



ASSESSMENT OF THE IMPLEMENTATION OF SCREENING TESTS IN FAMILY MEDICINE AND GENERAL PRACTICE CLINICS, AND THE BARRIERS AFFECTING IT

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ABSTRACT

Screening tests are central to early disease detection in primary care, yet their implementation often falls short of recommendations in everyday practice, and evidence from Jordanian primary care remains limited. This cross-sectional study surveyed 206 physicians in governmental family medicine and general practice clinics across all 12 governorates of Jordan to assess self-reported implementation of six screening tests (blood pressure, diabetes, dyslipidemia, breast cancer, colon cancer, and osteoporosis screening), identify barriers and facilitators, and compare implementation between family medicine specialists and general practitioners. Implementation varied substantially by test, from about half of respondents reporting coverage above 75% of eligible patients for blood pressure and diabetes screening to fewer than one in five for breast and colon cancer screening, and differed significantly between the two physician groups for every test examined. Overall, 110 of 206 respondents (53.4%) met the study definition of high screening adherence: 87 of 106 family medicine specialists (82.1%) versus 23 of 100 general practitioners (23.0%). In an adjusted logistic regression model, specialty showed the strongest association with high adherence (adjusted odds ratio 17.58, 95% confidence interval 8.62 to 38.35). Heavy patient load, referral or waiting-time difficulty, and low patient awareness were the most frequently reported barriers; on-site screening access without referral and improved staffing were the most frequently reported facilitators. These findings indicate that screening implementation in this governmental primary care setting remains inconsistent and lower among general practitioners, though the cross-sectional, self-reported design limits causal interpretation.

KEYWORDS: Screening programs; Primary care; Family medicine; General practice; Jordan healthcare.

INTRODUCTION

Noncommunicable diseases (NCDs) accounted for at least 43 million deaths worldwide in 2021, equivalent to three-quarters of non-pandemic-related mortality, with the large majority of these premature deaths occurring in low- and middle-income countries.^[1] Detection, screening, and treatment of NCDs are recognized as core components of an effective primary health care response, and delivering high-impact preventive interventions through primary care is considered a sound economic investment because early detection can reduce the need for more costly treatment later.^[1] Beyond chronic-disease risk factors such as hypertension, diabetes, and dyslipidemia, structured screening for cancers including

breast and colorectal cancer, and for conditions such as osteoporosis, is similarly central to reducing morbidity and mortality through early detection, when intervention is most effective.

Despite this evidence base, the actual delivery of recommended preventive and screening services in everyday primary care practice consistently falls short of guideline targets. In a widely cited analysis of primary care workload, the time required to deliver all preventive services recommended for an average patient panel was estimated to substantially exceed the time primary care physicians actually have available in a working day, illustrating a structural gap between what guidelines

recommend and what busy clinics can feasibly implement.^[2] This mismatch between recommended and achieved screening coverage has been documented across multiple screening modalities and health systems, indicating that under-implementation is not an isolated or setting-specific problem but a recurring feature of preventive care delivery in primary care generally.

The factors underlying this implementation gap have been characterized across several recurring domains in the literature. A recent overview of reviews on the integration of prevention into primary care organized barriers and facilitators into individual-level factors, relating to health professionals and patients; organizational-level factors, concerning practice structure, service delivery, and accessibility; and contextual-level factors, involving the socio-cultural and political/legal environment, spanning eight underlying themes.^[3] Commonly reported physician-level barriers include limited consultation time and competing clinical priorities, gaps in awareness of or agreement with specific guidelines, and the absence of systematic reminder or tracking mechanisms, while reported facilitators include structured clinical protocols, interprofessional support, and stronger patient engagement and trust.^[2,3] These domains offer a useful frame for interpreting screening-implementation gaps at the level of the individual clinic and physician, rather than attributing low uptake solely to patients.

Whether a physician has completed formal postgraduate training in family medicine is itself plausibly relevant to how consistently preventive guidelines are applied in practice. In Jordan, where limited residency capacity means that many medical graduates enter practice as general practitioners without family medicine training, general practitioners working without this structured training have been described as relying more heavily on referral to specialists and practicing with less mentorship than family medicine specialists, who apply more structured, evidence-based approaches to primary care management.^[4] Because preventive screening is a core competency emphasized in family medicine training specifically, comparing screening implementation between family medicine specialists and general practitioners working within the same governmental clinic system offers a direct way to examine whether this training distinction is associated with measurable differences in preventive practice.

Evidence specific to screening implementation in Jordanian primary care remains limited. A national, community-based survey of colorectal cancer screening in Jordan found that only 9% of surveyed adults aged 45 years or over had ever undergone colonoscopy, with lack of information, fear of complications, and embarrassment cited as the leading reported barriers.^[5] A Jordanian cross-sectional study of periodic health examination uptake found that recent contact with primary health care, income, and health knowledge —

rather than sex or smoking status — were the strongest predictors of undergoing a periodic health examination, again pointing to health-system contact and patient knowledge as key levers.^[6] A comparable picture has been described for breast cancer, where Jordan has no regular systematic screening program and national effort rests mainly on periodic awareness campaigns, so that mammography uptake remains largely opportunistic.^[7,8] However, this existing Jordanian evidence has focused primarily on patient-reported barriers and uptake for single screening tests; direct, physician-reported data on the implementation of multiple screening tests across family medicine and general governmental practice clinics in Jordan, and on how implementation differs between family medicine specialists and general practitioners specifically, is lacking.

