

This is an Open Access document downloaded from ORCA, Cardiff University's institutional repository:<https://orca.cardiff.ac.uk/id/eprint/100534/>

This is the author's version of a work that was submitted to / accepted for publication.

Citation for final published version:

Elsadig, H., Weiss, Marjorie , Scott, J. and Laaksonen, R. 2018. Use of clinical guidelines in cardiology practice in Sudan. *Journal of Evaluation in Clinical Practice* 24 (1) , pp. 127-134. 10.1111/jep.12746

Publishers page: <http://dx.doi.org/10.1111/jep.12746>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the publisher's version if you wish to cite this paper.

This version is being made available in accordance with publisher policies. See <http://orca.cf.ac.uk/policies.html> for usage policies. Copyright and moral rights for publications made available in ORCA are retained by the copyright holders.



Use of clinical guidelines in cardiology practice in Sudan

Hwaida Elsadig¹, Marjorie Weiss², Jenny Scott³ and Raisa Laaksonen⁴

1- Dr. H. Elsadig, at the time PhD student?, Department of Pharmacy, University of Bath*

2- Professor M. Weiss, Professor of Pharmacy Practice, at the time Department of Pharmacy, University of Bath; now School of Pharmacy and Pharmaceutical Sciences, Cardiff University.

3- Dr. J. Scott, Senior lecturer, Department of Pharmacy, University of Bath

4- Dr. R. Laaksonen, Adjunct professor, Faculty of Pharmacy, University of Helsinki

Keywords: guidelines, cardiology, prescribing, Sudan, doctors, healthcare system

***Correspondence:**

Hwaida Elsadig, P.O.Box; 2678, Khartoum, Sudan, Email: hwaida.elsadig@bath.edu

Summary

Rationale, aim and objective: The aim of this study was to explore the views of prescribers in cardiology in Sudan about the use of guidelines in clinical practice and the extent to which guidelines, whether national or international, can be adopted in clinical practice in Sudan. **Methods:** Interviews were conducted with the consultants of the two main cardiac hospitals in Sudan. This was followed by a survey among the doctors in the hospitals in order to examine the views of a larger population of prescribers about the matter investigated. **Results:** Twelve consultants were interviewed and 47 prescribers (60%) replied to the questionnaire that followed. The majority of the doctors relied on foreign guidelines to prescribe for their patients. The doctors acknowledged the limitation of using foreign guidelines in Sudan. A number of doctors were not in favour of following any guidelines as they perceived that the practice in Sudan does not allow implementation of guidelines. **Conclusion:** The prescribers in Sudan had to rely on guidelines made in foreign countries if they want to get the benefit of evidence-based medicine to their patients but they had to find a way to adapt these guidelines to their patients and to the healthcare system they are working within. However, it is not known if this adaptation of the foreign guidelines is providing the benefits intended or is risking evidence-based medicine.

Clinicians as well as health policy makers need to develop tools for making prescribing and patient care more effective especially with regard to pharmacological interventions (1-3). The recent definition for clinical guidelines by the Institute of Medicine in the United States states that guidelines are 'statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options' (4). The use of clinical guidelines in medicine has been advocated based on the assumption that the information provided by these guidelines is derived from strong scientific evidence and hence will lead to evidence based practice (5). This has led to the use of guidelines in prescribing in becoming part of clinical practice in many countries

around the world (2, 6). For prescribers, using the evidence from high quality research provided by the guidelines, is expected to lead to appropriate prescribing (1-3, 7).

Whereas evidence and safety of a certain treatment are the main factors in achieving appropriate prescribing, other factors like intuition, limited resources and patient related factors have to be considered (7). One of the definitions of appropriate prescribing is 'the outcome of a process of decision making that maximizes net individual health gains within society available resources' (7). This definition which relates the individual health gain with the society resources in prescribing is an important element in the challenges facing prescribers in healthcare settings of limited resources. Thus achieving appropriate prescribing will require combining both scientific evidence presented by the guidelines and professional judgement that considers both the individual patient and the health care system.

