

Knowledge, Attitudes, Practices and Barriers in use of Evidence-Based Medicine Among Resident Physicians in Kenya: A Mixed Methods Study

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Abstract

Background

Evidence based medicine (EBM) helps clinicians to integrate latest research evidence in to their daily clinical practice. There is a need for all healthcare professions to adopt it in order to provide scientific, safe, efficient and most cost-effective care. Postgraduate residents are at the frontline of healthcare delivery and all medical institutions should strive to produce practitioners of EBM. Studies have shown that physicians are still struggling to adapt to this paradigm shift in the practice of medicine but very few studies have been done in Sub Saharan Africa (SSA). This study explored the knowledge, attitudes, practices and barriers of evidence-based practice among resident physicians in a tertiary teaching hospital.

Methods

A mixed methods cross-sectional study that used convergent parallel design was conducted. The quantitative arm was conducted among all residents enrolled in the Master of Medicine (MMed) program at Aga Khan University Hospital Nairobi (AKUHN). It included an online survey exploring the knowledge, attitudes, practices and barriers of EBM among all residents. Simultaneously, semi-structured In-Depth Interviews (IDIs) were carried out among 18 purposefully selected residents in order to explore the same themes in more depth.

Results

A total of 101 residents (99%) responded to the survey. The mean scores for knowledge, attitude and practice of EBM among residents were 73.88, 66.96 and 63.19 respectively, which were generally higher than in comparable studies. There was a significant association between department and year of residency with practice of EBM. The most common barriers faced by residents were lack of time, lack of EBM skills and patients' unawareness about EBM.

From the qualitative study, residents demonstrated good knowledge and support of EBM but practice remained relatively poor. Barriers to EBM were characterized by lack of motivation, time, skills and resources, patient overload, intimidation from patients and fear of challenging consultants.

Conclusion

There was good understanding and support of EBM among residents at AKUHN. The practice of EBM rated high from quantitative findings but this was not supported by qualitative findings. The management of AKUHN should enhance the culture of EBM through regular and frequent workshops for residents.

Background

Practice of Evidence-Based Medicine (EBM) provides a paradigm shift in the way clinical services are offered and medical education undertaken. EBM is defined as “the conscientious, explicit and judicious use of the best evidence in making decisions about the care of patients” (1).

There are five main steps to practice EBM which include developing a well articulated clinical research question, searching for the research information, critically appraising the research evidence acquired, determining applicability of the evidence to the patient and evaluating the overall performance (2). The challenge faced by most physicians is acquisition of skills on how to carry out efficient searches and systematically critique the literature for evidence (3)(4).

Despite a 20 years-history of EBM and increased availability of EBM resources, many practicing clinicians, especially in Low and Middle Income Countries (LMIC), are still not exposed to this global trend and critical appraisal skills are still not part of formal training (5). Medical residents are usually at the frontline of healthcare provision in teaching hospitals, in addition to their responsibility of teaching their juniors, and therefore they play a key role in the integration of EBM into daily practice (6).

The high disease burden in Africa associated with poor health infrastructure and limited resources raises the need for cost-effective approaches to integrating best available research evidence into policy-making and clinical practice. Although important strides have been made to improve research productivity in Africa, there is limited effort to promote use of evidence overall and practice of EBM in particular, at both undergraduate and postgraduate levels (7). For example, up to 70% of the post-graduate doctors use textbooks as main source of information in Africa (8). Major barriers to the practice of EBM include unawareness of the EBM resources, power interruptions and lack of computing facilities.

Few rigorous studies have been conducted in LMIC as well as in high-income countries to explore the knowledge, attitudes and practices of EBM among residents. Studies have shown that there is good support of EBM among doctors but there is still a deficit in knowledge and practice (9). In a study conducted in Sudan, only 10% of the residents used EBM for more than 50% of their practice. In Saga University Japan, again only slightly over half of the residents understood EBM terminology, but many considered EBM practice to improve patient care and nearly all of them believed that EBM also assisted in clinical decision making (6). Similarly in Iran, only half of the residents were familiar with EBM concepts but majority were positive towards the idea of practicing EBM (10).

A systematic review illustrated that the degree of familiarity with EBM was low and that textbooks were still considered to be the key source of information, with only 50% practicing EBM (11). In contrast, a study conducted in Tikur Anbessa Hospital in Addis Ababa among interns and residents, showed that 75.5% had heard about EBM and widely used EBM resources during clinical decision making were UpToDate, Google and PUBMED (12).

Barriers to the practice of EBM appear to fall into three different categories: doctors' personal, organizational and patient-related barriers. Personal barriers include lack of familiarity and use of EBM resources, discomfort going beyond trusted clinical routines (13), lack of experience in forming research

questions and hierarchical dependence on senior staff. Other personal barriers include senior physicians' resistance to change their practice and lack of access to EBM training opportunities (14). Organizational related barriers include patients overload, lack of libraries and information technology resources in the hospitals and lack of time (9)(11). Findings of a qualitative study demonstrated that patient preferences could trump evidence because physicians found it difficult to explain the role of evidence to patients who preferred a more traditional approach (15).

Very limited research has been done on the awareness, perceptions and use of EBM in Sub Saharan Africa (SSA), especially in East Africa. The overall aim of this study was to evaluate the knowledge, attitudes and practices of EBM among resident physicians at Aga Khan University Hospital Nairobi (AKUHN) and perceived barriers to practicing EBM during patient care.

Methods/design

Design

A mixed methods cross-sectional study that used convergent parallel design was conducted among residents in AKUHN.

Study setting and participants

AKUHN is a private university that offers Master of Medicine (MMed) degrees in nine specialties namely anaesthesiology, anatomic pathology, clinical pathology, family medicine, general surgery, internal medicine, imaging and diagnostic radiology, obstetrics and gynaecology (OBGYN) and lastly paediatrics and child health. Each specialty consists of four years of training and examinations leading to an MMed degree.

