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Qualified doctor and medical students' use of information resources: *what is used and why?*

Health Information and Libraries Journal

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Abstract

Background: Learning to use information resources optimally is an important, and fast changing, challenge for doctors and medical students. Many resources exist to support evidence-based clinical decision-making but a wide range of factors influences their use.

Objective: To explore qualified doctor and medical students' use of information resources, to determine what is used and why.

Methods: A stratified sample of 46 qualified doctors and medical students were recruited in Devon, UK. Participants kept a self-report diary of the information resources used over a week. The diaries were then used to stimulate recall within a semi-structured interview. Diary data were collated into tables of resource use. Qualitative data from the interviews were transcribed verbatim and thematically analysed.

Results: A wide range of resources were used by participants but typically for a short duration of time. Categories of reasons for accessing information resources were to check, to learn and to demonstrate. The two main factors influencing choice of information resource were ease of access and quality of information. There were some differences in use between subgroups.

Discussion & Conclusion: Information resources must be quick, easy to access, and tailored to the different purposes that they serve for qualified doctors and medical students.

Key Messages:

Implications for Practice

1. Speed and ease were the most important factors influencing information resource choices.
2. Given the time pressures on clinicians, information resources must be easily accessible and user-friendly.
3. Passwords were significant barriers and resources that were difficult to access were not used.
4. There were some differences in use between subgroups (GPs, hospital consultants, GP trainees, hospital trainees, medical students).
5. This study contributes to the literature on the information seeking behaviour of doctors across the training continuum.

1. INTRODUCTION

Making clinical decisions is increasingly challenging.¹ Consultation times are shorter², patient expectations are higher³ and there is an increasingly large evidence base to incorporate into practice.⁴ The explosion in published medical research means that accessing, appraising and synthesising information in order to make informed evidence-based decisions⁴ is a crucial skill required by doctors. Equally, the integration of evidence-based practice into undergraduate medical curricula⁵ means that medical students are being equipped with these skills in the early stages of medical training.^{6, 7} There are a variety of types of resources available to support evidence-based practice including journals, textbooks, e-resources, phone applications and social networking sites. But how do qualified doctors and medical students decide which information resources to utilise?

Information behaviour, sometimes also referred to as human information behaviour (HIB),⁸ concerns the information needs and information behaviour that can follow physiological needs, cognitive needs and affective needs (e.g. anxiety). 'Information-seeking behaviour arises as a consequence of a need perceived by an information user, who, in order to satisfy that need, makes demands upon formal or informal information sources or services, which result in success or failure to find relevant information'.^{9: 251}

Over the years there has been a plethora of research on the information seeking behaviours of doctors.^{4, 10-12} A literature review by Davies on articles published between 1996 to 2006 found that research has mainly focused on the types of clinical information sought by doctors¹³ e.g. for diagnosis, drug therapy, epidemiology or treatment therapy, the frequency of information need¹⁴⁻¹⁶ i.e. how many questions were generated per patient, the differences according to type of healthcare setting,^{14, 17} the patterns of information resource use according to purpose of search¹⁸ and the time spent searching.¹⁹ There has also been research around the information sources utilised by doctors including the number of sources utilised^{20, 21} and a comparison of information sources utilised.^{17, 19}

In comparison, research on the information seeking behaviours of medical students is quite scarce. While there has been a number of evidence syntheses on the information seeking behaviour of doctors,^{4, 9-11} the only study found focusing on medical students looked at social media use.²² The research that has been conducted on medical students has been primarily concerned with the types of information resources utilised²³⁻²⁵, the use of hand held computer clinical decision support tools,^{5, 21} internet usage to satisfy information needs,²⁶⁻²⁸ the reading habits of medical students²⁹ and the use of electronic resources.³⁰⁻³² The studies have mainly been conducted outside Europe, for example the Arab Emirates,³¹ India,²⁷, Sudan,²⁸ USA.^{26, 29, 30}