Given the established burden of preventable disease, the well-documented gap between recommended and delivered preventive care, and the specific absence of Jordanian data comparing screening implementation by physician training background, there is a clear rationale for directly surveying physicians working in family medicine and general practice clinics about their screening practices and the barriers and facilitators they perceive. Such data can identify where implementation gaps are largest, which barriers are most actionable, and whether differences in physician training background are associated with differences in preventive practice — information needed to target future quality-improvement efforts in this setting.

The present study was therefore conducted with the following objectives, consistent with the approved study proposal:

Primary Objective: To assess the rate of implementation of key screening tests in family medicine and general practice clinics.

Secondary Objectives

1. To identify barriers and facilitators influencing screening adherence.
2. To compare screening practices between family medicine specialists and general practitioners.
3. To explore potential system-level improvements to enhance screening uptake.

MATERIALS AND METHODS

Study design and setting

This was a cross-sectional descriptive study of physicians working in family medicine and general practice clinics in the governmental health sector in Jordan. The approved study proposal described two components: (A) an online, self-administered survey of physicians, and (B) a record-based audit of screening documentation in patient files. The present report is based on the physician survey component; the record-based audit was not completed and is therefore not reported here. No audit findings are presented or

estimated anywhere in this manuscript, and the survey-based results reported here stand independently of that component. The study is reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) recommendations for cross-sectional studies.^[9]

Data collection ran from December 2025 to January 2026, following ethical and administrative approval.

Participants

Eligible participants were physicians working in family medicine or general practice clinics in the governmental sector. Physicians not directly involved in patient care were excluded. Participants were recruited by convenience sampling through email and professional networks, with a target sample size of 200–300 respondents specified in the approved proposal. A total of 215 physicians were invited, of whom 206 completed the survey (response rate 95.8%); all 206 were included in the final analytic sample (Fig. 1), comprising 106 family medicine specialists and 100 general practitioners. Respondents practiced in all 12 governorates of Jordan, most commonly Amman ($n = 88$), Irbid ($n = 45$, including Al-Ramtha), Al-Balqa ($n = 21$), Al-Karak ($n = 13$) and Al-Zarqa ($n = 13$).

Data collection tools

Data were collected using a self-administered questionnaire built in Google Forms, structured into the following sections per the approved proposal: (A) demographics and professional background; (B) self-reported screening practices across six screening tests (blood pressure, diabetes, dyslipidemia, breast cancer, colon cancer, and osteoporosis screening); (C) barriers to screening, presented as a check-box, multi-select item; and (D) facilitators of screening, presented as a check-box, multi-select item, followed by a closing thank-you section.

For each of the six screening tests, the questionnaire stated the eligibility criteria and the screening modality that respondents were to apply, so that all physicians estimated coverage against the same standard: blood pressure screening in all adults aged 18 years or over, annually; diabetes screening in adults aged 35 years or over or at high risk, every three years by fasting glucose; dyslipidemia screening in patients aged 35 years or over, by lipid profile; breast cancer screening in women aged 50–70 years, every two years by mammography; colon cancer screening in patients aged over 45 years, by fecal occult blood test or referral for colonoscopy; and osteoporosis screening in patients aged 65 years or over, by referral for DEXA scan.

The survey opened with a written introduction and consent statement describing the study, confirming that participation was voluntary and that responses would be confidential and used only for research purposes, followed by a required checkbox item (“I agree to

participate”) that respondents had to select in order to proceed. Survey completion was therefore conditional on consent, and all 206 analysed respondents provided consent by this mechanism.

No personally identifying information was collected.

Outcome definitions

Implementation of each of the six screening tests listed above was self-reported by physicians on a four-band ordinal scale describing the approximate proportion of eligible patients screened, with eligibility for each test defined in the questionnaire as set out under Data collection tools: less than 25%, 25–50%, 51–75%, or more than 75%. A composite adherence score was derived as the mean of the six screening tests’ band codes (coded 1–4 in band order), rescaled to a 0–100 scale. A binary high screening adherence outcome was defined by a median split on this composite score: respondents scoring at or above the cohort median were classified as High adherence and those below the median as Low adherence. The cut-point was the exact sample median of the composite score, 500/9 (55.56 to two decimal places); respondents whose score equalled the median were classified as High. This definition was locked at the time of the primary analysis and is applied unchanged wherever the high-adherence outcome is used in this manuscript.

Statistical analysis

Categorical variables are reported as frequencies and percentages. For continuous variables, a documented, non-arbitrary rule was applied to select the summary statistic and comparison test: a Shapiro–Wilk test for normality was performed on the adherence score; if the resulting P value exceeded 0.05 the variable was summarized as mean (standard deviation) and compared using the independent-samples t -test, and otherwise as median (interquartile range) compared using the Mann–Whitney U test. Categorical variables were compared between family medicine specialists and general practitioners using Pearson's chi-square test without continuity correction; where any expected cell count was below 5, Fisher's exact test was substituted for that specific comparison.

