Closing the Surveillance Gap: A Digital Dashboard Framework for Continuous Monitoring of Public Health Facility Standards Between Quality Certification Cycles in India

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***Abstract*—India certifies public health facilities against the National Quality Assurance Standards (NQAS) and specifies what those facilities must have and do through the Indian Public Health Standards (IPHS). Certification of a district hospital requires at least 70 per cent overall and in each of eight areas of concern, and remains valid for three years. The intervening period is the least observed phase of the cycle, and it is also the phase in which the conditions that certification measured are most likely to change. This paper sets out a design for a lightweight digital dashboard that would monitor facility standards continuously between certification cycles, built on data systems that already exist rather than on new data collection. Published assessments of facility compliance and certification, national programme documents and the operating national health information systems were reviewed to establish what is already captured, at what frequency and with what reliability. From that audit, seven design principles and a four-layer architecture were derived: data sources, a validation layer, an analytical layer applying statistical process control, and a governance layer with defined escalation. Fifteen indicators are proposed, each mapped to an IPHS domain and an NQAS area of concern, and each drawn from a system that already generates the value. Eleven of the fifteen are machine-generated and require no additional entry by facility staff. Values are reported as variation over time on run and control charts rather than as a single ranked score, and every signal carries a named owner and a defined response time. Continuous monitoring between certification cycles is achievable at low marginal cost because most of the required data is already collected; what is missing is not measurement but the reconciliation, analysis and escalation that would turn existing data into a signal someone is obliged to act on. The framework is presented for evaluation and requires piloting before adoption.**

***Index Terms*—continuous monitoring, dashboards, health information systems, Indian Public Health Standards, National Quality Assurance Standards, quality assurance, statistical process control.**

I. INTRODUCTION

The argument that health systems should be judged by what they deliver rather than by what they build is now well established: the Lancet Global Health Commission on High Quality Health Systems concluded that poor-quality care, not lack of access alone, accounts for a majority of amenable deaths in low- and middle-income countries [1]. India has responded with an unusually complete measurement architecture. The Indian Public Health Standards (IPHS), first issued in 2007 and revised in 2012 and 2022, specify for every level of facility the services to be offered and the infrastructure, staffing, drugs, equipment and diagnostics required to offer them [2]. The National Quality Assurance Standards (NQAS), operational since 2015 and accredited by the International Society for Quality in Health Care, organise assessment around eight areas of concern and

apply department-wise checklists in which each checkpoint is scored two for full compliance, one for partial and zero for non-compliance [3].

National certification of a district hospital requires at least 70 per cent overall, at least 70 per cent in every department and in each of the eight areas of concern, at least 50 per cent on each individual standard, and a patient satisfaction score of at least 70 per cent or 3.5 on a five-point scale. Certification is valid for three years, subject to validation by the state quality assurance committee in each of the two subsequent years [4]. The programme has scaled rapidly: from 6,506 certified facilities in December 2023 to 50,373 by December 2025, of which 1,710 were secondary-care facilities including district hospitals [5].

The architecture is therefore strong at the moment of assessment and thin between assessments. A certification decision is a judgement about a facility during a short and heavily prepared window. What happens to that facility over the following thirty-six months is recorded, if at all, in systems that were built for other purposes and are rarely read together. This paper argues that the gap is not a measurement gap but an integration gap, and sets out a design for closing it.

The contribution is threefold. First, it establishes the case that the inter-certification interval is where quality is most likely to decay and least likely to be observed. Second, it audits what India's operating health information systems already hold, and shows that most of what continuous monitoring would require is already being collected for other reasons. Third, it specifies a framework — architecture, indicator set, analytical method and escalation pathway — concrete enough to be piloted, costed and criticised. It is a design proposal, not an evaluation: no claim is made that the framework works, because it has not yet been implemented anywhere.

