

EFFECTIVENESS OF CONTINUING MEDICAL EDUCATION IN GHANA: A PRELIMINARY STUDY

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Abstract

Introduction: The purpose of this study was to evaluate the impact of a Continuing Medical Education (CME) activity on the level of knowledge of Ghanaian physicians. CME is well studied in resource-rich countries, but little is known about the efficacy of CME in Lower- and Middle-income countries.

Methods: This cross-sectional study used anonymous semi-structured questionnaires in a self-assessment method of evaluation. Participants of the CME conference organized by the Ghana College of Physicians and Surgeons, dubbed Medical Knowledge Fiesta, were asked to evaluate the utility of the educational content at the conference, and then at three- and six-months post-conference. Data was reported anonymously using aggregation and analysed using descriptive statistics.

Results: The data indicates a 53% knowledge diffusion rate at three months and 63% at six months post CME.

Sixty-six percent and 77% of participants implemented new knowledge within three months and six months post CME, respectively. At three months post CME, 65% of participants indicated CME changed their practice, and this increased to 82% at six months. Changes reported include 57% of participants asking different and/or additional questions during patient assessments three months post CME which increased to 74% at the sixth month survey. Thirty-three percent of participants scheduled more follow up appointments three months post CME which increased to 44% six months post CME.

Conclusion: In this study, CME improved physician knowledge in Ghana. Within six months following the CME, 82% of respondents reported a change in their medical practice.

Key Words: Education, Medical, Continuing, Ghana.

Introduction

Ghana, with a population 28.2 million¹, has approximately 2,600 doctors practicing medicine within its borders.² Limited internet and international journal access coupled with fiscal challenges traveling to international medical meetings means local continuing medical education (CME) is critical to improving physician knowledge. Ghana has a gross domestic product (GDP) of approximately USD42.69 billion.³ In 2014, total healthcare expenditure, both public and private, comprised about 3.6% of GDP compared to 5.6% of GDP for developing sub-Saharan African countries, and approximately 4.5% of GDP in all other Low- and Middle-Income Countries (LMICs).³ Public sector health care expenditure for Ghana was 59.8% of

GDP compared to 42.6% for developing countries in sub-Saharan African and 37.1% for LMICs in general.³ Ghana achieved independence from Britain in 1957 and formal training of medical doctors in Ghana to serve the national need began in 1962. Since then, there has been expansion in medical training facilities. The last decade saw an unprecedented commitment by the Ghana College of Physicians & Surgeons (GCPS) to establish postgraduate training of specialists and subspecialists in various medical disciplines. In 1999, Ghana began their Family Medicine Residency Program.⁴ The National Ambulance Service began in 2004 and was expanded in 2008⁵ with the training program in Emergency Medicine being launched in 2010. Further, as Ghanaians begin to live longer, the GCPS began work on a Geriatrics training program. Additionally, medical schools and expanded residency programs work in tandem with continuing medical education (CME).

Ghana is one of the few nations in sub-Saharan Africa that has formal CME requirements to maintain a medical license. The Ghana Medical and Dental Council requires physicians to earn 15 points (credits) annually from a minimum of three educational activities. Moreover, a recertification in ethics is required every

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three years.⁶ Unlike many other countries, Ghana's CME credit system is not based on the duration of an educational activity, but on the educational format of the activity. For example, in the United States, performance improvement CME (PI CME) is a 20-credit activity per project and internet searching and learning is a 0.5 credit activity per internet search.

Other formats of CME, such as conferences, workshops and online learning are duration based and typically one hour is equivalent to one credit. However, Ghana, as seen in table 1, places more credit and thus

more emphasis on multidisciplinary meetings (5 credits) and less emphasis on online enduring materials (1 credit). Ghana also limits the number of credits a physician can earn from the various format categories. Again, in table 1 we see that Ghanaian physicians can earn two CME credits per peer reviewed article with a maximum of four articles a year for a total of eight credits of the 15 required credits. Despite a formal CME system, few published reports on the effectiveness and/or outcomes of Ghanaian CME exist.

