

Exploring Medical Students' Needs and Feedback on Using Clinical Guidelines Websites – A Case Study

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Abstract. Medical students are some of the main users of guidelines as they use them during education in medical school, internships and later when they start working as practitioners. Understanding clinical guidelines users' needs and their habits in searching for answers to their clinical questions is necessary to improve guideline websites' usability and students' curriculum regarding learning skills using digital sources. This paper addresses future physicians' information-seeking behaviour related to their use of Web-based clinical guidelines. In this study, two different methods were applied, questionnaire and semi-structured interview in order to understand Norwegian medical students frequency of using guidelines, the sources they use more often, whether they have ever doubted the guideline content and if so how they have been ensured about the right recommendations, whether they are familiar with evidence-based medicine, GRADE methodology, standard medical terminologies, whether they are aware about searching guidelines using standard terminologies in guideline websites. Six themes of importance were identified for designing and improving online guideline information. It was found that the new generation of medical students used electronic resources as their first choice for information seeking, with over 70% of medical students using guidelines on a daily or weekly basis; in contrast to previous studies on information-seeking behaviour of doctors. The results of this paper are useful for improving medical students' curriculum regarding use of standard terminologies, the GRADE method and use of technology. In addition, results are useful for user-centred design of guideline websites and are a stepping stone to improve guideline publication and presentation on the web.

Keywords: Clinical guidelines, Medical students, Evidenced-based medicine, Standard terminology, Guideline website, user-centred design

1 Introduction

Clinical guidelines are defined by the US Institute of Medicine as ‘systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific circumstances’[1]. Clinical practice guidelines are developed with the aim of reducing variability in practice and improving the quality of health care [2]. Guidelines can be used for different purposes such as assisting in clinical decision-making, educating, assessing and assuring the quality of care, guiding for resource allocation and reducing the risk of legal liability [3].

Over the last 20 years, many professional organisations, research groups and commercial publishers have been involved in the development of clinical guidelines (i.e. more than 320 organisations by 2016, according to the National Guidelines Clearinghouse [4], for developing English-language clinical guidelines), not to mention the innumerable unpublished private and institutional guidelines in the world.

To facilitate guideline accessibility, guideline organisations publish guidelines on the Web. However, finding the right information in a guideline and comparing guidelines of interest can be challenging for users, especially as the number of electronically available guidelines increases [2]. On the one hand, a usability evaluation of published clinical guidelines on the Web is necessary to investigate how presentation affects guideline use [5]. In addition, understanding guideline users’ needs, their habits in searching and how they perceive guidelines, are necessary to elicit requirements and features to design a guideline website with better usability. It is also necessary to evaluate if there is any gap between guideline website designers’ perspectives and guideline users’ needs on browsing and accessing the clinical content.

Although there many are published articles about information-seeking behaviour of medical doctors, information-seeking behaviour of medical students and how they use clinical guidelines has been neglected. In one study, researchers conducted a literature search of published articles for a ten-year period (1996–2006) on information-seeking behaviour of doctors including all medical and surgical staff, and general practitioners (GPs). However, they excluded medical students or other health-care staff, qualified or not, from their study [6]. They explored types of information need by medical doctors, frequency of information need, time spent searching, time required to search effectively, barriers to information searching, information searching skills, information sources utilised by doctors, computer usage and use of the Internet as an information resource. According to their literature review, ‘a lack of training or issues with the technology is often raised by doctors’ and ‘the lack of training was the most common barrier to using the Internet (74%) and databases

(62%) according to a UK study' [6, 7]. Furthermore, they found that to be effective in literature searches, doctors must possess more than basic search skills, the less familiar doctors are with the computerised resources means searching would take even longer.

In another study, researchers focused on the information-seeking behaviour of clinical staff in a large health-care organisation to inform training and resource planning [8]. They found that 'people and text resources appear to be favoured over electronic resources and that this has not changed over time, even though access to electronic resources has increased' [8]. According to their study, all clinical staff show a clear preference for Google among electronic resources, as Google can yield results quickly in time-pressured clinical environments. However, there are concerns about the quality of information returned using Google [8, 9]. This study also did not focus on medical students searching habits or the sources they consult.