Participants in the quantitative phase were students from all nine MMed degree programmes, but in different stages of their PGME (Post Graduate Medical Education) residency. Year one and two residents are considered as "Junior residents" while year three and four are known as "Senior residents". All residents had been introduced to the concepts of EBM and trained on how to use the online library resources. However senior residents had been in the programmes longer and had more exposure to opportunities to implement the EBM process.

Participants in the qualitative phase included 18 residents (two from each of the nine departments) who were purposively selected and invited to participate in the interviews. Half of the residents were junior while the other half were senior.

Data collection

Quantitative phase

Quantitative tool - Data were collected using an online self-administered 5 point likert scale questionnaire sent via Survey Monkey®. It comprised of five sections consisting a total of 64 items (Additional file 3).

Section 1: Questions 1–4 ($n = 4$ items) consisted questions on socio-demographic variables.

Section 2: Questions 5–7 ($n = 23$ items) targeted students' knowledge about EBM.

Section 3: Questions 8–9 ($n = 18$ items) explored students' attitudes towards EBM.

Section 4: Questions 10–11 ($n = 9$ items) explored residents' utilization of EBM resources.

Section 5: Questions 12 ($n = 10$ items) assessed the barriers that impede the practice of EBM among residents.

The questions were adapted from a validated questionnaire, used in a study conducted in Saga University teaching hospital (6) and from other studies (12)(16)(17)(18). The questionnaire was revised slightly based on the feedback from the pilot study done on ten alumni to check for clarity and flow. Minor modifications were made to suit the local set-up, for example, adding resources and barriers specific to the AKUHN library/system.

Recruitment and data collection: All residents were first sensitized about the study before questionnaires were sent out. The main objectives of the study were carefully explained to them during their respective departmental meetings in a bid to increase the response rates. An invitation to participate in the study along with the final questionnaire were then sent to all 102 residents via Survey Monkey®. They were sent weekly reminders for the first four weeks and then those who still hadn't responded, received daily reminders with a request to complete the survey. The survey was conducted between September-October 2017.

Qualitative phase

Qualitative data were collected using an interview guide, consisting of the following sections: knowledge, attitude, practice and barriers of EBM (Additional file 4). An invitation to participate in In-Depth Interviews (IDIs) was sent to participants purposively selected from the nine departments. They were contacted via a phone call to set a mutually agreed date and time for the IDIs. The principal investigator (MU) conducted IDIs and probing was employed in order to generate rich data. Participants were given a general information letter to read before they signed a written informed consent form.

Interviews lasted between 30 to 40 minutes and were audio-recorded. The interviews were conducted in a quiet private room to allow residents to feel comfortable and to avoid interruptions. The participants were interviewed between September-December 2017.

Analysis

Quantitative

Quantitative data were analyzed using SPSS version 20. Frequencies of different socio-demographic strata (age, sex, department and year of study) were used to describe the study population. The total scores obtained by all residents on all the individual items on the Likert scale were computed for each variable of knowledge, attitude and practice, ensuring that the categories assigned to the negative statements (especially when assessing attitude) were scored by reversing the scale. For evaluation of the knowledge, attitudes and practices of EBM among residents; the total scores were divided by the highest possible scores to obtain the mean and Standard Deviation (SD) scores for each variable.

Tests of association such as simple linear regression were used to examine the relationship between socio-demographic variables (age, sex, department and year of study) and the knowledge, attitudes and practices towards EBM. All variables with a p-value of ≤ 0.25 in the univariate analyses were then included in the multiple linear regression model to identify their combined effect on the outcomes. P-value of < 0.05 was considered statistically significant. Parameter estimates: Linear regression coefficients, 95% Confidence Intervals (CI) and p-values were recorded for each explanatory variable.

Qualitative

Qualitative data were analyzed using thematic framework analysis (19). Audio-recorded interviews were first transcribed verbatim into textual data. Familiarization of data was then achieved by reading and rereading each transcript thoroughly. Two members of the research team (MU & CK) independently coded the transcripts and generated themes. Any disagreement on codes and emerging themes was resolved through discussion. This process served to maximize the rigor and validity of the analysis. A picture of the whole data was then built through charting followed by mapping and interpretation of the data.

Results

A total of 101 (99%) responded to the survey. The socio-demographic characteristics of respondents are shown in Table 1 (Additional file 1).

Table 1
Socio-demographic characteristics of study participants

Participants (n = 101)		n (%)	
Age	< 30 years	40 (39.6)	
	≥ 30 years	61 (60.4)	
Sex	Male	58 (57.4)	
	Female	43 (42.6)	
Department	Anaesthesiology	11 (10.9)	
	Anatomic Pathology	11 (10.9)	
	Clinical Pathology	7 (6.9)	
	Family Medicine	7 (6.9)	
	General Surgery	12 (11.9)	
	Internal Medicine	14 (13.9)	
	Imaging & Diagnostic Radiology	13 (12.9)	
	Obstetrics & Gynaecology (OBGYN)	12 (11.9)	
	Paediatrics & Child Health	14 (13.9)	
	Year of study	One	30 (29.7%)
		Two	26 (25.7%)
Three		23 (22.8%)	
Four		22 (21.8%)	

Table 1: Socio-demographic characteristics of study participants

Knowledge, attitude and practice of EBM: The mean scores for knowledge, attitude and practice of EBM among residents were 73.88 (SD 13.74), 66.96 (SD 6.54) and 63.19 (SD 8.43) respectively.

