

## Advantages of bedside testing techniques in current scenario.

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### Abstract

The speedy detection is important key for estimating the severity of the disease and its treatment in patients. The conventional clinical diagnostic procedures are exhausting and expensive as it takes longer time. High-end, expensive tools are required, as well as support from an expert technician and interpretation of the results. The devices which can be used near or at the site of patients for relatively speedy diagnosis called as Point-of-care diagnostic tests. It can be beneficial in doctors' clinics, multispecialty hospitals, and in patient's residence. It gives fast feedback in various sorts of medical tests. The cost of diagnosis as well as the unavailability of sufficient test kits affect disease prognosis very much. So the fast, cost effective, reliable techniques of diagnostic device are required urgently. The rapid and easy-to-use devices will make easier onsite testing. This review discusses the present state of diagnostic equipment utilized in clinical settings, as well as their benefits and drawbacks. The ramifications of POC diagnostic gadgets and future technology breakthroughs are also examined here in order to improve the status of India's healthcare and related industries.

**Keywords:** Point-of-care, Diagnostic techniques, Bedside testing, Diagnostic method, Indian healthcare systems.

### Introduction

Point-of-care Diagnostic techniques are medical diagnostic testing methods that performed at or at the point of care when and where the patient is being treated. It is a set of easy medical tests that can be performed at the patient's location site. This differs in a way that can be useful in contrast to the past trend of testing being limited to the medical laboratory, in which a specimen is taken in a laboratory away from the point of care, and then the results are awaited for hours or days, during which time the care must continue without the needed information [1]. POCT denotes the simple and quick collection of test findings, allowing patients to begin therapy based on test results as soon as possible. They are very simple to handle so it is widely used by physicians for outdoor patients, indoor patients and in emergencies. Its usefulness

ranges from outdoors patients to ICU and personal use. It helps physicians and medical staff for correct diagnosis too. It accurately draws lab quality test results within minutes rather than hours. Point of care diagnostic process ensures patients to receive the most and efficient care when and where it is needed by using portable testing devices. India is developing country and POC diagnostic equipment's have major role in the medical area due to its affordability and advancement. POC testing was first introduced in 1962 with the creation of a technology for rapid determination of blood glucose and then in 1977 with the introduction of rapid pregnancy tests. Later various types of urine strips have been available In 2000s and 2010s decades. Likewise, to measure arterial oxygen saturation pulse oximeter can be used as it is quick, simple, noninvasive, affordable way. Earlier to measure arterial oxygen saturation

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needs a sample collection from intra-arterial needle puncture in laboratory and has to wait for results.

Medical facilities in India are complicated by the fact that the country has the world's most diverse population (about 1.38 billion people). In India, there is only one doctor for every 1666 people, according to the demand for healthcare services. Healthcare workers are under a massive workload as a result of this extremely distorted ratio, which has an impact on their performance and efficiency at work. In terms of healthcare and developments, India is a resource-limited country. Due to India's large population, procuring high-end, automated, and pricey tools and their performance is tough. These pricey devices and equipment necessitate frequent maintenance and service. These expensive equipment's and instruments require frequent maintenance and service by qualified personnel for optimal performance, which adds to the entire cost of diagnosis and eventually places the burden on the end-user, i.e. the patient. As a result, sophisticated medical technologies are inaccessible to professionals and patients. As a result, the widespread use of POC diagnostic equipment promises benefits and aids in improving the healthcare status of a large population. The World Health Organization (WHO) has established 'ASSURED' criteria for Point Of Care tests in resource-constrained settings. POC devices are easy to assess and can be simple enough to be practiced at the primary care level and in remote settings with no laboratory infrastructure. And have potential to be used Indian medical system [2].

## Aims and Objectives

To describe the current state of point-of-care (POC) diagnostic technologies and their benefits in the Indian health-care system.

## Material and Method

Available Peer-reviewed paper, article, journal, research work on Google Scholar, Pub-Med., Reference books, related to POC diagnostic devices.

### *Diagnostic devices*

Medical equipment is used in the diagnosis, monitoring or treatment of medical conditions. The diagnostic devices plays vital role to diagnose and monitor the vital parameters derived from the body. Thus helps physician to measure and observe various aspects of a patient's health so that they can make a diagnosis. Some of the most commonly used diagnostic tools are thermometer, Bio signal recording instruments (ECG, EEG, EMG, and so on), Glucometer, Pulse oximeter and patient monitoring system like Stethoscopes, Sphygmomanometer, Ophthalmoscopes, Otoscope, Electrocardiogram etc.

