International Journal of Multidisciplinary Research & Innovation
Volume 2. Issue 2, 2024. University of Kabianga, Kenya. ijmri@kabianga.ac.ke

Content Validity Assessment and Outcomes of Kenya Clinical Officers Pre-Internship Licensure Examinations

Choge Joseph Kiprop[1], Marcella Otieno[2], Manaseh Bocha[3], Violet Aswa[4], Eunice Muthoni Kuria[5], Wako Ibrahim[6],Maina Nduru[7],Angel Munavu[8], Marie Meckel[9]

[1]*Masinde Muliro University of Science & Technology, KENYA.*
[2]*Kenya Medical Training College.KENYA.*
[3]*Clinical Officers Council.KENYA.*
[4] *Medical Training College.KENYA.*
[5] *Clinical Officers Council.KENYA.*
[6]*Clinical Officers Council. KENYA.*
[7]*Kenya Medical Training College. KENYA.*
[8]*Thika Level 5 Hospital,Kenya. KENYA.*
[9]*Baypath University, U.S.A.*

ABSTRACT

As part of quality assurance, Clinical Officers Council (COC) conducted the content validity assessment of Kenyan Clinical Officers to determine the association between the program type and the dimensions of professional competence questions, the dimensions of professional competence, assessment of the cognitive level of the test items, evaluate how practitioners rate the relevance of the test items and the subsequent performance by candidates. The cross-sectional study adopted both qualitative and quantitative approaches. Purposive sampling of test items from five examination series conducted between 2018 and 2021 were used. Appropriate descriptive and inferential statistics were used for data analysis. Results showed a highly significant association between the program type and the dimension of professional competency of the test item question (X^2 (3, N = 600) = 24.567, p < .0005). Overall, majority (78%& 82%) of test items were found to be relevant both Degree and Diploma examinations (I-CVI, 0.78). Most of the Degree and Diploma test items reached a good reliability with Cronbach's Alpha (0.873 and 0.835), while the test items on cognitive level reached an excellent Cronbach's Alpha reliability (0.972 and 0.988), respectively. Since the Cronbach's Alpha reliability coefficient values for the test items were above the acceptable minimum of 0.70 for most social research situations, all the test items were therefore worthy of retention. Practitioners found 96% of health sytems management and 76% of the community health test items to be relevant, unlike relatively lower percentages reported by post-interns. There was subsequent notable improvement (from 55% to 58%) in the mean scores in most Universities. Revision of COC examination policy to improve examination standards and performance, professional competence, validity, cognitive level, capacity building, best timing and collaborative development of a guiding examination blue print is recommended.

Keywords: Examinations, Licensure, Validity

1. INTRODUCTION

Clinical Officers are among the key pillars of the health care system in Kenya (Akinyi, Choge & Gracia, 2021; McAuliffe et al., 2009; Miseda et al., 2017). They form an integral part of the cadres that the World Health Organization has targetted for transformation and scaling up of their training and education (WHO,2021), in order to improve the overall health of the world population. Clinical Officers are legally recognized to practise medicine upon successful completion of their training (Mbindyo et al., 2013). After the institutional training and graduation, the candidates proceed to sit their pre-internship licensure examination offered and supervised by the Clinical Officers Council. Those who pass the pre-internship examination are issued with a practicing licence to cover the entire period of the subsequent one year of internship, as laid down in the regulations of the Clinical Officers Council, the regulatory body governing Clinical Officers training, licensing and professional practice. The licensure examination is a form of clinical assessment that is intended to test the examinees' competence and fitness to practise (Bridley et al., 2018; Epstein et al., 2007; Zaweski et al.,2019).

The Clinical Officers in Kenya practise medicine in similar manner and professional level as the Physician Associates in the United States of America, Great Britain, The Netherlands, Germany and elsewhere in the World (Roderick et al., 2012; Mullan & Frehywot, 2007)). Although in 2010 the Clinical Officers and their equivalent cadres was identified in forty seven Sub-Saharan countries (Eyal et al., 2015; Mullan, F., &

Frehywot, S. (2007; Negash & Garcia, 2021[a,b]), they currently exist in more than fifty countries of the world (Kerlen, 2021) and they are known by numerous names, depending on what name has been adopted by each country. In many countries within Sub-Saharan Africa, they are known as mid-level health workers (Couper, 2018), associate clinicians, among other names WHO,2010; St. Jacques et al., 2021). However, the International Labour Organization (ILO) has categorized this cadre among paramedical practitioners, as documented by the International Standard Classification of Occupations (ISCO) (Monir Hossen et al., 2021). Despite the nomenclature of this cadre that may have become confusing to many, their roles are nevertheless vital. In some countries this cadre performs surgeries, including Caeserian Section (Mothebe & Showstark, 2021), a task whereby research findings have shown that post-operative assessment and quality care after surgery, especially Caeserian Section, had no clinically significant differences in their outcomes when performed by Clinical Officers compared to Medical Doctors (Dovlo, 2004; Joshi et al., 2014; Bergström, 2015; Grimes et al., 2014).

Clinical Officers and their equivalents across the world are also involved in public health, health education and health management, among numerous other roles (Mullan & Frehywot, 2007). In some countries they work under supervision of Medical Doctors while in others, they work independently or with limited supervision, depending on their scope of training and practice (Dovlo, 2004; Joshi et al., 2014; Bergström, 2015; Grimes et al., 2014; Negash & Garcia, 2021)[a,b]. Many countries have found this cadre to be extremely important as fit for purpose in the implementation of the universal health coverage (van der Vleuten et al., 2012) and in alleviating the shortage of health care workforce (McAuliffe et al., 2009; Miseda et al., 2017) and therefore, the training of this cadre has spread to countries including Australia, Canada, Great Britain, The Netherlands and Germany were earlier documented (Roderick et al., 2012). However, more recently, India, Israel, Liberia, New Zealand, Saudi Arabia and in countries that formerly comprised the Soviet Union have also been documented (Showstark, 2021).

