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Utilization of Point-of-Care-Testing Devices for Clinical Diagnosis: The Case of Community Health Nurses in Effutu Municipality

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Abstract

By offering quick and accurate diagnosis and treatment, Point-of-Care-Testing (POCT) devices have the potential to improve patient care. Although the vast majority of Community Health Nurses (CHNs) make use of POCT instruments, not much is known about their perceptions, attitudes and knowledge of the use of these devices. The objective of the study was therefore to investigate CHNs' knowledge, attitudes and perceptions regarding the use of POCT devices in the Effutu Municipality. The study employed a cross-sectional survey with a sample size of 100 CHNs with varying levels of education and experience. Information was gathered from the CHNs using a structured questionnaire that was created based on empirical literature. The data was analyzed after sorting and coding them onto a computer. Study results show that most CHNs had received enough training, prior knowledge and hands on experience in the use of POCT devices. The knowledge came from several places, including internet searches, professional training programs, short courses, self-study and from colleagues. Furthermore, a great majority of CHNs in the Municipality of Effutu expressed positive opinions regarding the usage of POCT devices. The CHNs recognized the potential benefits, of using POCT devices in outpatient departments and consequently valued the associated benefits such as speed, ease of use, accuracy and dependability of results that come with it. Therefore, it is imperative to promote knowledge sharing and ongoing education among healthcare professionals regarding the utilization of POCT equipment.

Keywords: Point-of-care-testing devices • Clinical diagnosis • Community health nurses • Effutu municipality

Introduction

Medical diagnostics is a crucial component of healthcare because it offers insightful information to support medical decisions that aim to enhance patient care and wellbeing [1]. Not only can accurate diagnosis benefit patients clinically, but it can also benefit the healthcare system financially. Consequently, the laboratory has remained a very important unit for all health care facilities anywhere in the world. However, generation and interpretation of results takes time and requires specialized knowledge. It is in this regard that the development of innovative diagnostics, specifically, easy-to-use analyzers which can be utilized at the point of care comes in handy. Point-of-care testing devices have become increasingly popular in healthcare delivery, particularly in the diagnosis and management of diseases [2]. Other names often given to POCT devices include, bed side testing, physician's office testing, off site testing, alternative site testing, etc.

The International Organization for Standardization defines POCT as a testing that is performed near or at the site of a patient with the result leading to possible change in the care of the patient [3,4]. They are usually conducted in a non-laboratory setting, during or shortly after the patient is seen by a healthcare provider [5].

The capacity of POCT devices to deliver fast, precise and dependable data is crucial because it can have a positive impact on patients, healthcare professionals and the health system as a whole. They reduce the requirement for laboratory tests and help healthcare providers manage resources more effectively [6]. As stated by Rajendran and Rayman [7], the use of POCT devices for blood glucose monitoring in diabetic patients improved glycaemic control and decreased the risk of hypoglycemia.

Some of the most frequently used POCT devices are urine pregnancy tests used to confirm pregnancy suspicions, Rapid Diagnostic Tests (RDTs) for malaria, glucometers for monitoring blood glucose levels, rapid diagnostic tests (RDTs) for Human Immunodeficiency

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Virus (HIV) and Hemoglobin (Hb) meters for anemia screening programs and in the management of sickle cell condition. The test kits often require only a small volume of blood, urine, faeces or sputum from a patient and can provide test results within few minutes. This enables a real-time discussion of test results between the health professional and patient during the initial consultations and has the potential to eliminate the need for a follow up appointment. POCT is accessible to all types of health practitioners, particularly those working in remote areas.

Community Health Nurses (CHNs) work in deprive communities and are an integral part of the healthcare system in the majority of Ghanaian rural communities. They offer crucial health services to people, families and communities. For people looking for healthcare services in rural communities, they are frequently the first point of contact. According to the National Association of School Nurses (NASN) [8], community health nursing is the application of both public health and nursing practice to improve and safeguard the health of people. Among other places, Community Health Nurses (CHNs) work at public health clinics, educational institutions and neighbourhood-based organizations. Similarly, they offer direct care in a range of contexts to people and families. In addition to avoiding illness, CHNs are essential in enhancing the general health of the populations they serve.