Hughes et al³³ highlights how various methods exist for examining information seeking behaviours including log-files, screen recording devices, think aloud techniques, post-use interviews, or survey instruments.³³⁻³⁶ While log files are useful for providing detailed descriptions of patterns of use (the "what"), 'but are not useful in describing choice behaviours, as little information about specific cognitive choices can be directly related to the observed data'.^{33: 646} Surveys have been used in research into physicians' internet use,¹² but the cost and effort required to achieve sufficiently large samples is a limitation. This has led to scholars to call for research beyond surveys and log files,^{35, 36} in particular examining the motivations of users' choices or choice behaviours using mixed data collection methods.³⁷

The aim of this research is to investigate what information resources qualified doctors and medical students use and why. This mixed-methods research will underpin the design of interventions to change behaviours, help healthcare organisations and medical schools

decide which information resources to procure³⁸ and inform how best to make resources available to clinicians and medical students.

2. METHODS

2.1 Mixed-method approach

A mixed-method approach, using a diary of information resources recorded by participants and stimulated recall interviews, was utilised to explore the factors underpinning qualified doctors and medical students' decisions around the information resources they utilise. A similar technique was used by Hughes to explore junior physicians use of Web2.0 resources.³³ Stimulated recall is an introspection procedure in which passages of behaviour of individuals are used to stimulate recall of their decision making.³⁹ Participants were asked to keep a self-report diary of the information resources used over a week to use as the stimulus in a semi-structured interview. For the purposes of this study, information resources included electronic resources, text sources, colleagues or internet sources. The interview was conducted as soon as possible after the diarised week in order to promote participant recall. In the interview, participants explained the reasons underpinning their decisions to access the resources chosen. Interviews were carried out between April 2010 and May 2011 by XX, XX, XX, XX and XX. A training session, involving role play, ensured the interviewers used a consistent approach across interviews.

2.2 Participants

The participants were qualified doctors and medical students based in the South West of England. A stratified sampling strategy was adopted, including qualified doctors across all grades and medical students across all years. General Practitioners (GP's), GP trainees, hospital consultants and hospital trainees across three Primary Care Trusts and three Secondary Care Trusts in Devon were recruited. In the UK, after graduating from medical school, junior doctors undertake a two year broad based training programme (called the Foundation Programme) based predominantly in a hospital setting. Training for a medical or surgical specialty, or for general practice, starts after this. Therefore, the GP trainees were at least two years post-graduation but the hospital trainees comprised doctors in the Foundation Programme and doctors in specialty training. The medical students were recruited from two sites of a single medical school in South West England.

2.3 Recruitment

For GPs, hospital consultants and registrars, a list of all GPs and relevant Secondary Care clinicians at each site was compiled (6 lists in total) through publically-available information or via the Trusts. Each list was randomised and participants were approached until sufficient numbers were reached. Clinicians were contacted by e-mail with an information sheet outlining the aim of the study and what participation would involve. A follow up phone call was scheduled to answer any questions and discuss the project further.

In order to recruit junior doctors one of the authors (LH) attended educational sessions for junior doctors at a secondary care trust hospital in Devon. Junior doctors are required to attend educational sessions as part of their Foundation Programme training. At the education session she gave a brief presentation about the study and distributed study information sheets and consent forms. After a cooling off period, junior doctors were approached to participate in the study.

An email was sent to all undergraduate students at the medical school inviting them to participate in the study, with an information sheet and consent form. The study was also advertised in each site and in student common rooms. After a cooling off period, students were approached to participate in the study.

2.4 Data Analysis

For purposes of analysis, there were five subgroups of participants: 1. consultants, 2. GPs, 3. hospital trainees, 4. GP trainees and 5. students. Breakdown of diary data into categories was undertaken for participants and tables were generated for each individual and group to enable comparative analysis within and across groups.

The stimulated recall interviews were transcribed verbatim. Thematic analysis⁴⁰ of the interview data was performed by one author (XX), by reading through each interview and forming ideas into categories and themes. A sub-sample of interviews were also coded by two of the other authors (XX and XX) and themes were verified. A thematic index was then developed by the research team to which the entire dataset could be coded. Data were coded by XX to the individual categories in the thematic framework.

2.5 Ethics Approval

Ethical approval was sought for both the clinicians and medical students. The NHS Research Ethics Service classified this study as a service evaluation which does not require review. For medical students, ethics approval was given by the medical school's Research Ethics Committee in February 2011.