As part of quality assurance, the training and practice of every Clinical Officer should be maintained at optimal standard to ensure quality health care is delivered. On the basis of the need to continually improve examination performance of candidates taking the pre - internship examinations over several years, the Clinical Officers Council decided to carry out the content validity assessment in order to determine if the examination was fit for its purpose.

2. MATERIALS AND METHODS

Both qualitative and quantitative approaches were adopted during the cross-sectional study design. Validity evidence was generated from the licensure examination administered to Degree and Diploma candidates in Kenya, respectively, by the Clinical Officers Council. Test items were sampled from five examination series conducted in September 2018, May 2019, September 2019, May 2020 and May 2021. A total of 300 test items were sampled for evaluation from each program. All the sixty short-answer questions (SAQs) were sampled for evaluation while 240 out of 500 multiple - choice (MCQ) questions were sampled (Table 1).

Table 1: Selection of Test Items.

Relevant Examination Subject	SAQs Paper	Total SAQs	Sampled SAQs	MCQs Paper II	Total MCQs	Sampled MCQs
Medicine	2	10	10	17	85	40
Pediatrics	2	10	10	17	85	40
Surgery	2	10	10	17	85	40
Reproductive Health	2	10	10	17	85	40
Community Health	2	10	10	16	80	40
Health System Management	2	10	10	16	80	40
Total	**12**	**60**	**60**	**100**	**500**	**240**

Key: SAQs = Short-answer questions; MCQs = Multiple choice questions

Judges who were selected through purposive sampling from among public and private practitioners, institutional trainers and post - internship candidates were engaged during the assessment (Table 2).

Table 2: Selection of Judges.

Category	Area of Evaluation	Number of Judges selected	Number of Judges who participated
Trainers	Cognitive Level Inclusion	10	9
Post-interns (Degree & Diploma)	Item Relevance Inclusion	20	20
Practitioners	Item Relevance Dimension of Professional Competence Inclusion	42	39
Total		**72**	**68**

The data was collected using electronic data collection platform application system created for that purpose. The data was collected electronically following relevant instructional steps to each judge participant. The first step involved contacting and informing each judge about the study. Those willing to participate were requested to provide their email addresses. The second step involved orientating each judge participant through four consecutive virtual meetings as convenient to all of them. The third step involved electronically activating the link and login credentials and unique individual password to each judge for purposes of data collection. Each judge was then requested to provide written consent and their socio-demographic biodata, before participating in the study and its subsequent evaluation depending on their respective categories. Those who declined were excluded from the study. The electronic setting was such that only the aspects being evaluated were visible to each category of judges. Internet access was facilitated to enable

each judge to actively participate in the study. For convenience of and for purposes of comparative analysis, the content of various curricula were categorized as practical, inter-personal or scholarly. The practical aspects were those considered as cognitive, technical, integrative or context in nature. The content that comprised of the core knowledge, application of knowledge, history taking, physical examination, patient management, surgical skills, procedural skills, case scenarios, community interventions, leadership and management skills also formed part of the practical category. Interpersonal category comprised of relationship, affective/ moral, communication skills, team work, interaction with colleagues, emotional intelligence, respect for patients and attentiveness. The scholarly content comprised of emerging issues and research, which also included any content that touched on habits of the mind.

Descriptive statistics using: sum, mode, mean, standard deviation were done. Inferential statistics used included: Item Level content Validity Index (I-CVI),which is a measure of the level of agreement among evaluators that is computed as the agreed items over the number of judges; Modified Cohen's Kappa (K), an index that measures the quality of the test items based on the agreement of the judges; Chi-square test of independence; type of question vs relevance, category of judge vs cognitive level, type of question and cognitive level and Logistic regression; to determine the likelihood of association Cronbach's Alpha estimates at 95% confidence interval; testing reliability on agreement of the evaluators.

3. RESULTS

The study investigated the association between the program type (Degree or Diploma) and the dimensions of professional competence questions. There was a highly significant association between the program type (Degree and Diploma) and the dimension of professional competency of the test item question (X^2 (3, N = 600) = 24.567, p < .0005). Overall, majority (78%& 82%) of test items were found to be relevant both in the Degree and Diploma (Figures 1 and 2) examinations (I-CVI, 0.78); hence the test items were recommended for inclusion in the licensure examinations, while a minority (15%) of test items assessed high level of cognitive skills. Most of the Diploma and Degree test items recommended for inclusion in the licensure examination reached a good reliability with Cronbach's Alpha= 0.873 and Cronbach's Alpha= 0.835, respectively. The trainers who assessed the test items on cognitive level found item inclusion to reach an excellent reliability, Cronbach's Alpha (α = 0.972 & α = 0.988) respectively. Since the Cronbach's Alpha reliability coefficient values for the test items were above the acceptable minimum of 0.70 for most social research situations, all the test items were therefore worthy of retention.

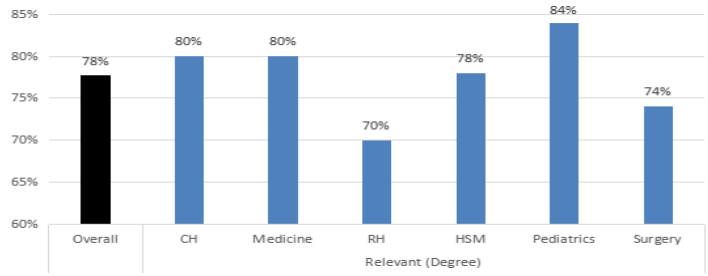

Figure 1: Practitioners' evaluation of relevance of Degree Program Test items.