Table 1: Medical and Dental Council – Ghana. 2016 CME requirements⁶	
Continuing Professional Development	(up to 3 credits)
Law and Ethics Management and Administration Cost and Management Accounting E-Learning Good record keeping Medical Education Entrepreneurship Updating clinical skills and information IT including computer assisted clinical programs	
CME Requirements per annum	
Multidisciplinary - one event covering up to at least 3 disciplines of medicine	5 credits/event
Subject based events with hand-on learning	5 credits/event
Subject based events (oral only)	3 credits/event
Online/distance learning courses certificates (Maximum of 4 credits/year)	1 credit/event
Published research (peer reviewed) (Maximum of 4 credits per year)	2 credits/paper
Non peer reviewed papers (One credit per year)	1 credit/paper
Resource Person at accredited event (Learning from teaching: In addition to programme credit)	1 credit/paper
Clinical meetings (certified by HOD) (Maximum of 4 Credits/year)	1 credit/event
Professional Association/groupings/ scientific meetings and conference	3 credits/event

CME is abundant in the United States and other resource-rich nations with many no cost offerings available online and in local healthcare facilities. Further, numerous studies and systematic reviews regarding the effectiveness of CME, particularly in the United States, are well published and commonplace compared to other countries. As the effectiveness of education is highly dependent on context, it is a challenge to ascribe the findings of previous research of the CME field to CME outside of the US. However, previous studies do provide some framework to assist in studying non-US CME.

In 1996, Umble & Cervero published a systematic review of CME noting the emphasis of researchers on identifying causal connections between CME and various impact variables as well as a focus on improving

evaluation methods to improve causal inferences. Their review not only demonstrated the effectiveness of CME but illustrated how CME research attempted to address some of the complex social constructs that influence the degree to which CME can be effective.⁷ Looking further at the work of Robertson et. al., the effectiveness of CME and its impact on clinical outcomes must take into account the context of physician practice. They concluded that continuing education needs to be viewed less as an individual physician learning activity and more as a social activity comprising numerous social interactions.⁸

For purposes of this study, knowledge diffusion was a key social interaction that aided in determining the effectiveness of the CME activity. By 'knowledge diffusion' we mean "the process by which an innovation

is communicated through certain channels over time among members of a social system.”⁹ With such a significant shortage of physicians in Ghana, CME must be designed with knowledge diffusion in mind so that information can reach those clinicians who are not able to attend larger medical meetings.

Cervero and Gaines (2015) continue to highlight the importance of social context and CME by observing that different educational approaches have different outcomes in different contexts, and that social, political, economic and other variables impact the effectiveness of CME. Their synthesis of systematic reviews includes reports of findings calling for research on the effectiveness of CME in terms of contextual influencers like learner motivation. They continued their analysis to observe research demonstrate that more positive outcomes were associated with education that incorporated a higher percentage of the intended learners, some interactivity, focused on simpler behaviour changes, and more serious clinical issues.¹⁰

It is with a focus on the contextual clinical realities of Ghana that the CME activity was developed and studied. Given that the clinical environment is very different in LMICs compared to resource-rich environments, repackaging existing CME for LMICs ignores cultural, language and resource differences making it less effective. Since August 2011, the GCPS in collaboration with the Ghana Physicians and Surgeons Foundation of North America and Africa Partners Medical has hosted an annual 4-day CME activity in Ghana, dubbed Medical Knowledge Fiesta. The CME faculty has comprised of Ghanaian, American, Canadian and British medical experts. While the CME activity has been well attended (250-500 participants each year), no attempt has been made to evaluate its impact on knowledge gain and change in practice. A number of Ghanaian and international collaborators have also been working together to offer CME throughout Ghana; however, there is little

published evidence on the effectiveness of CME in improving physician practice in Ghana.

The aim of this study was to evaluate the impact of a CME activity on the level of knowledge and practice of Ghanaian physicians. It is envisioned that beyond information obtained from on-site and follow-up evaluations, this study will collate information to improve the effectiveness of CME offerings designed by and for physicians in Ghana.

