

Point of care testing: Knowledge and utilization amongst Doctors in Government hospitals in Edo State, Nigeria

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Abstract

Objective: The study assessed the knowledge and utilization of point of care testing (POCT) amongst doctors in two health facilities in Edo State, Nigeria.

Methods: A descriptive cross-sectional study was carried out using a multistage sampling technique. Data were collected from 174 doctors in both centers using a 25 item structured questionnaire which was analyzed using SPSS version 20.0.

Result: The mean age of respondents was 31.26 ± 2.14 years with 120 (69.0%) males and 54 (31.0%) females (male: female = 2.2:1). Knowledge of POCT and utilization of POCT devices was good in 50.6% and 32.2% of respondents respectively. Utilization of POCT correlated significantly with knowledge of POCT ($r = 0.67, P < 0.001$) and availability of POCT devices ($r = 0.43, P < 0.001$). There was statistically significant association between utilization of POCT devices and Hospital ($\chi^2 = 9.95, P = 0.002$); job designation ($\chi^2 = 10.03, P = 0.018$) and availability of POCT devices ($\chi^2 = 6.80, P = 0.001$). However, no statistically significant relationship was found between utilization of POCT devices and sex ($\chi^2 = 0.23, P = 0.629$).

Conclusion: Promotion of POCT's utilization with regulation, training of doctors and establishment of regulatory framework/assessment teams will help improve healthcare services and achieve more beneficial outcomes. That way, POCT that is faster could be better.

Key words: Availability, knowledge, point of care testing, utilization

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Introduction

Point of care testing (POCT) can also be referred to as bedside test,^[1] physicians office testing^[2] or decentralized testing.^[3] POCT may also be defined as laboratory testing conducted close to the bedside of patients care.^[4]

According to the Academy of Medical laboratory science, Ireland (2007)^[5] POCT service may be defined as a quality-assured pathology service using analytical devices (including test kits and analysers), provided near to the patient rather than in the traditional environment of a clinical laboratory.

Its use now encompasses all fields having increased over the past decade and has evolved from the demand of analytical information more rapidly than is available from the central laboratory. Some of the earliest references to diagnostic methods are found in the teachings of Ayurveda medicine which provided a detailed description concerning the inspection of urine. The first point of care tests were performed about a century ago and were based on color and blood condition before the advent of modern diagnostic laboratories.^[6]

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Point of care testing is accomplished through the use of transportable and handheld instruments, e.g. blood glucose meter and test kits (e.g., retroviral screening and malaria test kits). The two most common sites of POCT are within the patients living environment (home, leisure, workplace etc.) and the intensive care units. Other sites of POCT include outpatient clinic, mobile hospitals, emergency rooms, ambulance/helicopter services, wards, consulting rooms, etc.

The provision of a result may avert a life-threatening crisis and may also ensure that there is more rapid and effective change in patient management.^[7] Thus, utilization of POCT lies in the value of the immediacy of response and result turnover time. Similarly, an immediate test result may help rule out a diagnosis and lead the clinician to consider another alternative.^[8,9]

Uses of POCT services include for estimation of blood glucose, urinalysis, alcohol/toxicology screening, blood gases estimation, detection of pregnancy and ovulation, cholesterol, triglyceride (TG) and high-density lipoprotein estimation, cardiac biomarkers, renal biomarkers, anticoagulant therapy monitoring etc.^[5] The benefits of POCT include reduced patient waiting time, reduced number of clinic visits, improved quality of life, reduced quantity of blood needed for testing, de-bulking of pressure in the central laboratory, easy accessibility, and affordability. All these advantages of POCT depend on the acceptability and analytical parameters in comparison with central laboratory methods.

With all these merits, some researchers believe that other important factors for consideration are the efficacy of the procedures being undertaken, medico-legal and safety aspects as well as clear clinical procedural protocols because the absence of these factors will lose POCT's value for money and more importantly patients may have inappropriate testing carried out and be subjected to further testing that may carry a higher cost/morbidity.^[10]

The patient is at the center of any discussion on the benefits of POCT. The goal of any health intervention is to bring many more benefits with minimal risk and affordable cost. The caregiver's knowledge and utilization of POCT have to be robust encompassing a focused and more effective method towards beneficial healthcare delivery to both the patient and healthcare system.