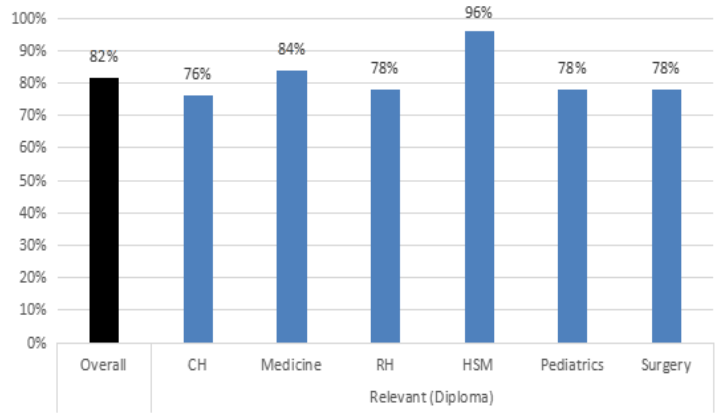

Figure 2: Practitioners' evaluation of relevance of the Diploma Program Test items.

Based on the majority (83% for both Degree and Diploma) response by the participants in the study that short-answer questions (SAQs) were considered more relevant compared to 81% and 76% for Diploma and Degree multiple choice questions (MCQs) respectively, most of the test items were considered to assess areas critical for professional practice (Figure 3).

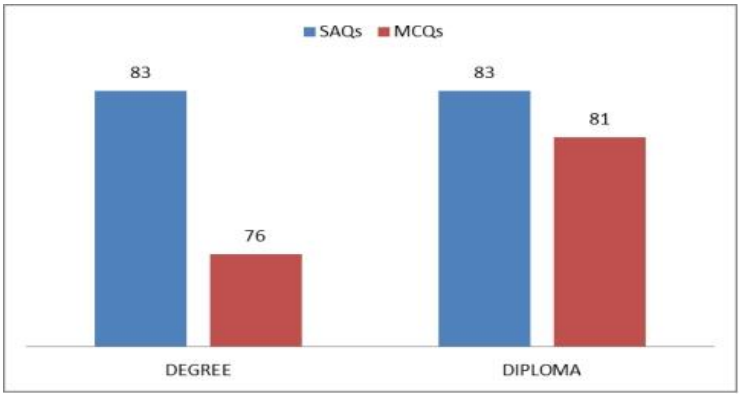

Figure 3: Practitioners' evaluation of relevance; comparison between SAQs and MCQs (%)

Since the study found that majority of the test items were relevant, the examination was therefore considered acceptable, despite varied views among practitioners and post-internship candidates (Figures 4 and 5).

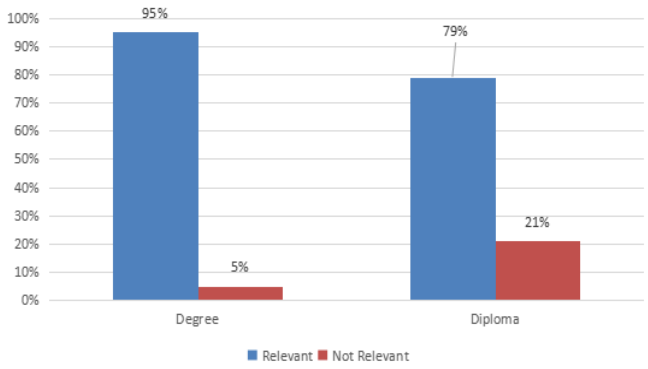

Figure 4: Post-interns' evaluation of relevance of the test items

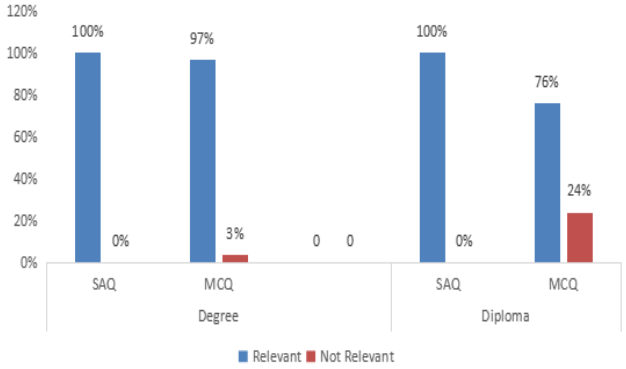

Figure 5: Post interns' evaluation of relevance; comparison between SAQs and MCQs

Whereas post interns (Degree and Diploma) found a significant number (18% and 56% respectively) of the Health Systems Management (HSM) test items irrelevant, the practitioners found otherwise in that 96% of HSM items in Diploma were considered relevant, as far as clinical practice was concerned. Diploma post - interns found 40% of community health items irrelevant while practitioners conversely found 76% of the items to be relevant. SAQs were generally considered more relevant than the MCQs.

The practical and scholarly dimensions were considered more relevant to both Degree and Diploma programs than the inter-personal dimensions (Figures 6 and 7). However, multi-dimensional aspects of the various curricula contents were more in diploma than degree program curriculum and 46% of HSM Diploma items were considered to be multi-dimensional.