The World Health Organization (2007) explained in their guidelines for prevention of cardiovascular disease that guidelines should be developed to suit economic, social, and cultural in addition to medical circumstances. A recent initiative by the WHO Regional Office for the Eastern Mediterranean region (WHO-EMRO) was to find a common approach towards either developing or adopting globally developed guidelines that can be applied for the EMRO region (10). One of the main criteria to enhance implementation of guidelines is that guidelines need to be written with the recipients of the service in mind (5). However, it is known to be a very difficult and costly process to develop new guidelines for each different group of recipients (1). Some international societies considered making what was referred to as global guidelines based on a level-wise approach to treatment that put in mind healthcare settings with limited resources (8). However, the caveat with this approach as argued is that it affects the strength of the guidelines and even the idea behind evidence-based practice as it may not be based on clinical evidence but on available resources. This provides a challenge for prescribers in countries with limited resources for example, Sudan where this study was conducted, who may have to use foreign guidelines not made to fit their healthcare systems.

One of the clinical specialities which is considered to be very much influenced by prescribing guidelines is cardiology (9). The World Health Organisation (WHO), the European Society of Cardiology (ESC), the American College of Cardiology (ACC), and the National Institute for Health and Care Excellence (NICE) in the United Kingdom are examples of health societies and organizations that have written guidelines recommending the use of certain medications to reduce morbidity and mortality from heart disease (11-14).

According to the WHO (2007), eighty per cent of deaths from cardiovascular diseases occur in low and middle-income countries and occur equally in men and women. In sub-Saharan Africa, CVD is rapidly increasing and has a major socio-economic impact on societies (15, 16). Statistics from the WHO (2006) and the Sudanese Federal Ministry of Health (2007) showed that heart diseases are the fourth cause of mortality in hospitals after malaria, pneumonia and septicaemia in Sudan. Data obtained from the Department of Non-Communicable diseases in the State Ministry of Health in Khartoum showed a drop in deaths from CVD in Khartoum from 2007 to 2009; but it is still the highest cause of deaths compared to the other non-communicable diseases in Khartoum medical units. Prescribing in cardiology as a clinical

area is going to be used as an example to examine the use of guidelines in prescribing in Sudan in this study.

Based on the areas discussed above the main objectives of this research were:

1. To examine the factors considered by doctors when prescribing for patients in Khartoum cardiac hospitals, in particular the use of clinical guidelines in prescribing
2. To identify the possibility of using clinical guidelines whether national or international in clinical practice in Sudan

Methods

The settings for this study were two of the main cardiology hospitals in Sudan located in Khartoum, the capital. Purposive sampling was used in this study which involved particular selection of participants who can explain the phenomenon investigated (17, 18). These participants were the doctors prescribing in cardiology in these two hospitals.

A sequential exploratory mixed method design was used (19). The first phase involved semi-structured interviews with the senior doctors in the two hospitals. The interviews were used to get in-depth information from those with the most experience in prescribing using a self-administered questionnaire among all the prescribers in the two hospitals to further explore the views of a wider range of prescribers.

For the interviews, an interview guide was developed. In addition to the research objectives, the interview guide was also based on a preliminary observation period of one month spent in the two hospitals before the start of data collection. The semi-structured design allowed flexibility in that issues of interest brought by the participants were also examined (20-23).

The interviews were conducted face to face in the two hospitals in Khartoum by the first author during the period May to July 2011. Audio-recording was carried out when participants' permission was given. The interviews were transcribed verbatim. The interviews were conducted in either the English or Arabic language based on the doctor's preference to make it easier to conduct the discussion. Those conducted in the Arabic language were later translated into the English language by the researcher who being from Sudan, was familiar with the language and the culture of the participants which helps in providing meaning-based translation that adds to the validity of the findings (24).

The questionnaire was developed based on the senior doctors' views in the interviews and after reviewing relevant literature (25-31) and followed a five-point Likert scale design. The questionnaire was pre-piloted for structure, content and language among a number of Sudanese doctors working in UK and Sudan who were not part of the survey population. The questionnaire was in the English language as the doctors in Sudan are expected to have reasonable understanding of the English language. The questionnaires were hand delivered to the participants during the period of June –July 2012. The questionnaires were hand-collected either directly from the participants or were left in a designated area in

the hospitals. The allocated time for collection also served as a reminder for the doctors who did not respond, to participate in the survey.

Data analysis

The N-vivo 10 software package was used to aid in analysis of the interviews. Frame-work analysis approach was used to analyse the data from the interviews (32). The stages involved first familiarization with the data involved, identifying key themes either derived from the study objectives or from the data, indexing or applying these themes to the data and then interpreting the information obtained from the doctors' quotes under appropriate themes.

The questionnaire was analysed using the statistical package SPSS (version 22). Descriptive statistics were conducted using numbers and percentages to show the prevalence of the views obtained from the participants. Kendal-tau test was conducted to identify some correlations between the different variables. The Mann-Whitney test was also used to examine any differences in responses between the different groups of prescribers according to gender and work experience outside Sudan.