The vast majority of Community Health Nurses (CHNs) make use of POCT instruments. On the other hand, not much is known about CHNs' perceptions, attitudes and knowledge with relation to using POCT devices [9]. The adoption and efficient use of POCT devices can be hampered by healthcare personnel' ignorance, unfavorable attitudes and misconceptions [10]. Research indicates that while CHNs may be well-aware of the possible advantages of POCT devices, they may not have received enough instruction in their usage, raising questions about accuracy and dependability. Furthermore, the degree to which healthcare professionals are willing to employ POCT devices in clinical settings may depend on how they view the devices' accuracy and dependability [9]. Regarding the quality control of POCT devices and the possibility of inaccuracies in test results, some providers could be worried [10]. Some nurses' attitudes and views, like those about cost-effectiveness, upkeep and assistance, have been noted as potential roadblocks to the adoption of POCT devices. I investigated CHNs' knowledge, attitudes and perceptions regarding the usage of POCT devices in the Effutu Municipality in light of this idea.

Materials and Methods

Study design, area and population

This quantitative descriptive cross-sectional study involved hundred (100) CHNs in active service who have had experience with the usage of POCT devices in the Effutu Municipality. The Effutu Municipality is a local government administrative district in the Central Region of Ghana. The Municipality has its administrative capital in Winneba. The Municipality is made up of diverse communities including Gyahadzi, Atekyedo, Nsuakyire, Winneba, Woarababa, Ansaful, Gyangyadzie and New Winneba. The municipality has a number of hospitals, health centers and Community-Based Health Planning and Services (CHPS) compounds which serve the community's health needs. Nonetheless, the research was conducted at some selected hospitals, community health clinics and CHPS compounds, all of which had CHNs actively engaged in the provision of healthcare services within the Municipality. The purposively selected facilities were the Ansaful CHPS compound, Atekyedo Community Clinic, Zongo Community Clinic, Winneba Municipal Hospital and Winneba Health Center. Selection was based on their accessibility, availability of POCT devices and the CHNs' willingness to participate in the study.

Instrument and data collection

A structured questionnaire made up of 25 items was developed based on empirical literature to solicit information from the CHNs. The instrument was exploratory in nature to help the nurses to easily share their views on the topic. The instrument was made up of five parts. The first part, made up of 7-items quizzed the nurses on their socio-demographic information. The second part of the instrument (9 items) questioned the CHNs on their level of knowledge and skills regarding the use of POCT device. The participants responded on a "yes or no" from 1 (no) to 2 (yes). In addition, part three of the instrument (4 items) looked at the attitude of the respondents towards the use of POCT device. Response options ranged from 1 (very positive), 2 (positive), 3 (neutral), 4 (negative) to 5 (very negative). Furthermore, part four (2 items) of the instrument required the CHNs to answer questions on the challenges they face in the use of POCT devices. Respondents were provided with a list of challenges to select the ones they face. The final part of the instrument (3 items) interviewed the respondents on the measures to ensure effective use of POCT devices. The participants responded on a "yes or no" scale ranging from 1 (no) to 2 (yes).

Two health promotion specialists from the University of Education, Winneba, were given the instrument to verify its face and content validity. Concurrently, a pre-test of the instrument was conducted with 15 CHNs who were selected from specific health facilities in the Gomoa East District of the Central Region. The pre-test subjects were considered to be working for the Ghana Health Service and to have somewhat comparable attributes to the study participants. Based on the pre-test data, the instrument's dependability value was found to be 0.803.