Advances in technology and legislature control have resulted in more reliable instruments. The major risk arises from poor operator competency, lack of supervision, governance and accreditation of the POCT service, failure to use quality schemes, inappropriate testing by inexperienced personnel and uncertainty on how to act on results. However, users must realize that POCT is not a replacement for central laboratory testing in making clinical decisions at all times.

Verification by central laboratory methods may sometimes be required.^[5]

Quality assurance including correct identification of patient to be tested, appropriate test selection, performing routine machine quality control checks, obtaining satisfactory specimen, proper interpretation and documentation of results into electronic database monitoring systems.^[11]

Regardless of sophistication of POCT devices, validation may be necessary. Validation of test is also important at some point in patient management and much more important is a clinician's ability to recognize such a need. A need for validation of POCT results occurs when results are at variance with patient's clinical state/clinical findings, with central laboratory values or with known established cut-off/standards. Using a more sensitive POCT device is an option for validation as some kits offer better sensitivity and higher quality assurances than others. Repeating the test when problems with sample collection are envisaged is could also be done. Central laboratory testing methods could also be also used to validate POCT results. Although the latter is argued by most clinicians to be best, it should be noted that some POCT test do not have a laboratory equivalent such as activated clotting time.^[12]

In addition, validation can be done on some POCT devices using kits provided by some manufacturers although the credibility is questionable. Operator errors and instrument errors could also be checked through adequate end-user competency assessment training programs.

A data management system will help establish reliability over time and if outcomes of patient management using POCT are weighed against individual cost of POC testing, it will be found that the benefits tend to make the cost of POCT cheaper as compared to the cost of central laboratory testing. Validation will be further improved with such data management systems as it can allow for regular auditing of test performance including harmonization of numeric results between central laboratory tests and POCT.^[12-14] However, the establishment of a POCT management program is helpful in achieving these goals.

Health planners and managers promotion of the utilization of POCT devices in their facilities depend on knowledge and necessity for utilization of such devices. While in some countries, guidelines do exist for the use of POCT devices and services with the aim of providing a framework for a better point of care service delivery,^[15] none exists in Nigeria currently.

Some medical conditions require frequent monitoring and frequent access to laboratory services is difficult for such patients. Most standard central laboratory testing consume a lot of time which makes POCT an essential mechanism

for more rapid/effective treatment. In addition, modern POCT devices are cheaper and provide a cost effective alternative to laboratory testing.^[16] Thus a clinician's knowledge of all these advantages and proper utilization of POCT devices will be of immense benefit to patients. Thus, the need for this study is to assess the need to improve knowledge and enhance the utilization of POCT in healthcare facilities.

In Nigeria, healthcare workers rendering POCT services include paramedics, laboratory technicians, laboratory scientists, doctors, etc., this study assessed the knowledge and utilization of POCT amongst medical doctors in government hospitals in Benin City, Nigeria. In Nigeria, doctors primarily manage patient's bedside testing services while another testing is majorly carried out in the central laboratory.

Methods

The study was conducted amongst 174 medical doctors of varying cadres at the University of Benin Teaching Hospital (UBTH) and Central hospital both in Benin City, Nigeria. One hundred and forty-one of the 647 and 33 of the 104 doctors were sampled in UBTH and Central Hospital respectively.

The study was a descriptive cross-sectional study and respondents were selected using a multistage sampling technique. Data were collected using an interviewer administered 25 item structured questionnaire consisting of four parts (part A [socio-demographics], B [assessment of respondent's knowledge of POCT], C [availability of POCT devices], and D [assessment of utilization of POCT]). Part A with six questions on socio-demographic data of respondents. Part B consisted of two questions (availability of POCT devices and where such devices are located) while Part C had 10 questions assessing knowledge with individual responses scored on a two-point Likert scale 1 for "Yes" and 0 for "No." The responses for part C were scored as poor (0–4), fair (5–6), and good (7–10). Part D consisted of seven questions assessing utilization scored on a two-point Likert scale; 1 for "Yes" and 0 for "No" with responses scored as poor (0–4) and good (5–7).

Data were analyzed using IBM Statistical Product and Service Solutions (IBM-SPSS) version 20.0. Frequencies and percentages were calculated, responses were scored and graded to assess knowledge, utilization and availability of POCT services. Chi-square test was used to compare frequencies, correlation charts were drawn using Microsoft Excel 2013. A $P < 0.05$ was used for determination of statistical significance. Ethical approval was granted by both hospitals and consent was taken from doctors individually.

