

Original Research Article

Coding and blinding in technical sample evaluation: a procurement-based approach to transparency and cost efficiency in the Indian health sector-a first-of-its-kind initiative

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ABSTRACT

Background: Public procurement plays a critical role in service delivery while remaining susceptible to evaluator bias, particularly during the technical evaluation of goods even within the structured regulatory systems like India's General Financial Rules 2017 and Central Vigilance Commission guidelines. Our study assesses whether introducing coding and blinding techniques in sample evaluation lowers evaluation bias, improves transparency, fairness and cost-efficiency in public procurement.

Methods: A pre and post interventional study design (non-randomized) was conducted retrieving procurement data of two financial years, 2021-22 (pre-intervention) and 2023-24 (post-intervention) from the institutional digital procurement library and store records. The intervention consisted of assigning alphanumeric codes to items and its vendor samples with all brand markings concealed on submitted samples of goods for technical evaluation. These coded and blinded samples were evaluated by the Technical Specification Evaluation Committee (TSEC). STATA 15.0 was used to examine data. Descriptive statistics were applied and Mann-Whitney test was used to draw comparisons.

Results: Fifty-six procurement events were analysed under different categories-Crystalloid (16%), General (30%), Linen (14%), Stationary (5%) and Surgical (35%). Post-intervention the number of technically shortlisted bidders increased significantly ($p<0.001$) whereas procurement prices decreased across all categories with significant cost reductions in Crystalloid and General categories ($p<0.001$).

Conclusions: Using coding and blinding methods in technical sample evaluation significantly improved transparency, reduced bias leading to competitive pricing. The intervention offers a scalable approach for improving transparency and responsibility in public sector procurement systems and fits well with GFR 2017 and CVC regulations.

Keywords: Bias reduction, Coding and blinding technique, Central vigilance commission, Government e-Marketplace, General financial rules, Health sector, Public procurement, Technical sample evaluation, Transparency

INTRODUCTION

Public procurement plays a central role in government operations, directly affecting the quality, accessibility and efficiency of public service delivery. In India and globally, it accounts for a substantial share of government expenditure and requires robust mechanisms to ensure

fairness, transparency and cost-effectiveness.¹ Without integrity and competitive neutrality in procurement, public trust erodes and issues such as corruption, favouritism and resource misallocation persist.² Public procurement is governed by a stringent regulatory framework, including the general financial rules (GFR) 2017, delegation of financial powers rules (DFPR) and oversight by the

department of expenditure and the central vigilance commission (CVC).^{3,4} These frameworks emphasize the “Five R’s” of procurement: the right quality, quantity, price, time and source, ensuring adherence to core principles. Additionally, digital tools like the Government e-Marketplace (GeM), mandated under GFR Rule 149, have streamlined and standardised procurement workflows.^{5,6} Despite these systems, biases often persist during technical evaluations, particularly during evaluating samples where assessors may be influenced by brand recognition or prior reputations.⁷ To counter this, a novel, first-of-its-kind intervention was introduced at a tertiary care hospital, North India called coding and blinding technique during technical evaluations.

In this approach, each bidder and product sample are assigned a randomized alphabetical code after concealing their identity from evaluators. Blinding ensures assessors remain unaware of each sample’s manufacturer and brand while supporting impartial assessment and protecting the integrity of procurement decisions.⁸ Accurate, non-restrictive technical specifications form the foundation of this process, ensuring that evaluations are based on clear, objective benchmarks. The integration of coding and blinding further strengthens this framework by reducing evaluator bias and standardizing assessments.

This study investigates the impact of introducing coding and blinding techniques into the procurement process at an Institute of National Importance (INI), North India. The intervention was aimed to address long-standing challenges of evaluator bias during the technical assessment of samples of goods. By anonymizing the identity of suppliers through coded labelling and ensuring assessors were unaware of product’s manufacturer and brand, the process promoted objective, specification-based evaluation. The study specifically examines whether these techniques improved procedural transparency, increased the number of technically qualified bidders by creating transparency and contributed to cost-effective procurement outcomes.