The instrument was self-administered by the researcher to the respondents. Participants were also informed that their participation in the study was voluntary, anonymous and confidential and that they might leave at any time without facing any repercussions. Additionally, before beginning the study, each participant provided their verbal or written consent. Participants were approached in the mid-morning when the Outpatient Department (OPD) was less busy. They were given ample time to complete the instrument. Data collection started on 9th August, 2023 and ended on the 29th September,

2023. Research approval was granted by the Effutu Municipal Health Directorate Review Board and assigned the reference number GHS/EFFMHD/HR-08. In addition, I sought and obtained authorization from the Medical Superintendent, the Administrator and the Deputy Director of Nursing Service (DDNS) and In-Charges of the various health facility in the Effutu Municipality. No incentives were given to participants.

Data analysis

The completed surveys that provided the data were examined and confirmed for accuracy. Because this was a quantitative study, the results were produced by analyzing the data with the Statistical Package for the Social Science (SPSS) version 26. The study's findings were interpreted using descriptive statistics and results presented in tables and figures.

Results

Socio-demographic characteristics

A greater percentage (75%) of the respondents were female whilst 25% of them were male. Also, the average age of the respondents was 24 years. Most of the respondents (67%) were diploma holders and a few (3%) of them had bachelor's degree. In addition, 77% of the respondents were community health nurses whereas 6% were principal community health nurse. The sample characteristics are presented in Table 1.

Characteristics	Frequency	Percentage (%)
Gender		
Male	25	25%
Female	75	75%
Religion		
Christian	84	84%
Muslims	15	15%
Traditionalist	1	1%
Marital status		
Single	73	73%
Married	26	26%
Co-habilitating	1	1%
Level of education		
Certificate	30	30%
Diploma	67	67%
Degree	3	3%
Rank		
Principal community health nurse	6	6%
Senior community health nurse	16	16%
Community health nurse	77	77%
Others	1	1%
Age		
21-25	55	55%
26-30	24	24%
31-35	15	15%
35 and above	6	6%
Years of experience		

Less than 1 year	24	24%
1 year	32	32%
2-3 years	25	25%
4 years and above	19	19%

Table 1. Socio-demographic characteristics of respondents.

Level of knowledge and skills regarding the use of POCT devices.

As presented on Table 2, Figures 1-6 a greater percentage (85%) of the respondents have heard of POCT devices and most of them (74%) have performed tests using the POCT devices. Also, more than half of the respondents (66%) had received adequate training on the use of POCT devices. Additionally, most of the respondents (53%) acquired knowledge on the use of POCT devices from their colleagues. Furthermore, the data revealed that 86% of the respondents were familiar with the pregnancy kits and could interpret results after testing with the POCT devices. However, less than a quarter of the respondents were familiar with cardiac markers and coagulation monitor.

Items	Frequency	Percentage
Heard of POCT devices before		
Yes	85	85%
No	15	15%
Performed tests using POCT devices		
Yes	74	74%
No	26	26%
Adequate training on the use of POCT		
Yes	66	66%
No	34	34%

Table 2. Level of knowledge and skills regarding the use of POCT device.

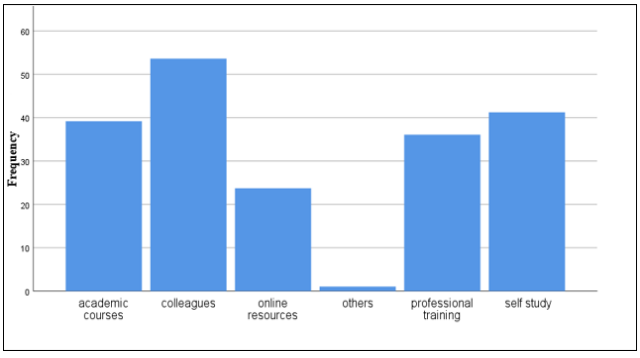

Figure 1. Sources to acquire knowledge about POCT devices among respondents.