Results

Demographics

Of the 25 senior doctors available in the two hospitals, 12 (48%) were interviewed. The rest of the seniors either apologized for non-participation, were not available in the hospital any time an attempt was made to contact them or agreed to participate but did not make it on the interview date. The characteristics of the interviewees are shown in Table 1.

For the survey, the number of doctors in the hospitals was estimated to be around 82. Due to the rotation program of the junior doctors it was difficult to get an exact number of the doctors available in the hospitals during the period of data collection. Forty-three doctors, out of 72 who were given the questionnaire, participated in the survey providing a total response rate of 60%. These doctors ranged in seniority from the least senior medical officers to the most senior cardiology consultants. The respondents' characteristics are shown in Table 2.

The main themes of the interviews based on the pre-set objectives of the study and the prescribers' responses were related to the influences on prescribing and the use of guidelines by doctors in cardiology. Similarly in the questionnaire the doctors were asked about their views with regard to different statements about factors affecting their prescribing particularly focusing on the use of guidelines in prescribing in Sudan.

Factors affecting prescribing

In the interviews the prescribers were asked to identify the factors that influence the choice of drugs for their patients. The main non-clinical factors identified as affecting prescribing were cost and availability. Almost all prescribers considered the cost of the drug as a major issue in prescribing especially considering that heart disease patients take their medications for life.

“Price of the drug, most of heart disease patients take medications for life so the cost is a very important factor.” (Interviewee4).

“[...] Availability is not reliable in Sudan [...].” (Interviewee 4)

“Availability and cost, I am sure if you asked all the doctors they will say the same thing.” (Interviewee 8)

In the survey, most of the prescribers ‘agreed’ or ‘strongly agreed’ that the availability of drugs (98% (n=42)), the use of guidelines (95% (n=41)), drug cost (95%, (41)), drug related effects (95% (41)) and the patient medical condition (91% (39)) affected their prescribing.

Use of guidelines in prescribing

Most prescribers agreed on the importance of following guidelines for appropriate prescribing as these guidelines are considered to be made based on evidence from research. In addition, having guidelines was considered to assist junior doctors in prescribing in spite of the fact that in certain cases it may not be possible to follow guidelines.

“No I think evidence has shown that guidelines based treatment improves survival, improves the outcomes so sticking to guidelines is actually important [...], you as a consultant cannot deal with every patient so once they [the doctors in training] know the guidelines, you have some sort of treatment plan that can be applied to all patients except when there is something outstandingly [different from the norm].” (Interviewee 5)

“Appropriate prescribing is the guidelines, if you can stick to the guidelines this is better.” (Interviewee 6)

One of the prescribers was against following any guidelines in practice in Sudan. He considered that guidelines are meant for healthcare systems with standard services.

“These things that we call guidelines, there are rules [...]; if the conditions are not available you cannot implement them. [...] Of course if things were organised, everything available, guidelines can work but this is not there and I don’t think in the coming fifty years it will [...], this all needs money.” (Interviewee 10)

Use of international guidelines

Most of the senior doctors considered it possible to use international guidelines for prescribing in cardiology but they have to adapt these guidelines to the environment in Sudan.

“Yes I can apply most of the international guidelines in Sudan [...] simply because we do not have our own guideline.” (Interviewee 2)

“Guidelines with a grain of salt, guidelines have to be adapted to local environment, and that’s what experience is.” (Interviewee 5)

An example where there is a need to use the guidelines in a modified way is when the recommended treatments are not available in Sudan.

“I cannot prescribe the new drug (X) which is not found in Sudan. We stick to guidelines but with a modified picture.” (Interviewee 11)

As guidelines recommendations usually involve follow up of treatment, this may not always be practical in Sudan due to either limited resources of many health centres in different parts of Sudan or the costs that financially-disadvantaged patients may incur.

“For example, use of warfarin, I cannot prescribe it as an anticoagulant for somebody who lives in ‘Um’ [A remote place in Sudan] [...] he/she is going to bleed [...] there is no follow up in certain areas even within Khartoum.” (Interviewee 8)

“Guidelines sometimes recommend for example renal function tests every two weeks or three weeks, this is very costly [for the patient].” (Interviewee 11)

For some doctors it was considered not mandatory to follow international guidelines recommendations step by step.