Knowledge about EBM

Among all the EBM resources, residents indicated that the most common resources they were aware of and used frequently were UpToDate (74.2%), PubMed (61.4%), Hinari (42.6%), Google Scholar (43.6%) and Clinical Key (43.5%) (Fig. 1) (Additional file 2).

Figure 1: Familiarity of EBM resources among residents

This is further illustrated in qualitative findings: *“When you’re not on call, doing daily work, then its easy you get to Hinari, UpToDate, PubMed directly.... it is very easy for us”*. (R9)

With regard to confidence in practicing the five steps of EBM, around 50% of the residents felt their level of confidence was either “good” or “very good” for four of the five steps of EBM. However, for critical appraisal, only 36.6% of the residents felt that their level of confidence was either “good” or “very good” (Fig. 2).

Figure 2: Residents’ level of confidence in EBM skills

Critical appraisal was similarly identified as the most challenging step of practicing EBM in the IDIs: *“Critical appraisal – still trying to get my head around that, we haven’t been taught to really criticize things from school, the system is take this and cram it, don’t ask questions, so that’s why its hard to think critically”*. (R1)

Attitude towards EBM

More than 90% of the residents agreed or strongly agreed that EBM improves patient outcomes, that it helps in clinical decision-making and should be taught to undergraduate students. Majority (> 80%) also disagreed or strongly disagreed that EBM is a mantra with no direct applicability to patients in rural settings, that it had no relevance in low resource settings and that it is suitable only for research based institutions. However, 74.3% of the residents either disagreed or strongly disagreed that the costs of EBM outweigh the benefits, indicating that EBM is cost-effective (Fig. 3).

Figure 3: Residents’ opinions about EBM

Similarly, qualitative findings showed most residents were convinced that EBM had significant impact on ensuring safer patient care: *“Before I came here (AKUHN), I used to follow my consultant or MO, I didn’t know how to look for stuff myself. And I think we used to give substandard care to patients out there. When I came here, I realized, what we were doing out there was witchcraft”*. (R16)

Residents believed that EBM was important in a number of ways, right from medical school to shaping future consultants. It was also vital as part of their residency as it made them competent doctors at an international level: *“Important to be taught in undergraduate level because if you are taught by someone whose practicing style is the old way then you have a muted experience and you don’t know how to approach EBM. The sooner you learn, the better your approach”*. (R2)

“Important for residents in order to be at par with everyone and you can practice medicine anywhere in the world and follow international treatment protocols and work in internationally accredited hospitals”. (R13)

Practice of EBM

Figure 4 depicts how often residents practiced EBM over the last month and how they managed the cases they saw over the same month. Sixty five percent of the residents said that they used EBM resources for half (or more) of the cases seen, 34.7% relied on consultants for half or more of the cases and 75.2% mostly relied on their knowledge to treat half or more of the cases.

Figure 4: Practice of EBM by residents during the last month

Despite a good understanding of and all the facilitating factors for EBM, actual application of EBM in day-to-day practice was quite low. Most residents (especially those in senior years) indicated looking up only 20–30% of patients on a daily basis, especially in senior years: *“Half the time you’re doing service provision, running around, checking up on results, doing procedures, so the time to sit down and start looking through data is impossible, 30% at most”.* (R18)

Barriers to the practice of EBM

The barriers faced by residents that emerged from the quantitative study were categorized into doctors’ personal barriers, organizational barriers and patient-related barriers as shown in Table 2 below.

Table 2
The mean scores for each of the barriers faced by AKUHN residents

Barriers	Total score (n/N)	Mean score	Standard Deviation
Lack of familiarity with EBM	267/505	2.64	1.18
EBM practice devalues clinical experience	194/505	1.92	0.74
Impracticality of EBM for everyday use	248/505	2.46	1.03
EBM removes the ‘art’ of medicine	200/505	1.98	0.77
EBM de-emphasizes history taking and physical examination skills	195/505	1.93	0.78
Lack of time to access EBM sources	338/505	3.35	1.18
Insufficiency of basic EBM skills	300/505	2.97	1.14
Skepticism over the quality of evidence	274/505	2.71	1.10
Patients’ unawareness about EBM and preference of traditional approach	286/505	2.83	1.09

Table 2: The mean scores for each of the barriers faced by AKUHN residents

The most important organizational barrier faced by residents was lack of time to access EBM resources due to heavy workload, with mean score of 3.35 (SD 1.18). This was also reflected in the qualitative

findings as illustrated by the following quotes: *“Number one barrier is large number of patients- so you do just bare minimum for each and just move on”*. (R12)

“There is a turn around time, if I end up spending few more minutes reading about a patient, during work hours, you neglect radiographs and there is a constant need for validating reports before certain time”. (R13)

The barrier with the second highest mean was a personal barrier – “insufficiency of basic EBM skills” with a mean score of 2.97 (SD 1.14) (Table 2). Doctors struggle to practice EBM in their daily practice because of lack of awareness and ability to think critically, because they have never been taught to question or think broadly since undergraduate education: *“Searching because it takes up the most time because you have to make sure you get right thing, people have to be taught technique for searching, there is a systematic way”*. (R5)

“Kenyan education makes us just follow orders, we are not taught to think outside the box. So we continue doing things a certain way without asking questions”. (R5)

Many residents felt that “Patients’ unawareness about EBM and preferences of traditional approach” was a major barrier to practice of EBM with a mean score of 2.83 (SD 1.09) (Table 2).

Conversely, the major concern from the qualitative findings was not lack of patients’ awareness about EBM but patients having too much access to health information. However most residents found this to be a motivator to read more but not a challenge. They felt that access to health information by patients had a positive influence on their practice of EBM and acted as a facilitator instead of a barrier. They generally believed that *“an informed patient was a good patient”*. (R15) Another resident said *“It stops you from slacking so I take it as positive and motivates me to up my game”*. (R13)

Relationship between knowledge, attitude, practice and barriers of EBM and socio-demographic factors

There were no significant variations in knowledge and attitudes towards EBM across the four participant characteristics (Table 3). However, the practice of EBM varied across department and year of study. Each unit increase in year led to a corresponding 1.48 increase in the mean score for practice of EBM (p-value = 0.01) and each unit increase in department led to a corresponding 2.20 decrease in the mean score of practice of EBM (p-value = 0.00).