In another study on exploring how primary care clinicians (GPs and practice nurses) derive their individual and collective health-care decisions, they found that GPs very rarely use expert systems or the Internet; average estimates of using these resources by GPs were less than once every week. Authors claimed they have never seen GPs using such systems to solve a clinical problem in real time; that even then it would probably only be to download information to give to patients. They stated that the most popular sources used by GPs included the popular doctors' and nurses' magazines mailed free of charge to practices in the United Kingdom [10].

One of the main users of guidelines is medical students. They use guidelines during education in medical school, internships and later when they start working as practitioners. Therefore, this study focused on exploring medical students' needs, their searching habits and how they perceive guidelines.

2 Material and Methods

For data collection, two methods were applied: questionnaire and semi-structured interview. Details of selecting participants and the applied methods are provided in this section.

2.1 Selection of participants

Participation in this case study was voluntary. To recruit volunteers, emails were sent to the medical students' mailing list at the Faculty of Medicine and Health Sciences at

the Norwegian University of Science and Technology. To ensure that medical students have sufficient experience with clinical guidelines use, emails were sent to medical students at fourth, fifth and sixth grade.

2.2 Survey

A total of 31 questions were sent online through the mailing list to the medical students. The survey focused on: frequency of using guidelines by medical students; the sources they use more often; whether they have ever doubted the guideline content and if so, how they have been assured about the right recommendations; whether they are familiar with evidence-based medicine, GRADE methodology (a methodology for evidence assessment and rating of guideline recommendations) [11]; standard medical terminologies (such as Mesh, ICD-10, ICPC, ATC, SNOMED-CT and RxNorm); and whether they are aware of searching guidelines using standard terminologies. In addition, receiving students' feedback on the implemented functionalities in guideline websites to search and access the guidelines were the subject of the questionnaire. A total of 38 medical students answered the survey.

Standard medical terminologies play a vital role in data integration, exchange and semantic interoperability between different health information systems [12]. International Classification of Disease (ICD) [13], International Classification of Primary Care (ICPC) [14], Systematised Nomenclature of Medicine Clinical Terms (SNOMED-CT) [15], Anatomical Therapeutic Chemical (ATC) [16], RxNorm [17] codes, the Logical Observation Identifier Names and Codes (LOINC) [18] and National Drug File Reference Terminology (NDF-RT) [19] are all examples of standard terminologies that have been proposed for disease, drug and laboratory classification.

2.3 Semi-structured interview

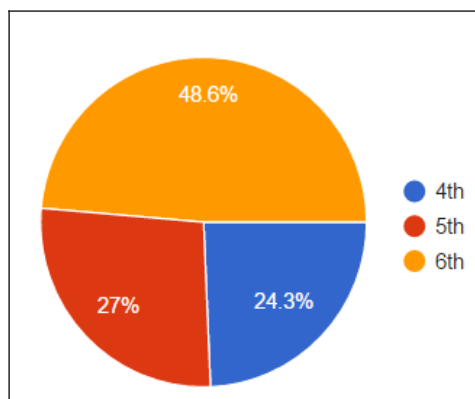
To enable participants to elaborate on their responses and uncover more details, semi-structured interviews were conducted. A total of 13 participants who answered the survey, participated in the interview. For each individual, the interview questions were tailored based on their answers to the survey.

2.4 Data analysis

The results from the survey and semi-structured interviews were analysed based on the step-by-step thematic synthesis method proposed by Cruzes et. al. [20]. The method enabled identification of themes of the results according to survey responses and transcribed texts from the interviews.

3 Results

Figure 1 presents the medical school year of respondents who participated in the case study. A total of six themes based on the step-by-step thematic synthesis method [20] were identified, which are presented in the following sub-sections in detail: 1) purpose of guideline (GL) use and consulted sources; 2) frequency of GL use; 3) question or doubt the GL; 4) standard terminologies and searching in GL websites; 5) GRADE of recommendations; 6) GL references and published dates.



5

Fig. 1: Respondents' medical school year

3.1 Purpose of GL use and consulted sources

The purposes of using GLs by medical students are presented in Figure 2. Students who were in fourth grade use GLs for educational purposes, while all students in sixth grade have been in internship and use GLs for both purposes. Half of the students in fifth grade have been in internship, thus using GLs for both purposes.