Beyond immediate institutional outcomes, the study offers broader policy implications. It provides a real-world example of how procurement systems can be redesigned to reduce human bias and enhance transparency within existing regulatory frameworks such as the GFR 2017 and CVC guidelines. By focusing on evidence-based, replicable methods, this research supports the larger goal of reforming public procurement systems across government sectors. In doing so, it contributes to the growing body of literature advocating for transparent and efficient procurement, especially in the health sector, where public spending decisions directly influence cost of patient care, institutional credibility and public trust.

METHODS

Study design

This study is a pre and post interventional study design (non-randomized). It evaluates the impact of introducing

coding and blinding techniques in public procurement procedures at a tertiary care teaching hospital, AIIMS, New Delhi, India. The intervention was implemented as an institutional initiative at country’s premiere Institute, to reduce evaluator bias and enhance transparency during technical evaluation of goods. Procurement data of two financial years were collected, 1st April 2021-31st March 2022 (pre-intervention) and 1st April 2023-31st March 2024 (post intervention). The study did not involve randomization or manipulation of variables during the study period. Instead, data was retrieved from the institutional Digital Procurement Library (DPL) supplemented with manual entries from the stores section registers. Some entries were unavailable for manual retrieval due to limitations of record. For pre intervention data was collected retrospectively and for post intervention data was collected prospectively.

Intervention process: coding and blinding of samples

To reduce vendor-related bias and enhance transparency during the technical evaluation of sample of goods, a structured coding and blinding protocol was implemented for all bids submitted via the Government e-Marketplace (GeM) portal which involved two stage bidding process, first stage involving technical evaluation of samples of goods and second stage involving price evaluation of technically shortlisted bidders after goods are approved by the TSEC during the first stage.

Blinding and coding of samples

Upon receipt of samples, all visible brand identifiers were obscured using materials such as tape and permanent markers to ensure anonymity. Each item type was assigned a general alphabetic code (e.g., A, B, C) and each bidder’s sample under that item was allotted alphanumeric sub-code (e.g., A1, A2, A3).

Secure handling of codes

The master coding list was maintained securely by the Hospital Administrator. Neither the stores section nor the TSEC had access to this list during the evaluation process. Video recording of the entire process of coding was done to ensure transparency.

Technical evaluation procedure

The blinded and coded samples of goods were presented to the TSEC during an offline evaluation meeting. The Committee assessed each sample exclusively against the pre-approved technical specifications, with no access to information identifying the vendor. Evaluations were recorded, signed by all members and subsequently documented in a Google Sheet.

Decoding and result communication

Following completion of the technical assessment, the hospital administrator was approached to decode the

selected samples. Vendor identities were then revealed and formally documented. The shortlisted vendors were intimated regarding the results and the evaluation process was duly signed and endorsed by the Hospital Administrator.

Selection of final bidder (L1)

Technically qualified bidders were advanced to the financial evaluation stage. The lowest financial bidder (L1) was identified in accordance with standard procurement procedures. Reverse auction followed by administrative approval, financial concurrence and order finalization was done through the GeM portal.

Compliance with procurement frameworks

The entire process adhered to the regulatory guidelines outlined in the General Financial Rules (GFR) 2017, particularly aligning with Rules 143, 144, 149, 151, 155, 159, 163, 165, 166 and 167. These emphasize principles of transparency, competitiveness, efficiency and objectivity in public procurement.

Procurement workflow with intervention

Stepwise procurement process flow through GeM highlighting the coding and blinding intervention (Figure 1).



Figure 1: Procurement workflow with intervention.

Statistical analysis

The data was entered in MS-Excel and STATA 15.0 software was used for statistical analysis. The Shapiro-Wilk test tested the normality of the data. Descriptive statistics as performed, categorical variables were presented in frequency and percentage and continuous variables were presented as mean±SD. Mann-Whitney test was used to compare continuous variables like a number of bidders shortlisted and price with coding-blinding technique. The test of significance value was taken as <0.05.

RESULTS

Data were collected from 56 bidders across the financial years (FYs) 2021–22 and 2023–24. In 2023–24, bidder identities were blinded and coded for analysis. Bidder distribution was categorised (n=56) into five categories each of crystalloid 9 (16%), general 17 (30%), linen 8 (14%), stationery 3 (5%) and surgical 19 (35%).