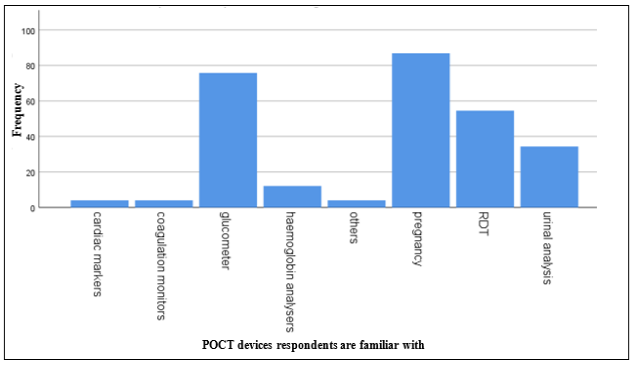

Figure 2. POCT devices respondents are familiar.

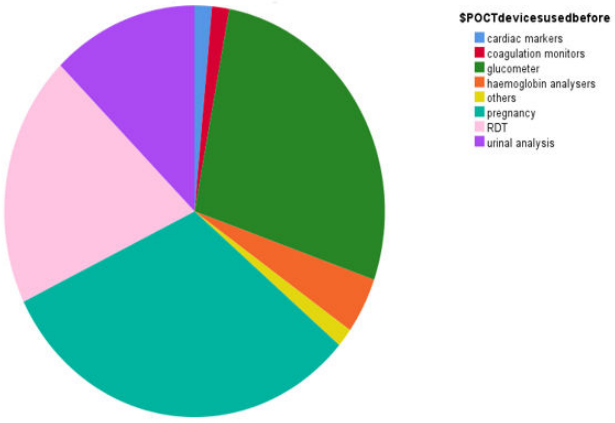

Figure 3. POCT devices respondents have used before.

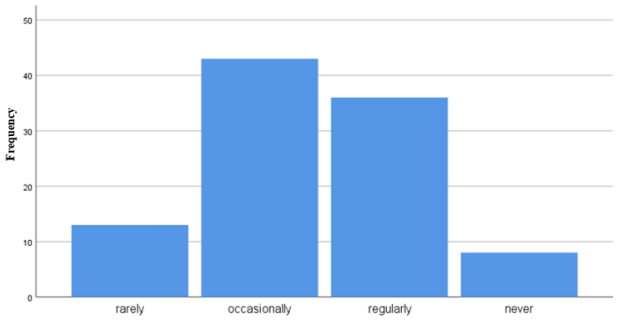

Figure 4. POCT devices often used by respondent.

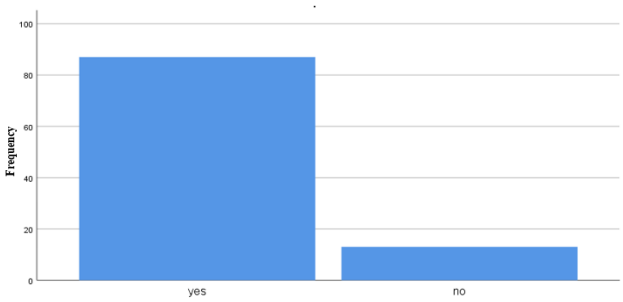

Figure 5. Respondent ability to interpret POCT results.

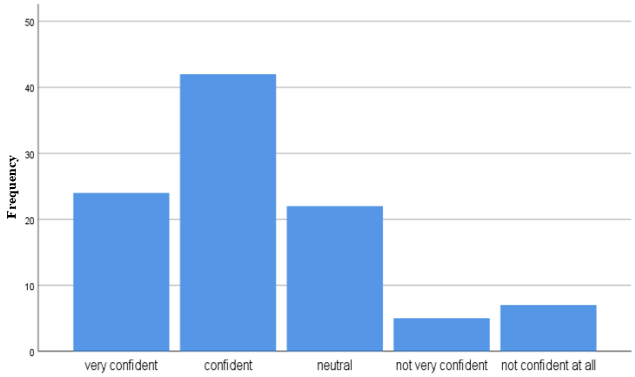

Figure 6. How confident respondent feel in interpreting POCT results.