Results

There were 174 doctors studied consisting of 141 doctors from the UBTH and 33 from central Hospital, Benin City, Nigeria. Half (87 [50%]) of the respondents were 20–29 years old, while 73 (42.0%) doctors were between 30 and 39 years of age. The mean age was

Table 1: Socio-demographic characteristics of respondents (n=174)

Characteristic	Frequency (n)	Percentage
Age		
20-29	87	50.0
30-39	73	42.0
40-49	11	6.3
50-59	2	1.1
>60	1	0.6
Mean age=31.26±2.14 years		
Sex		
Male	120	69.0
Female	54	31.0
Religion		
Christianity	170	97.7
Islam	1	0.6
ATR	3	1.7
Educational qualification		
MBBS	160	92.0
BDS	2	1.1
Fellowship	12	6.9
Job designation		
House officer	75	43.1
Medical officer	9	5.1
Resident doctor	85	48.9
Consultant	5	2.9
Hospital		
UBTH	141	81.0
Central hospital	33	19.0

UBTH=University of Benin Teaching Hospital; ATR=African Traditional Religion

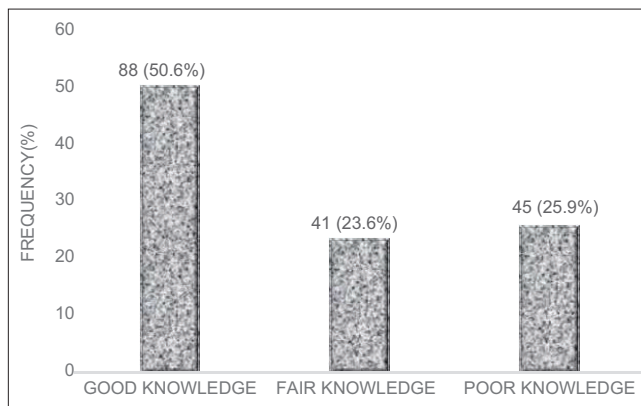


Figure 1: Assessment of respondent's knowledge of point of care testing

31.26 ± 2.14 years. Most (69%) respondents were males with a male/female ratio of 2.2:1. There were 85 (48.9%) resident doctors, 75 (43.1%) house officers, 9 (5.1%) medical officers and 5 (2.9%) consultants who took part in the study [Table 1].

Table 2: Relationship between availability of POCT and hospital

	Availability of POCT n (%)		χ^2/P
	Yes	No	
UBTH	59 (41.8)	82 (58.2)	10.23/<0.001
Central hospital	4 (12.1)	29 (87.9)	

POCT=Point of care testing; UBTH=University of Benin Teaching Hospital

Table 3: Relationship between knowledge of respondents on POCT and selected variables

	Knowledge n (%)			χ^2/P
	Good (n=88)	Fair (n=41)	Poor (n=45)	
Hospital				
UBTH	75 (53.2)	31 (22.0)	35 (24.8)	2.10/0.350
Central hospital	13 (39.4)	10 (30.3)	10 (30.3)	
Job designation				
House officer	35 (46.6)	20 (26.7)	20 (26.7)	3.37/0.761
Medical officer	6 (66.7)	1 (11.1)	2 (22.2)	
Resident doctor	44 (51.8)	20 (23.5)	21 (24.7)	
Consultant	3 (60.0)	0 (0.0)	2 (40.0)	
Availability of POCT devices				
Yes	37 (58.8)	12 (19.0)	14 (22.2)	2.66/0.265
No	51 (46.0)	29 (26.1)	31 (27.9)	

POCT=Point of care testing; UBTH=University of Benin Teaching Hospital

Table 4: Relationship between respondent's utilization of POCT and some selected variables

	Utilization of POCT devices n (%)		χ^2/P
	Good (n=56)	Poor (n=118)	
Hospital			
UBTH	53 (37.6)	88 (62.4)	9.95/0.002
Central hospital	3 (9.1)	30 (90.9)	
Job designation			
House officer	15 (20.0)	60 (80.0)	10.03/0.018
Medical Officer	3 (33.3)	6 (66.7)	
Resident Doctor	35 (41.2)	50 (58.8)	
Consultant	3 (60.0)	2 (40.0)	
Availability of POCT devices			
Yes	28 (44.4)	35 (66.6)	6.80/0.001
No	28 (25.2)	83 (74.8)	
Sex			
Male	40 (33.3)	80 (66.7)	0.23/0.629
Female	16 (29.6)	38 (70.4)	