“As long as I am within the room of the guidelines, there is no problem, but never stick to it word by word.” (Interviewee 11)

Other doctors considered that overall, international guidelines are not suitable to be applied on Sudan.

“They do not cover our situation in Sudan.” (Interviewee 8)

“We should not be bringing foreign guidelines and say we want to implement them.” (Interviewee 10)

More than half of the doctors (57% (24)) who participated in the survey indicated that clinical guidelines could be implemented in practice in Sudan. Although there was a major agreement (86% (36)) that guidelines are to be made for a targeted population, similar to the interviewed doctors’ views, 79% (34) of the participants considered it possible to apply the international guidelines to Sudanese patients. The prescribers’ responses to the statements about the use of guidelines are shown in Table 3.

When doctors in the survey were asked to identify the guidelines that they were following, (32% (13)) did not mention any, while the rest of the prescribers described NICE guidelines (37% (15)), published in

the UK, American (17% (7)) or European guidelines (5% (2)) as their first preferred guidelines. Some of the prescribers (23% (9)) considered their practice to draw upon a combination of international guidelines.

In a different question about how often they apply guidelines, the majority of the prescribers (72% (31)) considered themselves as 'often' or 'very often' applying guidelines when prescribing. However, when the prescribers were presented with the statement that the practice in Sudan does not follow guidelines, 42% (18) considered that to be true while about 46% (20%) perceived the practice to be following guidelines.

Personal experience versus guidelines' recommendations

When prescribers were asked about prioritizing guidelines recommendation over personal experience or the other way round, they had different opinions.

"Guidelines, absolutely, I tell them [junior doctors] 'Do and Do not' in guidelines, after that comes my experience which they [junior doctors] see it by themselves. But I follow guidelines unless there is something else that makes me not to follow it." (Interviewee11)

"You need to take both [guidelines and experience] obviously [...] I never do something out of experience which has not got evidence, if I do that I do it in very rare situations, as a clinician in areas where there is no evidence you are allowed to use experience but if the evidence is with or against a certain treatment, I do not pay attention to experience. But generally I do not find problems with both." (Interviewee 5)

"Experience is more important than guidelines [...] studies were built on restricted conditions." (Interviewee 4)

In the survey, while 56% (24) of prescribers were in agreement that following clinical guidelines is more important than following personal experience, 40% (17) considered the opposite to be true and that following personal experience comes first. Some prescribers also linked experience with therapeutic traditions which was considered to precede guidelines.

"I like to use digitalis, old school, all my colleagues use amiodarone, but I have long experience with it, 32 years and I know the benefits" (Interviewee 10)

"For prescribing I use what is known and common and according to my experience" (Interviewee 7)

For some doctors experience was not necessarily personal experience but the experience of senior doctors.

"We ask the seniors for their experience." (Interviewee1)

"I personally will take the boss [senior consultant] opinion in this stage." (Interviewee 9)

Availability of national guidelines

As one of the doctors mentioned earlier that the use of international guidelines is due to the lack of national guidelines, prescribers were asked about the availability of national guidelines in cardiology. Some of the doctors confirmed that there are Sudanese guidelines made for hypertension. Others considered that there may be some national guidelines but they could not verify if they were actually implemented in practice.

“Only for hypertension, there are no other guidelines.” (Interviewee1)

“There are but not updated [...] guidelines. In most of the doctors meetings they do talk about the need to have Sudanese guidelines.” (Interviewee8).

In the survey, when the doctors were asked about the availability of Sudanese guidelines, almost half of the participants (51% (22)) were not sure if such guidelines exist while 35% (15) thought that there were no Sudanese guidelines in cardiology. Only 14% (6) of the prescribers confirmed the availability of the Sudanese Guidelines for Hypertension. Other prescribers were sceptical about the attempts made by some doctors to make national guidelines.

“[...] the national guidelines for me they are not working” (Interviewee6)

“How to write a guideline is a big issue, you cannot leave it for two or five persons to do it, they need to have the background to look into the randomised controlled trials otherwise it will be copying” (Interviewee4).

Association between variables and comparison between the groups

The questionnaire findings were further explored to examine potential relationships between the prescribers' characteristics and their responses. . Using Kendall tau-b test some statistically positive significant relationships were found between the prescribers' current position and their views with regard to the use of guidelines as shown in Table 3. There were more positive responses from the prescribers with regard to the use of guidelines as they became more senior in their position. Prescribers with work experience outside Sudan were more likely to be positive about the relevance of guidelines to their practice (Mann-Whitney test $U = 99$, $p = 0.028$) than those with no experience outside Sudan. Regarding gender, male doctors were more likely to agree than female doctors that guidelines are more important than experience ($U = 98$, $p = 0.021$), while female doctors were more likely to agree than male doctors that adherence to written guidelines is not always desirable ($U = 98$, $p = 0.024$).

