AI-Based Analysis of Hospital Waiting Time Inequality

Tresna Dey

Abstract

The price of healthcare to a patient in Bangladesh is frequently calculated in hours prior to being calculated in Takas. A treatment ticket in a nation where the major public hospitals have exceedingly high patient waiting lists (OPDs) is more than just a piece of paper: it is a portal to a lengthy and frequently uncertain process of waiting. It is common to spend more time queueing than being served by the patients, with the waiting time extending to patient registration until consultation and even diagnostics.

These delays are not just annoying, they have physical consequences on health effects, stress and economic output.

As we head into 2026, studies into healthcare data analytics are shedding light on an ugly truth that had been overlooked, namely: waiting time is an object of measurement, and as such, a detail of inequality. The delays to care are not merely the symptom of the resource deprivation; they are the reflection of the internal socioeconomic, gendered, and geographic division of society. Predictive modeling has allowed hospitals and policymakers to measure the amount of the so-called patience gap and put it into the perspective of attacking the systemic inequities in healthcare provision. Waiting is no longer some hidden aspect, it is a structural determinant of health, which can be analyzed, predicted and finally controlled.

Waiting in Bangladesh is coldly separated into both the public and privatized sector. Under normal conditions, the average total waiting time of outpatient services in tertiary public hospitals, like the Dhaka Medical College Hospital (DMCH), is about 66.6 minutes but during peak periods, which is normally between 9 AM and 11 AM, there is a possibility of significant increase. Research of hospitals that was not digitized reported that patients spent three to eight hours spending on ticketing, registration, diagnostic procedures, and consultation per visit. This long wait is added to by old fashioned administration, overcrowding of the institutions and absence of digital infrastructure. In comparison, the experience of private clinics and specialty practitioners (usually found in urban centers) is significantly different. Most work on prior booking, online booking or installed online booking systems eliminating dissimilar delays of

patients awaiting consultation to less than five or ten minutes. Such a dichotomy underscores the two-sided nature of healthcare in Bangladesh: in which wealth and access to the digital world dictate both the quality of care and its time as well.

In addition to the institutional differences, there are also gendered and socioeconomic differences in the waiting times. In quantitative analyses, a socioeconomic gradient of time is shown, which means that the median waiting time of male patients is up to 19 times shorter than that of female patients in certain facilities, indicating the presence of social norms, gender-based mobility restrictions, and potentially biased treatment trends. On the same note, patients with better-income families can avoid the long lines and getting additional private services and more educated patients can easily navigate the administration process, which shortens their effective waiting time. These trends highlight the fact that time, in and of itself, i.e. the amount of time spent waiting to receive care, is uneven, being wealthy, gender, and geographically stratified.

Predictive modeling offers a tool of high importance in order to establish communities and patient groups that face longer waits systematically. Of particular importance is geographic factors. Using a combination of GIS information and hospital patient records, researchers will be able to map onto the slow areas where the delays are most significant. In rural areas, patients are experiencing compounded prehospital delays which are caused by transportation limitations, long distances, and fragmented referrals to urban medical centers. Studies have shown that in certain areas as many as 41 percent of rural dwellers take over 12 hours to access preliminary medical treatment which was 23 percent in urban dwellers. Some of the areas that are considered to be high risk areas, like Rajshahi or parts of Dhaka, are the areas that are always known to be overcrowded and lack proper allocation of resources, which makes them the best target areas.

Waiting experiences are also determined by socioeconomic gradients. XGBoost and random forests machine learning algorithms prove that household income and educational level are good predictors of waiting time. Patients who are better literate or educated are likely to have reduced time in contact to diagnosis. To illustrate, the research data on lung cancer patients indicate that the median wait times of highly educated people are shorter by far compared to uneducated ones, and this tendency is also associated with the accrued benefits due to knowledge, navigation skills, and social networks. In the same way, the better-paid patients have a higher form of a private shield to avail themselves of supplementing the services with their own, skipping the queue lines altogether. These trends validate the fact that waiting is not a neutral measure, but a socially organized measure, and inequities in waiting times is a manifestation of inequalities in access, opportunity and power.