II. THE SURVEILLANCE GAP

A. Certification is a point-in-time judgement

Certification records a facility's state during an assessment window, and the incentives surrounding assessment shape what that window shows. The most detailed published account of how facilities reach the threshold comes from a policy analysis of a certification drive in Bhavnagar district, Gujarat. It identifies the enablers as political support from district leadership, individual policy champions with detailed knowledge of the standards, a small dedicated implementation team providing on-site support, positive framing of certification as achievable, and peer mentoring by already-certified facilities. It also records, candidly, that the district's strategy was to meet the 70 per cent threshold rather than to pursue complete compliance, and that the adaptations used included temporary fire escapes, sharing of equipment between facilities and locally donated items [6].

That account should be read as evidence of what is achievable, not as an indictment. It documents genuine capability building — training, teamwork, on-site problem solving — alongside arrangements that are temporary by design. The question it raises rather than answers is what survives once the assessment team has left and the district's attention has moved to the next cohort of facilities. No published Indian study follows facilities through the interval to find out.

B. What the compliance evidence suggests

Studies that assess facilities outside a certification drive report compliance in the moderate range. An assessment of all 22 district hospitals in Haryana against IPHS norms found a mean quality score of 66.5 per cent, with eight hospitals above 70 per cent, eleven between 60 and 70 per cent and three below 60 per cent [7]. A state-wide assessment of public health facilities in Punjab found that functional equipment such as electrocardiography machines, oxygen, masks and ambu bags was deficient at all levels, and that district and sub-district hospitals stocked approximately half of the expected medicines, community health centres about two-thirds [8]. An assessment of primary health centres in Buldana district, Maharashtra, found the buildings and prescribed rooms largely in place while vacancy rates reached 85 per cent for counsellors, 54 per cent for staff nurses and 46 per cent for laboratory technicians, alongside interrupted supply of some drugs [9].

A descriptive analysis of NQAS certification status among primary care facilities in Tamil Nadu adds a complementary observation: among facilities whose certification was deferred, quality management was the most commonly unmet area of concern, followed by outcome [10]. The areas that fail are those least reducible to a one-off capital investment.

C. The failing domains are the fastest-changing ones

Taken together, these findings identify a specific and consequential pattern. The domains in which Indian public facilities most often fall short — posts vacant against sanction, equipment out of service, drugs out of stock — are precisely the domains whose state can change within weeks. A hospital that was fully compliant on staffing in March can be two specialists short by August through ordinary transfers and retirements. An analyser that passed inspection can be awaiting a spare part for eleven weeks. A drug that was in stock on assessment day can be stocked out for the following quarter.

Buildings, by contrast, do not decay on that timescale, and it is buildings that a point-in-time assessment measures most reliably. The mismatch is the heart of the problem: the certification cycle observes at three-year intervals a set of conditions that fluctuate monthly. Nothing in the current architecture is designed to detect that fluctuation, and the international evidence gives no grounds for assuming it does not occur — reviews of hospital accreditation report reasonably consistent effects on process and organisational measures and inconsistent effects on sustained outcomes, and one systematic review concluded that the evidence was too scant to support any conclusion about effectiveness [11]–[13].

III. AVAILABLE DATA: AN AUDIT OF OPERATING SYSTEMS

A proposal for continuous monitoring is only credible if it does not ask overstretched facility staff to fill in more forms. The audit below asks a narrow question of each operating national or state system: what does it already hold that bears on IPHS compliance, how often is it updated, and what would have to be true for it to be usable as a monitoring input?

The national digital foundation is now substantial. Under the Ayushman Bharat Digital Mission, 363,520 health facilities had registered on the Health Facility Registry and 564,851 professionals on the Healthcare Professional Registry as of February 2025, with 159,020 facilities using ABDM-enabled software [14]. A national IPHS portal publishes facility-level assessment status against the standards, classifying facilities into bands below 50 per cent, at or above 50 per cent, and at or above 80 per cent [15]. The Health Management Information System (HMIS) has collected routine service data from public facilities for over a decade, and patient feedback is collected through the Mera Aspataal platform, launched in 2016 [16].

