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Research Article

Perceptions of Interventional Cardiologists in Türkiye Toward Domestic Coronary Devices: A Web-Based Cross-Sectional Survey

Hasan Burak İşleyen[1], Ertuğrul Okuyan[2]

[1]Department of Cardiology, Nişantası University Faculty of Medicine, Istanbul, Türkiye
[2]Department of Cardiology, Medipol University Faculty of Medicine, Istanbul, Türkiye

Abstract

Objectives: Türkiye has pursued policies to reduce external dependence on medical technologies; however, physician-level evidence on domestically manufactured coronary devices is limited. We evaluated self-reported utilization, satisfaction, and future-adoption attitudes toward locally manufactured diagnostic catheters, guiding catheters, PTCA balloons, and coronary stents among interventional cardiologists in Türkiye and explored whether these views varied according to selected practice characteristics.

Methods: We conducted a web-based cross-sectional survey between May and June 2020. The questionnaire was distributed through professional e-mail lists and yielded 147 responses. All close-ended items were mandatory, and no missing responses were observed for the variables included in the primary quantitative analyses. Results are reported as n (%). Key proportions are accompanied by 95% Wilson confidence intervals. Exploratory subgroup comparisons used Fisher's exact test after prespecified category collapsing to limit sparse cells.

Results: Respondents came from all seven geographic regions of Türkiye. Of the respondents, 76/147 (51.7%) worked in training and research hospitals, and 61/147 (41.5%) reported a daily PCI volume of 5-10 cases. Low domestic-device use was common across all device classes and was most pronounced for coronary stents, for which 93/147 (63.3%) reported use in ≤20% of cases. Low stent satisfaction (≤20%) was reported by 66/147 (44.9%). For the future-use item, 111/147 physicians (75.5%, 95% CI 68.0-81.8) selected the response "I would use domestic products if quality were sufficient," and 29/147 (19.7%, 95% CI 14.1-26.9) selected "I actively prioritize domestic products." In an exploratory binary analysis, 137/147 respondents (93.2%, 95% CI 87.9-96.3) expressed at least some openness to greater domestic-device use. Perceived import dependency above 75% was reported by 91/147 (61.9%, 95% CI 53.8-69.4). Supportive future attitudes were more frequent among physicians with >10 years in specialist practice than among those with ≤10 years (98.6% vs. 88.3%, p=0.019). No clear association was found with institution type, academic title, or PCI volume.

Conclusion: In this 2020 physician sample, domestically manufactured coronary devices were used infrequently and were rated modestly, especially in the stent category. At the same time, future resistance was not absolute: most respondents indicated willingness to increase use if quality standards were met. The pattern is consistent with a quality-trust gap rather than categorical rejection. The findings remain useful as a pre-acceleration baseline, but they should be interpreted in light of self-reporting, non-response bias, and the time gap between data collection and submission.

Keywords: Interventional cardiology, coronary stents, medical devices, domestic manufacturing, physician survey, Türkiye, health services research

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Address for correspondence: Hasan Burak İşleyen, MD. Department of Cardiology, Nisantasi University Faculty of Medicine, Istanbul, Türkiye
E-mail: hasanburak.isleyen@nisantasi.edu.tr

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Many health systems seek to reduce dependence on imported medical devices because supply vulnerability affects continuity of care, affordability, and strategic resilience. The pandemic period made this dependence more visible by exposing bottlenecks in device and equipment supply chains and by renewing interest in local production capacity.[1-6]

Türkiye has long had an import-dominated medical-device market. Official trade guidance has described the sector as heavily dependent on imported products, while more recent country guidance still reports that roughly three-quarters of the market is import-based, despite growth in domestic manufacturing incentives and exports.[7-8] At the same time, the national policy framework has increasingly emphasized local capability, from the Eleventh Development Plan to the current Twelfth Development Plan, alongside regulatory alignment with European medical-device legislation and domestic product-rule frameworks.[8-12]

In interventional cardiology, adoption decisions are made in a high-consequence technical environment. Operators judge devices on deliverability, trackability, radial strength, recoil, visibility, and confidence in real-world performance. These considerations are especially pronounced for coronary stents, where design features and platform characteristics can influence procedural handling and longer-term outcomes.[13-15] Procurement systems also shape uptake because physician preference, institutional purchasing rules, and cost containment intersect in device selection.[3,4,16]