The sources students often use to find answers for their clinical questions are presented in Figure 3. The GL websites that medical students generally consult are presented in Figure 4. About 26% of participants use other GL websites including Folkehelseinstituttet (fhi.no), Norsk Helseinformatikk (nhi.no), legevakthandboka.no, BMJ Best Practice (bestpractice.bmj.com), PubMed, felleskatalogen.no, Store medisinske leksikon (sml.snl.no) and mobile apps: legevakthåndboka, felleskatalogen, veileder i pediatri, veileder i antibiotika, medisinsk biokjemi, Micromedex Drug Interactions.

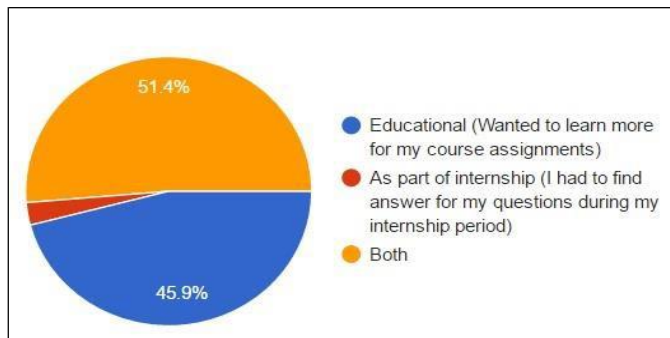


Fig. 2: Purpose of using GLs

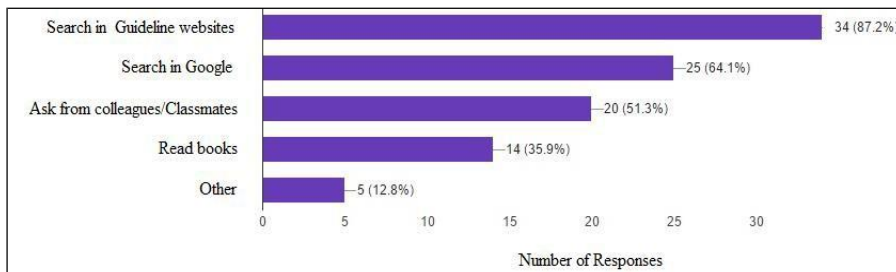


Fig. 3: Sources used by students looking for answers to their clinical questions

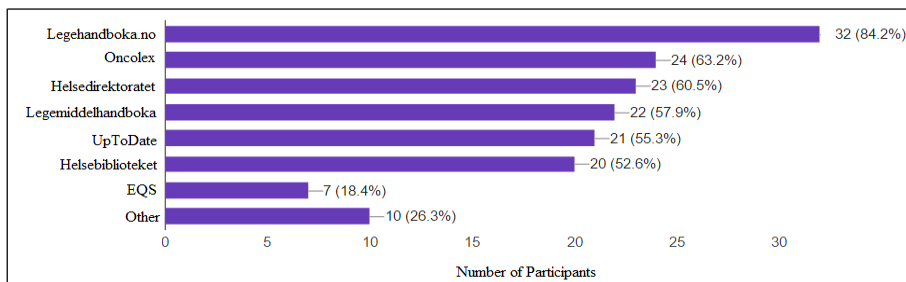


Fig. 4: GL websites that respondents consult the most

3.2 Frequency of GL use

Figure 5(a) presents the frequency with which medical students use GLs. We could not see any difference in frequency of GL use between students in fourth, fifth and sixth grade. We asked the respondents if they have been in internship, with 60.5% having been in internship. Among those who have been in internship, 82.6% stated that they use GLs more frequently than before internship (Figure 5(b)).