A cautionary observation. At the time of access for this paper, the national IPHS portal displayed 767 district hospitals in its total facility count and 839 district hospitals in its assessed count, with a similar pattern at other levels, so that the number of assessed facilities (212,071) exceeded the number of facilities (209,385). The discrepancy may reflect facilities assessed more than once, reclassification between levels, or records awaiting reconciliation; the cause is not knowable from the public interface. Whatever its explanation, it makes a design point that no framework should have to learn the hard way: a monitoring system must reconcile its denominator against a single authoritative facility registry before it computes anything at all. This is the first function assigned to the validation layer in Section V [15].

TABLE I Operating Data Systems and What Each Could Contribute to Continuous Monitoring

System	What it already holds	Update frequency	What would have to be true for it to be usable
National IPHS portal [15]	Facility-level assessment status against IPHS, in three score bands	Periodic, on assessment	Reconciliation of the facility list against a single registry; clarity on whether entries are self-reported or verified
NQAS assessment records [3], [4]	Full checkpoint-level scores by area of concern, at certification and annual surveillance	Annual at best	Machine-readable release of checkpoint scores rather than only the aggregate and the pass or fail

System	What it already holds	Update frequency	What would have to be true for it to be usable
Health Management Information System	Service volumes, clinical rates, facility monthly returns	Monthly	Validation rules at entry; the known tendency to over-report must be measured, not assumed away
ABDM Health Facility Registry [14]	Authoritative identity and classification for 363,520 registered facilities	Continuous	Use as the single denominator for every other system
Mera Aspataal [16]	Patient feedback collected through multiple channels	Continuous	Dimension-level rather than global reporting; a sampling frame that does not depend on facility staff
State drug logistics, e.g. e-Aushadhi	Stock on hand, issue and receipt, stock-out duration by item	Real time	An application programming interface exposing stock status at facility level
State human resource and payroll systems	Posts sanctioned and posts filled, by cadre and facility	Monthly	Mapping of payroll records to the facility identifier used by the registry
Statutory biomedical waste returns	Segregation and disposal compliance	Monthly	Nothing further; the return is already filed with the regulator

ABDM, Ayushman Bharat Digital Mission; IPHS, Indian Public Health Standards; NQAS, National Quality Assurance Standards. Figures as reported by the sources cited.

The conclusion of the audit is the premise of the rest of this paper. With the partial exception of dimension-level patient experience, continuous monitoring of the domains that most often fail requires almost no new data collection. It requires that data already generated for payroll, procurement, maintenance, regulatory and service-reporting purposes be reconciled against a common facility identifier, computed into a small set of indicators, and placed in front of someone with the authority and the obligation to respond.

IV. DESIGN PRINCIPLES

Seven principles constrain the design. They are stated first because most of the framework's specific choices follow from them, and because a reader who rejects a principle can locate precisely which parts of the design fall with it.

1) Collect nothing that an operating system already holds. Every additional form displaces clinical time, and the marginal value of a manually re-entered number is close to zero.
2) Measure the leading indicators, not the lagging ones. Staffing, stock and equipment uptime change first; service volumes and outcomes change later, and satisfaction scores change least of all.
3) Prefer machine-generated values to self-reported ones. Where a value must be self-reported, require verifiable evidence attached to the entry and re-audit a random sample.
4) Report variation over time, not a single ranked score. A facility's own trajectory is more informative and less gameable than its position in a league table, and league tables invite the presentational effort that certification drives already attract.
5) Every signal has a named owner and a defined response time. A dashboard that raises signals nobody is obliged to answer becomes decoration within two quarters; the evidence on routine health information systems in low- and middle-income countries finds that technology alone does not improve data use, and that feedback and supervision are what make the difference [17].
6) Cap the burden explicitly. The framework proposes a hard ceiling of fifteen indicators and a design target of under two hours of facility staff time per month, with any new indicator requiring the retirement of an existing one.

7) Publish facility-level detail to the facility and aggregate detail publicly. Public naming of individual facilities on incomplete data invites gaming and demoralisation without a corresponding gain in accountability.