Diffusion of Innovations provides a useful interpretive framework for this problem. Within that framework, technologies with uncertain performance diffuse slowly, whereas technologies perceived as advantageous, reliable, and compatible with clinical workflow are more readily adopted.[17] Physician adoption research in other settings likewise suggests that acceptance depends on perceived utility and trust rather than on novelty alone.[18] Against this background, we surveyed interventional cardiologists in Türkiye during May-June 2020. The aim was to describe self-reported use of domestically manufactured coronary devices, satisfaction with those devices, and attitudes toward future adoption, while treating the 2020 dataset as a baseline snapshot captured before the more recent phase of policy acceleration in domestic medical-technology production.[8-11]

Methods

Study Design and Setting

This study was a cross-sectional, internet-based physician survey reported with reference to the STROBE and CHERRIES frameworks.[19-21] Data collection was performed between 1 May and 30 June 2020. The target population was interventional cardiologists practicing coronary angiography and/or PCI in Türkiye.

Questionnaire Scope and Variable

The original questionnaire covered cath-laboratory practice more broadly, including institutional characteristics and selected procedural habits. The present report focuses on the domestic-device component of that questionnaire. The analyzed variables included geographic region, institution type, academic title, years in specialist practice, daily PCI volume, self-reported use of domestically manufactured diagnostic catheters, guiding catheters, PTCA balloons, and coronary stents, satisfaction with those device classes, future willingness to increase domestic-device use, and perceived national import dependency. The questionnaire was investigator-developed for this study. A formal psychometric validation study was not performed.

Survey Administration and Data Handling

The survey was distributed through professional e-mail lists, reaching approximately 600 physicians directly. Responses were collected through Google Forms. Close-ended items were mandatory. Two free-text questions were optional and asked about perceived material shortages and suggestions to reduce external dependency; these items were not included in the quantitative analyses. Google Forms was configured to limit duplicate responses through single-account submission. Participation was voluntary and anonymous.

Statistical Analysis

Categorical variables were summarized as n (%). Analyses were planned using an available-case approach at the item level. In practice, no missing responses were observed in any close-ended item included in the primary quantitative analyses, so the denominator was 147 throughout those analyses. Missingness occurred only in the two optional free-text items, which were not entered into the quantitative dataset. Utilization and satisfaction were recorded as ordered percentage bands (≤20%, 20-40%, 40-60%, 60-80%, >80%). For descriptive interpretation, the ≤20% band was treated as a low-use or low-satisfaction category. Key proportions are presented with 95% confidence intervals calculated by the Wilson method.

To address reviewer concerns that purely univariate reporting would underuse the dataset, we performed exploratory bivariate analyses for three prespecified outcomes: supportive future adoption attitude, low coronary-stent use, and low coronary-stent satisfaction. Supportive future adoption was defined as selection of either 'I active-

ly prioritize domestic products' or 'I would use domestic products if quality were sufficient.' For these exploratory analyses, institution type was collapsed into tertiary public/academic centers (university, training and research, and city hospitals) versus state/private hospitals; academic title was collapsed into specialist versus academic rank; years in specialist practice were collapsed into ≤10 versus >10 years; and daily PCI volume was collapsed into <10 versus ≥10 cases/day. Fisher's exact test was used for these 2×2 comparisons. Because these subgroup analyses were exploratory, no multiplicity correction was applied, and the findings are interpreted cautiously. All tests were two-sided, and $p<0.05$ was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA).

Ethics

Institutional academic board approval for the research topic was documented (Decision No. 6; 19 January 2018). Under the local institutional framework in place at the time, a Health Sciences University, Istanbul Bagcılar Training and Research Ethics Committee application was not sought because the survey was anonymous, voluntary, limited to physician opinions, and involved no patients, patient data, or biological material. Electronic informed consent was obtained through the survey introduction statement, and questionnaire completion was accepted as implied consent.

AI Statement

AI tools were not used to generate data, perform statistical analyses, select results, or determine scientific conclusions.

Results

Participant Characteristics

A total of 147 interventional cardiologists responded. Participants represented all seven geographic regions of Türkiye. The largest proportion practiced in the Marmara region (40.8%), and the most common institution type was training and research hospital (51.7%). Specialists accounted for 53.7% of respondents, 36.7% had 5-10 years of specialist experience, and the most common daily PCI volume was 5-10 cases (41.5%) (Table 1). All close-ended items included in the quantitative analysis were complete (Fig. 1).