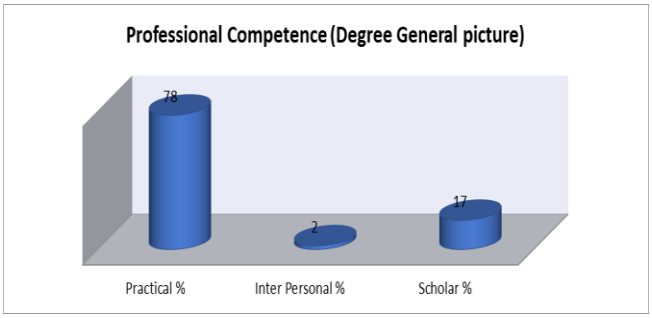

Figure 6: **Percentage Distribution Assessment of Professional Competence of the Degree Test Items.**

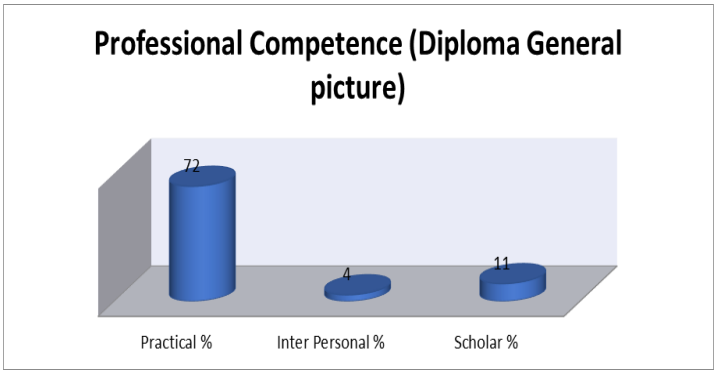

Figure 7: Percentage Distribution Assessment of Professional Competence of the Diploma Test Items.

A majority (75%) of test items were recommended for inclusion in the licensure examinations with I-CVI of 0.78, while a minority (15%) of test items assessed high level of cognitive skill with a I-CVI of 0.78. The percentage distribution assessment of cognitive level of test items for degree and diploma programs is shown in Figure 8, while the comparative percentage distribution of cognitive level SAQs and MCQs for the degree and diploma programs are shown in Figure 9.

The percentage Distribution Assessment of Item Inclusion (as recommended by participating practitioners and post-interns, respectively) among questions for Degree and Diploma programs are shown in Figures 10, 11 and 12.

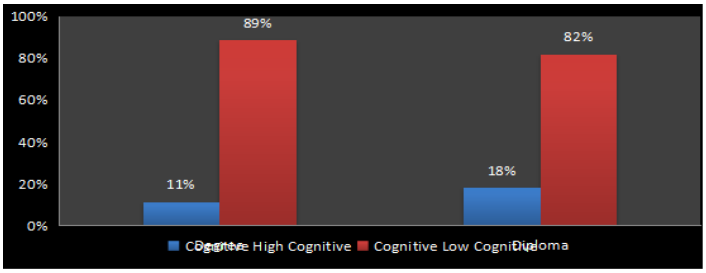

Figure 8: Percentage Distribution Assessment of Cognitive Level of Test Items for Degree and Diploma Programs.

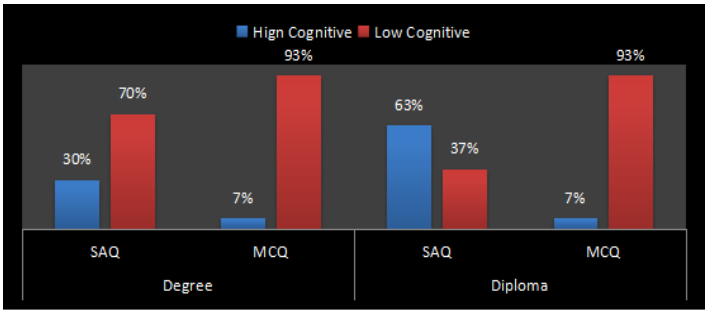

Figure 9: Percentage Distribution Assessment of Cognitive level of SAQs and MCQs for Degree and Diploma Programs.

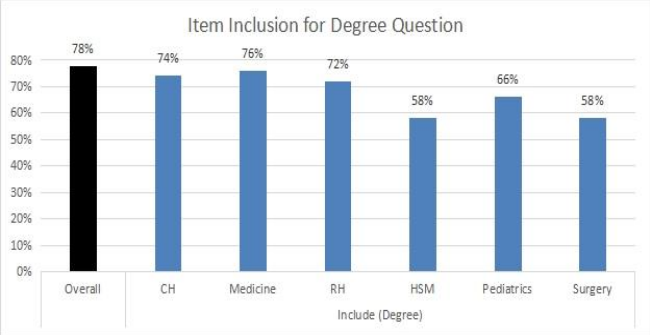

Figure 10: Percentage Distribution Assessment of Item Inclusion among questions for Degree Program, by Practitioners.

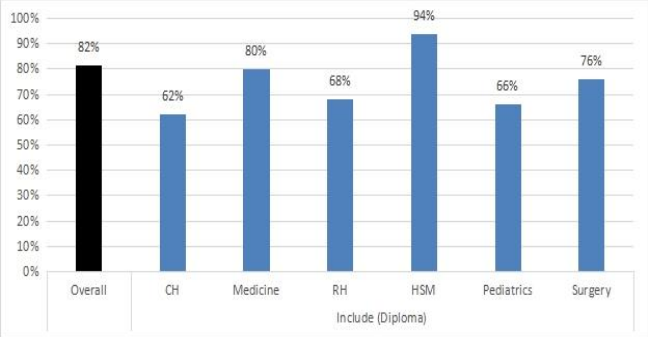

Figure 11: Percentage Distribution Assessment of Item Inclusion among questions for Diploma Program, by Practitioners.