Attitude towards the use of POCT devices

The results indicated that more than half (55%) of the respondents demonstrated positive attitude towards the use of POCT devices. Also, the data showed that majority of the respondents (78%) believe that POCT devices are most beneficial in the outpatient department. Moreover, the results revealed that less than half of the respondents trust in the technology behind POCT but are concern about privacy and data security of POCT devices. Additionally, 31% of the respondents think that POCT devices increases confidence in diagnostic accuracy (Table 3).

Attitude	Frequency	Percentage
Feeling about the use of POCT devices		
Very positive	23	23%
Positive	55	55%
Neutral	18	18%
Negative	14	14%
Very negative	0	0%
Factors that influence their attitude towards POCT devices		
Speed and efficiency of testing	73	73%
Easy to use	93	93%
Accuracy and reliability of results	36	36%

Concern about privacy and data security	23	23%
Cost-effectiveness	19	19%
Trust in technology	23	23%
Perception of POCT devices		
Beneficial in improving patients care	75	75%
Easy to use	86	86%
Enhances efficiency in healthcare delivery	48	48%
Increases confidence in diagnostic accuracy	31	31%
Improves patient satisfaction	48	48%

Table 3. Attitude towards the use of POCT devices.

Challenges in the use of POCT devices

From the analysis, it was revealed that majority (75%) of the respondents encounter difficulty while using POCT device. Most of the respondents (53%) finds it difficult to interpret results produced by POCT devices accurately. A little over half of the respondents stated limited availability of necessary reagents and supplies as a challenge whereas 31% of the respondent indicated accuracy and reliability of results as a challenge. Again, 30% of the respondent indicated lack of clear guidelines for the use of POCT devices as another challenge with a quarter of the respondents mentioning difficulty in maintaining and calibrating POCT devices as another challenge. In addition, an appreciable number (21%) of the respondents find the operation of the POCT device as a challenge (Figures 7 and 8).

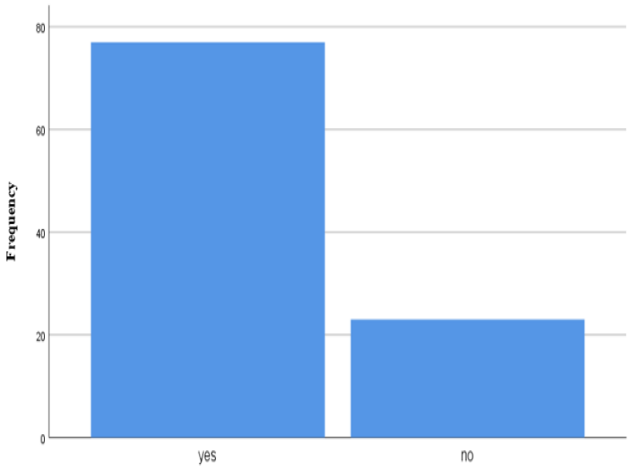

Figure 7. Difficulty encountered by respondents while using the POCT devices.

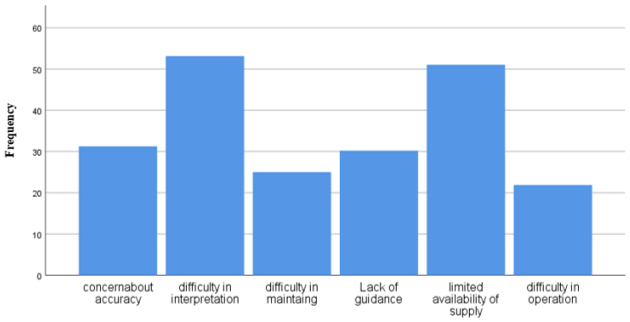

Figure 8. Challenges encountered by respondents in the use of POCT devices.