3. RESULTS

3.1 Participants

A stratified sample of 46 participants took part in the study, including qualified doctors across all grades (n=31) and medical students across all years (n=15) (Table 1). The qualified doctors comprised 8 hospital consultants, 10 GPs, 8 hospital trainees and 5 GP trainees. Of the 31 doctors who participated, 18 were male and 13 were female. The 15 medical students comprised 2 year 1 students, 2 year 2 students, 4 year 3 students, 1 year 4 student and 6 year 5 students. Five were male and 10 were female.

Table 1: Sample Characteristics

	Participant	n=	Male/Female
1.	Consultants	8	6/2
2.	GPs	10	8/2
3.	Hospital trainees	8	3/5
4.	GP trainees	5	1/4
5.	Students	15	5/10
	Total	46	26/20

3.2 Resources used

There were three main categories of resources utilised by participants: paper (e.g. books, journal articles, leaflets, personal notes), electronic (e.g. websites, local intranet sites) and people (e.g. colleagues, trainers).

28/31 qualified doctors completed diaries (2 consultants and 1 GP did not). These doctors accessed information 292 times during the diarised week (10.4 times each on average). They used 96 different resources, with 60 of the 96 only being used once by one person. The most frequently accessed resources for doctors were Oxford Handbooks and Google (six separate users), followed by the British National Formulary (BNF), GPNotebook and Wikipedia (five users), patient.co.uk (four users) and colleagues and NICE Guidelines (three users). Internet sites were used most frequently and books, other than the BNF and Joint Formulary, very rarely. Trainees accessed resources more often than GPs and hospital consultants, and GPs and GP trainees accessed more resources than their counterparts in hospitals (Table 2).

Table 2: Information resources used per week

	Completed Diaries	Median entries	diary Range	SD
1. Consultants	6/8	5	2-9	2.8
2.GPs	9/10	7	2-18	6.2
3.Hospital trainees	8/8	8	3-26	7.1
4.GP trainees	5/5	12	7-32	10.6
5.Students	14/15	23	5-84	19.4

14/15 students completed diaries (1 year 5 student did not). Student resource use was higher, with these participants accessing information 370 times during the diarised week (26.4 times each on average). They often researched the same topic on multiple occasions. Year 5 students tended to use less resources and showed greater parity with trainees. The most frequently accessed resource for students was Wikipedia, with 8/14 using it twice or more during the target week. Oxford handbooks, Google and patient.co.uk were the next most frequently accessed resources by students. Students used text books far more frequently than the doctors and this accounted for around a quarter of the resources.

GPs and GP trainees seemed to have better access to people resources than hospital consultants and team meetings served as arenas for discussing ideas or challenging cases. All 5 GPs made specific reference to people as resources including internet forums, such as doctors.net.uk. Discussions with peers were felt to be helpful, informative and reassuring. Medical students interacted with expert staff in hospitals, including doctors, pharmacists and nurses but, interestingly, only the fifth year students recorded staff as resources.

3.3 Time spent using resources

38% resource use was ≤ 5 minutes (Table 3). Hospital trainees and medical students usually used resources for longer, however, with 6-29 minutes the most common category, accounting for 25 / 45 (55%) and 116 / 326 (35%) of entries, respectively.

Trainees in both categories had a greater proportion of entries in higher duration categories (Table 2). Hospital trainees spent longer with information resources than GP trainees. There were marked individual differences, however, for example one hospital consultant accounted for 9 / 11 of sessions ≥ 30 minutes. Students had more variable search durations, with lots of short searches (93 / 326 ≤ 5 mins, 29%) and some much longer ones (49 / 326 ≥ 60 mins, 15%) (Table 3).

Table 3: Time spent using information resources, as determined by entries in participant diaries.

	≤ 5 mins	6-29 mins	30-59 mins	≥ 60 mins	Total
1.Consultants	12	7	6	5	30
2.GPs	55	6	3	0	64
3.Hospital trainees	7	25	10	3	45
4.GP trainees	31	15	5	0	51
5.Students	93	116	68	49	326
Total	198	169	92	57	516

The interviews suggested that doctors usually accessed information between patient consultations but sometimes also during consultations, particularly during GP and GP trainee consultations, so that they could show them helpful resources or to print out information leaflets to take away.