### *Point of care (POCT) diagnostic equipment's*

Simple to complex systems with multiplex functionality are used in point-of-care diagnostic devices. It is a type of medical diagnostic testing that is performed at or at the point of care and is necessary at the time and location of patient care. It is a set of easy medical tests that can be performed at the near to patient's bed [3]. This is in contrast to the traditional system, which involved sending specimens away from the site of care

and then waiting hours or days for the results, during which time care had to continue without the needed information. These devices produce results outside of laboratory settings by collecting and analyzing specimens at the time of the patient's visit to the doctor's office or outpatient treatment location. Point of care diagnostic test kits are easy to assess as simple as a thermometer so patients can use this diagnostic devices at home, Advances in technology have expanded the applications of point of care diagnostic devices to provide a broader range of tests. Various POC devices gather blood, saliva, urine, stool, and even skin cells. They then expose the sample to a medium intended to detect the presence of certain types of cells or chemical markers. The medium like a strip infused with a substance or chemical that will react with the sample and show a visible result (like the colors that emerge in a home pregnancy test kit) that indicates the presence or absence of the disease or condition the test is performed to detect. A number of unique point-of-care diagnostic test gadgets for a variety of applications have been developed as a result of modern technical breakthroughs. Some of the most widely used devices in laboratories are disposable kits, quick assay dipsticks, reusable handheld devices like glucose monitoring kits, and multipurpose bench top devices [4]. Some Point care devices, such as rapid test pads and dipsticks, are extremely basic, requiring only a single step of sample application to receive results, while others require sample processing, handling, and result exposition procedures. Some common applications include:

- Cholesterol testing
- Blood glucose level testing
- Alcohol or drug tests
- Analysis of electrolytes and enzymes present or absent in the sample.
- Tests for signs of infection.
- Fecal matter tests for markers of colon cancer.
- Blood markers for certain cardiac conditions.
- Levels of blood gases that might cause medical concern.
- Pregnancy testing.
- Heart (Cardiac) diseases markers.

Some of the recently developed point of care diagnostic devices to detect the presence of blood alcohol levels comes in the form of wearable that use electrochemical sensors. There are various types of POC devices and has different applications. POC devices are Disposable like Rapid test kits, Some are reusable like Thermometer, It can be used in clinic like blood analyzer or in field (Blood pressure monitor) Some are invasive (Blood glucose monitor) some are noninvasive (Pregnancy test kits). The result obtained from POC devices are manually, or Visible (Dipsticks), Electronic display (Pulse oximeter). cost wise some are having low cost (Dipsticks) and some are high cost (Portable sonography). The results given by POC devices are Qualitative (Malaria detection kit), Semi qualitative (Urine dipstick) and Quantitative (Blood Analyzer) [5].

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### **Merits of bedside testing**

Testing, diagnosis with Point of care instruments is handier as these devices are small and easily movable. They provide fast results. POC devices defend the integrity of samples and few even deliver results via net property integrated into the device. Several in vitro medical specialty firms within the development part for a brand new product team with a medical specialty and life sciences device style company to make sure that new devices can work as meant. There square measure many edges to doing the tests with purpose of care tools owing to its portability, Convenience, Speed, property, Sample Quality, Quality Assurance and show quick results so quicker implementation are merits of purpose of care devices of medical aid.

### **Present status of Indian healthcare system**

India encompasses a large health care system; however there square measure several variations in quality between rural and concrete areas yet as between public and personal health care. Most of the Indian population i.e. 700 million individuals lives in rural areas wherever the condition of medical facilities is disgraceful. Rural areas typically experience doctor shortages; typically have minimum accesses to adequate healthcare. The foremost leading issue in India could be a severe shortage of trained personnel within medical tending system; this includes doctors, nurses, paramedical workers and PHC workers. The condition remains troublesome in rural areas, wherever most of India's population resides. The doctor-to-patient ratio is simply 0.7 doctors per one thousand individual that awfully low. It is long term process to enhance this situation. This is often compared by the World Health Organization (WHO) as average of 2.5 doctors per thousand individual. To look out this example there is an urgent need of recent practices and procedures to make sure that quality and timely tending reaches the neglected corners of the Indian villages. There square measure many of policies and programs are being conducted by the Government however but the success and effectiveness of those programs is questionable due to large gaps within the execution. Healthcare that is both affordable and accessible is critical to the growth and well-being of Indians as well as the country's economy. Point of care devices can help to facilitate the condition. To scale back over burden on Indian healthcare system and on advanced medical system, purpose of care medical specialty tools are used as a previous step in clinical designation.