Discussion

This mixed method study investigating the influence of guidelines in prescribing in cardiology in Sudan found that the main factors identified by cardiology doctors in Khartoum as affecting prescribing decisions were affordability of the medication to the patient, the availability of the drug prescribed and cardiology guidelines recommendations. Availability and cost of medication were also considered as factors affecting the implementation of guidelines.

The majority of doctors (72% (31)) affirmed that they were using guidelines when prescribing. Other studies in the EMRO region showed similar positive attitude from healthcare professionals towards the use of guidelines in practice (33). However, the prescribers in this study were divided in their opinions in considering whether the current practice in hospitals in Sudan is following guidelines or not. It may be that following guidelines is a personal decision taken by doctors in the hospitals but they could not see that implementation of guidelines is a practice endorsed by their hospitals. The Sudanese Evidence Based Medicine Association (SEBMA) although still in its early stages has a clear plan to educate and promote the use of evidence based medicine in healthcare practice in Sudan (34).

Most of the doctors were found to rely on international guidelines. Using international guidelines was considered as a suitable option in the absence of national guidelines. Doctors who were using international guidelines were trying to adapt the foreign guidelines to the healthcare situation in Sudan. Difficulty in implementing foreign guidelines is expected when they are applied to different populations (5, 35). Thus the doctors were choosing from the international guidelines what can be applied in Sudan and for their type of patients. This may be a logical approach in trying to implement evidence based treatment promoted by these international guidelines in settings with limited resources. However, this approach can affect the benefits expected from guidelines which can only occur when guidelines are taken as a whole set of recommendation whereby each part of the evidence is linked to the other. Some has cautioned that not following the sequence of treatment as presented in the guidelines can lead to the treatment provided not to be based on evidence (8) .

The solution in implementing clinical guidelines in healthcare settings like Sudan can be seen in having national guidelines to suit the patients and the healthcare system of the country. The concept of guidelines being suitable for settings where there are particular social conditions and limited resources issues, is recognised and has been promoted in order that the perceived benefits from guidelines are not missed by patients in different parts of the world (36). However, the challenge for countries with limited resources is that it is considered a costly process to make guidelines from scratch (1). During this study it was found that there are national guidelines in hypertension in Sudan (37). These guidelines were adapted from British, European and World Health Organization guideline. However, many of the doctors involved in this study were not aware of the existence of such guidelines. Different elements may have led to these guidelines not being recognized or used by most of the doctors in cardiology. For example, when interviewed, few doctors were sceptical about the ability of a number of healthcare professionals in writing suitable clinical guidelines. Non-inclusive guidelines developing committees was previously considered to be a great limitation for the use of guidelines (6, 38). Some doctors in the study also criticized the national guidelines as being a duplication of other international guidelines and therefore, not fit for practice in Sudan. Societies such as the Pan-African Society of Cardiology emphasized the need for making guidelines based on studies on African patients in order to achieve the best management of diseases like hypertension (39). However, in the absence of such local studies, and with the limited resources available, national guidelines in countries like Sudan will presumably continue to be adapted from international guidelines. In such case, these adapted guidelines should consider the resources of the healthcare system and the type of patients involved in order for them to be applicable in practice.

Although the recommendations of international organizations such as the WHO is for guidelines to be made to suit the socio economic state of the healthcare settings in which they are applied (40), some have also argued that to be able to use guidelines, there are certain criteria that need to be available in the health care system itself (1). This later argument was shared by some of the prescribers in Sudan who considered that it was not possible to implement any guidelines in practice in Sudan as hospitals even within Khartoum, the capital, were not able to provide comparable services. For these prescribers and those who considered the international guidelines were not fit for the healthcare system in Sudan, and did not trust the available national guidelines prioritizing personal experience when prescribing was the solution.