Table 3

Relationship between level of knowledge, attitude and practice and socio-demographic factors.

		Linear Regression Coefficient (95% CI)	P-value	Multiple Linear Regression Coefficient (95% CI)	P-value
Knowledge	Sex	-3.50 (-8.97-1.98)	0.21	-3.16 (-8.62-2.31)	0.25
	Age	0.75 (-2.27-1.72)	0.13	0.53 (-0.52-1.59)	0.32
	Dept.	-0.02 (-1.13-1.09)	0.97		
	Year	1.89 (-0.51-4.29)	0.12	1.26 (-1.34-3.87)	0.34
Attitude	Sex	1.50 (-1.11-4.10)	0.26		
	Age	-0.16 (-0.63-0.31)	0.50		
	Dept.	0.24 (-0.29-0.77)	0.37		
	Year	0.11 (-1.04-1.27)	0.85		
Practice	Sex	1.10 (-2.27-4.48)	0.52		
	Age	-1.03 (-4.21-2.16)	0.52		
	Dept.	-2.15 (-2.64- -1.67)	0.00	-2.20 (-2.67- -1.72)	0.00
	Year	1.13 (-0.34-2.60)	0.13	1.48 (0.40- 2.57)	0.01

Table 3: Relationship between level of knowledge, attitude and practice and socio-demographic factors.

Discussion

Knowledge about EBM

The overall mean score for Knowledge among residents at AKUHN was generally higher than in comparable studies done in other settings (12)(10)(20). In a systematic review done in Iran, the mean score for knowledge of EBM among doctors was less than 50% (11). This shows that the general level of familiarity with EBM and its concepts is quite high among residents at AKUHN. This could be explained by the introductory EBM course in AKUHN that is conducted during the orientation week which residents explained was very useful as it provided a strong foundation to build on. Although residents found this training very useful, almost all of them felt it was too short and congested. Residents at AKUHN also have better access to internet and a vast online library. Each department in AKUHN has doctors rooms facilitated with computers with access to the online library. Residents reported that resources were readily available to them and that the activities at AKUHN such as journal clubs, surgical seminars and Continuing Medical Education (CMEs) further enhanced their understanding and familiarity of EBM. In addition, AKUHN is a private not-for-profit institution striving to reach international standards in terms of

EBM while in Ethiopia, government is the main health care service provider striving mainly to improve access to basic health services in rural areas. Similarly in Sudan, there is no formal training in EBM that resulted in gaps in knowledge, skills and awareness. Most medical professionals in Sudan base their clinical judgments on their experience, consultations with colleagues and common sense (9)(20).

AKUHN residents were more aware and used the following resources in their practice: UpToDate, PubMed and Hinari. Knowledge of other resources was indicated but their utilization during clinical practice remained low. In a study conducted in Japan, PubMed and Clinical Evidence from the BMJ publishing group were indicated as the resources most used during clinical practice but they also used UpToDate and "I Chuu Shi" (6). Similarly, in a study done in Ethiopia, UpToDate, Google and PubMed were the most used resources in clinical practice (12). Studies have shown that UpToDate has become a very popular tool among residents because it answers clinical questions at the point of care with speed and ease (2) (21). Qualitative findings also confirmed that residents mostly used UpToDate because it provides the most synthesized data in a logical manner and is easy to use. UpToDate can also be accessed from different personal devices through a subscription, which AKUHN offers to the residents. However, the use of UpToDate differed across different specialties as per data obtained from AKUHN library- Paediatrics and Internal Medicine had the highest number of hits where as Anaesthesia had the lowest.

Residents also self-rated their level of confidence using each of the five EBM skills. Most residents believed their confidence level was acceptable or good for each skill, including critical appraisal and literature search. Despite rating their level of confidence as acceptable or good for critical appraisal and literature search in the online survey, these findings were contradicted in the IDIs where the residents identified critical appraisal and searching for literature as major barriers in the practice of EBM. This could be explained by the fact that residents were allowed to express their challenges more freely in the IDIs and more probing was done by the researcher to find out why exactly they faced these challenges compared to a close-ended questionnaire where probing is not possible. This is similar to what literature has shown that physicians mostly find it challenging to carry out efficient searches or critical appraisal (3)(4). Another factor that could explain the discrepancy between the quantitative and qualitative findings is that the IDIs were carried out on a smaller sample (18 residents) compared to 101 residents who completed the online survey so maybe the challenges with literature search/critical appraisal may not be representative of the whole resident population.

There was no significant association between year of residency and knowledge of EBM. Similarly, there was no significant correlation between year of residency and level of knowledge in the study conducted in Japan but this was not the case in the Ethiopian study which found a significant correlation between year of residency and knowledge of methodological terminology (6)(12). Contrary to our expectation, higher level of graduate medical training doesn't translate to higher level of EBM knowledge. As stated by junior residents in the interviews, first years are usually overwhelmed with clinical work and do not get to practice EBM as much as they would like to. Senior residents mentioned that they have more time to polish their EBM skills compared to first years but there was no correlation between the two variables from quantitative findings. Perhaps the level of knowledge did not increase with year of residency due to

lack of continuous training and lack of refresher courses in EBM over the four years of residency. This emphasizes the need to repeat EBM training or refresh skills at departmental level regularly over the years to help residents retain and improve on the knowledge and skills of EBM taught during orientation.