“And so I showed her what I was thinking and backed that up with GPnotebook, but then also gave her an information sheet from patient.co.uk” Male, GP Trainee.

A few doctors preferred not to access information during patient consultations as they felt it showed uncertainty or lack of knowledge, but another talked about a temporal shift in patients' perspectives and expectations about this.

“I don't like putting things into Google with patients being present [...] it doesn't look good. [...] The bit I don't like about it is I don't know what I'm going to get back [...] And if I make a decision as to one of them to click on to look at, why did I decide that one and not another one? So it becomes a ... there's the potential for it to look as being indecisive or not knowing what you're doing really” Male, GP.

“Normally I always do it [during] the patient consultation...I suppose something that's happened over the years of being in practice, the attitude [was that] if you ever looked anything up from a patient point of view [then the patient assumed] you don't know it. And I think the perspective is completely different now, the patient's expectation is that you will look things up or check things and talk through things. And if you share it with them I think that's fine. And that's probably something that internet access has done” Male, GP.

3.4 Reasons for accessing information resources

The reasons that qualified doctors and medical students gave for accessing information fell into 3 main categories: to check, to learn and to demonstrate.

1) To check

This category included checking prescribing information (drug dosages, first and second line treatments, and contraindications), checking diagnosis and management information, reminding oneself about something vaguely remembered, or to check out a 'gut feeling'.

"a lot of what I look up is just to clarify what I think I'm going to use, so checking a drug dose or checking the first line or second line drug if somebody's allergic" Female, GP Trainee.

Eight of the 10 GPs made some reference to checking or rechecking things: before a consultation to check on something they knew was about to come up; or during or after a consultation to check that they hadn't missed something important.

"if ... somebody comes in who's got a diagnosis of some rare syndrome that I've forgotten all about because it's not where my work usually goes, I will look that up just to make sure that there aren't any associations with that clinical syndrome that I might have missed" Female, GP.

Trainees tended to do more checking, especially at the start of training.

"so that, again, tends to be information for myself, so after the patient's left, checking that the symptoms were what I thought they were, there wasn't anything else I might be missing, just a brief check really and that's that" Female, Hospital Trainee.

GP trainees were nearly always checking out resources for specific patients but hospital trainees were more likely to spend time checking out specific areas of their practice (rather than individual patients). Students also commented on checking things but in their case it was often in preparing for assessments.

For doctors, most checks were done during working hours, as near to the consultation as possible. After a bad experience or a leave of absence, doctors were inclined to make more regular checks.

2) To learn

There was variation in the degree of learning amongst different participant groups. Consultants did not appear to seek out information in the same way as GPs and GP trainees, who encounter more varied clinical presentations. Some doctors talked of feeling under pressure to keep up to date, recognising that things change and develop over time, but not necessarily having dedicated time for learning.

For medical students, this category included working towards academic tasks, such as assignments. The needs of students varies and changes over their time in medical school as they progress from pure study where learning and exams are predominant to being on placements where they encounter real and often unfamiliar patient cases. This variety shows that there is a need for resources that cover differing levels of knowledge and experience, a

wide range of specialist subject-matter and those that provide more generalised definitions and references.

"then I knew that I had some clinical assessments coming up the following week, so the week that we're having the interview, and so I also spent some time doing a bit of revision for that" Medical Student.

3) To demonstrate

This category highlights that doctors in particular were sometimes not accessing information resources for their own benefit, but for the benefit of trainees, medical students and/or patients. Teaching is a significant part of a doctors' role and affected the resources accessed, used or recommended.

"The trainee wasn't aware of the use of nasal sprays and how you should use them. There's a really good diagram in the Joint Formulary about using nasal sprays in an upside down position, so I got that out to show them and the patient the picture" Male, GP.

3.5 Reasons underpinning choice of information resources

There were two main reasons underpinning the choice of information resource by doctors and students: ease of access, and quality of information.

1) Ease of access.

The critical factor underpinning decisions about choice of information resource related to ease of access, particularly whether a password was required.