POCT=Point of care testing; UBTH=University of Benin Teaching Hospital

Eighty-eight respondents had good knowledge accounting for 50.6% of all doctors in the study while 41 (23.6%) and 45 (25.9%) had fair and poor knowledge of POCT respectively [Figure 1]. The availability of POCT device in emergency units and other units in both hospitals studied showed that 41.8% of respondents from UBTH consented

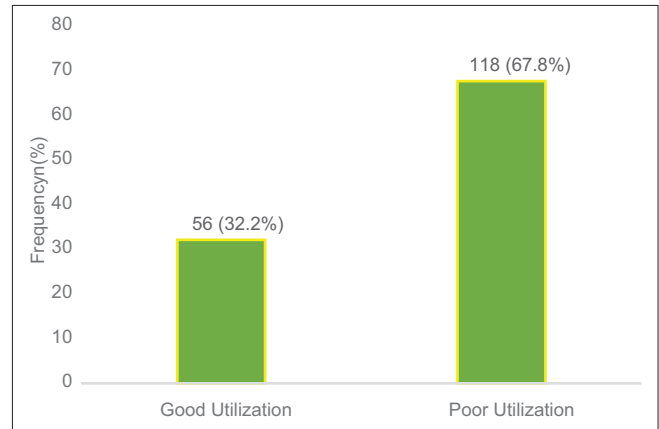


Figure 2: Assessment of respondent's utilization of point of care testing

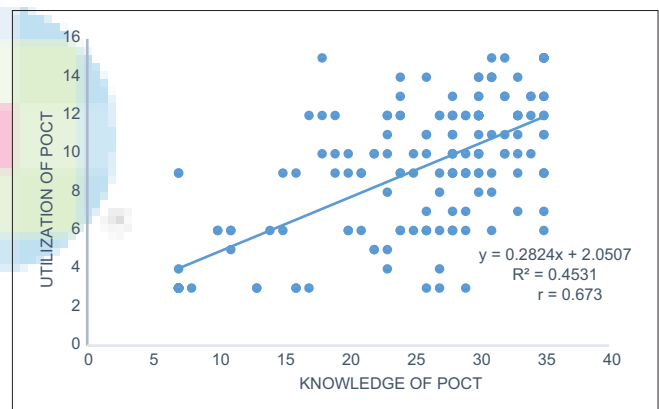


Figure 3: Relationship between respondent's knowledge and utilization of point of care testing

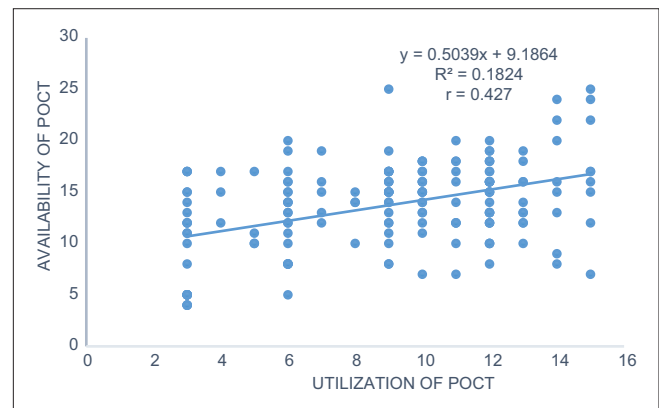


Figure 4: Relationship between utilization and availability of point of care testing

to its availability while 12.1% of doctors agreed that POCT was available in Central Hospital [Table 2].

There was no statistically significant association between the level of knowledge of POCT and hospital ($\chi^2 = 2.10$, $P = 0.350$); job designation ($\chi^2 = 3.37$, $P = 0.761$); and availability of POCT devices ($\chi^2 = 2.66$, $P = 0.265$) [Table 3].

Utilization of POCT devices was poor in over two-third of respondents (67.8%) while utilization was good amongst 32.2% of doctors in the study [Figure 2].