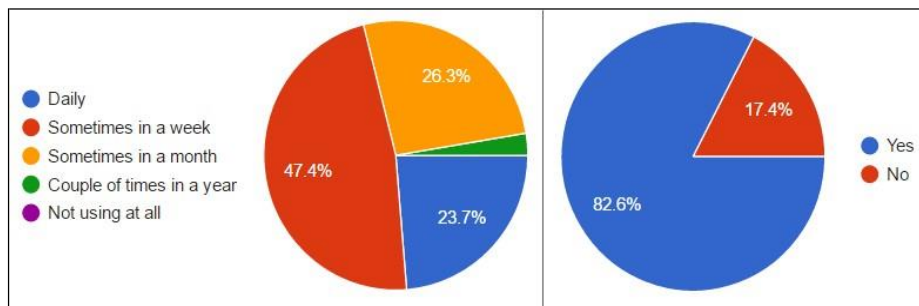


Fig. 5: (a) Left: frequency of GL use, (b) Right: more use of GLs due to internship

3.3 Questioning or doubting the GLs

Participants were asked if they have ever found GL content misleading or wrong (Figure 6(a)) and if they ever doubted the GL content/recommendations they read (Figure 6(b)). In addition, 5.4% of participants stated that there were occasions when they had questions about GLs and found it necessary to contact the GL publisher. Although the participants had questions or doubts about the GL content, however none of them contacted the publisher. The reasons for not contacting the GL publisher are presented in Figure 7. In the survey, they were asked about the most reliable sources for them if they have doubted the GL content or its recommendations. The result is presented in Figure 8.

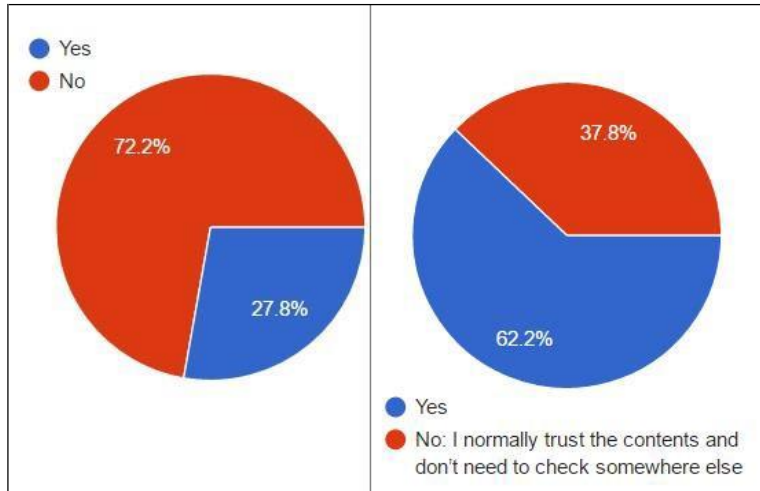


Fig. 6: (a) Left: if ever found GL content misleading or wrong? (b) Right: if doubted the GL content/recommendations?

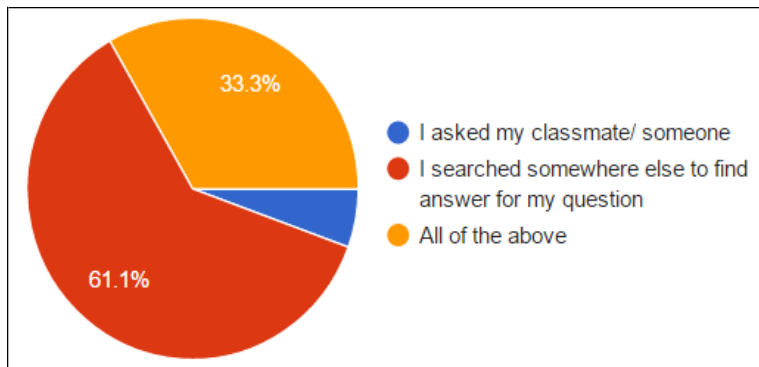


Fig. 7: Reasons respondents did not contact GL publisher

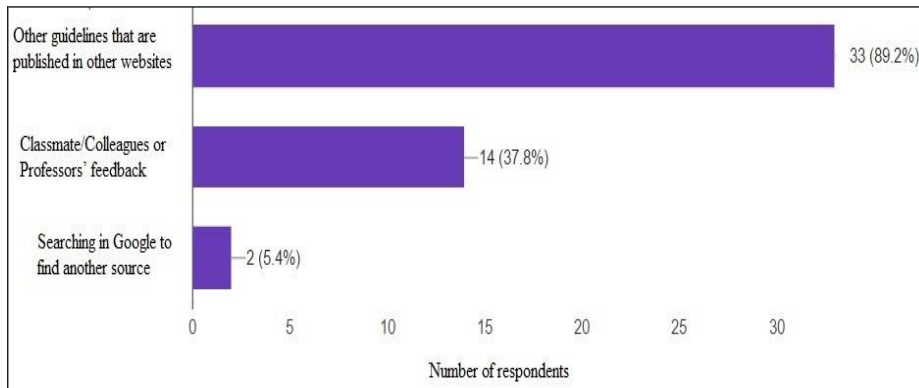


Fig. 8: The most reliable source for respondents after they doubt GL content/recommendations

