding social-epistemological dimensions into account, while developing credible, reliable, and accurate online health information. As other studies already showed that variety of well-embedded teaching modes could promote patients' health literacy [8,29,51]. Incorporation of constructivist teaching modes is essential when higher order thinking skills (e.g. knowledge building and problem-solving thinking) are required [24,25,36].

Despite of all taken precautions, the location of researcher's device could not be hidden since the IP address will remain visible, even when using a VPN. This could have had an influence on the search results. Additionally, since the found websites are dependent of searcher's IP address, we

cannot state that the websites in our study are the same websites patients and living donors would have found. Additionally, in our study, we included websites which offered objective information about kidney transplantation. However, it is not given that patients and living donors would also only use websites that offer objective information targeted especially to patients and living donors. As noted in Fig. 2, a large part (20/50; 40%) of the found websites did not, to a certain extent, objectively inform Internet searchers (e.g. blogs, news articles, etc.) and were therefore excluded for data analysis. However, it is very well possible that searchers would also access these websites, influencing their (e)Health literacy.

4.2. Innovation

Now that shared decision making is the norm in most clinics [41], the goal of patient education has changed from instructing the patient which actions to take, into assisting patients in their education about taking care of their own care and plan their own goals [52]. Therefore, it is important that patients are able to understand and apply what they have learned, but they also have to analyse and evaluate the information when decisions are to be made or treatments have to be adhered. To learn goals that are now relevant for patients are more demanding, and similar to learning goals for students.

To the best of our knowledge, our study is the first to explore the availability of didactical characteristic known from student learning on websites targeted for kidney transplant patients and living donors. Our study suggests that more interactive and constructive teaching modes should be included while developing online health information to improve patients' (e)health literacy. Since most health care professionals do not have training in the provision of patient education [52], we recommend to involve education or science communication professionals to provide a appropriate availability of teaching modes and content topics, while developing online health information.

4.3. Conclusion

In conclusion, the diversity in teaching modes of Dutch websites on kidney transplantation targeted for patients and living donors was limited and active knowledge building, such as assessments, was hardly encountered. Kidney transplant patient education from these resources seemed mainly oriented on individual learning. In addition, the available content topics only provided a partial view on kidney transplantation, since the availability of information regarding contact with others, e.g. support, was limited. A more balanced availability of teaching modes and content topics is desirable to improve the fit with the didactical goals of understanding and application of online health information by patients and living donors to be more (e)health literate and make informed decisions about their disease management.

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