Waiting time does not simply constitute a management issue but it is a structural determinant of health. Delays of long duration are allied with reduced quality of life, heightened mental distress, and adverse clinical occurrences, especially with urgent or time sensitive illnesses like myocardial infarction, stroke or infectious diseases. Ironically, studies have shown that public hospitals are in most cases over-utilized with

doctor patient ratio being higher than the required ones yet the private ones are under utilized due to excessive fees which are prohibitive to most of the patients. There has been promise of alleviating these bottlenecks by the introduction of digital solutions, Health Information and Communication Technology (HICT) and hospital information systems. Digital ticketing, electronic patient records and AI-based appointment systems have the potential to save a few hours per patient visit, which is one of the most inefficient elements of the care pathway, manual registration and queuing, which may take up to a quarter to half of all waiting time.

The 2026 roadmap focuses on creating equity to the operations of the hospitals with the help of information-driven schedules and forecast-driven resource assignments. The key to this strategy is AI-optimized appointment systems. Machine learning algorithms can transform hospitals into less predictable and more predictable first come, first served systems, and more dynamic in their scheduling by simulating the duration of consultations, the likelihood of patients not showing up, and the future inflows of patients to the hospitals and subsequently accomplish a greater reduction in waiting times. Research may indicate that this type of optimization might result in a reduction of the total wait times by up to 56 percent; especially in the high demand departments. On the same note, predictive resource leveling enables administrators to allocate medical staff and other support personnel to the department that has the highest demand, which further minimizes inequities in waiting times. Patients can also make informed choices about where and when to seek care through real-time transparency dashboards, which can be accessed via mobile applications, to redistribute patient loads across facilities and decongest them.

These predictive systems have a wider social implication beyond the operational enhancement. Policymakers can evaluate healthcare equity, which was not possible before, by being able to see the waiting times and quantify them. The time is also a quantifiable proxy of fairness by showing the systemic obstacles that place women, low-income groups, and rural dwellers in an unequal position. With the help of treating waiting as a structural determinant of the health, the interventions can be implemented in such a way that they prioritize the most disadvantaged to ensure that the resources are distributed in proportion to need, and not to purchasing power. Furthermore, AI insights can become part of the national health planning to make evidence-based choices regarding the location of new facilities, the distribution of staff, or the development of digital infrastructure, which strengthens the principle of equal access on both sides of the urban-rural divide.

It is important to conduct ethical implementation. Models should make sure that the predictive algorithms do not cause a continuation of the disparities. As an example, in case AI suggestions prefer affluent districts because of a greater baseline compliance or digital literacy, interventions would increase inequalities. The predictive systems need to be audited regularly, be accountable and transparent in order to preserve trust and deliver fair results. Also, there should be protection of patient privacy, safe management of personal and medical information. The technical sophistication of AI in healthcare scheduling is as significant in

2026 as its ethical use is.

To sum up, the time that patients spend waiting to receive healthcare services in Bangladesh is an immense indicator of inequality, which crosses with socioeconomic status, gender, education, and place. AI and predictive analytics offer an effective set of instruments to measure, forecast, and eventually decrease these inequalities. Utilizing maps of slow zones, information on high-risk populations, and scheduled improvement of allocation of resources, hospitals can redefine waiting as something that cannot be seen but can be obtained and measured as a component of care.

The time of the patient should be appreciated in the time of Smart Bangladesh just as their health. Any minute of waiting is a minute of unproductive time, emotional tension, or even deteriorated health. With AI incorporated into the functioning of hospitals, we will be working towards a system where the pace of care will be dictated by medical necessity, not social economic status or the physical location. This vision is not only efficiency, but fairness, equity and justice in access to healthcare.

Combined with AI-driven resource management, predictive modeling allows overcoming the concept of reactive administration of hospitals and transitioning to proactive governance of the entire health system. With the detection of inequalities in waiting time, staff redistribution, AI-based appointment scheduling, and transparency dashboards, Bangladesh could be on the way to an equitable healthcare system that would provide care to every citizen. Waiting is not something inevitable anymore but a quantifiable value that can be used to reform, so that all patients, irrespective of the income, education level, gender, and home district, will have equal access to timely care and receive the necessary one.

Waiting time is, in short, a reflector of structural disparities that are inherent in the healthcare system. Bangladesh can use AI to comprehend and manage these disparities to not only enhance the efficiency of operations but also strengthen social justice in health. The way to a more equal healthcare system is quantifiable, practical, and factual. AI will also not only be able to streamline hospital schedules in the future, but it will also ensure that the basic tenet of care, that one has a right to care, rather than a privilege, and that no patient is made to wait longer due to his/her identity or the place of his/her residence, will be compromised.