The doctors in this study were divided between whether following guidelines is the primary influence on treatment decisions, whether clinical experience comes first or as some suggested, experience was rooted in guidelines recommendations and thus a link exists between the two. Although clinical experience based on the number of years of practice is expected to lead to accumulation of knowledge and skills and hence have a positive effect on patient care; this may not always be the case. Some evidence suggested that doctors with longer years of practice demonstrated a decrease in quality of healthcare compared to those with fewer years of practice (41). Part of the reason for that was argued to be that older generations of doctors are either resistant to change their traditional practice or are less likely not to keep up with the up to date recommendations for treatment. Hospital resident doctors in Sudan were previously found to be supportive of the use of EBM in practice but they lacked the skills and knowledge to do so (42).

Considering the above challenges in using guidelines especially in healthcare settings with limited resources, there does not seem to be a one solution to overcome all the difficulties. Considering Buetow et al (1997) definition of appropriate prescribing which is prescribing that ‘maximizes net individual health gains within society available resources’, a possible solution to ensure that health gains are achieved from the use of international guidelines in countries like Sudan is to provide evidence from research to support doctors in that their manipulation of foreign guidelines to suit certain settings provides more benefit than harm to patient care.

Conclusion

This research identified that prescribers in Sudan were largely dependent on foreign guidelines for prescribing. The prescribers were facing a number of challenges in trying to adapt the recommendations of the foreign guidelines to the situation of the patient and the healthcare system in the country. This was considered as the only practical approach in the absence of national guidelines. However, research is required to determine whether this adaptation of foreign guidelines, which is most of the time done individually, will lead to the most possible appropriate prescribing that can be achieved in limited–resources healthcare settings.

Finally, as it was not possible to get the views of all the prescribers in the two hospitals, it is not known if those who did not participate may have had different opinions. In addition, as this study included only prescribers from the two main cardiology hospitals in Sudan, it may not be possible to generalize the

findings of this study. However, a degree of transferability of these findings can be expected to be applicable in similar settings to where the research was conducted.

Acknowledgments

This study was part of a PhD project which was made possible by a fee-waiver scholarship from the University of Bath and funding assistance from London Gordon-Memorial College Trust Fund.

References

1. Feder G, Eccles M, Grol R, Griffiths C, Grimshaw J. Using clinical guidelines. *BMJ*. 1999;318(7185):728-30.
2. Hewitt-Taylor J. *Clinical guidelines and care protocols*. Chichester, West Sussex Hoboken, NJ: Wiley; 2006. Available from: <http://libproxy.bath.ac.uk/login?url=http://www.mylibrary.com?id=44894>. Accessed 22nd November 2011.
3. Woolf SH, Grol R, Hutchinson A, Eccles M, Grimshaw J. Clinical guidelines: potential benefits, limitations, and harms of clinical guidelines. *BMJ*. 1999;318(7182):527-30.
4. [IOM.nationalacademies.org](http://iom.nationalacademies.org). Standards for Developing Trustworthy Clinical Practice Guidelines - Institute of Medicine [Internet]. 2015. Available from: <http://iom.nationalacademies.org/Reports/2011/Clinical-Practice-Guidelines-We-Can-Trust/Standards.aspx> . Accessed 22nd February 2017).
5. Keeley PW. Clinical guidelines. *Palliat Med*. 2003;17(4):368-74.
6. Shaneyfelt TM, Centor RM. Reassessment of Clinical Practice Guidelines Go Gently Into That Good Night. *Jama-J Am Med Assoc*. 2009;301(8):868-9.
7. Buetow SA, Sibbald B, Cantrill JA, Halliwell S. Appropriateness in health care: application to prescribing. *Social science & medicine*. 1997;45(2):261-71.
8. Fried M, Krabshuis J. Can 'Cascades' make guidelines global? *J Eval Clin Pract*. 2008;14(5):874-9.
9. Meulen RHJt. *Evidence-based practice in medicine and health care a discussion of the ethical issues*. Berlin: Springer; 2005. Available from: <http://libproxy.bath.ac.uk/login?url=http://www.mylibrary.com?id=34668>. Accessed 18th October 2011.
10. Developing/adapting evidence-based guidelines in the Eastern Mediterranean Eastern Mediterranean Health Journal. 2016; 22 (4). Available from: <http://www.emro.who.int/emhj-volume-22-2016/volume-22-issue-4/developingadapting-evidence-based-guidelines-in-the-eastern-mediterranean-region.html>. Accessed 22nd February 2017.

11. Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H, et al. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The Task Force for the management of acute coronary syndromes (ACS) in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC). *European Heart Journal*. 2011;32(23):2999-3054.
12. NICE. Prevention of Cardiovascular Disease. 2010. Available from: <https://www.nice.org.uk/guidance/ph25/chapter/1-recommendations>. Accessed 22nd January 2011.
13. Smith SC, Jr., Allen J, Blair SN, Bonow RO, Brass LM, Fonarow GC, et al. AHA/ACC guidelines for secondary prevention for patients with coronary and other atherosclerotic vascular disease: 2006 update: endorsed by the National Heart, Lung, and Blood Institute. *Circulation*. 2006;113(19):2363-72.
14. WHO. Prevention of CVD- Guidelines for assessment and management of cardiovascular risk 2007. Available from: http://www.who.int/cardiovascular_diseases/guidelines/Pocket_GL_information/en/ Accessed 20th August 2015.
15. Abanilla PK, Huang KY, Shinnors D, Levy A, Ayernor K, Aikins AG, et al. Cardiovascular disease prevention in Ghana: feasibility of a faith-based organizational approach. *Bull World Health Organ*. 2011;89(9):648-56.
16. Suliman A. The state of heart disease in Sudan. *Cardiovasc J Afr*. 2011;22(4):191-6.
17. Bowling A. *Research methods in health investigating health and health services*. Maidenhead, Berkshire, England ; New York, NY: McGraw Hill/Open University Press; 2009. Available from: <http://libproxy.bath.ac.uk/login?url=http://lib.mylibrary.com?id=333790>. Accessed 5th April 2015.
18. Smith F. *Research methods in pharmacy practice*. London: Pharmaceutical Press; 2002. xviii, 286 p. p.
19. Creswell JW. *Research design : qualitative, quantitative, and mixed methods approaches*. 2nd ed. Thousand Oaks, Calif. ; London: Sage; 2003. xxvi, 246 p. p.
20. Creswell JW, Plano Clark VL. *Designing and conducting mixed methods research*. Thousand Oaks, Calif.: SAGE; 2007. xviii, 275 p. p.
21. Mason. *Qualitative researching*. 2nd ed. London: Sage; 2002. 223p. p.
22. Oppenheim AN, editor. *Questionnaire Design, Interviewing and Attitude Measurement*. London: Continuum; 2003.
23. Smith F. *Conducting your pharmacy practice research project : a step-by-step guide*. London: Pharmaceutical Press; 2005. xi, 142 p. p.
24. Choi J, Kushner, K.E., Mill, J. and Lai, D.W. Understanding the language, the culture, and the experience: translation in cross-cultural research. *International Journal of Qualitative Methods*. 2012;11(5):652-65.

25. Awad A, Matowe, L and Capps, P. . Medical doctors' perceptions and expectations of the role of hospital pharmacists in Sudan. *Pharm World Sci.* 2007;29:557–64.
26. Greenfield S, Bryan S, Gill P, Guttridge K, Marshall T. Factors influencing clinicians' decisions to prescribe medication to prevent coronary heart disease. *Journal of Clinical Pharmacy & Therapeutics.* 2005;30(1):77-84.
27. Ljungberg C, Lindblad AK, Tully MP. Hospital doctors' views of factors influencing their prescribing. *J Eval Clin Pract.* 2007;13(5):765-71.
28. Nutescu EA, Park HY, Walton SM, Blackburn JC, Finley JM, Lewis RK, et al. Factors that influence prescribing within a therapeutic drug class. *Journal of Evaluation in Clinical Practice.* 2005;11(4):357-65.
29. Oshikoya KA, Oreagba I, Adeyemi O. Sources of drug information and their influence on the prescribing behaviour of doctors in a teaching hospital in Ibadan, Nigeria. *Pan Afr Med J.* 2011;9:13.
30. Schumock GT, Walton SM, Park HY, Nutescu EA, Blackburn JC, Finley JM, et al. Factors that influence prescribing decisions. *Ann Pharmacother.* 2004;38(4):557-62.
31. Theodorou M, Tsiantou V, Pavlakis A, Maniadas N, Fragoulakis V, Pavi E, et al. Factors influencing prescribing behaviour of physicians in Greece and Cyprus: results from a questionnaire based survey. *BMC Health Serv Res.* 2009;9:150.
32. Pope C, Mays N. *Qualitative Methods in Health Research. Qualitative Research in Health Care.* Third edition ed: Blackwell Publishing Ltd; 2006. p. 69-74.
33. Wahabi HA, Alzeidan, RA, Fayed AA, Esmail SA and Al Aseri ZA. Attitude and practice of the health care professionals towards the clinical practice guidelines in King Khalid University Hospital in Saudi Arabia. *J Eval Clin Pract.* 2011; 17 (4): 763–767.
34. Wahabi HA. Evidence-based healthcare in Sudan. *BMJ* 2006;333:815. Available from: <http://www.bmj.com/rapid-response/2011/10/31/evidence-based-health-care-sudan>. Accessed 22nd february 2017.
35. Hajjaj FM, Salek MS, Basra MK, Finlay AY. Non-clinical influences on clinical decision-making: a major challenge to evidence-based practice. *J R Soc Med.* 2010;103(5):178-87.
36. Lindback C, K CA, Wrammert J, Vitrakoti R, Ewald U, Malqvist M. Poor adherence to neonatal resuscitation guidelines exposed; an observational study using camera surveillance at a tertiary hospital in Nepal. *BMC pediatrics.* 2014;14:233.
37. **(SSH) Sudanese Society of Hypertension (SSH). Sudan Hypertension Guidelines 2012. Available from: <http://ssh-sd.org/guidelines>. Accessed 12th July 2011.**
38. Woolf SH, Grol R, Hutchinson A, Eccles M, Grimshaw J. Potential benefits, limitations, and harms of clinical guidelines. *BMJ.* 1999;318(7182):527-30.
39. Dzudie A, Ojji D, Anisiuba BC, Abdou BA, Cornick R, Damasceno A, et al. Development of the roadmap and guidelines for the prevention and management of high blood pressure in Africa: Proceedings of the PASCAR Hypertension Task Force meeting: Nairobi, Kenya, 27 October 2014. *Cardiovasc J Afr.* 2015;26(2):82-5.