The primary outcome of interest was high screening adherence, as defined above. A multivariable logistic regression model was fitted with high screening adherence as the outcome and the following prespecified predictors: specialty (family medicine specialist vs. general practitioner, with general practitioner as the reference category), years of clinical experience (an ordered four-level factor: less than 5, 5–10, 11–20, and more than 20 years, using orthogonal polynomial contrasts to test linear, quadratic and cubic trends across levels), and the number of endorsed barrier items (a simple count across all nine barrier options, including the open-ended “Other” category). Individual barrier and facilitator items were not entered as separate predictors, so that items endorsed by fewer than 10 respondents

could not introduce sparse-cell or quasi-separation problems; such items were retained in the descriptive barrier and facilitator rankings. Crude (unadjusted, single-predictor) and adjusted odds ratios with 95% confidence intervals and P values were obtained from the fitted models. Model diagnostics comprised convergence status, a quasi-separation flag (any coefficient with an absolute value greater than 10, or a non-estimable coefficient), generalized variance inflation factors, and a McFadden-style pseudo- R^2 . A Firth penalized-likelihood logistic regression was prespecified as a sensitivity analysis, to be run only if the separation diagnostic flagged a problem in the standard model. Because the median-split cut-point is by construction sample-dependent, the specialty association was additionally re-estimated under three alternative outcome definitions as a prespecified robustness check.

All statistical tests were two-sided, with statistical significance set at $P < 0.05$, consistent with the 95% confidence level used throughout for effect estimates. Analyses were performed in R version 4.5.3 (R Foundation for Statistical Computing, Vienna, Austria) using the tidyverse (dplyr 1.2.1, tidyr 1.3.2, stringr 1.6.0, forcats 1.0.1), gtsummary (2.5.0), flextable (0.9.11), broom/broom.helpers (1.0.12/1.22.0), and car (3.1-5) packages, with a fixed random seed set for reproducibility.

As the record-based audit component was not completed, no comparison between self-reported screening practice and chart-documented screening was undertaken.

Ethical considerations

The study protocol was reviewed and approved by the Scientific Research Ethics Committee of the Jordanian Ministry of Health (Al-Bashir Hospitals Administration), approval reference MOH/REC/2025/577, at its meeting of 27 November 2025. Administrative authorization to distribute the questionnaire electronically to family physicians and general practitioners in governmental hospitals and health centers affiliated with the Ministry of Health was subsequently granted by the Directorate of Medical Education and Training (letter no. 21395, 15 December 2025). Participation was voluntary and informed consent was obtained electronically from every participant at the start of the survey, as described under Data collection tools. No personally identifying data were collected; data were stored securely and used solely for research purposes.

RESULTS AND DISCUSSION

RESULTS

The respondent flow for this study is summarized in Fig. 1. A total of 215 physicians were invited to participate, of whom 206 completed the survey (response rate 95.8%); all 206 consented and were included in the final analytic sample, comprising 106 (51%) family medicine specialists and 100 (49%) general practitioners.

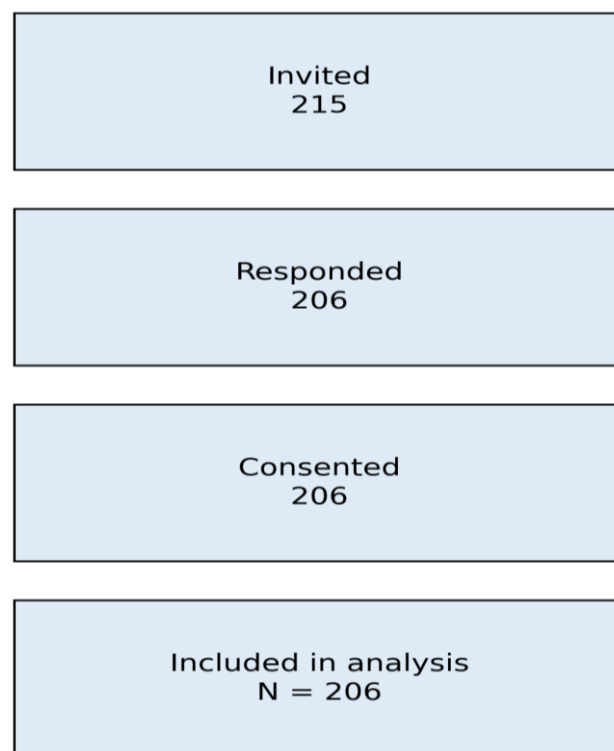


Fig. 1. Respondent flow diagram.

The composite adherence score (Materials and Methods) was non-normally distributed on Shapiro–Wilk testing ($P < 0.001$) and is therefore summarized as median (interquartile range) throughout this manuscript. The overall median adherence score was 55.56 (IQR 22.22–77.78) on the 0–100 scale, and differed markedly between groups: 75.00 (IQR 61.11–83.33) among family medicine specialists versus 27.78 (IQR 11.11–45.83) among general practitioners (Mann–Whitney U test, $P < 0.001$). Applying the locked median-split definition, 110 of 206 respondents (53.4%) were classified as having high screening adherence and 96 (46.6%) as having low adherence. High adherence was reported by 87 of 106 family medicine specialists (82.1%) compared with 23 of 100 general practitioners (23.0%) ($P < 0.001$). With 96 observations in the smaller outcome group and five terms in the adjusted model, the analysis provided approximately 19 events per variable.

Demographic and professional characteristics of the 206 respondents, by specialty, are shown in Table 1. The two groups differed significantly across five of the six characteristics examined. Family medicine specialists were concentrated in the 30–39 age bands (75% of family medicine specialists were aged 30–39, versus 41% of general practitioners), while general practitioners were more concentrated in the youngest band (under 30: 42% vs. 2.8%; $P < 0.001$ by Fisher’s exact test, used for this comparison because one expected cell count fell below 5). Family medicine specialists were more often female (72% vs. 45%, $P < 0.001$) and more often based in comprehensive medical centers (81% vs. 66%, $P =$

0.014). Years of clinical experience did not differ significantly between groups ($P = 0.2$). Reported daily patient volume differed significantly ($P < 0.001$); general practitioners more often reported seeing more than 60

patients per day (35% vs. 12%). Use of a formal international screening guideline (e.g., USPSTF, NICE) was reported by 96% of family medicine specialists compared with 60% of general practitioners ($P < 0.001$).