Measures to ensure effective use of POCT devices

Most of the respondents (86%) are satisfied with the use of POCT devices in healthcare facilities and 93% of them recommended other healthcare professionals to use the POCT devices. In addition, majority (95%) of the respondent think that adequate training programs on the use of POCT devices is very necessary. Also, close to half (43%) of the respondents recommended regular control and calibration of POCT to ensure their effective use whilst a little over half (52%) of the respondents indicated proper documentation and reporting system for POCT results. Furthermore, 65% of the respondent indicated that continuous professional development opportunities for CHNs on POCT devices can ensure the effective use of the POCT devices. Again, more than a quarter (40%) of the respondent also said that standardized protocols for device usage and result interpretation can also help ensure the effective use of the POCT devices. Finally, 34% of the respondents think adequate supply chain management for the device reagent and consumables is another measure to ensure the effective use of POCT devices (Table 4).

Item	Frequency	Percentage
Satisfaction with the current usage of POCT devices		
Yes	86	86%
No	14	14%
Recommendation for the use of POCT devices		
Yes	93	93%
No	7	7%

Table 4. Measures to ensure effective use of POCT devices.

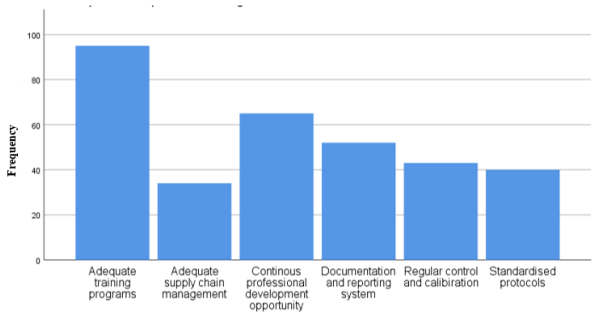

Figure 9. Measures to ensure effective use of POCT devices.

Discussion

Utilizing POCT devices is a common practice for CHNs. The perspectives, attitudes and understanding of CHNs toward the use of POCT devices, on the other hand, are poorly understood. The goal of the study was to find out how community health nurses in the Effutu Municipality felt about using POCT devices in terms of knowledge, attitudes and views. There were one hundred CHNs in the sample and 75%of them were female. With an average age of 24 years, the majority of the nurses surveyed in the current study are young adults and in a relatively early stage of their career confirming the findings of Cosgrave, Maple [11].

Comparably, the analysis showed that a sizable portion of CHNs knew about POCT devices beforehand, signifying that nurses are generally aware of POCT devices and their functions. Moreover, a significant segment of the nurses disclosed having conducted examinations utilizing POCT devices, suggesting firsthand acquaintance with these devices. This first-hand experience points to a certain degree of familiarity and competence with using POCT devices for diagnostic applications. Majority of the nurses stated they had received sufficient instruction on how to utilize POCT devices. This training, which may have taken the form of workshops, instructional programs or on-the-job training, probably improved the nurses' understanding of how to use the devices safely and effectively.

In terms of sources of information on POCT devices, the study discovered that the CHNs used a variety of channels to learn about using POCT devices. The majority of nurses learned from their peers, demonstrating the value of knowledge-sharing and peer learning in the healthcare environment. However, a considerable percentage of the nurses reported occasionally using POCT devices especially those who work at the hospitals. According to Drenck, the diagnostic process in most hospitals is based on laboratory testing, where there are skilled and experience laboratory scientist capable of producing accurate, dependable and repeatable results and the nurses and physicians may prefer the laboratory results over the results produced by POCT devices.

What is noteworthy is that the majority of CHNs showed a favorable attitude about using POCT devices. Positivity toward POCT devices can boost CHNs' confidence in the reliability and correctness of the test results as well as their readiness to use them [12]. In terms of variables that affect the CHNs' perception of using POCT devices, a sizable majority of the nurses said that the testing speed had an impact on medical diagnosis. According to Rajsic, Breitkopf [13], POCT devices can speed up the turnaround time for crucial laboratory tests, which can result in quicker patient diagnosis and treatment. This implies that nurses' perceptions of POCT devices are positively influenced by how quickly they can obtain test results. The discovery implies that the nurses acknowledge the possible benefits of utilizing POCT instruments in non-inpatient environments which leads to better clinical results, shorter hospital stays and higher patient satisfaction [14,15].