Methods

Setting

Participants included in this study were Ghanaian doctors who practice medicine in Ghana and who attended the Medical Knowledge Fiesta held from 14th to 17th September, 2015 under the theme Improving Quality and Safety of Patient Care at the Ghana College of Physicians and Surgeons, Ridge, Accra. This conference is one of the largest CME meetings in Ghana and therefore attracts a lot of doctors in Ghana. All conference attendees were eligible for the study and attendees who did not give their consent were excluded.

CME structure and content

Table 2 outlines the content of the meeting which includes plenary sessions, program tracks and workshops. There were seven plenary sessions, eight workshops and ten program tracks. Teaching methods included didactic lectures, small group discussions and hands-on skill training. Content covered a range of clinical topics including one of Ghana’s first papers in Interventional Radiology. Workshops included a few non-clinical topics such as succession planning, scientific writing and a workshop on how to relocate to Ghana to practice medicine. In line with the meeting’s theme, much of the content focused on quality improvement and patient safety.

Table 2: 2015 Medical Knowledge Fiesta content areas (Accra, Ghana)

Program Tracks	Workshops
OB/GYN	Cardiology
Family Medicine	Radiology
Internal Medicine	Scientific Writing
Public Health	Adult Basic Life Support
Paediatrics	Palliative Care
Anaesthesiology & Emergency Medicine	Relocating Home
Surgery	Succession Planning
Laboratory Medicine	Mental Health
Eye & ENT	
Psychiatry	

Data Collection

Using a modified Information Assessment Method (IAM) survey design, each program track and workshop session was evaluated. IAM was developed by Roland Grad and Pierre Pluye of McGill University in Montreal Canada. It “systematically documents reflection on

health information delivered or retrieved from electronic knowledge resources. IAM enhances reflective learning, evaluation of knowledge resources, and two-way knowledge exchange between information users and information providers”.¹¹ IAM was selected over session evaluation approach because the instrument is

highly client-centred more so than content-centred. It helps to facilitate using the content as opposed to just knowing the content. Questions included multiple choice questions, with some questions accepting a single response and other questions accepting multiple responses. Question formats also included yes/no, open-ended, and four-point scale questions. Eighty session evaluations were collected during the CME conference.

The three- and six-month follow-up surveys were distributed electronically through Qualtrics. The follow-up surveys included questions about implementation and sharing of information in respondents' practice environments. (In LMICs, implementation of new clinical knowledge is as important as sharing that knowledge with one's colleagues. Not all the physicians in a hospital or a practice, particularly in remote areas, can attend CME conferences where knowledge is disseminated. Thus, many clinicians in LMICs may rely on their peers who are able to attend CME conferences to share what they learned. To the researcher's knowledge, there has not been a study on knowledge diffusion post CME in a LMIC. Effective knowledge diffusion requires a certain level of valuation by the learners to determine if the knowledge disseminated at a CME conference is worth diffusing within their clinical social systems. Therefore, the follow-up surveys included a four-point scale question asking participants to what extent they shared what they learned to identify if diffusion took place.