Attitude towards EBM

The mean score of attitude for residents at AKUHN was higher than reported in the systematic review of 28 studies done in Iran (11). This shows that most residents at AKUHN had a positive attitude towards EBM. More than 90% of the residents believed that EBM improves patient outcomes and that it helps in clinical decision-making. This is similar to the findings of studies done in Ethiopia, Iran and Sudan (12) (10)(20). The positive attitude was also reflected in the qualitative findings, where residents mentioned that EBM was “cost-effective” for patients though costly because it could only be practiced in an “ideal setting” where resources are available. This shows that residents at AKUHN have welcomed the application of EBM which is a paradigm shift in the practice and teaching of medicine. The excellent library facilities and freely available online resources and teaching of EBM could have positively influenced the attitude of residents at AKUHN.

Most residents at AKUHN also believe that EBM should be taught to undergraduate medical students, similar to the findings in other studies (6)(12). These opinions were also reflected in the IDIs because residents strongly believed that EBM is a practice that should be instilled right from undergraduate to create better future EBM practitioners. This shows that if the skills of literature search and critical appraisal were taught right from medical school, then residents would find it easier to continue the practice into residency. In SSA, EBM is usually not a part of the Undergraduate Medical Education curriculum. A study done at the University of Lagos revealed a positive impact on the medical students following introduction of an EBM course. The graduates reported a significant enhancement in their knowledge and attitude towards EBM and acquisition of lifelong learning skills (22).

Practice of EBM

The mean score for practice among residents at AKUHN was rated quite high in the quantitative study but low in the qualitative study. The low usage of EBM which was reported from the IDIs correlates with the usage of EBM in the systematic review done in Iran, which reported a usage of 20% (11). More than half of the residents reported that they used EBM resources for 50–100% of the cases they had seen over the last month and only 2% reported not using EBM resources in the quantitative survey. In comparison, only 14.4% of the residents used EBM for 50–100% of their clinical practice and nearly one third of the study population did not practice EBM (9). This could probably be explained by the barriers reported by the residents like lack of time, resources and skills. Similarly, residents in the IDIs reported practicing EBM on only 20–30% of the cases that they saw daily. This figure is lower than that reported in the quantitative survey but correlates with the figure in a study conducted in Sudan in which most residents (44.4%) practiced EBM less than 25% of the time. The high usage of EBM in the quantitative survey could be due to self-reporting bias where residents could have over-reported their usage of EBM to look good or they couldn't accurately recall their usage of EBM over the past month. However, during the IDIs, residents were

able to ask for clarifications in case they didn't understand the question compared to a close-ended online questionnaire where probing and clarification was not possible (23).

In this study, we found a significant correlation between department and year of residency with the practice of EBM. However, similar associations have not been explored or reported in previous studies. As the year of residency increased, the practice of EBM also increased. One reason for this significant association could be that as residents progress in their training from junior to senior level, they assume an increased level of responsibility to make independent decisions about patient management. Senior residents are also directly responsible for mentoring and supervising junior residents, making presentations at conferences hence they become facile in using the literature to solve specific problems. These added responsibilities require senior residents in their respective departments to become more adept in using literature and be able to routinely demonstrate the ability to research and critically appraise selected topics and apply the acquired information directly to patient care where applicable or share the knowledge with their juniors.

Barriers that hinder practice of EBM at AKUHN

Majority of residents in AKUHN experienced a number of barriers when implementing EBM, which were categorized into organizational, personal and patient related barriers. The most common barrier faced by residents was lack of time to access EBM resources which is an organizational barrier. Lack of time and patient overload were also the most common challenges faced by doctors in studies conducted in Japan and Sudan (6)(9). Lack of time in our set-up could be explained by the factors mentioned in the qualitative study such as the constant demand of service delivery over academics, the overwhelming call schedules for residents and the high patient load. Lack of time is a well-recognized barrier that is constantly cited in medical literature. An effective electronic search ranges from 30 seconds to 27 minutes per question, depending on the type of resource and the expertise of the searcher (24). A resident running a busy clinic with patients waiting to be attended to may not have this time to search literature. Therefore lack of time is an important impediment to the adoption of EBM and warrants an early solution to enhance the practice of EBM at AKUHN.

Apart from time constraint, the other two common barriers faced by AKUHN residents were insufficient basic EBM skills (a personal barrier) and patients' unawareness about EBM (patient-related barrier). A study in Ethiopia also reported lack of skills as an important barrier (12). Searching for literature and critical appraisal were perceived as the most difficult steps because searching takes time and there is lack of strong basic knowledge in statistics. One of the reasons for this challenge could be the lack of training in critical thinking and problem solving skills during the early school years. Many residents mentioned that they weren't equipped with adequate skills to "think outside the box" while in school. To overcome this barrier, residents suggested early introduction of EBM right from medical school and teaching of critical thinking skills from primary and secondary school level. Kenya requires urgent reforms in the education system to move away from the traditional teaching methods and put more emphasis on improving problem-solving skills in order to meet demands of the changing world (25).

The barrier “patients’ unawareness about EBM” was rated quite high in this study in comparison to other studies done in Japan, Ethiopia and Sudan (6)(12)(9). However from the qualitative findings, most residents felt that patients visiting AKUHN were “well-informed” and that was a facilitator rather than a barrier. Patients who came to clinics with health information did not intimidate residents at AKUHN. Most residents took that as an opportunity to read more and to “up their game”. A survey among 1050 physicians in United States of America showed that majority believed that patient bringing information to the visit had a beneficial effect on the physician-patient relationship but this would worsen if they seemed to be challenging physician’s authority or asking for inappropriate treatment (26). Fear of litigation is a driving factor for residents to practice EBM, which is accepted as the gold standard for practicing medicine.