Also, the results suggest that a significant number of nurse's encounter difficulties or barriers when utilizing these tools, underscoring the necessity of resolving these concerns to guarantee the successful and efficient application of POCT devices in healthcare environments. The most frequent difficulty they encountered while using POCT devices was accurately interpreting the results. In addition to potential mistakes in data input or interpretation, CHNs can be worried about the reliability and accuracy of test results [16]. The nurses also have challenge in correctly analyzing and understanding the diagnostic information provided by POCT devices [17].

Nevertheless, regardless of the challenges, an overwhelming majority of the nurses are satisfied with the usage of Point-of-Care Testing (POCT) devices in the health sector. This suggests that the majority of CHNs perceive the current utilization of POCT devices in healthcare facilities as effective and beneficial. It is important to acknowledge this positive sentiment and build upon it to further enhance the utilization of POCT devices. Moreover, a resounding

majority of the nurses said they would advocate for other medical professionals to utilize POCT devices. The positive attitude toward POCT devices can boost CHNs' confidence in clinical diagnosis, patient care and shorter hospital stays and increased patient satisfaction [12]. In addressing the challenges in the use of POCT devices a sizable majority of CHNs stressed the value of thorough training courses on POCT device usage, upkeep, interpretation of results and quality control of POCT devices guaranteeing their efficient utilization in health facilities.

Conclusion

The use of POCT devices for medical diagnosis by Community Health Nurses (CHNs) is an essential component of primary healthcare services. The CHNs in the Effutu Municipality often possess a high degree of expertise and proficiency when it comes to using POCT devices. The majority of the CHNs had undergone sufficient training, had prior knowledge and had practical experience with these devices. The knowledge was acquired from a variety of sources, including professional training, university courses, self-study, coworkers and internet sites. Additionally, the vast majority of CHNs in the Municipality of Effutu showed favorable attitudes toward the use of POCT devices. They appreciated features including speed, simplicity of use, precision and dependability of results and acknowledged the possible advantages, particularly in outpatient settings in the use of POCT devices. It is critical that healthcare institutions and organizations create and put into place thorough training programs for medical staff on POCT equipment use, upkeep and quality assurance. Meanwhile, for CHNs to be properly trained to utilize POCT devices, manufacturers must also supply thorough and easily navigable training materials, such as manuals, videos and online resources. It would be crucial to address issues with cost effectiveness, trust, privacy and data security in order to encourage more acceptance and usage of POCT devices in medical practice.

Limitations and future direction

This study provides vital information regarding utilization of POCT among CHNSs in the Effutu Municipality of Ghana. Nevertheless, it has some limitations. This study is restricted to a single municipality in Ghana and participants were selected by purposive sampling, which limit the generalizability of the findings to other CHNs outside the municipality. Furthermore, because of the subjective nature of the study, it is likely that studied nurses may have given responses suitable to the researchers (social desirability bias). It is imperative to explore the reasons some health facilities experience regular shortage in the supply of POCT devices and how district and municipal health directorates can better support CHNs. Moreover, further research is required on interventions to increase POCT use among CHNs in the municipality and beyond. Similarly, using a more comprehensive sampling method to ensure the generalizability of findings to a larger population is warranted. A longitudinal study to examine changes in the knowledge, attitudes and perceptions in the use of POCT among CHNs in the municipality would be ideal. In order to gain a deeper understanding of the experiences of CHNs using POCT devices nationwide and the socio-cultural elements influencing their decision to use these devices, future research could greatly benefit from the integration of qualitative methodologies.

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Author Contribution

MAB was responsible for the study's conception, protocol design, data collecting and acquisition. Data administration, processing and analysis were handled by MAB. The original manuscript was created by MAB, who also edited and significantly edited it before submitting it to a journal.

Competing Interest

The author declare that he has no competing interest.

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