3.4 Standard terminologies and searching in GL websites

Figure 9 presents the percentage of participants who are familiar with standard terminologies. It is noteworthy that none of the participants are familiar with SNOMED-CT and RxNorm. Respondents were asked if they know how to search for GLs in GL websites using standard terminologies. Results are presented in Figure 10. Among the participants who knew how to use standard terminologies for searching in GL websites, most (69.2%) used ICD-10 and MeSH (53.8%). Details are presented in Figure 11.

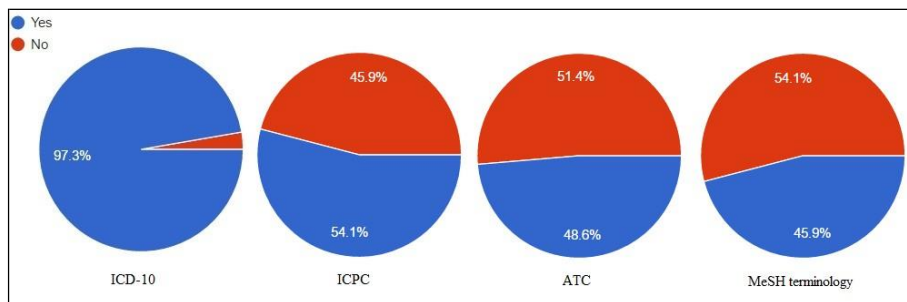


Fig. 9: Respondents' knowledge of standard terminologies

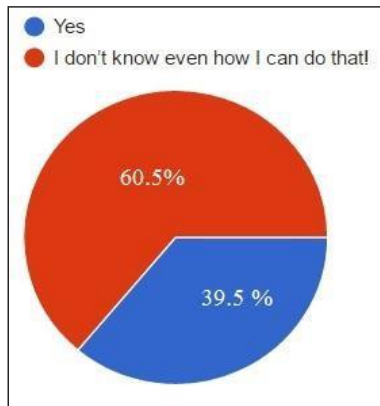


Fig. 10: Knowledge of searching GL websites using standard terminologies

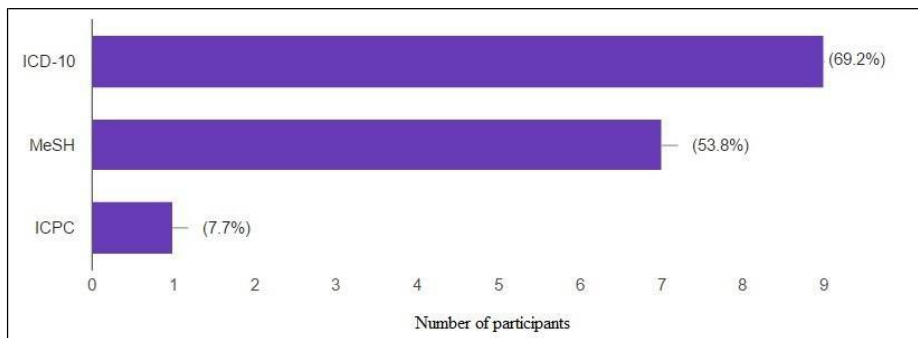


Fig. 11: Use of standard terminologies when searching GL websites

3.5 GRADE of recommendations

Participants were asked if they have knowledge of the GRADE methodology and rating of recommendations. As presented in Figure 13, only 67.6% of respondents were familiar with GRADE.

