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# Do Physicians Do as They Say?

## The Case of Mammography

Barry G. Saver, MD, MPH; Thomas R. Taylor, MD, PhD; Jonathan R. Treadwell, PhD; William G. Cole, PhD

**Objective:** To assess the utility of survey-based physician policy in predicting actual mammography ordering behavior, as measured by medical record abstraction.

**Design:** Cross-sectional survey of practicing community physicians. Responses were correlated with data abstracted from the medical records of patients in the practices of the participating physicians.

**Participants:** Family and general practitioners in Washington State. Medical records of female patients aged 40 to 80 years provided data on actual mammography performance.

**Main Outcome Measures:** The proportions of female patients aged 40 to 49 and 50 to 80 years who had received a screening mammogram within the previous 2 years.

**Results:** Of the more than 100 potential predictors available, only 4 were significantly associated with screening rates for women younger than 50 years and only 3 were associated with screening rates for older women. Regression models explained only 21% to 25% of the variance in screening rates. Physician estimates of screening rates were poorly correlated with actual screening rates.

**Conclusions:** Practicing physicians do not know how well they screen their patients using mammography. Extensive survey data, including direct estimates of behavior, demographics, policy measures, and case scenario responses, were of limited use in predicting actual screening rates. Our results underscore the importance of using data rather than proxy measures to study physician performance.

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**M**AMMOGRAPHY IS A preventive measure that, if used appropriately, can prevent approximately one fourth of deaths from breast cancer.<sup>1</sup> However, mammography use in the United States<sup>2</sup> and in Washington State<sup>3</sup> has lagged behind recommendations such as those of the US Preventive Services Task Force, Washington, DC,<sup>4,5</sup> or the American Cancer Society, Atlanta, Ga.<sup>6,7</sup> Why is this potentially lifesaving service underused? Women cite the lack of a recommendation from their physician as a major reason for not having obtained a mammogram.<sup>8,9</sup> For this reason, much recent effort has focused on attempting to increase the frequency with which physicians recommend mammography to their patients.

To estimate this frequency, many observational and interventional studies have used physician self-report measures such as the reported percentage of patients screened, whether the physicians routinely recommended screening, or re-

sponses to case scenarios.<sup>10-19</sup> Little work has correlated results from physician surveys with actual practice to determine which measures are most predictive of what physicians actually do. In one study of preventive services, self-reported rates

*For editorial comment  
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did not seem to be good predictors of actual behavior among community family physicians.<sup>20</sup> Another study of preventive services found that, using many potential predictors, only the estimated percentage of visits scheduled for prevention and the belief that patients were skeptical about new preventive medical practices were predictive of mammography performance, explaining 26% of the variance.<sup>21</sup> In this study, the mean compliance with American Cancer Society and National Cancer Institute, Bethesda, Md, mammography guidelines was 29%. A 1984 study found that physicians who

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## SUBJECTS, MATERIALS, AND METHODS

### PHYSICIAN RECRUITMENT

Physician subjects were recruited for a study testing a physician-based intervention for its effect on mammography screening rates. This study was approved by the Human Subjects Review Committee of the University of Washington, Seattle. The analysis reported herein is concerned with physician behavior prior to enrollment in the study; hence, it is unaffected by the nature or results of the intervention study, other than potential effects of a volunteer bias among participants.

Physician recruitment was carried out as shown in **Figure 1**. Employees of the Group Health Cooperative, Puget Sound, were excluded as it had a mammography screening program operating independently of the physicians. Recruitment was assisted by use of "liaison physicians," analogous to a method used by RAND, Santa Monica, Calif, researchers.<sup>27</sup> The liaison physicians selected names of eligible physicians in their areas whom they knew; physicians unclaimed by all of the liaisons were divided among the liaisons in their areas. The initial recruitment packet contained an invitation letter signed by the liaison physician that described the project and what participation would involve, a consent form, and a letter of endorsement from the Washington Academy of Family Physicians, Olympia. Nonresponding physicians were sent a second packet 2 weeks after the first. One week after the second mailing, the liaison physicians were asked to telephone nonresponding physicians and attempt to get a decision. Approximately 1 to 2 weeks after this, a third mailing was sent to physicians who still had not responded. Following this, the remaining nonresponding physicians were telephoned by one of us (B.G.S.) in a final attempt to obtain a decision about participation.