Electronic resources were generally perceived as easier to access BUT usernames and passwords constituted a major barrier with participants reporting multiple passwords, and passwords that expired. The issue of open access and passwords was the biggest deterrent to using resources and a great irritation.

"Because I can never find my password and I can never remember what it is and it just completely puts me off accessing it basically. Maybe that's lazy, but actually I don't need that information enough to make the effort" Female, GP.

One GP stated very clearly his belief that all software for health and education should be open access. A minority of qualified participants used password-protected sites. Anything that prevented speed and ease of access made a resource unpopular and infrequently used. Health services sites requiring passwords to access them were perceived as providing good resources but were little used because of the easy access to other (potentially lower quality) sites. This password frustration was particularly the case for qualified doctors, who were under more time pressure. Few students referred to password problems though this began to become more apparent for Year Five students as they began to enter the professional world.

"Password rubbish, another sort of layer of time-wasting". Female Medical Student

Familiarity was another factor in terms of ease of access, probably because it cut down on time. There were several accounts across the groups of being introduced to a resource when still in medical school and using that resource to this day.

Ease of navigation of a resource, once inside, was also key.

"It has to be really clear, updated and easy to find way round" Male GP.

Having to pay for sites, or resources within a site (e.g. full text of journals), was another barrier and irritation, particularly for medical students.

Textbooks were perceived as harder to access than electronic resources (e.g. library access, short loans), expensive to purchase, heavy to carry around, but some small books were perceived as a useful resource.

"I don't tend to get my books out very often, just because they are so heavy and they're so awkward and you put them on your desk and it takes up your whole desk, whereas if you just load it on your laptop it saves space" Female Medical Student.

2) Quality of information

The second category underpinning choice of information resource was the quality and provenance of the information. Key features of information that was perceived as high quality were that they were up-to-date, from a trustworthy source and cited the appropriate evidence.

"Because that's the one we feel has got the greatest, meaningful evidence to back it up in terms of current knowledge" Female, GP.

"It's a ... NICE [national healthcare guidelines in UK] is a trusted national peer reviewed ... well respected ... yeah, website. Again, I don't find it very user-friendly, but it's authoritative and I feel I trust it" Male, GP Trainee.

An example of where there was concern about up to date information amongst qualified doctors was the national drug formularies and several commented on the difference between the online version (harder to use but up-to-date) and the handbook. A number of respondents observed that many books were out-of-date even before they became published.

For medical students, the assessment of quality was slightly different (and often less evidence-based). The ability to judge the quality of a resource grew with time but all groups recognised that some resources needed to be approached with caution, even though they were still used extensively (e.g. Wikipedia). They liked resources that had been recommended by the medical school, staff or peers. They were also only interested in information appropriate to stage of training. Medical students are expected to critically appraise information and so the pressure on them to know how to assess the quality of a resource was perceived to be high.

"if my friends have used it or if other colleagues have used it, because if it's quite popular then it should be quite a good resource.... if I'm on the computer, I use Wikipedia. I know it's obviously not the most reliable resource in some respects, but I suppose because it's an encyclopaedia generated by just people interested in the topic ..., it can be quite reliable in that sense" Female, Medical Student.

4. DISCUSSION

This study explored qualified doctors and medical students' decisions about accessing medical information resources. This study contributes to the literature on the information seeking behaviour of doctors across the training continuum as while there is ample research on the information behaviours of doctors there is limited research on medical students, particularly in the UK. The findings will help healthcare organisations and medical schools to make procurement and deployment decisions relating to information resources.

The most notable feature of participant diaries was the diversity of resources used and typically short duration of resource use. Medical students had quite distinct patterns of resource use compared to qualified doctors, although this difference was less pronounced in year 5 medical students.

Interview data enabled exploration of issues in greater depth, such as reasons underpinning preferences and barriers to use. The most significant features were that resources had to be quick and easy to access, navigation within resources had to be simple and content had to be reliable and trustworthy. Other studies have reported similar findings.^{10, 17, 41} The fact that clinicians only have time to complete 'quick and dirty' searches because of time constraints is worrying and may pose a barrier to evidence-based practice.¹⁰

The main barriers to accessing or using resources were passwords and, to a lesser extent, format of information. When time is scarce, having to find a password and log on took too long. Furthermore the information was often available elsewhere and was quicker and easier to access. A study of internet information-seeking behaviour also found that clinicians value unlimited access to resources.⁴¹ These findings have implications for password-protected resources procured by healthcare organisations and medical schools. Significant resources are required to procure resources and this current study suggests that password-protected resources are unlikely to be used.