There was a statistically significant association between utilization of POCT devices and hospital ($\chi^2 = 9.95$, $P = 0.002$); job designation ($\chi^2 = 10.03$, $P = 0.018$) and availability of POCT devices ($\chi^2 = 6.80$, $P = 0.001$). However, no statistically significant relationship was found between utilization of POCT devices and sex ($\chi^2 = 0.23$, $P = 0.629$) [Table 4].

There was a positive significant correlation between respondents' utilization of POCT devices and knowledge of POCT ($r = 0.673$, $P < 0.001$). A positive significant correlation was also found between the availability of POCT devices and utilization of POCT devices ($r = 0.427$, $P < 0.001$) [Figures 3 and 4].

Discussion

The numerous advantages and potentials of POCT cannot be achieved if the primary caregiver of the patient doesn't possess an all-encompassing knowledge of POCT devices and services. The present study showed that knowledge was good in about 50.6% of doctors which is contributory to the low level of utilization observed as most clinicians have little training in quality laboratory practices.^[12] Though, knowledge has an effect on general use of POCT devices, it also has a major effect on use of certain POCT devices (e.g. Cardiac marker analyzers) especially when more common devices have not been adopted.

Varied point of care tests mostly occurs in laboratories and hospitals as opposed to home and office testing where a few basic tests are carried out. Thus, there ought to be more POCT devices and services available in the clinical setting from which patients can benefit. The availability of POCT devices and services was very low in Central Hospital, Benin. Though it was more available in comparison with UBTH, it was inadequate. The adequacy of POCT devices and services require POCT programs that are viable business models to ensure sustainability and dependability because even cost and economic benefits have a major role to play in availability.^[17] Furthermore, availability affects an individual's willingness to seek

knowledge on use, functionality, interpretation and other information to ensure successful utilization. The definition of POCT by Price *et al.*,^[18] (that POCT is the provision of a test when the result will be used to make a decision and to take appropriate action that will lead to an improved health outcome) summarizes the need for a physicians knowledge in decision taking as regards a point of care test. The individualized necessity and benefit of a point of care test to a patient should be based on knowledge as the mere availability of POCT devices does not automatically ensure their adoption as they are geared towards making clinical decisions.^[19]

Utilization of POCT services was assessed as good in 32.2% of the respondents. This percentage was low in contrast to availability (36.2%) of POCT devices. Utilization is poor despite the practice noticed in both centers where POCT devices were shared between units; for example, glucometers were sometimes transferred from wards to consulting rooms giving a false idea of availability of the device in both units. Also, utilization was shown to be associated with the hospital in the study with UBTH utilizing more POCT devices which are likely due in part to its availability in UBTH as opposed to central Hospital. Utilization was also related to job designation. House officers and resident doctors perform most of the procedures on patients in addition to spending more time with patients. Their utilization of POCT devices in patient management is thus more than that of other cadres of doctors.

In addition, validation of POCT result is mainly done using central laboratory results that are not harmonized with POCT results nor are they audited. Furthermore, POCT data management is nonexistent in both hospitals. There is also no team established to set standards and cross-check procedures and devices. Though utilization was good in 32.2% of respondents, the quality of such services available may also not be maximal, and the validity of results obtained questionable.

Patients are thus not benefiting from the merits POCT offers. The waiting time and inability to meet the frequency of checks for some peculiar medical conditions (such as hourly blood sugar checks in some patients in critical care) may lead to increase morbidity and poor management outcomes. The doctors who have knowledge of the POCT devices are not retrained nor are any competency based tests administered on POCT. Newer devices with better accuracy are also not being purchased or utilized. Information influences policy making, and if the end users of POCT do not demand for better and newer devices it is only expected that the management of these facilities would not be enthusiastic in purchase or training.

It is definite that doctors require more knowledge and improved skills to enhance the utilization of POCT devices.

Training should also encompass knowledge of validity and quality control as doctors are also likely to head policy formulation and data management teams when they are constituted in the future.

Conclusion

There is inadequacy of POCT devices in the hospitals studied due in part to inadequacy of knowledge that affects overall utilization although POCT offers better patient management outcomes. Interventions thus require a need for education of doctors through training, setting up of regulatory units for cross checks and standardization and procurement of POCT devices to increase its availability. When these are put in place utilization will improve, and better patient management outcomes achieved.

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