V. THE PROPOSED FRAMEWORK

A. Architecture

The framework has four layers. The data layer draws from the operating systems audited in Section III. The validation layer reconciles the facility list against the Health Facility Registry, applies automated range and consistency rules, and re-audits a random sample of self-reported values. The analytical layer computes the indicator set and applies statistical process control to distinguish ordinary fluctuation from a change worth investigating. The action layer routes each signal to a named owner with a defined response time, and records the action taken so that the correction itself becomes the following month's data. Fig. 1 sets out the architecture.

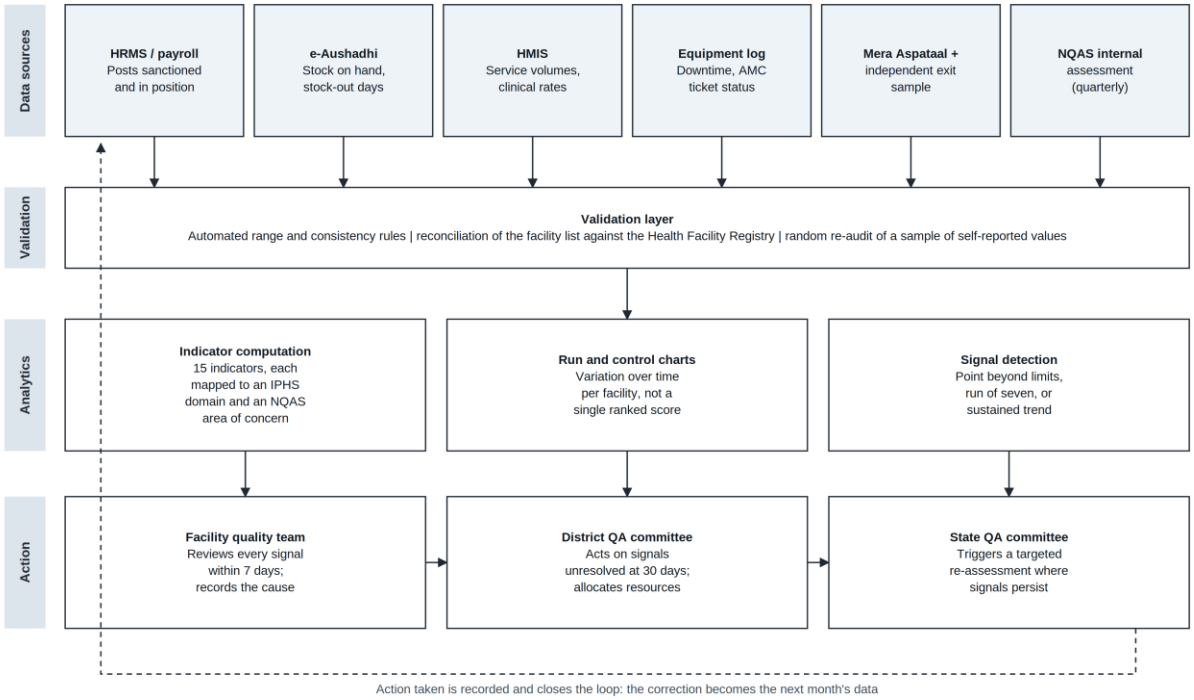

Fig. 1. Four-layer architecture of the proposed monitoring framework.

B. The indicator set

Fifteen indicators are proposed, listed in Table II. Each is mapped to an IPHS domain and an NQAS area of concern, so that a signal on the dashboard points at the same construct the eventual assessment will examine. Eleven of the fifteen are generated by a system without facility staff entering anything; three require a short structured entry; one, the internal self-assessment, is deliberately retained as a self-reported measure because the discordance between it and the machine-generated indicators is itself diagnostic.