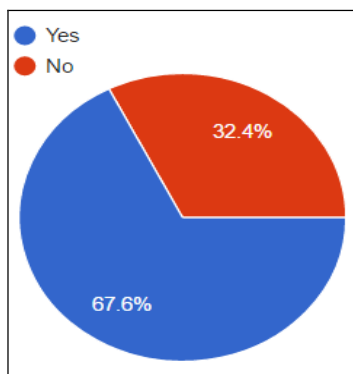


Fig. 13: Participants' familiarity with the GRADE method

3.6 GL references and publication date

Participants' were asked if they check the GL version or the publication date (Figure 14(a)). In addition, 48% said they check references in GLs (Figure 14(b)).

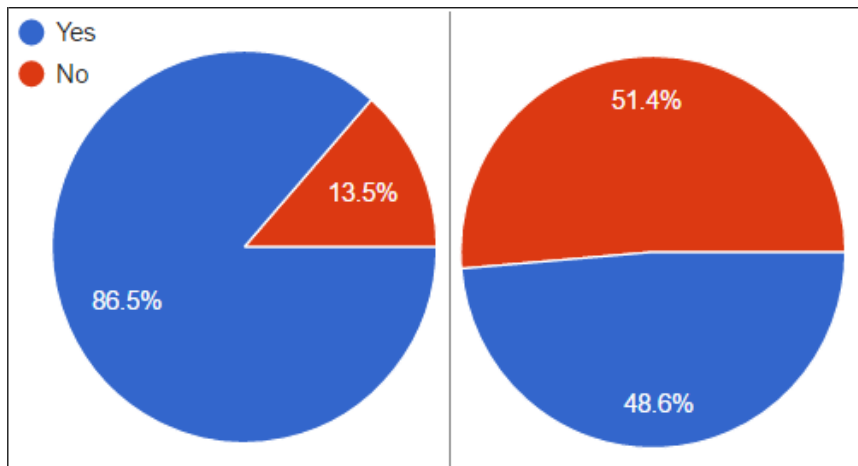


Fig. 14: Participants' checking (a) Left: GL version or publication date, (b) Right: references

In addition, participants were asked if they print or electronically store the identified GLs for reuse in the future. As presented in Figure 15, most of the respondents prefer to save GLs in PDF or electronic version rather than print the GLs.

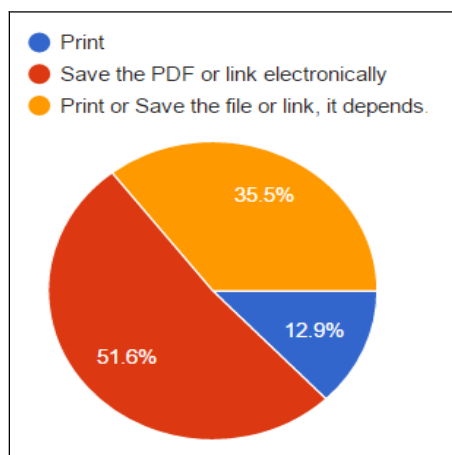


Fig. 15: Respondents' habits in reusing the identified GLs

4 Discussion and Conclusion

This study explored medical students' attitudes and feedback regarding clinical practice GLs websites in Norway. Based on the results, six themes were identified: purpose of GL use and consulted sources; frequency of GL use; questioning or doubting the GLs; standard terminologies and searching in GLs; knowledge of GRADE methodology; and GL references and publication date.

According to the results in Figure 3, over 60% of medical students look for answers to their clinical questions in published GLs on the Web. This is in contrary to results published by researchers who focused on the information-seeking behaviour of doctors (not medical students) and stating that 'people and text resources appear to be favoured over electronic resources and that this has not changed over time, even though access to electronic resources has increased' [8]. This means that the new generation of medical students use electronic resources as their first choice for information seeking and 'the lack of training' is not a barrier for them to use the Internet and databases as stated by GPs in other studies [6, 7]. Furthermore, results in Figure 5(b) show that internship increased GL use. According to Figure 5(a), over 70% of medical students use GLs either on a daily or weekly basis. This is contrary to results in other research stating that GPs very rarely use expert systems or the Internet; where average estimates of using these resources by GPs were less than once every week [10].