Respondents from all groups recognised and differentiated between types of search, for example, highlighting the need for quick access to simple and clarifying definitions, up-to-date sources on drugs and their use and other features pertinent to drugs, up-to-date resources for specialised practice and in-depth information for learning. For these reasons generic search engines and sites such as Google and Wikipedia had a place alongside medical-specific sites. Resources tailored to these different purposes are needed. Despite the increasing move towards internet use and increasingly mobile devices, resources still lie within a range of media and it is important for resource providers to endeavour to make them accessible and user-friendly. Resources that are difficult or frustrating to access for those whose time is limited are likely to be bypassed.

While many participants accessed information during patient consultations, there were a couple that did not like to do this, because they felt it demonstrated uncertainty or lack of knowledge. Our review of the literature on information seeking behaviour identified little research examining when clinicians access information resources. However a study of clinicians' use of information tools from the patient's perspective found that patients reported having greater confidence in the care and advice caregivers offer when they use information tools⁴² although some suggested diminished confidence in care and a more impersonal environment resulting specifically from the use of the computer in the office.

The results of the current study support other research. The finding that clinicians tend to access information resources to satisfy prescribing queries were similar to those of Wilson et

al⁹ who found that printed drug resources were used several times a week by GPs. Our study found that participants spent on average 10.8 minutes looking for information. Other studies have reported slightly longer times (14.4 minutes⁴³ and 15 minutes⁴⁴) but not at the point of care. For studies exploring resources used at the point of care, as in our study, the times were shorter (5-10 minutes).⁴⁵

The finding that registrars made a higher number of entries in their diaries than GPs or consultants could relate to their level of knowledge and the fact that they are still learning and need to look things up. We would expect that this need would reduce as they get more experienced. However a study by Bergus & Emerson⁴⁶ found that family residents do not ask better-formulated clinical questions as they advance in their training. The higher number of entries by registrars could be about confidence in decision-making rather than lack of knowledge.

The types of information resources accessed varied amongst clinicians. Generally they preferred resources that were quick and easy to access, usually internet resources or their own books. Davies found that doctors mainly used text sources followed by humans followed by electronic resources.¹⁰ This could represent a change over time as the majority of the studies in this systematic review were conducted >13 years ago or it could be related to the fact that use of the BNF or people as information resources may have underrepresented in participants diaries in our study.

Strengths and limitations of the study

It is important to consider both the strengths and limitations of our study. The topic is important and the study is timely, given the rapidly changing technologies and pressure on resources. Using the participant's diary in the interview to stimulate recall of specific instances where doctors and medical students accessed information resources during their clinical practice strengthens the findings. A standard retrospective interview may have elicited generalisations. The sample size of 46 is large for this type of qualitative research. However the diary itself was self-report and prone to intentional or unconscious editing. The study was conducted by an interdisciplinary research team which brought different but complementary perspectives to the research, enriching the design and methods used. The results from the diary data stand in their own right and strongly indicate patterns of resource use. However, interview data drew attention to the fact that a number of participants had failed to record all their resources during the target week and/or had not recognised that some things could be considered resources. These 'missing' resources potentially could skew the data presented.

The details recorded here are reported as they were named in the diaries, whereas some of the resources are clearly equivalent, though named differently. For example, local formularies or unique local intranet sites have different names and locations. Some references to Guidelines were also vague and may in fact have been local guidelines or named guidelines. If these had been amalgamated then they again could have influenced the ranking of resources.

5. CONCLUSIONS

To conclude, our study has shown that while quality of evidence was an important consideration, speed and ease including passwords as barriers were more important factors affecting clinicians' decisions about the information resources to access. If clinicians only have a small amount of time to access information it is vital that evidence-based resources that can be quickly and easily accessed are available to them.

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