TABLE II Proposed Indicator Set for Continuous Monitoring

Indicator	Maps to	Source	Freq.	Verification
Specialist posts filled against sanctioned strength (%)	Inputs / human resources	HRMS or payroll	Monthly	Machine-generated; no facility entry
Nursing and technician posts filled against sanction (%)	Inputs / human resources	HRMS or payroll	Monthly	Machine-generated; no facility entry

Indicator	Maps to	Source	Freq.	Verification
Essential drug list items in stock on the reporting date (%)	Inputs / drugs	State drug logistics	Monthly	Machine-generated from the logistics system
Stock-out days in the month for ten tracer drugs	Inputs / drugs	State drug logistics	Monthly	Machine-generated
Days each tracer item of equipment was non-functional	Support services	Equipment log linked to maintenance ticketing	Monthly	A maintenance ticket identifier is mandatory for every downtime entry
Diagnostic tests performed as a share of the required test menu	Support services	HMIS or laboratory system	Monthly	HMIS validation rules
Hours in the month without oxygen, power backup or running water	Inputs / infrastructure	Facility utility log	Monthly	Utility and maintenance records; random verification
Biomedical waste segregation compliance (%)	Infection control	Statutory regulatory return	Monthly	Already filed with the regulator; no new entry
Hand hygiene audit compliance (%)	Infection control	Facility quality team, standard proforma	Quarterly	Random re-audit of a sample of facilities
Outpatient and inpatient volumes against the preceding 12-month median	Service provision	HMIS	Monthly	HMIS
Referral-out rate and caesarean section rate	Clinical care	HMIS	Monthly	HMIS
Mean waiting time from registration to consultation	Patient rights	Queue or token system; timed sample where absent	Monthly	Independent timed sample each quarter
Dimension-level patient experience: drugs, cleanliness, staff conduct, waiting	Outcome	Patient feedback platform plus an independent exit sample	Monthly	Interviews by non-facility staff, away from the point of care
Grievances received and share closed within the service standard	Patient rights	Grievance portal	Monthly	Portal timestamps
Internal NQAS self-assessment score, by area of concern	Quality management	Facility quality team	Quarterly	Annual state validation; discordance with machine-generated indicators flags the facility

HMIS, Health Management Information System; HRMS, human resource management system; NQAS, National Quality Assurance Standards. Tracer drugs and tracer equipment should be defined by the state and held stable for at least three years so that trends remain comparable.

C. From score to signal

The analytical choice that distinguishes this framework from a conventional reporting portal is that it does not report a score. It reports whether an indicator's behaviour this month is consistent with its own recent history. Statistical process control provides the standard apparatus: a centre line, control limits derived from the facility's own variation, and a small

set of rules for identifying special-cause variation — a single point beyond the control limits, a run of seven consecutive points on one side of the centre line, or a sustained trend [18]. The method has been applied in healthcare for two decades, and a recent systematic review and bibliometric analysis of control charts in healthcare quality monitoring identified 73 studies applying them to processes including waiting times, infection rates and medication errors, with a third of that literature published in the three years preceding the review [19].

Three consequences follow. A facility that has always had three specialists against five sanctioned posts does not generate a signal every month; it generates one when the fourth post falls vacant. A facility that improves is visible as an improvement rather than as a still-inadequate score. And the comparison that matters becomes intra-facility rather than inter-facility, which removes most of the incentive to present rather than to report. Minimum denominators must be specified for the rate-based indicators so that small numbers do not generate spurious signals; a facility conducting nine caesarean sections in a month cannot support a control chart on that rate alone.

D. Governance and escalation

A signal that no one is obliged to answer is noise. The framework therefore specifies the escalation pathway as tightly as the indicator set, and Fig. 2 sets it out. A signal is classified, reviewed by the facility quality team within seven days with the cause and the corrective action recorded, and closed only if the following two months return to control. Signals unresolved at thirty days pass to the district quality assurance committee, which holds the resource, procurement and transfer levers that most failures actually require. Signals that persist beyond that pass to the state committee, which may trigger a targeted re-assessment of the failing area of concern — not of the whole facility, and ahead of the three-year cycle.

This last provision is the framework's principal link back to the existing certification architecture. At present a facility that deteriorates has no route back into assessment until its cycle ends. A targeted, signal-triggered re-assessment gives the state a proportionate instrument between doing nothing and repeating a full assessment, and it gives the facility a reason to treat the dashboard as consequential.