Table 1: Demographic and professional characteristics by specialty.

Characteristic	General practitioner N = 100	Family medicine specialist N = 106	Overall N = 206	p- value
Age group				<0.001
less than 30	42 (42%)	3 (2.8%)	45 (22%)	
30-34	25 (25%)	39 (37%)	64 (31%)	
35-39	16 (16%)	40 (38%)	56 (27%)	
40-44	7 (7.0%)	10 (9.4%)	17 (8.3%)	
45-49	7 (7.0%)	3 (2.8%)	10 (4.9%)	
over 50	3 (3.0%)	11 (10%)	14 (6.8%)	
Gender				<0.001
Female	45 (45%)	76 (72%)	121 (59%)	
Male	55 (55%)	30 (28%)	85 (41%)	
Years of experience				0.2
less than 5	38 (38%)	29 (27%)	67 (33%)	
5-10	39 (39%)	44 (42%)	83 (40%)	
11-20	18 (18%)	21 (20%)	39 (19%)	
more than 20	5 (5.0%)	12 (11%)	17 (8.3%)	
Clinic setting				0.014
comprehensive medical center	66 (66%)	86 (81%)	152 (74%)	
primary medical center	34 (34%)	20 (19%)	54 (26%)	
Patients seen per day				<0.001
less than 20	5 (5.0%)	12 (11%)	17 (8.3%)	
20-40	24 (24%)	48 (45%)	72 (35%)	
41-60	36 (36%)	33 (31%)	69 (33%)	
more than 60	35 (35%)	13 (12%)	48 (23%)	
Uses a screening guideline				<0.001
Yes, international guidelines (e.g., USPSTF, NICE)	60 (60%)	102 (96%)	162 (79%)	
No formal guideline	40 (40%)	4 (3.8%)	44 (21%)	

n (%). *P* values from Pearson's chi-square test without continuity correction, except for age group, where Fisher's exact test was used because one expected cell count was below 5.

Self-reported implementation of each of the six screening tests, overall and by specialty, is shown in Table 2 and Fig. 2. Implementation varied considerably by test: overall, more than 75% patient coverage was most commonly reported for diabetes screening (50% of respondents) and blood pressure screening (48%), and least commonly for colon cancer screening (9.7%) and breast cancer screening (12%). The distribution across the four implementation bands differed significantly

between family medicine specialists and general practitioners for every one of the six tests ($P < 0.001$ in each case), with family medicine specialists consistently shifted toward higher patient coverage. For example, more than 75% coverage was reported by 68% of family medicine specialists versus 26% of general practitioners for blood pressure screening, and by 75% versus 23% for diabetes screening. The gap was similarly present, though smaller in absolute terms given the lower overall coverage, for the two cancer screening tests: more than 75% coverage for colon cancer screening was reported by 15% of family medicine specialists versus 4.0% of general practitioners, and for breast cancer screening by 19% versus 4.0%.

Table 2: Implementation of individual screening tests, overall and by specialty.

Screening test	General practitioner N = 100	Family medicine specialist N = 106	Overall N = 206	p-value
Blood pressure screening				<0.001
Less than 25%	10 (10%)	5 (4.7%)	15 (7.3%)	
25-50%	36 (36%)	11 (10%)	47 (23%)	
51-75%	28 (28%)	18 (17%)	46 (22%)	
More than 75%	26 (26%)	72 (68%)	98 (48%)	

Diabetes screening				<0.001
Less than 25%	20 (20%)	2 (1.9%)	22 (11%)	
25-50%	42 (42%)	7 (6.6%)	49 (24%)	
51-75%	15 (15%)	17 (16%)	32 (16%)	
More than 75%	23 (23%)	80 (75%)	103 (50%)	
Dyslipidemia screening				<0.001
Less than 25%	35 (35%)	6 (5.7%)	41 (20%)	
25-50%	35 (35%)	11 (10%)	46 (22%)	
51-75%	9 (9.0%)	15 (14%)	24 (12%)	
More than 75%	21 (21%)	74 (70%)	95 (46%)	
Breast cancer screening				<0.001
Less than 25%	57 (57%)	13 (12%)	70 (34%)	
25-50%	23 (23%)	30 (28%)	53 (26%)	
51-75%	16 (16%)	43 (41%)	59 (29%)	
More than 75%	4 (4.0%)	20 (19%)	24 (12%)	
Colon cancer screening				<0.001
Less than 25%	62 (62%)	25 (24%)	87 (42%)	
25-50%	21 (21%)	27 (25%)	48 (23%)	
51-75%	13 (13%)	38 (36%)	51 (25%)	
More than 75%	4 (4.0%)	16 (15%)	20 (9.7%)	
Osteoporosis screening				<0.001
Less than 25%	61 (61%)	11 (10%)	72 (35%)	
25-50%	26 (26%)	24 (23%)	50 (24%)	
51-75%	10 (10%)	40 (38%)	50 (24%)	
More than 75%	3 (3.0%)	31 (29%)	34 (17%)	

n (%) in each of the four patient-coverage bands per screening test. *P* values from chi-square test without

continuity correction (whole distribution per test, not per band).