Table 1. Participant and practice characteristics (N=147)

Characteristic	n (%)
Geographic region	
Marmara	60 (40.8)
Mediterranean	31 (21.1)
Mediterranean	31 (21.1)
Central anatolia	16 (10.9)
Southeastern anatolia	12 (8.2)
Aegean	11 (7.5)
Black Sea	10 (6.8)
Eastern anatolia	7 (4.8)
Institution type	
Training and research hospital	76 (51.7)
University Hospital	34 (23.1)
City Hospital	19 (12.9)
Private Hospital	12 (8.2)
State Hospital	6 (4.1)
Academic title	
Specialist physician	79 (53.7)
Associate professor	49 (33.3)
Professor	19 (12.9)
Years as cardiology specialist	
<=5 years	23 (15.6)
5-10 years	54 (36.7)
10-15 years	35 (23.8)
15-20 years	15 (10.2)
>20 years	20 (13.6)
Daily average PCI volume	
<5 cases	32 (21.8)
5-10 cases	61 (41.5)
10-20 cases	39 (26.5)
20-30 cases	10 (6.8)
>30 cases	5 (3.4)

PCI: Percutaneous coronary intervention. All denominators are N=147.

Domestic-Device Utilization

Low domestic-device utilization was common in all four device categories (Table 2A). The ≤20% use band was selected by 64/147 respondents (43.5%) for diagnostic catheters, 81/147 (55.1%) for guiding catheters, 62/147 (42.2%) for PTCA balloons, and 93/147 (63.3%) for coronary stents. The stent category showed the least penetration of domestic products: only 29/147 respondents (19.7%) reported stent use above the 40% threshold, compared with 51/147 (34.7%) for diagnostic catheters, 33/147 (22.4%) for guiding catheters, and 57/147 (38.8%) for PTCA balloons.

Satisfaction with Domestic Devices

Satisfaction followed a similar pattern (Table 2B). Low satisfaction (≤20%) was reported by 47/147 physicians (32.0%) for diagnostic catheters, 62/147 (42.2%) for guiding catheters, 53/147 (36.1%) for PTCA balloons, and 66/147 (44.9%)

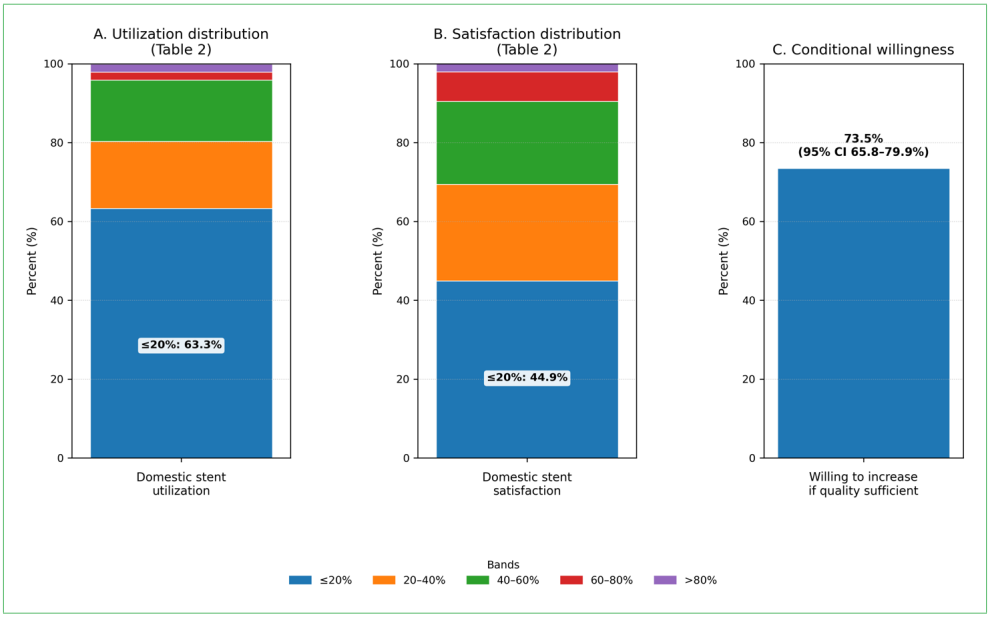

Figure 1. Distribution of domestic-device utilization, satisfaction, and future-use openness. Panel A shows the distribution of self-reported domestic coronary stent utilization across ordinal percentage bands (≤20%, 20-40%, 40-60%, 60-80%, >80%). Panel B shows the corresponding satisfaction distribution for domestically manufactured coronary stents. Panel C shows the proportion of respondents expressing willingness to increase domestic-device use if quality were sufficient. Values are based on 147 respondents.

for coronary stents. Satisfaction above the 40% threshold was reported by 63/147 (42.9%), 42/147 (28.6%), 50/147 (34.0%), and 45/147 (30.6%) respondents, respectively.