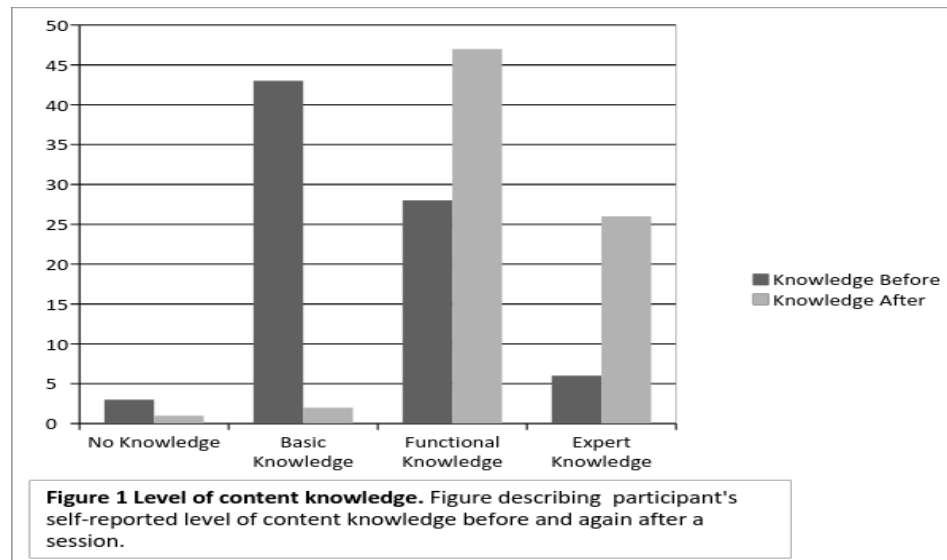
This research protocol was reviewed by the University of Wisconsin–Milwaukee Institutional Review Board and granted Exempt Status under Category 1 as governed by 45 CFR 46.101(b). (IRB#16.041) The study protocol was reviewed and approved by the Ethical and Protocol Review Committee of the University of Ghana Medical School. All attendees were informed that participation in the study was completely voluntary. Conference faculty and staff were excluded from the study.

Results

Two hundred and fifty physicians attended the 2015 Medical Knowledge Fiesta CME. Eighty completed session evaluations were collected at the time of the conference. One hundred and eighty (72%) of the 250 attendees were sent the follow-up surveys. Sixty-eight participants (37.7%) responded to the three-month follow-up survey and 37 (20.5%) participants responded to the six-month follow-up survey. The Medical and Dental Council in Ghana requires physicians to earn 15 credits from at least three separate CME activities a year.⁶ The follow-up survey data indicates that most participants or 63% (n=43) attended 3-5 conferences/seminars per year when asked on the three-month follow up survey. On average, study participants had previously attended the Medical Knowledge Fiesta once or twice prior to the 2015 meeting.

Survey at the time of the CME event

During the workshops and session tracks, most participants, 43, claimed to have basic knowledge of session content before the start of the session (n=43) with 28 claiming to have functional knowledge of the session content before the start of the session (n=28). After the sessions, participants reported an increase in session content knowledge with (n=47) reporting functional knowledge and (n=26) reporting expert knowledge (figure 1). Participants were asked a question allowing for multiple answers as to how their practice would improve (no change, diagnostic approach, therapeutic approach, disease prevention or prognostic approach). Fifty-one of 122 responses (42%) reported they plan to change their therapeutic approach in their clinical practice. When asked about the impact of the content on the participant or the participant's practice, 52 of 101 (51%) stated they had learned something new.



Using the modified IAM model of evaluation at the end of each session, participants were asked if they plan to use the content/information on a specific patient. Forty-five percent (n=31) stated yes and 29% (n=20) stated possibly. If participants stated yes, a follow up question was asked as to how they intended to use the information. Forty-four percent (n=17) stated they will manage patients differently. Thirty three percent (n=14) stated that will use the information to better understand a particular issue related to the patient. Considering the same patient, participants were asked if they expect any health benefits as a result of applying the knowledge learned in the session. Ninety-three percent (n=40) stated yes. Again, a follow up question was asked to identify possible health benefits for the patient. Forty-four percent (n=33) indicated the information will help to improve this patient's health status, functioning or resilience (i.e., ability to adapt to significant life stressors). Twenty-nine percent (n=22) stated the information will help to prevent a disease or worsening of disease for this patient. Twenty-seven percent (n=20) stated that the information will help to avoid unnecessary or inappropriate treatment, diagnostic procedures, preventative interventions or a referral, for this patient.

The session evaluation asked to what extent participants became more interested in the subject. This question speaks to motivation. The World Health Organization in their 1990 report on Systems of Continuing Education for district workers emphasizes the importance of continuing education in the health professions not only to increase knowledge but to serve as a motivating factor amongst scarce human resources.¹² Sixty-seven percent (n=49) of participants reported being more interested in the session content to a great extent. Participants were also asked about motivation and intent to change in practice. These questions focused on their determination to change

practice and 94% (n=65) stated that they were determined to try to change at least to a moderate extent.