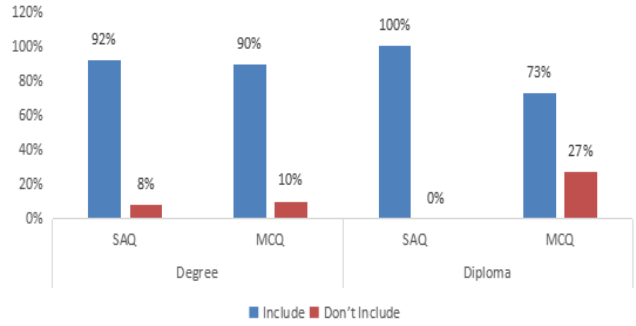

Figure 12: Percentage Distribution Assessment of Item Inclusion among questions for Diploma Program, by Post - Interns.

During implementation stage of the content validity research findings, there was a notable improvement in the mean scores in most of the universities. The overall mean scores improved from 55% in May 2020 to 58% in September 2021. At least three universities recorded mean scores of 60% and above during September examination compared to May 2020 examination with only one University posting a mean score of 60% (Figure 13).

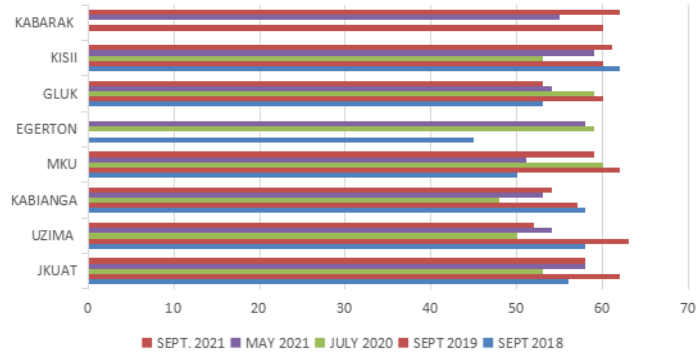

Figure 13: Percentage Mean Scores per University offering BSc Clinical Medicine (2018 - 2021 Research Study Period).

4. DISCUSSION

According to the results of the study, all the items tested during the study were valid, although this mainly supported the test items of low order cognitive level. It is therefore encouraging that the highly significant association between the type of professional training programs in clinical medicine and their dimension of professional competency means that the low order cognitive level test items should be included in the licensure examinations. However, educational and clinical practitioners also recommend inclusion of a significant number of high order cognitive level test items, given the complex scenarios in clinical medicine licensure examinations and practice. Validity of the licensure examination is important because it confirms the competence of the candidate being examined, as determined in one previous research by Vanni (2015) who showed that a valid test is an accurate, true measure of a student competency. The competencies of physician assistants, a cadre that is synonymous with clinical officers, have also been demonstrated in previous research studies (Carter et al., 2019; Goldgar et al., 2019; Jogerst et al., 2015; Loar et al., 2020; van der et al., 2012; Weniger,2021). In the case of the current research study, the results showed that most of the test items were valid in assessing areas considered critical for professional practice but only as far as low order cognitive level of testing was concerned.

There is need therefore, to determine validity of the high order cognitive level test items. This so because a different research by Kleeman (2017) showed that validity of an examination can be compromised if a test does not measure what it is supposed to measure and therefore does not reflect the knowledge and skills of the examinee. In the case of the results of the current research study, it should be of concern that a lower proportion of the high order cognitive level tests were captured during the study. There is an urgent need to improve this situation.

Inadequate performance by some candidates during licensure examinations was noted in a recent study in Kenya by Kuria *et al*., (2021). Inadequate performance has been reported in numerous other past researches (Epstein, 2007; Nyagena et al., 2013; Yates et al., 2010; Dube et al., 2018; Jayanthi et al., 2014; Taylor et al., 2013; Stevens, 2018; Kumwenda et al.,

2017; Jasmen et al., 2012). However, the factors adversely affecting licensure examinations may also be multiple, as one study found (Farooq et al., 2012). The study by Kuria *et al*., (2021) also found that there was statistical significance between the teaching methods and performance during licensure examinations. Some of the recommendations from that study included the need to ensure that experienced faculty should be entrusted to teach and set competency based licensure examinations. This is inkeeping with past research findings. The research by Kuria *et al*., (2021) also formed a basis for the current research with a major aim of determining the validity of the licensure examinations since many regulatory bodies worldwide have a mandatory requirement that their professionals should pass a standardized licensing examination before they are eligible for their professional practice, as is discussed by Coons (2014). The need to ensure that licensure examinations trully tests the competency of the candidates before they are allowed to engage in medical practice that demands high quality of professional practice and one that is also safe for the patients and meets their expectations. One previous research study by Singh (2012) found that implementation of mandatory standards helps both the lecturers and their students to perform better during examinations. A separate study conducted in Philippines by Jasmen *et al*., (2012) revealed that certain factors can predict performance in licencure examinations (Jasmen et al., 2012).