Figure 4 presents a list of the most popular GL websites utilised. Usability of the *Legehandboka.no*, *Oncolex.com*, *Helsedirektoratet.no* and *Helsebiblioteket.no* were evaluated in previous studies [21, 22]. Combining the results of the previous studies and this research indicates the importance of GL websites with good usability and an efficient search function to enable fast access to the right clinical recommendations. This has been raised by other researchers who studied Norwegian and Danish GPs attitudes towards GL use and who found that the GL 'format, accessibility and implementation strategy influence the use of clinical guidelines' [23].

Based on the results in Figure 14(b), 48% of respondents check references in the GLs for credibility of recommendations. Although this study did not explore the medical students' feedback on transparency of GL development and its impact on the use of GLs, checking GL references can be considered as an indicator for checking credibility. In one study, researchers found that transparency in the process of development and implementation of GLs is important for GPs [24]. Combining the results with this study shows that the credibility of recommendations is important both for medical students and GPs for GL uptake. Therefore, not only is the fast access to GL content important but also providing easy access to the citations and demonstrating the rationale behind the GLs can save their time and cognitive load.

Similar to a previous study [23], where researchers found out that GPs are

sometimes sceptical regarding the evidence on which clinical guidelines are based, according to the results (Figure 6), about 28% of participants found the GL content misleading and 62% doubted the GL content. This has been stated on a general basis. Although most GL websites have a link to contact the publisher, asking questions or commenting on the GL content, none of the participants contacted the publisher. According to Figure 8, they would rather search in another GL website (89.2%), Google (about 5.4%) or ask someone else (38.8) about their question or doubt regarding GL content. This indicates that online published GLs are still the main source for students even though they may doubt the GL content. Hence, exploring the root cause of doubting GL content is one way to improve GL website usability and compliance with recommendations.

Regarding searching in GL websites using standard terminologies, communicating search features in GL websites to users is important. Although each website may have their own manual, we cannot assume that users spend time reading about the implemented features. Therefore, providing advance search features to the user in a hover box when they start writing search keywords in search boxes can take their attention and inform them. On the other hand, there are certain requirements that should effectively be inserted into the curriculum in medical faculty to enable medical students to access GLs in an efficient way using technology, as these are the future GPs. As an example, basic understanding of medical terminology is important for many reasons: it allows communication in one language with other health professionals; it reduces mistakes and to use quickly and efficiently patient records while it can also be used in searching for clinical guidelines published on the Web. Therefore, it is required that community leaders must be sought out and involved in designing the curriculum with regard to advances in medical informatics such as standard terminologies, GRADE methodology and effective use of search engines. The curriculum must have a clearly defined evaluation process that includes accountability and evaluation to assure appropriate inclusion of material throughout the curriculum. In addition to the curriculum, it is also important to evaluate effective learning by using GLs and courses in medical schools. Medical students are often overwhelmed by the excessive amount of factual knowledge they are obliged to learn. Although evaluating the learning experience of medical students using GLs was not the subject of this research, it is interesting to explore how applying scientifically based learning strategies can help medical students to learn successfully and improve memory.

In this study, GPs' needs and their feedback on using GL websites were not explored. Future work could explore GPs' feedback and compare it to the results of this research, investigating whether they are sceptical about the evidence in the GLs compared to medical students and to what extent. According to literature, it was found that GPs were also sceptical about the evidence base for GLs [25]. There are also other similar studies that explored GPs' 'recent use of GLs and reasons for using

them; how GPs used them; where they stored them and which attributes of GLs they considered to be most, and least, useful' [26]. The results showed that prescribing was the most common reason for accessing a GL, GLs were often used for making therapeutic decisions rather than preventive measures, they stored GLs in their consulting room and read them when they felt they needed to [26]. It is noteworthy that this study was published in 2001 and use of GL websites was not the subject of the research.

The results in this research propose a first step that can be used in exploring concepts that improve curricula in medical schools and effective learning. Furthermore, results of this paper are useful for user-centred design of GL websites and are a stepping stone to improve GL publication and presentation on the web. GL Web designers should communicate the implemented functionalities and provide information about effective searching in GL content.

According to the results, there are mobile apps available that are used by medical students to search for GLs. Therefore, it is important to evaluate the use of mobile apps in comparison to Web applications regarding GL access, level of presented content and perceived usefulness. In addition, tailoring the GL presentation and content for users with different levels of medical knowledge seems necessary and should be considered in evaluation.

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