Future Adoption Attitudes and Perceived Import Dependency

For the future-use item, the most frequently selected response was "I would use domestic products if quality were sufficient," chosen by 111/147 respondents (75.5%, 95% CI 68.0-81.8). A further 29/147 (19.7%, 95% CI 14.1-26.9) selected "I actively prioritize domestic products." In a binary exploratory summary, 137/147 respondents (93.2%, 95% CI 87.9-96.3) expressed at least some openness to greater domestic-device use. Perceived import dependency remained high: 54/147 respondents (36.7%) estimated dependency at 75-90%, and 37/147 (25.2%) at >90%, for a combined 91/147 (61.9%, 95% CI 53.8-69.4) who perceived dependency above 75% (Table 3).

Table 2. Domestic device utilization and satisfaction by device category (N=147)

Measure	Band	Diagnostic catheter n (%)	Guiding catheter n (%)	PTCA balloon n (%)	Coronary stent n (%)
Utilization	<=20%	64 (43.5)	81 (55.1)	62 (42.2)	93 (63.3)
	20-40%	32 (21.8)	33 (22.4)	28 (19.0)	25 (17.0)
	40-60%	34 (23.1)	29 (19.7)	35 (23.8)	23 (15.6)
	60-80%	9 (6.1)	3 (2.0)	12 (8.2)	3 (2.0)
	>80%	8 (5.4)	1 (0.7)	10 (6.8)	3 (2.0)
Satisfaction	<=20%	47 (32.0)	62 (42.2)	53 (36.1)	66 (44.9)
	20-40%	37 (25.2)	43 (29.3)	44 (29.9)	36 (24.5)
	40-60%	43 (29.3)	31 (21.1)	35 (23.8)	31 (21.1)
	60-80%	10 (6.8)	4 (2.7)	8 (5.4)	11 (7.5)
	>80%	10 (6.8)	7 (4.8)	7 (4.8)	3 (2.0)

Values are n (%). Response bands reproduce the original questionnaire categories and are therefore ordinal descriptive bands rather than exact interval measurements. All denominators are N=147

Table 3. Key adoption attitudes and perceived import dependency (N=147)

Item	n/N (%)	95% CI
Willing to increase domestic device use if quality is sufficient	108/147 (73.5)	65.8-79.9
Perceived import dependency >75%	91/147 (61.9)	53.8-69.4
Perceived import dependency 75-90%	54/147 (36.7)	29.4-44.8
Perceived import dependency 50-75%	47/147 (32.0)	25.0-39.9
Perceived import dependency >90%	37/147 (25.2)	18.8-32.8
Perceived import dependency 20-40%	8/147 (5.4)	2.8-10.4
Perceived import dependency 0-20%	1/147 (0.7)	0.1-3.8

CI: confidence interval (Wilson method).

Exploratory Subgroup Analyses

Exploratory bivariate analyses are shown in Table 4. Supportive future adoption attitudes were more frequent among physicians with >10 years in specialist practice than among those with ≤10 years (69/70 [98.6%] vs 68/77 [88.3%], p=0.019). No statistically significant association was observed between supportive future attitude and institution type, academic title, or daily PCI volume. Low coronary-stent use and low coronary-stent satisfaction were not significantly associated with the collapsed institution, title, experience, or PCI-volume groups, although numerically low stent use was more common in state/private hospitals than in tertiary public/academic centers (83.3% vs 60.5%, p=0.070).