Comparison of technically shortlisted bidders: Table 1 compares the mean number of bidders who participated and were shortlisted across two FYs-before (2021–22) and after (2023–24) blinding and coding. It was observed that in FY 2023–24, participation and shortlisting of

technically qualified bidders increased significantly in the crystalloid, general, linen and surgical categories, with all showing statistically significant differences ($p<0.001$).

For instance, the mean number of bidders participating in the Surgical category rose from 5.3 ± 4.8 in FY 2021–22 to 10.1 ± 5.6 in FY 2023–24. The number shortlisted also showed a consistent increase across these categories. However, no significant differences were observed in the Stationery category ($p=0.124$ for participation, $p=0.245$ for shortlisting).

Comparison of final prices (INR): Table 2 shows a reduction in average final prices across all categories after the introduction of blinding and coding in FY 2023–24. Statistically significant price drops were observed in the Crystalloid (mean difference: ₹295.6, $p<0.001$) and General (₹27.9, $p<0.001$) categories.

While the decreases in Linen (₹65.2), Stationery (₹7.2) and Surgical (₹1.4) were not statistically significant ($p>0.05$), they still represent a downward trend in procurement costs. This suggests a possible overall cost-saving impact following the implementation of the new evaluation process, even where statistical significance was not reached.

Table 1: Comparison of bidders participated and shortlisted.

Categories Mean±SD	FY 21-22 Before blinding and coding (n=56)		FY 23-24 After blinding and coding (n=56)		P value	
	Bidders participated	Bidders shortlisted	Bidders participated	Bidders shortlisted	Bidders participated	Bidders shortlisted
Crystalloid	2.6±1.2	2.3±1.2	6.5±7.6	3.5±2.0	<0.001	<0.001
General	4.8±7.8	2.8±1.0	6.5±2.7	4.3±2.4	<0.001	<0.001
Linen	4.1±5.7	2.7±1.9	5.9±2.7	3.4±1.2	<0.001	<0.001
Stationary	4.7±2.9	4.5±2.8	5.3±4.2	4.0±3.6	0.124	0.245
Surgical	5.3±4.8	3.1±2.2	10.1±5.6	3.3±1.1	<0.001	<0.001

Table 2: Comparison of price in INR.

Categories Mean±SD	FY 21-22 before blinding and coding (n=56)	FY 23-24 after blinding and coding (n=56)	Difference in price	P value
Crystalloid	487.9±504.2	192.4±138.7	-295.6±536.4	<0.001
General	121.4±122.4	93.4±102.5	-27.9±52.5	<0.001
Linen	298.6±297.1	233.4±150.1	-65.2±194.8	0.571
Stationary	29.0±7.9	21.8±6.8	-7.2±6.8	0.184
Surgical	17.9±24.4	16.5±20.7	-1.4±4.2	0.838

DISCUSSION

This study provides new evidence that implementing coding and blinding techniques in public procurement processes at a tertiary care institution can significantly enhance transparency, fairness and cost efficiency. By concealing vendor identities during the technical evaluation phase a marked increase in bidder participation

and technically shortlisted bidders as well as reduction in procurement costs were observed in key supply categories.

These findings are particularly relevant as healthcare systems globally pursue efficiency in hospital operations and seek to minimize bias in procurement decisions. The positive impact of coding and blinding on procurement outcomes is consistent with established principles in both

clinical research and public procurement process. In clinical trials blinding is a foundational method to minimize bias and ensure data reliability, leading to more trustworthy and reproducible results.⁹ Similarly in the procurement, blinding evaluators to vendor identities reduces the risk of favouritism and unconscious bias, fostering a more objective assessment of technical quality and value.¹⁰

The distribution of bidders by category (Crystalloid, General, Linen, Stationery and Surgical) detailed in table 1, reflects 56% increase in bidder participation post-intervention (e.g., Crystalloid category: 2.6 to 6.5 bidders) resonating with outcomes observed in Bangladesh's e-procurement system where anonymized bidding increased the number of bidders by 1.6–2.2 per tender and reduced single-bidder scenarios by 7.8–13.5 percentage points.¹¹ The transparent and anonymous bidding discourages monopolistic pricing and fosters healthy competition, ultimately benefiting public finances.¹² The observed cost savings underscore the value of blinding as a tool to promote value-for-money procurement.