CME follow up surveys

Three and six months following the 2015 Medical Knowledge Fiesta, electronic surveys using Qualtrics were disseminated to 180 meeting attendees. E-mail addresses gathered from the conference registration were used and a link to the Qualtrics survey was included in the email along with instructions. The link aided in keeping responses anonymous. Given some of the power grid issues and unreliability of internet connectivity in Ghana, the survey link was mailed three times to each respondent at the three-month and again at the six-month time periods.

Sixty-eight participants responded to the three-month follow-up survey and 37 participants responded to the six-month follow-up survey. Attendees were asked to what extent they had implemented what they learned during the 2015 Medical Knowledge Fiesta. Three months post CME, 45 of 57 (79%) respondents stated, at least to a moderate extent, they have tried to implement what they learned. This was down slightly six-month post CME to 24 of 32 (75%) respondents. While this question addressed attempts at implementation of knowledge, we asked about use of knowledge signifying successful implementation. Three months post CME, 44 of 58 (76%) participants reported using what they learned at least to a moderate extent compared with 28 of 33 (85%) at six months post CME. (Table 3) We also asked about the extent to which participants did things differently because of what they learned. Thirty seven of 57 (65%) of participants at three months post CME stated at least to a moderate extent, they did things differently because of what they learned which increased to 23 of 33 (70%) at six months post CME.

Table 3: Descriptive Statistics on content implementation into medical practice.

		N	Mean	Std. Dev	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Tried to implement	3 months	62	2.94	.827	.105	2.73	3.15	1	4
	6 months	32	3.00	.803	.142	2.71	3.29	1	4
	Total	94	2.96	.815	.084	2.79	3.12	1	4
Used what you learned	3 months	63	2.97	.803	.101	2.77	3.17	1	4
	6 months	33	3.09	.723	.126	2.83	3.35	1	4
	Total	96	3.01	.775	.079	2.85	3.17	1	4

When asked a multiple response question about possible changes to their practice, 57% reported that they asked their patients different and/or additional questions during assessments three months post CME activity. This increased to 70% at six months post CME. (Table 4) Additional research is needed to learn why participants continued changing practice up to six months post CME

A question focused on knowledge diffusion was asked on the follow up surveys. This becomes valuable in LMICs where those who practice medicine particularly in rural districts cannot always travel to CME conferences and may have limited access to relevant medical education via the internet, journals or other sources. The question was asked to what extent participants had shared the information with others.

Thirty of 56 (53%) reported sharing the information with others at the three-month post CME mark. This increased to 21 of 32 (66%) at six months post CME. This data, along with comments to some of the open-ended questions, suggests that the information provided at the CME activity was perceived as credible and valuable to the point that it was worth sharing with others.

Table 4. Self-Reported Changes in Practice

	3-Month	6-Month
I ask patients different and/or additional questions during assessments	57%	70%
I order more tests	14%	23%
I refer more patients to a specialist	33%	17%
I manage more of the care myself	35%	33%
I schedule more follow-up appointments	33%	43%
Other (specify):		
I kick started the process to restore my medical license in Ghana		
I do more staff education		
I do more health education		
It hasn't changed much	14%	3%
N/A		
None of the above		
Public health education to my community as well nearby communities		

One limitation of the study is the small sample size. The unreliable power grid throughout Ghana means that some who attended the CME activity may not have received the follow-up surveys, despite multiple attempts. Considering several communication and technological challenges with electronic surveys in LMICs, we are impressed with the rate of response. We understand some attendees did not have the opportunity to participate. Ghana's healthcare system has a fragmented electronic health record system in certain facilities and is not nationwide. The variability in which medical records are maintained complicates accessing certain clinical data points. Therefore, we did not access point-of-care practice data to determine change in practice. We relied on change in practice based on self-report, which could be subject to bias. Additionally, many CME activities do not gather data on knowledge diffusion thus there is little to no data available to compare the knowledge diffusion rate of this study to.