Discussion

This survey identified a consistent pattern across four coronary device classes. Current use of domestically manufactured products was low, satisfaction was also limited, and the stent category was viewed least favorably. At the same time, the dominant future-use response was conditional rather than rejectionist: most physicians indicated that they would increase local-device use if quality were sufficient. That combination is best interpreted as a quality-trust gap. Diffusion of Innovations theory predicts that adoption slows when a technology's relative advantage and reliability remain uncertain.[17] Physician adoption studies in other technology domains show a similar dependence on perceived usefulness, compatibility, and trust.[18] In device procurement, cost alone rarely resolves this problem. Purchasing structures can widen or narrow adoption by determining whether physicians can test, compare, and repeatedly use products that meet their clinical expectations.[3,4,16] The stent findings deserve particular attention. Coronary stents are not interchangeable commodities from the operator's perspective. Platform design, strut architecture, visibility, radial strength, longitudinal integrity, and deliverability all affect procedural confidence and downstream performance.[13-15] Against that background, it is unsurprising that the stent category combined the lowest domestic use with the lowest satisfaction. The survey does not identify which technical attributes drove those perceptions, but it does show that the barrier was strongest in the most performance-sensitive device class. The exploratory subgroup analyses add modest analytical depth to an otherwise descriptive survey. The only clear association was that physicians with longer specialist experience more often expressed a supportive future attitude toward greater domestic-device use. This pattern can be read in more than one way. More experienced operators may be less polarized and more willing to incorporate alternative products if quality is documented. Another possibility is that greater exposure to procurement cycles makes senior physicians more familiar with the trade-off between ideal preference and realistic supply constraints. These interpretations remain inferential because the survey was not designed to test mechanisms.

The temporal context is central to interpretation. These data were collected in early 2020, when pandemic-related supply stress was beginning to reshape health-system thinking about industrial resilience.[5,6] Since then, Türkiye's policy language on medical technologies has moved further toward domestic capability, as reflected in successive development plans and current official trade guidance.[8-11] Regulatory alignment with European device rules has also advanced.[7,11,12] Even so, recent official sources still describe the Turkish market as heavily import-dependent, with around 75% of the market composed of imported devices as of the end of 2024.[8] For that reason, the present dataset should not be read as a current market estimate. Its value lies in providing a documented 2020 baseline from before the more recent phase of policy acceleration.

Several limitations should be acknowledged. First, the sample was assembled through professional e-mail distribution rather than a formal national sampling frame. A response rate of roughly 24.5% can be estimated only against the approximately 600 physicians directly reached, and no individual-level information was available for non-responders. A formal non-response bias analysis, therefore, could not be performed, which limits inference about national representativeness.[22-24] Second, all quantitative measures were self-reported and were not externally validated against procurement records or cath-lab inventories. Third, the questionnaire was author-developed and did not undergo formal psychometric validation. Fourth, the data were

collected in 2020, so current attitudes may differ. Fifth, the subgroup analyses required category collapsing because of cell sparsity and should be viewed as exploratory rather than definitive.

The study also has strengths. Respondents were drawn from all seven geographic regions of Türkiye, all close-ended items used in the primary analyses were complete, and four distinct coronary device classes were assessed within the same respondent pool. The questionnaire captured not only current use and satisfaction but also forward-looking attitudes and perceived system-level dependency. That combination allows a more policy-relevant reading than a simple prevalence survey.

In summary, domestically manufactured coronary devices were used sparingly and rated modestly in this 2020 physician sample, especially in the stent category. Yet, the survey does not support a narrative of absolute clinician resistance. The prevailing attitude was conditional openness tied to quality. That finding provides a practical message for industrial and procurement policy: adoption is more likely to move through quality assurance, transparent performance evidence, and operator confidence than through origin labeling alone.

Conclusion

Among interventional cardiologists responding to this 2020 web-based survey, domestically manufactured coronary devices had low reported utilization and modest satisfaction, with coronary stents showing the least favorable profile. Most respondents nevertheless indicated at least conditional openness to greater use if quality standards were met. The results support interpretation in terms of a quality-trust gap and provide a baseline reference for future surveys conducted after the more recent phase of domestic medical-device policy development in Türkiye.

Disclosures

Ethics Committee Approval: Under the local institutional framework in place at the time, a Health Sciences University, Istanbul Bagcılar Training and Research Ethics Committee application was not sought because the survey was anonymous, voluntary, limited to physician opinions, and involved no patients, patient data, or biological material.

Informed Consent: Written consent was obtained from all participants.

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Peer-review: Externally peer-reviewed.

Ethics and Consent: Institutional academic board approval for the research topic was documented (Decision No. 6; 19 January 2018). Under the local institutional framework in place at the time, a separate ethics committee application was not sought because the survey was anonymous, voluntary, limited to physician opinions, and involved no patients, patient data, or biological material. Electronic informed consent was obtained through the survey introduction statement, and questionnaire completion was accepted as implied consent.

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