### **Utility of POCT diagnostics devices in Indian healthcare system**

Indian health care system may be is a resource-limited as Asian nation is developing country in case of medical facility and achievements, wherever quality supplying remains an enormous question. The benefits of POC testing equipment on a large scale ensure benefits and aid in improving the medical quality of a large population. The majority of India's population (65%) lives in rural areas. Asian nations offer a big market opportunity for POC diagnostic device firms to grow and meet the needs of the world's most populous people. Diagnostic practices are crucial part of preventive healthcare

and there is a greater emphasis on screening big groups of people to prevent diseases including tuberculosis, heart disease, and thyroid disease. Bedside medical facilities are especially important in this scenario since they are brought closer to the patient and allow the diagnosis and treatment process to just be closed very quickly. Purpose of care (POC) diagnostic devices show results outside of laboratory setting by collection and analyzing specimens at the time of the patients visit to the doctor's workplace or patient treatment location.

These devices offer speedy feedback of assorted medical tests. It is utilized in doctors' offices, hospitals, and in patients' homes. Many serious diseases and disorders now have better diagnostic capabilities thanks to point-of-care testing technologies. Because the vast majority of people in Asian countries cannot afford the cost of traditional medical specialist tactics, POC diagnostic devices give the best value for money. Medical testing machines are costly and complex, and they require qualified personnel to use. Point-of-care (POC) testing devices are designed to be portable and need fewer resources than clinical analyzers, allowing them to meet many of the health-care system's specific constraints. Diagnostic techniques are inconvenient or may be inaccessible to large segments of the population, particularly those in rural communities and developing countries. They consume a significant amount of money resources (approximately 100% of a country's GDP is spent on health expenditures), Due to limited health status screening, they have a hard time detecting disorders at an initial stage [6].

POC findings are highly useful for continuous monitoring of specific analyses or repeat follow-up tests to track treatment progress. Sometimes, patients will use purpose of care diagnostic devices reception, like physiological condition or blood sugar tests. Advances in technology have dilated the applications of purpose of care diagnostic tools to produce a broader vary of tests. Testing with POC devices is convenient. The devices are tiny and moveable. They supply quick results. POC devices shield the integrity of samples and a few even deliver results via net property integrated into the device. There are spreads of devices that are utilized in POC settings that embody disposable kits like speedy assay dipsticks, reusable hand-held devices like aldohexose observance kit, utilized in the testing laboratory.

The functions of those devices supported varied principles and mechanisms like quantitative analysis, potentiometry, fluorimetry, chemical science, microfluidics, etc. The proper usage of POCT significantly minimizes the amount of time spent on the job. This is especially important in the case of acute illnesses like heart disease [7-9].

The device's automatic multiplex analytical tools perform the data analysis, which eliminates the requirement for a skilled technician. POC test results are saved in the clinical system and communicated with health workers via a central server, which benefits the patient while also benefiting the doctors because point-of-care testing in India has a much higher interconnectivity. This fact makes it considerably more challenging to provide and sustain attention facilities

in remote areas with minimal resources. The POC medical specialty market grew at a nine.3% compound annual rate of growth (CAGR) from 2013 to 2018 and is expected to grow at a similar rate in the future.

POC diagnostic tests are extremely useful and practical for continuous monitoring of explicit analyses or frequent follow-up tests in order to visualize the prognosis of illness and treatment effectiveness. POC testing substantially reduce TAT, which is vital and particularly helpful in handling severe conditions such as cardiac disorders. Low TAT is also advantageous in resource-constrained situations. Patients who travelled from afar to be evaluated believed that the evaluation would be finished in a routine checkup, saving them money on travel expenses. In addition, the goal is accomplished in a single visit, which decreases the risk of infection spreading further. The use of point-of-care diagnostic technologies has improved management assurance by allowing for faster diagnosis and analysis. The demand is will increase within the Indian market because of its advantages over conventional testing strategies. As most of Indian population confined to rural population is major a part of Indian population of the country. Thus, Rapid, simple accessible, price effective POC take a look at devices overcomes the prevailing medical specialty methodologies like the high-end lab-based systems [10,11].

## Conclusion

POC diagnostic devices prove very beneficial for healthcare workers as well patients. POC diagnostic devices function very efficiently that is being used in hospitals and for individual use because of that manual errors are reduced. It is easy to use because it includes features such as portability, ease, speed, connectivity, sample quality, and quality assurance. Point of contact in nations with large populations, such as India, where cases are fast growing and diagnostic methods may be effective in containing the COVID-19 pandemic. POC diagnostic technologies should become more tailored and data-centric, which will benefit India's primary healthcare system and put it on track to achieve comprehensive universal health coverage.

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