Conclusions

Over the last two decades, EBM has arisen as a new paradigm for medical practice and education. However, many barriers to its implementation exist among residents who are still in training but are usually at the frontline of healthcare provision, making them essential key stakeholders in the practice of EBM.

Although there is good understanding and support of EBM among residents at AKUHN, the practice still remains a challenge. Major barriers to practice identified were lack of time and lack of skills to practice EBM.

Residents at AKUHN acknowledged the importance of EBM in their practice and advocated for more regular and frequent workshops to enhance their comprehension and skills of using EBM. The training should be carried out within departments as well as at PGME level. Activities such as journal clubs and CMEs should also be encouraged at departmental level to promote the culture of EBM.

Findings from our study and literature has shown that teaching of EBM should also be integrated into undergraduate teaching curriculum to further enhance critical thinking skills right from the beginning to allow an easier transition into its application during postgraduate clinical training.

Future research should include experimental longitudinal studies to evaluate the effects of an EBM training course on participants’ knowledge, attitudes and practice of EBM through out the programme to understand the changes and transitions that take place. The study could also be expanded to include all health care professionals within AKUHN to assess the knowledge, attitude and practice of EBM among locum doctors, faculty members and nurses.

Abbreviations

AKUHN Aga Khan University Hospital Nairobi

CI Confidence Interval

CME Continuing Medical Education

EBM Evidence Based Medicine

IDIs In-depth Interviews

LMIC Low and Middle Income Countries

MMed Master of Medicine

OBGYN Obstetrics & Gynaecology

PGME Post Graduate Medical Education

SD Standard Deviation

SSA Sub Saharan Africa

Declarations

Ethics approval and consent to participate

Ethical approval to conduct this study was obtained from AKUHN Ethical Review Committee. Residents were allowed to make informed decision whether to participate or not. Electronic consent was obtained for the online survey and written informed consent for the qualitative part of the study.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MU conceptualized and designed the study and research questions, carried out data collection, data analysis and initial interpretation, and drafted the manuscript. CK and AK were methodology supervisors of the project, DK was the content supervisor of the project. MM, CK and AK reviewed and revised the analysed data and manuscript. All authors read and approved the final manuscript.

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Tables

Additional file 1: Tables

Table 1: Socio-demographic characteristics of study participants

Participants (n=101)		n (%)	
Age	< 30 years	40 (39.6)	
	≥ 30 years	61 (60.4)	
Sex	Male	58 (57.4)	
	Female	43 (42.6)	
Department	Anaesthesiology	11 (10.9)	
	Anatomic Pathology	11 (10.9)	
	Clinical Pathology	7 (6.9)	
	Family Medicine	7 (6.9)	
	General Surgery	12 (11.9)	
	Internal Medicine	14 (13.9)	
	Imaging & Diagnostic Radiology	13 (12.9)	
	Obstetrics & Gynaecology (OBGYN)	12 (11.9)	
	Paediatrics & Child Health	14 (13.9)	
	Year of study	One	30 (29.7%)
		Two	26 (25.7%)
		Three	23 (22.8%)
Four		22 (21.8%)	

Table 2: The mean scores for each of the barriers faced by AKUHN residents

Barriers	Total score (n/N)	Mean score	Standard Deviation
Lack of familiarity with EBM	267/505	2.64	1.18
EBM practice devalues clinical experience	194/505	1.92	0.74
Impracticality of EBM for everyday use	248/505	2.46	1.03
EBM removes the 'art' of medicine	200/505	1.98	0.77
EBM de-emphasizes history taking and physical examination skills	195/505	1.93	0.78
Lack of time to access EBM sources	338/505	3.35	1.18
Insufficiency of basic EBM skills	300/505	2.97	1.14
Skepticism over the quality of evidence	274/505	2.71	1.10
Patients' unawareness about EBM and preference of traditional approach	286/505	2.83	1.09

Table 3: Relationship between level of knowledge, attitude and practice and socio-demographic factors.

		Linear Regression Coefficient (95% CI)	P-value	Multiple Linear Regression Coefficient (95% CI)	P-value
Knowledge	Sex	-3.50 (-8.97-1.98)	0.21	-3.16 (-8.62-2.31)	0.25
	Age	0.75 (-2.27-1.72)	0.13	0.53 (-0.52-1.59)	0.32
	Dept.	-0.02 (-1.13-1.09)	0.97		
	Year	1.89 (-0.51-4.29)	0.12	1.26 (-1.34-3.87)	0.34
Attitude	Sex	1.50 (-1.11-4.10)	0.26		
	Age	-0.16 (-0.63-0.31)	0.50		
	Dept.	0.24 (-0.29-0.77)	0.37		
	Year	0.11 (-1.04-1.27)	0.85		
Practice	Sex	1.10 (-2.27-4.48)	0.52		
	Age	-1.03 (-4.21-2.16)	0.52		
	Dept.	-2.15 (-2.64- -1.67)	0.00	-2.20 (-2.67- -1.72)	0.00
	Year	1.13 (-0.34-2.60)	0.13	1.48 (0.40-2.57)	0.01