Discussion

Current literature in the area of CME in sub-Saharan Africa touches on access to knowledge such as

reported limited CME access in Malawi.¹³ There is evidence of an initiative from *World Anaesthesia Journal* where journal editions were converted to hypertext and Adobe PDF formats and sent free of charge to targeted anaesthetists in developing countries.¹⁴ The use of mobile tablet technology to increase access to CME has been reported in Tanzania.¹⁵ A paper on continuing professional development in Botswana¹⁶ outlines an educational needs assessment for future education while another paper concluded that there was the need for more CME in Nigeria.¹⁷ A study by Mock et. al, regarding a one-week (40 hour) CME trauma course in Ghana included follow-up with participants one year after the training. The Mock study showed improved clinical knowledge.¹⁸ In 2014, Achonduh et. al, published research in the *Malaria Journal* where researchers conducted an in-depth analysis of the management of uncomplicated malaria in Cameroon. Researchers then created training interventions and measured its impact on patient care.¹⁹ The researchers assessed the change in clinicians' practice in the management of uncomplicated malaria. They concluded that up to 92% of participants agreed to adopt a new practice of perform an RDT malaria test before prescribing antimalarials to a patient.¹⁹

In this study, using a modified IAM session evaluation tool along with the follow up surveys allowed researchers to identify changes in the level of learner's medical knowledge, the learner's ability to identify specific patients whose care could be improved by the knowledge gained and the learner's self-reported attempt to implement what they learned. The fact that 66% of six months follow-up survey respondents shared what they learned with others suggests that learners thought the CME content contextually relevant to their practice environment. Our findings confirm the continued need for CME in LMICs. The level of contextualization, "the degree to which an intervention is matched to the circumstances of its application,"²⁰ is critical for effective CME in LMICs. Of note, 88% of the speakers for the 2015 Medical Knowledge Fiesta were Ghanaians who practice medicine in Ghana. Therefore, the speakers were well versed in the culture, language, laws and clinical practice environments of the learners.

The WHO 1990 report on continuing education emphasises that motivation it is a critical component of learning. Participants were asked how much more interested they were in the subject and how willing they were determined to try to practice what they had learned.¹² Therefore, knowledge transfer, motivation, implementation and knowledge diffusion were assessed in this study on the effectiveness of CME in terms of medical knowledge and skills of Ghanaian physicians.

Implications for future research

The Medical Knowledge Fiesta is an annual event. It will be important to study this CME activity in future

to compare data longitudinally. More research as to how and why participants chose to share what they learned with others is important as there is little data in the area for LMICs. CME research provides few studies focusing on the learning team as opposed to individual physicians. Additionally, participants continued to change their practice even six months after the CME activity. It would be ideal to study a learner cohort exposed to specific CME content and track the patient outcome data longitudinally. This model could be replicated for other CME content as well. This would be an important outcome from the conference for Ghana and research into the effectiveness of CME in developing practice guidelines in LMICs.

Conclusions

This study demonstrates the effectiveness of CME in improving medical knowledge of physicians in Ghana. Eighty-eight percent of the speakers for the CME activity were local Ghanaians who are not only experts in medicine, but were aware of the cultural, language, applicable laws and clinical guidelines of Ghana. Ghanaian physicians increased their medical knowledge and maintained that knowledge over an appreciable period. Given the limited resources available in Ghana, the knowledge diffusion rate of 63% six months after the CME activity indicates the physicians' high perceived value in CME content and their willingness to share the knowledge with others in their clinical settings.