40. WHO. Pocket book of hospital care for children. Guidelines for the management of common illnesses with limited resources 2005. Available from: <http://whqlibdoc.who.int/publications/2005/9241546700.pdf>. Accessed August 12, 2012. Internet document.
41. Choudhry NK, Fletcher RH, Soumerai SB. Systematic review: the relationship between clinical experience and quality of health care. *Ann Intern Med.* 2005;142(4):260-73.
42. Zeidan AZ, Behairy MM. Knowledge Attitudes and Practices of Evidence based Medicine among Residence Doctors in Sudan. *Sudan JMS* 2011 Vol 5 (3). Available from: <http://khartoumspace.uofk.edu/handle/123456789/17471show=full>. Accessed 22nd February 2017.

Table 1 Characteristics of senior doctors' interviewed

Code	Gender	Years of practice in cardiology
Interviewee 1	F	1
Interviewee 2	M	1
Interviewee 3	F	10
Interviewee 4	M	19
Interviewee 5	M	5
Interviewee 6	M	27
Interviewee 7	F	12
Interviewee 8	M	11
Interviewee 9	F	< 1year
Interviewee 10	M	24
Interviewee 11	M	12
Interviewee 12	M	< 1year

Participants' characteristics	Frequency of doctors (%)	Number of doctors (N)
Gender		
Male	71	29
Female	29	12
Current* position		
Medical Officer	32	13
Registrar	49	20
Physician	5	2
Cardiology Fellows*	5	2
Consultant Cardiologist	10	4
Work experience		
Experience outside Sudan	27	11
No experience outside Sudan	73	30

*Cardiology Fellows: physicians on training to become cardiologists

Table 3 The use of guidelines in clinical practice in Sudan

	*SD % (N)	D	NA	A	SA	**Kendall-tau -b
Not possible to apply guidelines in Sudan	9(4)	48(20)	5(2)	36(15)	2(1)	
Possible to make guidelines in Sudan	-	7(3)	14(6)	56(24)	23(10)	0.296 (p=0.034)
International guidelines can be followed in Sudan	-	16(7)	5(2)	60(26)	19(8)	
Clinical guidelines are to be made for targeted population	2(1)	7(3)	5(2)	57(24)	29(12)	
Clinical guidelines more important than experience	2(1)	35(15)	7(3)	35(15)	21(9)	0.450 (p=0.001)
Clinical experience is more important than guidelines	16(7)	35(15)	9(4)	35(15)	5(2)	0.448 (p=0.001)
Practice in Sudan is not based on guidelines	7(3)	39(17)	12(5)	37(16)	5(2)	
Adherence to guidelines is not always desirable	9(4)	21(9)	12(5)	52(22)	5(2)	

*SD: Strongly Disagree, D: Disagree, NA: Neither agree nor disagree, A: Agree, SA: Strongly Agree

** Significant correlation between prescribers' current position and their views about use of guidelines