Figures

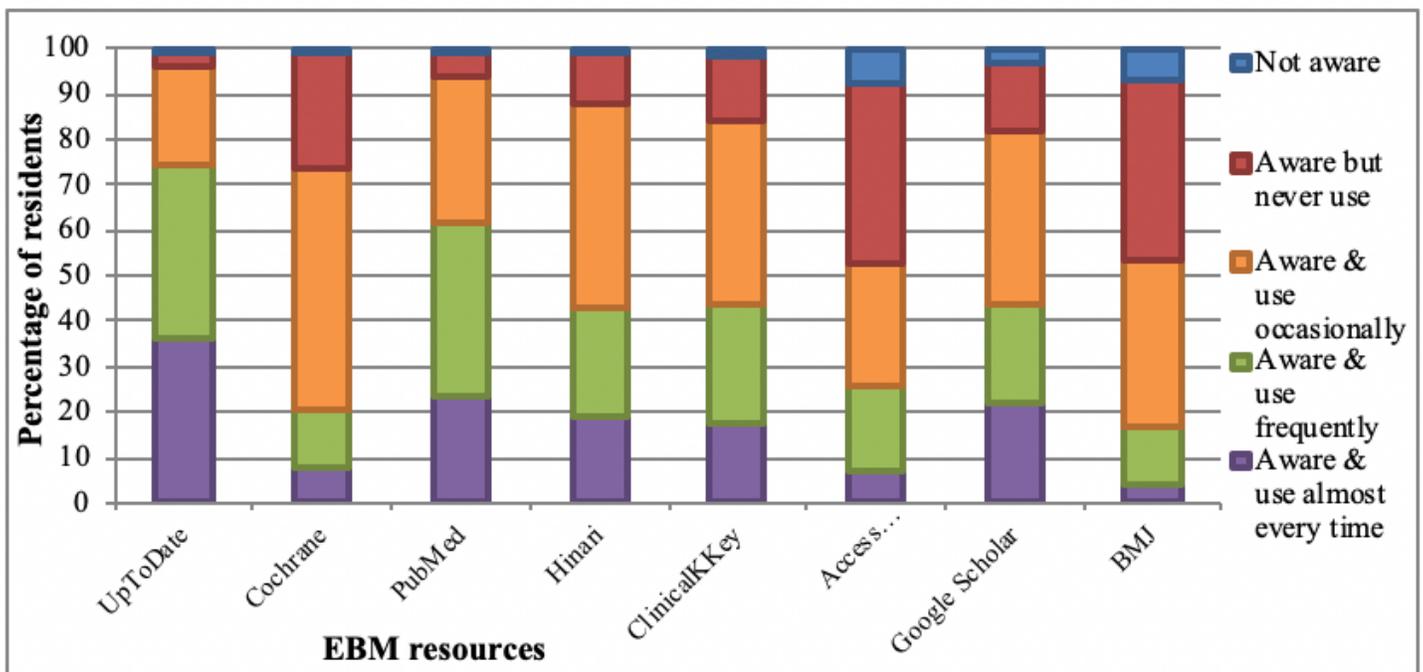


Figure 1

Familiarity of EBM resources among residents

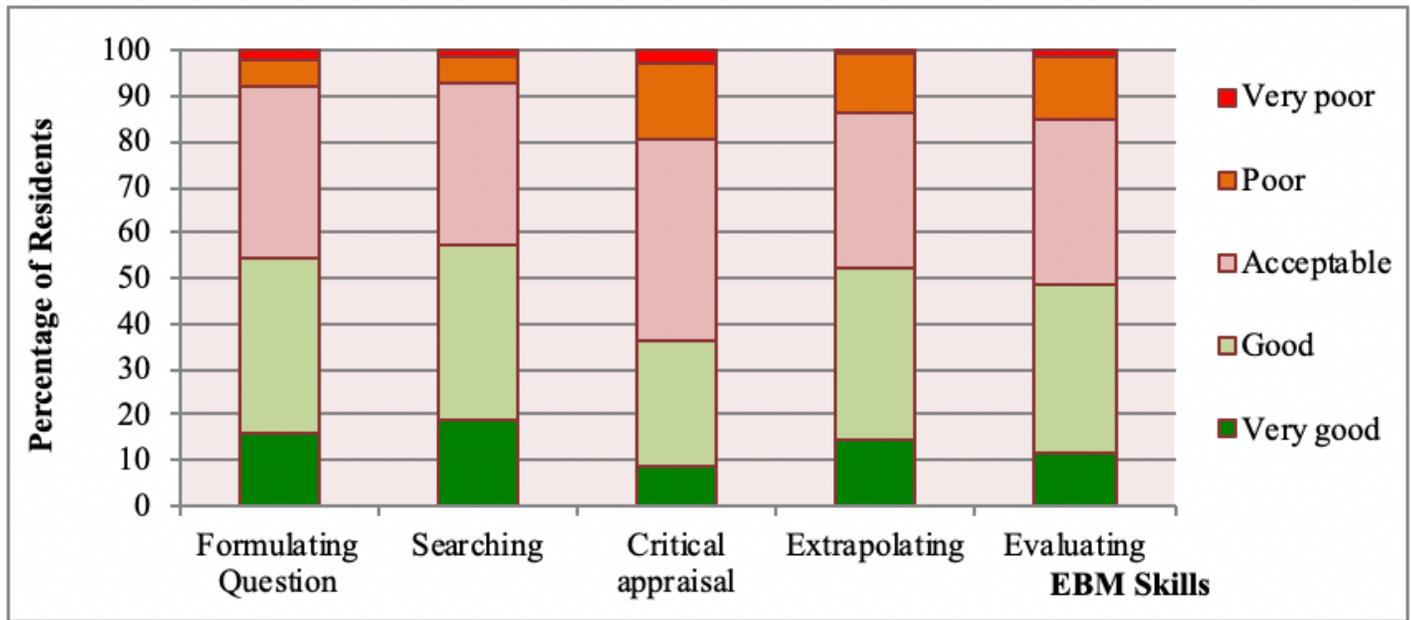


Figure 2

Residents' level of confidence in EBM skills

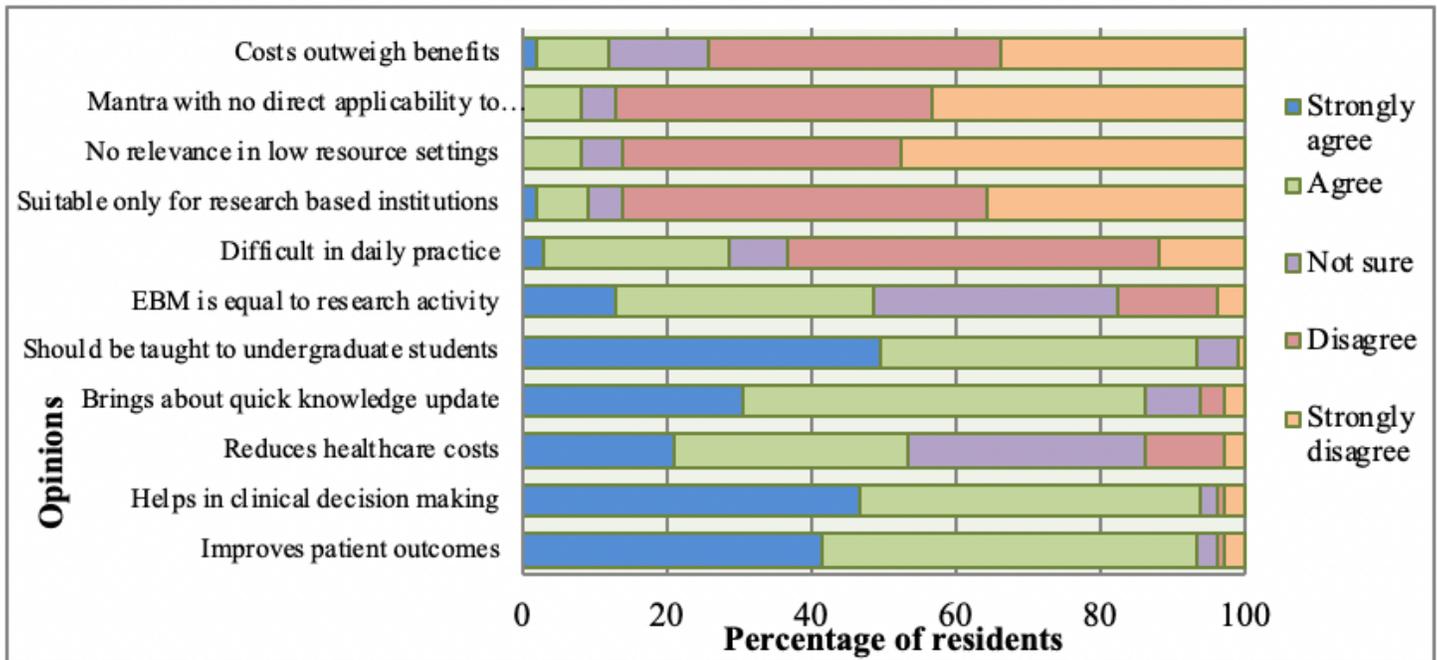


Figure 3

Residents' opinions about EBM