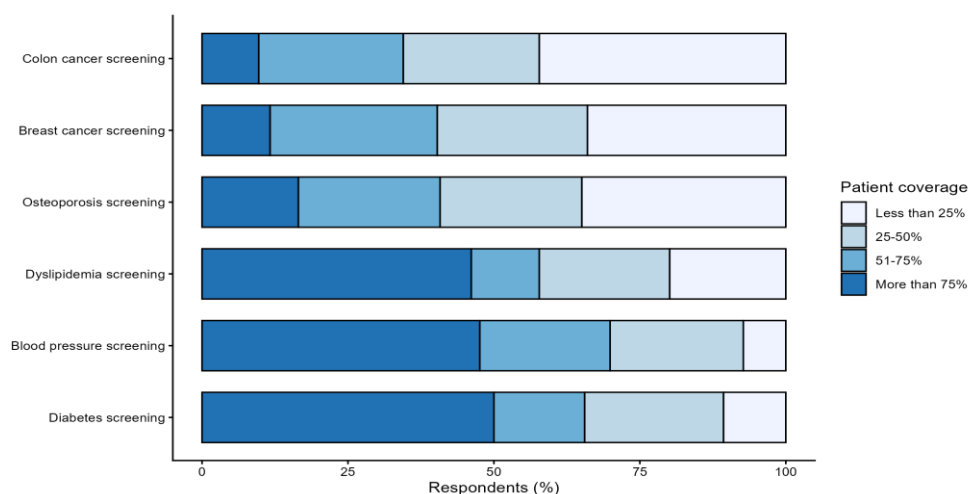


Fig. 2: Implementation rates for each screening test, by patient-coverage band.

Barriers and facilitators to screening implementation, ranked by endorsement frequency across all 206 respondents, are shown in Tables 3a and 3b and Fig. 3. The most frequently endorsed barriers were heavy patient load (57.3%), difficulty with referrals or long waiting times (54.9%), low patient awareness or refusal (51.9%), and limited consultation time (49.5%). The least frequently endorsed were legal or medico-legal concerns (5.3%) and an open-ended "Other" category

(3.9%). Respondents endorsed a median of 3 barriers each (range 1–7). The most frequently endorsed facilitators were providing screening facilities on-site without the need for referral (54.9%), improved staffing or reduced workload (51.5%), and public education and awareness (49.0%); the facilitator referencing Activate Health community clinics specifically was endorsed by 84 respondents (40.8%).

Table 3a: Barriers to screening implementation, ranked by frequency (N = 206).

Barrier	n	%	Fewer than 10 endorsements
Heavy patient load	118	57.3	No
Difficulty with referrals or long waiting times	113	54.9	No
Low patient awareness or refusal	107	51.9	No
Limited consultation time	102	49.5	No
Cost or availability of screening tests	82	39.8	No
Conflicting or unclear guidelines	33	16.0	No
Problems documenting results in the medical record	24	11.7	No
Legal or medico-legal concerns	11	5.3	No
Other	8	3.9	Yes

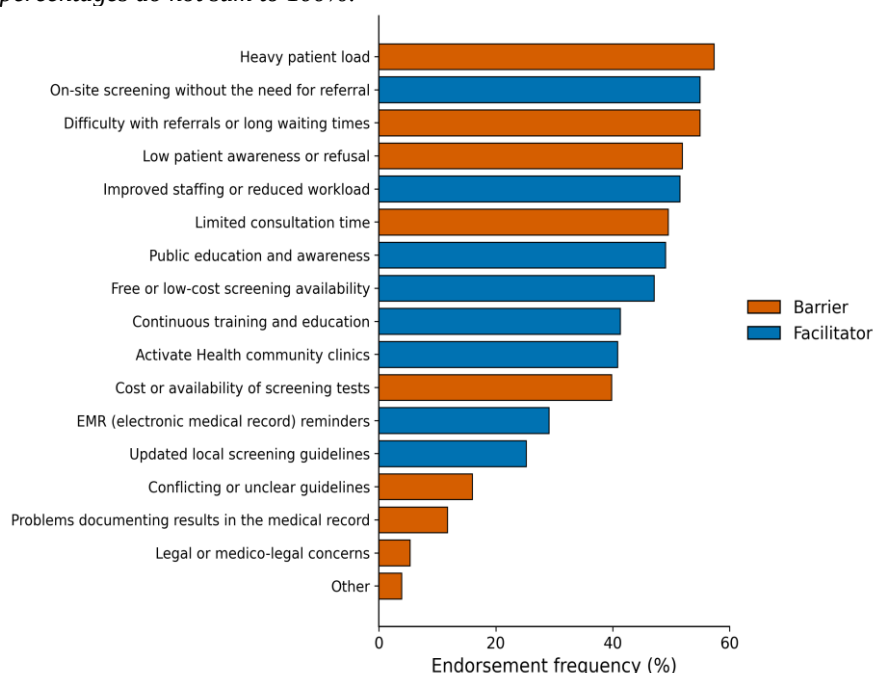
Multi-select item; percentages do not sum to 100%.
Items endorsed by fewer than 10 respondents are
flagged; all nine items contributed to the barrier count

used in the regression model, but no individual item was
entered as a separate predictor.

Table 3b: Facilitators to screening implementation, ranked by frequency (N = 206).

Facilitator	n	%
On-site screening without the need for referral	113	54.9
Improved staffing or reduced workload	106	51.5
Public education and awareness	101	49.0
Free or low-cost screening availability	97	47.1
Continuous training and education	85	41.3
Activate Health community clinics	84	40.8
EMR (electronic medical record) reminders	60	29.1
Updated local screening guidelines	52	25.2

Multi-select item; percentages do not sum to 100%.