Although it was not within the scope of the current study to establish the calibre of examiners who set the examinations whose results formed a basis of the assessment test items, the regulatory bodies endowed with the responsibility of setting examinations should ensure that there is no significant variation in the cognitive levels of the test items considered during the licensure examinations. In one research study carried out in Nigeria by Idowu (2016), qualifications of lecturers has long been identified to contribute to poor performance of students in examinations. However, lecturers too may identify the performance of students on the basis of their own levels of understanding, according to another study by Sadler *et al*., (2013), although a different study by Kunter *et al*., (2013) found that the teacher's academic abilities had no effect on the students' instructional process and performance. In this regard, teacher quality, which refers to all teacher-related characteristics that produce favourable educational outcomes (Cochran-Smith & Maria Villegas, 2015), including student performance, is of paramount importance. The quality of lecturers who teach Clinical Officers and their equivalents worldwide deserves much attention from all stakeholders. One study by Kandri *et al*., (2009) in fact found that a combination of experienced and less experienced lecturers can synergistically contribute to student performance (Kadri, Alwi & Hashim, 2009). One World Bank report (1997) showed a positive correlation between the teacher experience in terms of years and the learners' academic achievements. Another study by Darling-Hammond (2010) found that with continued professional advancement, long - serving teachers performed better owing to increased chances they were exposed to in order to improve on their previous performance, automatically translating to improved learner outcomes, including internship learning experiences (Muthaura et al., 2015).

Numerous researches have shown that the experience of the teacher has direct impact on the performance of the student (Idowu, 2016; Sadler et al., 2013; Kunter et al., 2013; Cochran-Smith & Maria Villegas, 2015; Kadri et al, 2009; World Bank. 1997; Darling-Hammond, 2010; Rice, Jennifer King. 2010). Similarly, adequate clinical experience exposure by each student is important for good student performance (Jayanthi et al., 2014; Dube et al., 2018). Darling-Hammond, 2010; Rice, Jennifer King. 2010; Jamshidi et al., 2016). Establishing the validity of the licensure examinations and ensuring student competency are therefore crucial, as recommended by some of the past reseach studies (Kleeman, 2017; Cater & Stoehr, 2019).

Although the majority of both the practioners and post-interns documented that most of the test items should be considered for inclusion in the licensure examinations, a relatively smaller proportion had divergent views about inclusion of some content areas into the licensure examination. It was notable that a relatively higher proportion of practitioners advocated for inclusion of most of the content areas than the post-interns did. This was expected because the practitioners have a longer experience than the post-interns, in dealing with application of various content areas. Nevertheless, the regulatory bodies should consider the divergent views on their own merit and whichever views merit inclusion or exclusion should be considered as such.

The fact that there was an improvement in the performance during licensure examinations offered to various Universities in Kenya following the current research findings showed that the weighted assessment of content validity during the examination setting contributed to the overall improvement of candidates during the licensure examinations. Nevertheless, more effort to investigate other contributing factors to unsastisfatory examination performance by some candidates should be sought. Kenya may not be the only country with challenges in licensure examinations. The regulatory bodies across the world should therefore explore widely the factors adversely affecting their licensure examination performance.

5. CONCLUSION

The Clinical Officers licensure examination adequately reflects professional practice and is consistent with their scope of practice. Content validity research improved the mean scores of the Universities. The licensure examination focused more on the practical dimension of competence and was relatively less effective in assessing high order than low order cognitive level examinations. The test items were generally acceptable to the assessors for inclusion in the licensure examinations.

6. RECOMMENDATIONS

Revision of the Clinical Officers Council (COC) examination policy to include the minimum examination standards,

collaborative development of an examination blue print to guide proportion of test items in the licensure examination is recommended. The recommended revised examination policy should include the dimensions of professional competence, cognitive level and capacity building for the Clinical Officers Council examiners and trainers to improve the quality of the licensure examinations. Furthermore, training institutions should assess content validity of their formative and summative examinations, with more emphasis on health systems management training. Assessments should be improved to include more practical tests. Capacity building for COC licensure examinations examiners should be done to improve the standard of examination performance. More research to determine the best timing for the licensure examinations, why some candidates fail the Clinical Officers Council licensure examinations after passing institutional final qualifying examinations and to determine the candidates' high - cognitive level individual test items performance are recommended.

7. ACKNOWLEDGEMENT

We would like to acknowledge the contributions by the entire Board of the Clinical Officers Council, who approved the funding for the research. We also thank the Clinical Officers Council for granting approval and permission to publish the information from their database for the benefit of improving the profession in general.

REFERENCES

[1] Ahmadzadegan, M. H., Khorshidvand, A.-a., & Pezeshki, M. (2015). A method for securing username and password against the Keylogger software using the logistic map chaos function. IEEE .

[2] Akinyi, A.D., Choge, J., Garcia, A. (2021). Clinical Officers: The Heart of Kenyan Healthcare. *Social Innovations Journal.* Retrieved from https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[3] WHO, 2021. Transforming and scaling up health professional's education and training. World Health Organization.https://apps.who.int/iris/bitstream/handle/10665/93635/9789241506502_%20eng.pdf;jsessionid=4223126A275676581135335E4F21F4BF?sequence=1. Published 2013. Accessed March 21,2021.

[4] Mbindyo, P., Blaauw, D., & English, M. (2013). The role of Clinical Officers in the Kenyan health system: A question of perspective. *Human Resources for Health, 11*, 32. https://doi.org/10.1186/1478-4491-11-32.

[5] Bridley, A., & Daffin, L. W. Jr. (2018). Clinical Assessment. In C. Cuttler (Ed), *Essentials of Abnormal Psychology*. Washington State University. Retrieved from https://opentext.wsu.edu/abnormalpsychology/.7. Bizumuremyi, C., Ngendakumana, J.C. (2021). Burundi-In the Heart of Africa: techniques paramédicales. *Social Innovations Journal.* Retrieved from https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[6] Epstein, R. M. (2007). Assessment in Medical Education. The New England Journal of Medicine, 356, 387-396.http://dx.doi.org/10.1056/NEJMra054784.

[7] Roderick S. Hooker and Christine M. Everett. 2012.The contributions of physician assistants in primary care systems. Health and Social Care in the community. 2012 20(1), 20-31. doi:0.1111/j.1365-2524.2011.01021.x. Retrieved; 4th February, 2023.