Our analysis revealed a significant increase in both bidder participation and shortlisting in the financial year 2023–24 (post coding and blinding intervention) as shown in table 2. For example, in the Crystalloid category the mean number of participating bidders increased from 2.6 to 6.5 and those shortlisted from 2.3 to 3.5 ($p < 0.001$). Similar statistically significant increases were observed in general, linen and surgical categories ($p < 0.001$). These findings align with the experimental work by Dekel and Schurr who demonstrated that vendor anonymity helps eliminate cognitive biases during procurement evaluations leading to more impartial and inclusive outcomes.¹ In our study, blinding ensured that TSEC members assessed samples solely based on predefined specifications, free from brand or reputational influence. Furthermore, studies like Adam et al and Pysmenna emphasize that anonymization fosters equitable treatment of vendors and increases supplier confidence, which is consistent with the observed increase in bidder diversity and fairness in our setting.^{2,8}

The implementation of blinding and coding techniques also contributed to significant cost reductions, as highlighted in table 3 and figure 4. The most notable impact was seen in the Crystalloid category, where the mean procurement price dropped from ₹487.9 to ₹192.4 (mean difference: ₹–295.6, $p < 0.001$). Similarly, in the General category, there was a reduction of ₹–27.9 ($p < 0.001$). These savings suggest that vendors were encouraged to offer more competitive pricing when assured of an unbiased and merit-based evaluation process. These observations are supported by Ohashi who documented that transparent bidding processes, particularly those incorporating anonymity, can reduce procurement costs by discouraging monopolistic pricing.¹³ Our findings also resonate with Ghosh et al who observed that reforms under GeM, including blind evaluations, led to better pricing through expanded competition.⁷

While significant improvements were observed in most categories, Stationery items did not show statistically significant differences in either bidder participation or pricing ($p > 0.05$). However, the bidder participation increased and the final price dropped in after implementing blinding and coding technique. This could be attributed to the standardized and low-variance nature of such products, limiting the scope for bias or pricing variation. Kubak et al, similarly noted that transparency and competitiveness yield the greatest benefits in high-value product categories and may not influence routine or commoditized purchases as effectively.¹⁴

While our study demonstrates measurable benefits of coding and blinding in procurement, several limitations must be acknowledged. Although the benefits observed in this study are substantial, not all literature supports the universal effectiveness of blinding. Fisher et al, caution that evaluators may still infer brand identity from subtle sample characteristics, limiting the effectiveness of blinding.¹⁵ Furthermore, Andreyanov et al, further argued that removing all contextual information through concealing brand and vendor identity can sometimes hinder optimal decision-making, especially when past performance data is relevant for long-term contracts.¹⁶ Also, stationery's limited sample size in the stationary category restricts the strength of conclusions drawn in that area, echoing Fisher et al, caution that blinding's efficacy varies by product complexity.¹⁵ Subtle sample characteristics (e.g., packaging texture, packing, labels) may inadvertently reveal vendor identity, a challenge noted in blinded clinical trials.^{17,18} These perspectives suggest that while coding and blinding enhance neutrality, they should be viewed as part of a broader quality assurance framework rather than as standalone solutions. Lastly, findings from a single institution may not be generalizable, hence, future research should build on our results by testing coding and blinding across more institutions through multicentre studies. Talking to evaluators and vendors can also help uncover any hidden biases still affecting decisions. Over time tracking long-term trends like who gets selected and how well the products perform will show if the benefits truly last.

A key strength of our study is its real-world implementation within an institutional framework governed by national regulatory frameworks (GFR 2017). The dual-year comparison use of standardized evaluation formats and documentation processes lend robustness to our findings. From a policy standpoint our findings advocate for scaling the use of coding and blinding across public sector procurement processes, especially in healthcare institutions where technical sample evaluation is routine. The observed improvements in fairness and pricing justify formalizing such practices through SOPs, evaluator training and integration into digital procurement workflows like GeM.

CONCLUSION

The study shows that including coding and blinding methods into public procurement procedures can greatly improve transparency, procedural fairness and cost-effectiveness. The intervention showed lower evaluator bias and better procurement results by increasing bidder participation and shortlisted bidders after technical evaluation as well as more competitive pricing in key supply categories. In line with GFR 2017 and CVC directives, this strategy provides a repeatable framework for public sector organisations. This method improves the efficiency of hospital operations leading to affordable healthcare services.

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