**Fig. 3: Barriers and facilitators to screening implementation, ranked by endorsement frequency.**

Results of the univariable and multivariable logistic regression models for high screening adherence are shown in Table 4 and Fig. 4. The adjusted model converged without evidence of separation or quasi-separation, and showed no material collinearity (all generalized variance inflation factors ≤ 1.11); its McFadden pseudo- R^2 was 0.322. Two variables

remained associated with high screening adherence after adjustment. The association was strongest for specialty: family medicine specialists had markedly higher adjusted odds of high adherence than general practitioners (adjusted OR 17.58, 95% CI 8.62–38.35, $P < 0.001$), similar in magnitude to the unadjusted estimate (crude OR 15.33, 95% CI 7.93–31.05). The linear trend across

years of experience was also significant after adjustment (adjusted OR 3.51, 95% CI 1.30–10.50, $P = 0.017$). Because years of experience was entered using orthogonal polynomial contrasts, this odds ratio describes the fitted linear component across the four ordered experience categories and should not be read as an odds ratio per year of experience; the trend P value is the interpretable quantity. The quadratic and cubic

experience terms were not significant (adjusted $P = 0.310$ and $P = 0.582$, respectively), indicating no evidence of a more complex, non-monotonic relationship beyond this linear trend. The number of endorsed barriers was not significantly associated with high adherence in either the crude (OR 0.94, 95% CI 0.77–1.14, $P = 0.524$) or adjusted model (OR 0.89, 95% CI 0.68–1.15, $P = 0.365$).

Table 4: Univariable and multivariable predictors of high screening adherence.

Predictor	Crude OR (95% CI)	Crude P	Adjusted OR (95% CI)	Adjusted P
Specialty: family medicine specialist (vs. general practitioner)	15.33 (7.93–31.05)	<0.001	17.58 (8.62–38.35)	<0.001
Years of experience: linear trend	3.72 (1.68–9.37)	0.002	3.51 (1.30–10.50)	0.017
Years of experience: quadratic trend	0.81 (0.39–1.75)	0.563	0.63 (0.25–1.57)	0.310
Years of experience: cubic trend	1.00 (0.54–1.82)	0.990	0.81 (0.38–1.70)	0.582
Number of barriers endorsed (per barrier)	0.94 (0.77–1.14)	0.524	0.89 (0.68–1.15)	0.365

OR = odds ratio; CI = confidence interval. Adjusted model: specialty + years of experience + number of barriers endorsed (ordinary logistic regression; convergence confirmed, no separation detected, all generalized variance inflation factors ≤ 1.11 , pseudo- $R^2 = 0.3216$). Years-of-experience terms are orthogonal

polynomial contrasts. High screening adherence defined by a median split on the composite adherence score (Materials and Methods). Reference category: general practitioner. Cross-sectional design — odds ratios are not causal estimates.

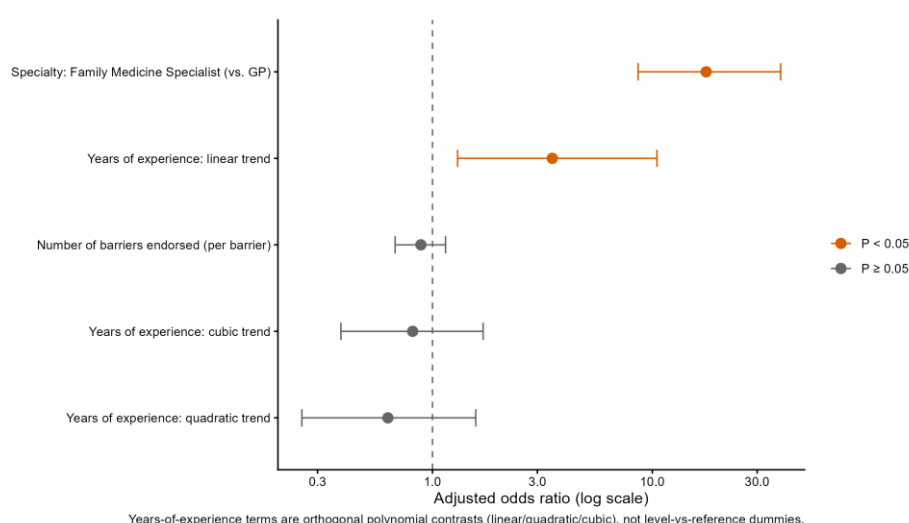


Fig. 4: Adjusted odds ratios (with 95% confidence intervals) for high screening adherence.

Because the median-split cut-point is sample-dependent, the specialty association was re-estimated under three alternative definitions of high screening adherence (Table 5). The adjusted odds ratio for specialty remained large and statistically significant under every definition examined, ranging from 5.79 (95% CI 2.92–12.06) when high adherence was restricted to the upper tertile of the

score to 17.58 (95% CI 8.62–38.35) under the primary definition. Modeling the composite score as a continuous outcome gave the same conclusion: family medicine specialists scored on average 34.7 points higher on the 0–100 adherence scale than general practitioners after adjustment (95% CI 28.0–41.4, $P < 0.001$).

Table 5: Sensitivity of the specialty association to alternative definitions of high screening adherence.