[8] Eyal, N., Cancedda, C., Kyamanywa, P., & Hurst, S. A. (2015). Non-physician Clinicians in Sub-Saharan Africa and the Evolving Role of Physicians. *International Journal of Health Policy and Management*, *5*(3), 149–153. https://doi.org/10.15171/ijhpm.2015.215. Retrieved; 4th February, 2023.

[9] Kerlen, A. (2021). Medicine from Down Under: Physician Assistants in Australia. *Social Innovations Journal.* Retrieved from: https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[10] Couper, I. (2018, July 16). Curriculum and training needs of mid-level health workers in Africa: A situational review from Kenya, Nigeria, South Africa and Uganda | BMC Health Services Research | Full Text. https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-018-3362-9.

[11] WHO, (2010). *International Classification of Health Workers—Definitive Guide*. Gregory Schmidt. http://www.gregoryschmidt.ca/writing/international-classification-of-health-workers.

[12] Monir Hossen, K., Garcia, A., Showstark, M. (2021). Medical Assistants/Sub-Assistant Community Medical Officer: The Physician Assistant Comparable in Bangladesh. *Social Innovations Journal.* Retrieved from https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[13] Mothebe, S., Showstark, M. (2021). Botswana's Doctor Assistant. *Social Innovations Journal*. Retrieved from https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[14] Dovlo D. Using mid-level cadres as substitutes for internationally mobile health professionals in Africa. A desk review. *Hum Resour Health*. 2004;2(1):7. doi:10.1186/1478-4491-2-7.

[15] Joshi R, Alim M, Kengne AP, et al. Task shifting for non-communicable disease management in low and middle income countries - A systematic review. *PLoS One*. 2014;9(8). doi:10.1371/journal.pone.01037546.

[16] Bergström S. Training non-physician mid-level providers of care (associate clinicians) to perform caesarean sections in low-income countries. *Best Pract Res Clin Obstet Gynaecol*. 2015;29(8):1092-1101. oi:10.1016/j.bpobgyn.2015.03.016.

[17] Grimes CE, Mkandawire NC, Billingsley ML, Ngulube C, Cobey JC. The cost effectiveness of orthopaedic clinical officers in Malawi. *Trop Doct*. 2014;44(3):128-134.doi:10.1177/0049475514535575.

[18] Mullan, F., & Frehywot, S. (2007). Non-physician clinicians in 47 sub-Saharan African countries. *The Lancet*, *370*(9605), 2158–2163. https://doi.org/10.1016/S0140-6736 (07)60785-5.

[19] Showstark, M. 2021. A Healthcare Cadre That Meets A Country's Needs. Social Innovations Journal. Vol. 8

(2021). https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[20] Negash, T., Garcia, A. (2021)[a]. Health Officer: A Physician Assistant Comparable Role in Ethiopia. *Social Innovations Journal.* Retrieved from https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[21] Negash, T., Garcia, A. (2021)[b]. Health Officer: Emergency Surgical Officer: The Ethiopian Integrated Innovative Masters PA Analogue Profession. *Social Innovations Journal.* Retrieved from https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[22] St. Jacques, L., Tsang, R., Ensafi, S. Patel, M. (2021). Physician Assistants in Canada. *Social Innovations Journal.* Retrieved from https://socialinnovationsjournal.com/index.php/sij/issue/view/78.

[23] Kuria, Eunice & Nyongesa, Margaret & Choge, Joseph & Boruett, Norbert. (2021). Factors influencing Bachelor of Science in Clinical Medicine students performance in Clinical Officer Council Licensure examination, Kenya. International Journal Of Community Medicine And Public Health. 8. 5676. 10.18203/2394-6040.ijcmph20214552.DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20214552.

[24] Jasmen S. Pasia, Marilyn U. Garzon, & Marleonie M. Bauyot. (2012). Determinants of Performance of Graduates in the Medical Technologist Licensure Examination. *Asian Journal of Health*, *2*(1), 1–1.

[25] Nyangena, E., Getanda, A., & Ngugi, S. (2013). Factors Influencing Success Of Bachelor Of Science In Nursing Graduates In Nursing Council Of Kenya Licensure Examinations. 12.

[26] Singh. (2012). Promotion and protection of all human rights, civil, political, economic, social and cultural rights, including the right to development [Data set]. Koninklijke Brill NV. https://doi.org/10.1163/2210-7975_HRD-9970-2016149.

[27] Coons, I. (2014). Use of Standardized Tests within Nursing Education Programs.

[28] Jasmen S. Pasia, Marilyn U. Garzon, & Marleonie M. Bauyot. (2012). Determinants of Performance of Graduates in the Medical Technologist Licensure Examination. *Asian Journal of Health*, *2*(1), 1–1.

[29] Yates, J., & James, D. (2010). Risk factors at medical school for subsequent professional misconduct: Multicentre retrospective case-control study. *BMJ*, *340*. https://doi.org/10.1136/bmj.c2040.

[30] Dube, M. B., & Mlotshwa, P. R. (2018). Factors influencing enrolled nursing students' academic performance at a selected private nursing education institution in KwaZulu-Natal. *Curationis*, *41*(1). https://doi.org/10.4102/curationis.v41i1.1850.

[31] Jayanthi, S. V., Balakrishnan, S., Ching, A. L. S., Latiff, N. A. A., & Nasirudeen, A. M. A. (2014). Factors Contributing to Academic Performance of Students in a Tertiary Institution in Singapore. *American Journal of Educational Research*, *2*(9), 752–758. https://doi.org/10.12691/education-2-9-8.