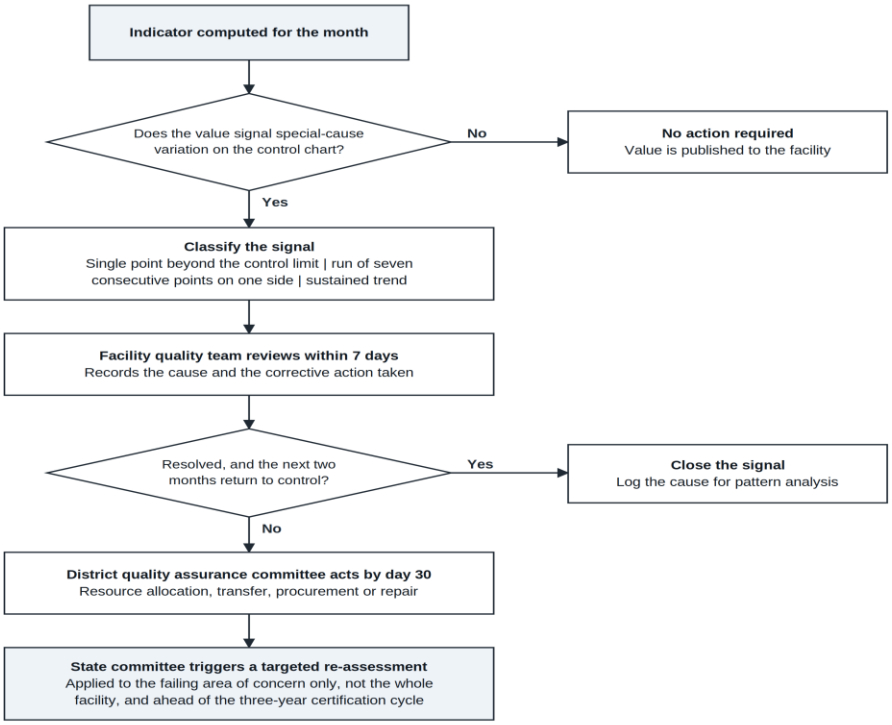

Fig. 2. Signal classification and escalation pathway.

VI. IMPLEMENTATION PATHWAY

The framework is specified to be piloted, and the pilot should be designed to fail informatively if the design is wrong.

Phase 1, four to six months. Establish the data plumbing in a single district: map every source system to the Health Facility Registry identifier, reconcile the facility list, and compute the eleven machine-generated indicators retrospectively for the preceding twenty-four months. This phase produces no dashboard and asks nothing of facility staff. Its output is a statement of how much of the indicator set can actually be computed from existing systems, which is the single most important unknown in the whole proposal.

Phase 2, six months. Build the control charts on the retrospective series, and run the analytical layer silently alongside normal operations. Compare the signals the system would have raised against what is known to have happened in those facilities. A framework that raises forty signals a month per facility is unusable; one that raises none is not measuring anything.

Phase 3, twelve months. Activate the escalation pathway in the pilot district with a matched comparison district continuing under existing arrangements. Pre-specify the evaluation: time from signal to recorded action, proportion of signals closed within the response standard, staff time consumed, and — as the outcome that matters — whether compliance measured at the next assessment differs between pilot and comparison districts.

Phase 4. Publish the evaluation whatever it shows, including the indicators that proved uncomputable and the signals that proved uninformative. The value of a framework paper such as this one is entirely contingent on somebody reporting what happened when it was tried.

VII. RISKS AND MITIGATIONS

The risks in Table III are not hypothetical; each has a documented precedent in the Indian or international literature on health information systems, and each is addressed by a specific design choice rather than by exhortation.