Definition of high screening adherence	Respondents meeting definition (n)	Specialty: family medicine specialist vs. general practitioner, adjusted OR (95% CI)	P
Primary definition: score $\geq$ sample median (tied scores classified High)	110	17.58 (8.62–38.35)	<0.001
Median split with tied scores classified	101	13.27 (6.66–28.06)	<0.001

Low			
Score ≥ 66.67 (mean band ≥ 3 , i.e. more than 50% coverage)	87	8.63 (4.42–17.74)	<0.001
Upper tertile of the adherence score	69	5.79 (2.92–12.06)	<0.001

OR = odds ratio; CI = confidence interval. Each row reports the adjusted odds ratio for specialty from the same multivariable logistic regression model specified in Table 4 (specialty + years of experience + number of barriers endorsed), refitted with the outcome redefined as shown. Confidence intervals are profile-likelihood intervals, as in Table 4. The primary definition is the one used throughout the manuscript.

DISCUSSION

These findings indicate that screening implementation in this sample of Jordanian governmental family medicine and general practice clinics was inconsistent across screening tests and consistently lower among general practitioners than among family medicine specialists, both descriptively (Tables 1 and 2) and in the adjusted regression model (Table 4). Implementation was comparatively higher for routine chronic-disease risk-factor screening (blood pressure, diabetes) than for the two cancer screening tests with the lowest overall coverage (colon and breast cancer screening), broadly consistent with prior evidence that structured cancer-screening pathways are harder to sustain in time-constrained primary care settings than simpler point-of-care measurements.^[2] The large, robust association between specialty and high screening adherence — the strongest association in the adjusted model even after accounting for years of experience and barrier burden — is consistent with the rationale set out in the Introduction for comparing these two groups: family medicine specialists in Jordan complete structured postgraduate training explicitly oriented toward primary care management, including preventive care, whereas general practitioners without this training have been described as relying more on specialist referral and less on structured, guideline-based primary care management.^[4] The parallel finding that a much higher proportion of family medicine specialists reported using a formal international screening guideline (96% vs. 60%, Table 1) is consistent with, though does not on its own establish, this training-based explanation for the specialty gap in adherence.

The significant linear (but not quadratic or cubic) trend for years of experience suggests that, independent of specialty, adherence tended to be higher among more experienced physicians, without evidence of a more complex pattern such as a mid-career dip or plateau. Because years of experience and specialty are both physician-level characteristics captured at a single point in time, this cross-sectional association cannot distinguish an effect of accumulated clinical experience from a cohort or era effect — for example, changes over time in training emphasis or guideline availability. A longitudinal or larger multi-site study would be needed to separate these explanations.

The barriers most frequently endorsed in this sample — heavy patient load, referral or waiting-time difficulty, low patient awareness, and limited consultation time — map onto the individual- and organizational-level domains described in the broader literature on integrating prevention into primary care,^[3] and echo the time-constraint mechanism previously described for preventive-service delivery generally.^[2] Barriers of this kind are not specific to this setting: a national survey of United States primary care physicians identified lack of patient follow-through and inability to pay for tests, rather than physician knowledge, as the principal perceived barriers to both breast and colorectal cancer screening, with greater barriers reported for colorectal cancer screening than for mammography,^[10] and knowledge, attitudes, practice and perceived barriers to colorectal cancer screening have similarly been examined among family physicians in a neighboring Gulf health system.^[11] Barriers reported here were predominantly system- and workload-related rather than knowledge-related: guideline-related barriers (“conflicting or unclear guidelines”) were endorsed far less often, by 16.0% of respondents, suggesting that interventions targeting consultation time, referral pathways, and patient-facing awareness may be more directly actionable in this setting than guideline-dissemination efforts alone. Consistent with this, the most frequently endorsed facilitators — on-site screening access without referral, improved staffing, and public awareness — point toward the same system-level levers rather than clinician education specifically. It is notable that reminder systems were among the least frequently endorsed facilitators (EMR reminders, 29.1%), even though reminders are among the better-evidenced quality-improvement interventions for increasing adherence to recommended care, whether delivered on paper^[12] or through the electronic record;^[13] this may reflect the current level of electronic record functionality available in these clinics rather than a judgment about the potential value of such systems. The number of endorsed barriers was not independently associated with high adherence once specialty and experience were accounted for; this null finding should be interpreted cautiously, since it reflects a simple count of endorsed items rather than a weighted burden measure, and does not rule out that specific individual barriers, rather than their total number, matter for specific screening tests.

Several limitations should be considered when interpreting these results. First, this is a cross-sectional, self-reported survey of physicians recruited by convenience sampling through email and professional networks. The odds ratios reported here describe associations, not causal effects. Although the response rate among invited physicians was high (206/215,

95.8%), convenience recruitment through professional networks means the sample cannot be assumed representative of all family medicine and general practice physicians in Jordan's governmental sector, and physicians with a particular interest in preventive care may have been more likely to be reached and to respond. Second, screening implementation was self-reported rather than verified against patient records, and self-report of guideline-concordant practice is subject to social-desirability bias; the record-based audit component that would have allowed a chart-based comparison was not completed. Third, the high-adherence outcome rests on a median split of a composite score built from six ordinal items, which discards information and uses a sample-dependent cut-point; the sensitivity analyses in Table 5 show that the specialty association persists under alternative definitions, but the absolute magnitude of the odds ratio does depend on where the cut-point is placed. Fourth, the adjusted model did not include daily patient volume, clinic setting or guideline use, all of which differed by specialty; guideline use in particular is more plausibly a consequence of specialty training than an independent confounder, and adjusting for it would partly remove the very pathway the specialty comparison is intended to capture. Finally, survey and record-audit data could not be compared, so this study cannot speak to any gap between what physicians report and what is documented in patient charts.