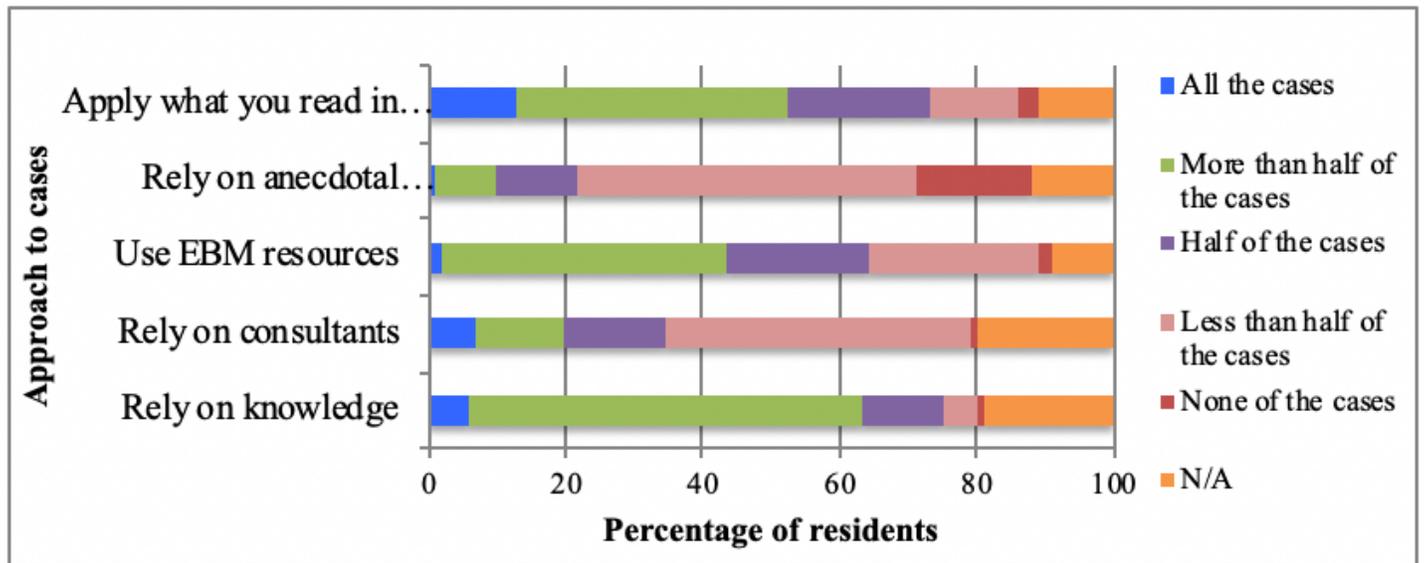


Figure 4

Practice of EBM by residents during the last month

Supplementary Files

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- [Additionalfile3questionnaire.docx](#)
- [Additionalfile4interviewguide.docx](#)