TABLE III Principal Risks and the Design Responses to Them

Risk	Why it is likely	Design response
Inflation of self-reported values	Any measure attached to consequences attracts presentational effort; certification drives already show threshold-oriented behaviour [6]	Eleven of fifteen indicators are machine-generated; self-reported entries require attached evidence; random re-audit; no direct financial incentive is tied to dashboard values
Data quality drift and over-reporting	A study of HMIS data quality in Haryana found over-reporting between facility records and reports submitted upward ranging from 1.4% to 6%, with completeness averaging 88.5% [20]	Validation rules at entry; periodic discordance audits comparing facility records with reported values; discordance itself reported as an indicator
Registry and denominator mismatch	The national IPHS portal was observed to report more facilities assessed than facilities in existence at some levels [15]	Reconciliation against the Health Facility Registry is the first function of the validation layer, executed before any indicator is computed
Burden on facility staff	Every reporting system in the public health system competes for the same scarce clinical and administrative time	Hard ceiling of fifteen indicators; a design target under two hours per month; any addition requires a retirement
Connectivity and the digital divide	Facilities with the weakest infrastructure are those most likely to have unreliable connectivity, biasing the system against exactly the facilities it should watch most closely	Offline-capable entry with deferred synchronisation; non-reporting itself is treated as a signal rather than as missing data

Risk	Why it is likely	Design response
The dashboard becomes decoration	Evidence from low- and middle-income countries finds that technology introduced without capacity building and feedback does not improve data use [17]	Named owners, defined response times, and the signal-triggered re-assessment that gives the dashboard consequence
Over-interpretation of small numbers	Rate-based indicators in low-volume facilities generate spurious special-cause signals	Minimum denominators specified per indicator; indicators suppressed rather than displayed where the denominator is too small
Attention flows only to what is measured	Fifteen indicators cannot represent the whole of quality, and what is on the dashboard will attract effort at the expense of what is not	The framework is explicitly positioned as a supplement to periodic full assessment, never as its replacement

VIII. LIMITS OF THE FRAMEWORK

Three limits deserve stating plainly, because a framework paper that claims too much invites the reader to discount the parts that are sound.

It does not measure clinical quality. Every indicator proposed here is a structural or process measure. Whether patients are correctly diagnosed and appropriately treated is not captured, and no dashboard assembled from logistics and payroll data ever will capture it. The framework watches the conditions under which good care becomes possible, which is a smaller claim than watching care.

It does not resolve the patient experience problem. Aggregate satisfaction in Indian public facilities is close to saturated — published studies report overall satisfaction of 72.8 per cent, 96 per cent and 97 per cent in different settings, while the same studies find majority dissatisfaction with waiting for diagnostics and with drug availability [21]–[23]. Dimension-level measurement collected by independent interviewers, as proposed here, is an improvement on a global item, but the underlying difficulty — that people receiving free care in a system with few alternatives report generously — is not something a dashboard design can fix.

And it has not been tested. Nothing in this paper is evidence that continuous monitoring improves compliance, patient experience or clinical outcomes. The argument establishes that the gap exists, that the data to close it largely already exists, and that a defensible design can be specified. Whether the design survives contact with a district health system is an empirical question, and Section VI sets out how it should be asked. The framework rests on Donabedian's distinction between structure, process and outcome, and confines itself to the first two [24].

IX. CONCLUSION

India assesses its public health facilities thoroughly and infrequently, against standards that specify conditions which change monthly. The three years between certification and re-certification are the least observed and most consequential phase of the cycle, and the domains most likely to decay during it — vacant posts, equipment out of service, drugs out of stock — are exactly the domains that published assessments identify as the recurring points of failure. The data required to watch those domains continuously is, for the most part, already being collected by payroll, procurement, maintenance, regulatory and service-reporting systems that do not currently speak to one another.

What this paper proposes is therefore modest in its data requirements and demanding in its governance requirements: reconcile the facility identifiers, compute fifteen indicators, plot them as variation rather than as scores, and oblige a named person to answer every signal within a stated period. The technical components are unremarkable and largely off the shelf. The difficult part is the institutional commitment to act on what the system shows, and the discipline to keep the indicator set small enough that acting remains possible. Both should be tested in a single district before either is asserted.

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