Notwithstanding these limitations, this study has several strengths. To our knowledge, it is among the first in this setting to directly compare screening implementation across six distinct screening tests between family medicine specialists and general practitioners within the same governmental clinic system, with respondents drawn from all 12 governorates of the country. It applied a prespecified, documented analytic plan with a locked outcome definition (Materials and Methods) rather than a post hoc threshold selection; it reports both descriptive implementation rates and an adjusted multivariable model with explicit diagnostics for model stability (convergence, separation, variance inflation); and it demonstrates through prespecified sensitivity analyses that the central specialty finding does not depend on the particular cut-point chosen.

CONCLUSION

This study assessed the implementation of six screening tests among 206 physicians practicing in governmental family medicine and general practice clinics in Jordan, and examined the barriers and facilitators physicians reported, as well as how implementation differed by physician training background. Consistent with the study's primary objective, self-reported implementation varied substantially by test, ranging from roughly half of respondents reporting more than 75% patient coverage for routine chronic-disease screening (blood pressure, diabetes) to fewer than one in five reporting the same level of coverage for breast and colon cancer screening.

Addressing the second secondary objective, screening implementation differed markedly and consistently between family medicine specialists and general practitioners: family medicine specialists reported higher implementation across all six screening tests, and specialty remained the variable most strongly associated with high screening adherence after adjustment for years of experience and barrier burden. This pattern is consistent with family medicine specialists' structured postgraduate training in primary care; however, given the cross-sectional design of this study, these associations should be understood as evidence of an association, not as evidence that specialty training causes higher adherence.

In line with the first secondary objective, heavy patient load, difficulty with referrals or long waiting times, low patient awareness, and limited consultation time were the barriers physicians most frequently identified, while on-site access to screening without referral, improved staffing, and public education and awareness were the most frequently identified facilitators. These findings suggest that the barriers physicians perceive in this setting are predominantly system- and workload-related rather than tied specifically to physician knowledge of guidelines.

With respect to the third secondary objective, these findings point toward several system-level directions that may be worth further evaluation for enhancing screening uptake in this setting; they are offered here as suggestions rather than definitive policy prescriptions, since this study did not test any intervention. Possible directions include expanding on-site or referral-free access to screening tests, addressing consultation-time and workload pressures, and strengthening public awareness of recommended screening. Given the specialty gap observed, structured family-medicine-oriented training or mentorship for general practitioners may also be a reasonable area for future study, though whether any of these measures would in fact improve implementation was not tested here.

Overall, this study provides physician-reported evidence that screening implementation in this setting remains inconsistent across screening tests and lower among general practitioners than family medicine specialists, identifies workload- and access-related barriers as the most commonly reported obstacles, and offers a starting point for future, more rigorous evaluation of interventions aimed at closing the gaps identified here.

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REFERENCES

1. Noncommunicable diseases, Fact sheet prepared by World Health Organization (WHO), updated 25 Sep 2025, <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>.
2. Yarnall KS, Pollak KI, Østbye T, Krause KM, Michener JL. Primary care: is there enough time for prevention? *Am. J Public Health*, 2003; 93(4): 635-41.
3. Clet E, Leblanc P, Alla F, Cohidon C. Factors for the integration of prevention in primary care: an overview of reviews. *BJGP Open*, 2024; 8(3): BJGPO.2023.0141.
4. Colton B, Zink T. Family medicine diploma program in Jordan: components for success and sustainability. *Fam. Med.*, 2025; 57(5): 364-70.
5. Abdulelah ZA, Abdulelah AA, Alqaisieh M, Khanfar AN, Hammad NH, Al Masoud EB, et al. National survey of barriers to colorectal cancer screening in Jordan. *East Mediterr Health J*, 2024; 30(2): 125-35.
6. Tayoun AA. Determinants of periodic health examination uptake: insights from a Jordanian cross-sectional study. *JMIRx Med.*, 2025; 6: 57597.
7. Abu-Helalah M, Asfour A, Almadani M, Alfayyadh M, Halayqeh S, Al Tamimi M, et al. Uptake rate, barriers, and attitudes towards mammography screening for breast cancer in Jordan. *Ann. Med.*, 2025; 57(1): 2514945.
8. Abu-Helalah MA, Alshraideh HA, Al-Serhan AA, Kawaleet M, Nesheiwat AI. Knowledge, barriers and attitudes towards breast cancer mammography screening in Jordan. *Asian. Pac. J Cancer Prev.*, 2015; 16(9): 3981-90.
9. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol.*, 2008; 61(4): 344-9.
10. Meissner HI, Klabunde CN, Breen N, Zapka JM. Breast and colorectal cancer screening: U.S. primary care physicians' reports of barriers. *Am. J Prev. Med.*, 2012; 43(6): 584-9.
11. Demyati E. Knowledge, attitude, practice, and perceived barriers of colorectal cancer screening among family physicians in National Guard Health Affairs, Riyadh. *Int. J Family Med.*, 2014; 2014: 457354.
12. Pantoja T, Grimshaw JM, Colomer N, Castañon C, Leniz Martelli J. Manually-generated reminders delivered on paper: effects on professional practice and patient outcomes. *Cochrane Database Syst. Rev.*, 2019; 12(12): CD001174.
13. Kukhareva PV, Li H, Caverly TJ, Fagerlin A, Del Fiol G, Hess R, et al. Lung cancer screening before and after a multifaceted electronic health record intervention: a nonrandomized controlled trial. *JAMA Netw Open*, 2024; 7(6): 2415383.