[32] Farooq, M. S., Chaudhry, A. H., Shafiq, M., & Berhanu, G. (2012). Factors Affecting Students' Quality Of Academic Performance: A Case Of Secondary.GMC. (2009). Clinical Placements For Medical Students. 24.

[33] Taylor, D. C. M., & Hamdy, H. (2013). Adult learning theories: Implications for learning and teaching in medical education: AMEE Guide No. 83. *Medical Teacher*, *35*(11), e1561–e1572. https://doi.org/10.3109/0142159X.2013.828153.

[34] Stevens, E. (2018, March 26). *The Challenges of Being an Adult Learner and How to Overcome Them*. https://careerfoundry.com/en/blog/career-change/the-challenges-of-being-an-adult-learner-and-how-to-overcome-them/

[35] Kumwenda, B., Cleland, J. A., Walker, K., Lee, A. J., & Greatrix, R. (2017). The relationship between school type and academic performance at medical school: A national, multi-cohort study. *BMJ Open*, *7*(8). https://doi.org/10.1136/bmjopen-2017-016291.

[36] Idowu, O. O. (2016). An Investigation of Mathematics Performance of High School Students in Lagos state, Nigeria: External Factors. *Urban Education Research & Policy Annuals*, *4*(1). https://journals.uncc.edu/urbaned/article/view/431.

[37] Sadler, P., Sonnert, G., Coyle, H., Cook-Smith, N., Miller-Friedmann, J., & Center, H.-S. (2013). The Influence of Teachers' Knowledge on Student Learning in Middle School Physical Science Classrooms. *AERJ*, *50*, 1020–1049. https://doi.org/10.3102/0002831213477680.

[38] Kunter, M., Klusmann, U., Baumert, J., Richter, D., Voss (Dubberke), T., & Hachfeld, A. (2013). Professional Competence of Teachers: Effects on Instructional Quality and Student Development. *Journal of Educational Psychology*, *105*, 805–820. https://doi.org/10.1037/a0032583.

[39] Cochran-Smith, M., & Maria Villegas, A. (2015). Studying teacher preparation: The questions that drive research. *European Educational Research Journal*, *14*(5), 379–394. https://doi.org/10.1177/1474904115590211.

[40] Kadri, M., Alwi, F., & Hashim, M. (2009). The Effect of Lecturer Gender, Teaching Experience and Student Gender on Students Achievement. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1458434.

[41] World Bank. 1997. World Development Report 1997 : The State in a Changing World. New York: Oxford University Press. © World Bank. https://openknowledge.worldbank.org/handle/10986/5980 License: CC BY 3.0 IGO."

[42] Darling-Hammond, L. (2010). Assessing Teacher Education: The Usefulness of Multiple Measures for Assessing Program Outcomes. *Journal of Teacher Education - J TEACH EDUC*, *57*, 120–138. https://doi.org/10.1177/0022487105283796.

[43] Rice, Jennifer King. 2010. The Impact of Teacher Experience: Examining the Evidence and Policy Implications. Brief No. 11.National Center for Analysis of Longitudinal Data in Education Research. The Urban Institute, 2100 M Street NW, Washington, DC 20037. Tel: 202-261-5739; Fax: 202-833-2477; e-mail: inquiry@caldercenter.org; Web site: *http://www.caldercenter.org.*

[44] GMC. (2009). Clinical placements for medical students. 24.

[45] Jamshidi, N., Molazem, Z., Sharif, F., Torabizadeh, C., & Najafi Kalyani, M. (2016). *The Challenges of Nursing Students in the Clinical Learning Environment: A Qualitative Study* [Research article]. The Scientific World Journal. https://doi.org/10.1155/2016/1846178.

[46] Vanni, N. (2015). *What is Exam Validity?* http://www.fisdap.net/blog/what_exam_validity.

[47] Kleeman, J. (2017). Six tips to increase content validity in competence tests and exams | Getting Results—The Questionmark BlogGetting Results—The Questionmark Blog. https://blog.questionmark.com/six-tips-to-increase-content-validity-in-competence-tests-and-exams.

[48] Carter K, Stoehr JD. Preparedness for clinical practice and the development of professional competencies. The Journal of Physician Assistant Education. 2019 Sep 1;30(3):164-7.

[49] McAuliffe E, Bowie C, Manafa O, Maseko F, MacLachlan M, Hevey D, Normand C, Chirwa M. Measuring and managing the work environment of the mid-level provider–the neglected human resource. Human resources for health. 2009 Dec;7:1-9.

[50] Miseda MH, Were SO, Murianki CA, Mutuku MP, Mutwiwa SN. The implication of the shortage of health workforce specialist on universal health coverage in Kenya. Human resources for health. 2017 Dec;15:1-7.

[51] Muthaura PN, Khamis T, Ahmed M, Hussain SR. Perceptions of the preparedness of medical graduates for internship responsibilities in district hospitals in Kenya: a qualitative study. BMC medical education. 2015 Dec;15(1):1-2.

[52] van der Vleuten CP, Schuwirth LW, Driessen EW, Dijkstra J, Tigelaar D, Baartman LK, Van Tartwijk J. A model for programmatic assessment fit for purpose. Medical teacher. 2012 Mar 1;34(3):205-14.

[53] Weniger GR. 2021. Predictive Effects of Physician Assistant Students' Pre-Admission Direct Patient Contact Hours on Performance in Supervised Clinical Practice Experiences.

[54] Zaweski J, Melcher BQ, Sedrak M, Von M, Fletcher S. Physician assistant educator competencies. The Journal of Physician Assistant Education. 2019 Mar 1;30(1):47-53.