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References

1. *WB Population, total*. Washington, DC. United States: The World Bank, 2017
2. AHWO. General country information. Brazzaville, Republic of Congo: *Africa Health Workforce Observatory*, 2017.
3. *WB Health expenditure, total (% of GDP)*. Washington, DC. United States of America: The World Bank, 2017.
4. Lawson HJ, Essuman AE. Country Profile on Family Medicine and Primary Health Care in Ghana. *Afr J Prim Health Care Fam Med*. 2016; Nov;8: e1-e6.
5. MOH. National Ambulance Service (NAS). Policy Briefing Paper 00. Accra, Ghana: *Ministry of Health*, 2008
6. *Medical & Dental Council Ghana*. Continuing professional development renewal of registration medical & dental practitioners. Accra, Ghana: 2015:1-5.
7. Umble KE, Cervero RM. Impact studies in continuing education for health professionals. *Evaluation & the Health Professions*. 1996;19:148-174.
8. Robertson MK, Umble KE, Cervero RM. Impact studies in continuing education for health professions: update. *JCEHP* 2003; 23:146-156.
9. Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, Robinson N Lost in knowledge translation: time for a map? *J Contin Educ Health Prof*. 2006 Winter;26: 13-24.
10. Cervero RM, Gaines JK. The impact of CME on physician performance and patient health outcomes: an updated synthesis of systematic reviews. *J Contin Educ Health Prof*. 2015; 35: 131-138.
11. *ITPCRG*. The Information Assessment Method. Montreal, Quebec: Information Technology Primary Care Research Group, McGill University, 2017
12. WHO. Systems of continuing education: priority to district health personnel. World Health Organization technical report series. Geneva, Switzerland: *World Health Organization*, 1990
13. Muula AS, Misiri H, Chimalizeni Y, Mpando D, Phiri C, Nyaka A. (2004) Access to continued professional education among health workers in Blantyre, Malawi. *Afr Health Sci*. 2004 Dec;4: 182-184.
14. Robinson G, Dobson M, Sewell, J. MED29/434: Using C&IT for continuing medical education in Africa - a pilot project in Zimbabwe. *Journal of Medical Internet Research*. 1999;1(Suppl 1): e67.
15. Nilseng J, Gustafsson LL, Nungu A, Bastholm-Rahmner P, Mazali D, Pehrson B, Eriksen J. A cross-sectional pilot study assessing needs and attitudes to implementation of Information and Communication Technology for rational use of medicines among healthcare staff in rural Tanzania. *BMC Med Inform Decis Mak*. 2014 Aug 27;14:78.
16. Kasvosve I, Ledikwe JH, Phumaphi O, Mpofu M, Nyangah R, Motswaledi MS, Martin R, Semo BW. Continuing professional development training needs of medical laboratory personnel in Botswana. *Hum Resour Health*. 2014 Aug 18;12:46.
17. Owoeye OA, Aina OF, Morakinyo O. Postpartum depression in a maternity hospital in Nigeria. *East Afr Med J*. 2004 Dec;81: 616-619.
18. Mock CN, Quansah R, Addae-Mensah L, Donkor P. The development of continuing education for trauma care in an African nation. *Injury*. 2005 Jun;36: 725-732.

18. Achonduh OA, Mbacham WF, Mangham-Jefferies L, Cundill B, Chandler C, Pamen-Ngako J, Lele AK, Ndong IC, Ndive SN, Ambebila JN, Orang-Ojong BB, Metoh TN, Akindeh-Nji M, Wiseman V. Designing and implementing interventions to change clinicians' practice in the management of uncomplicated malaria: lessons from Cameroon. *Malar J*. 2014 May 29;13:204.
19. ICEBeRG. Designing theoretically-informed implementation interventions. Tyne, United Kingdom. Quansah R, Addae-Mensah L, Donkor P. The development of continuing education for trauma care in an African nation. *Injury*. 2005 Jun;36:725-732.
20. Achonduh OA, Mbacham WF, Mangham-Jefferies L, Cundill B, Chandler C, Pamen-Ngako J, Lele AK, Ndong IC, Ndive SN, Ambebila JN, Orang-Ojong BB, Metoh TN, Akindeh-Nji M, Wiseman V. Designing and implementing interventions to change clinicians' practice in the management of uncomplicated malaria: lessons from Cameroon. *Malar J*. 2014 May 29;13:204.
21. ICEBeRG. Designing theoretically-informed implementation interventions. Tyne, United Kingdom. Improved Clinical Effectiveness through Behavioural Research Group. *Implement Sci*. 2006 Feb 23;1:4.