Of the eligible physicians, 138 (39%) consented to participate. A brief survey mailed to a random sample of 56% of the nonparticipating physicians obtained a 67% response rate. It revealed them to be generally similar to consenting physicians. However, they were older (mean age, 49 vs 46 years;  $P=.03$ , Student *t* test), in practice longer (mean, 21 vs 17 years;  $P=.02$ , Student *t* test), and more likely to be in private practice (49% vs 26%;  $P=.005$ ,  $\chi^2$  test); they were less likely to be board certified (59% vs 80%;  $P=.001$ ,  $\chi^2$  test). Nonrespondents also estimated they had a slightly

smaller proportion of black patients in their practices (3% vs 5%;  $P=.01$ , Student *t* test).

### PHYSICIAN SURVEYS

An initial physician survey was mailed to all consenting physicians; a second survey was later sent to all but the one third of the physicians randomized to our control group. For each survey, there were 2 follow-up mailings followed by telephone calls, if necessary. Both surveys contained 2 sets of case scenarios of women aged 40 to 49 and 50 to 80 years, respectively; each set described an asymptomatic woman coming in for her annual physical examination who had not been screened recently with mammography and systematically varied her age and history of breast cancer in first- and second-degree relatives. For each case, respondents were asked 2 questions: (1) how strongly they would recommend mammography (range: would not recommend to uncertain based on a 5-point scale from "would recommend, but not strongly" to "would recommend with strongest recommendation") and (2) when they would recommend subsequent mammography if they had ordered one and it was normal. The first survey contained questions concerning physicians' demographic characteristics; descriptors of their practice settings; their experiences with mammography and breast cancer and attitudes about mammography; their policies for the performance of clinical breast examination; estimates of the costs of mammography and the proportions of their patients with insurance coverage for mammography; and rankings of the importance of a number of issues including various patient risk factors, expressed interest by patients in mammography, use of postmenopausal hormone replacement therapy, and having had dysplasia on a previous mammogram. It also contained a 14-item risk-preference survey.<sup>28</sup> The second survey did not contain the demographic or risk-preference questions but did repeat some of the other questions and additionally inquired about policies for women aged 70 to 80 years and any policy or practice changes during the course of the study. A final, brief survey was mailed to all participants at the end of the study asking them to estimate the proportions of their patients in each age range whom they had screened in the previous 2 years and the proportions of visits made primarily for prevention or health maintenance by patients in these age groups.

rated mammography as important were more than 3 times as likely to recommend mammography as those assigning it a low importance rating, but only about 15% of the patients overall received a recommendation.<sup>22</sup>

In areas other than preventive services, there have been mixed findings about the usefulness of self-reported activity. Epstein and McNeil<sup>23</sup> found physicians' policies for test-ordering behavior to be strongly correlated with their behavior. Lomas et al<sup>24</sup> found that, following the release of a consensus statement advocating a reduction in the performance of cesarean sections, many physicians reported they had reduced their rates but no appreciable change had actually occurred. Policy modeling using responses to case scenarios varying cer-

tain key factors is frequently performed based on findings suggesting that these policy models are more predictive of what people will actually do than direct statements of policy.<sup>25</sup> However, the literature about whether such derived policy models do reflect actual practice is mixed.<sup>26</sup>

Given the potential benefits of extending mammography to all eligible women and the reported importance of physicians in determining whether a woman gets a mammogram, an inexpensive yet valid means of assessing physician performance in recommending mammography would be useful. We examined whether such an inexpensive measure can be found.

## PATIENT DATA

Patients were selected on the basis of having made an office visit to a participating physician in either of two 2-month periods during 1992 to 1993. The 2-month periods were different for each physician depending on their date of enrollment in the study, but for each physician the 2 periods were 5 months apart. Medical records were selected for abstraction until either sufficient medical records had been abstracted to yield 11 patients aged 40 to 49 years and 11 patients aged 50 to 80 years who were eligible but not up-to-date for mammography, or 100 medical records had been abstracted in each time period. Patients were excluded if they were not in the specified age ranges, not regular patients of the study physician (at least 2 visits in a 2-year period and at least 50% of the visits being with the study physician), had a history of breast cancer, or had serious comorbid conditions making screening mammography at least arguably inappropriate (eg, congestive heart failure, a nonbreast malignant neoplasm not in remission for at least 5 years, or chronic obstructive pulmonary disease requiring continuous oxygen therapy). Any evidence in the medical record of performance of a mammogram was accepted, such as a mammogram report or comments regarding results of a mammogram, as was documented refusal to obtain a mammogram. Accuracy of medical records abstraction was tested by having our lead abstractor, who had participated in the design and piloting of the abstraction documents and the training of the other abstractors, reabstract a sample of each abstractor's medical records in a blinded fashion. Approximately 5% of all medical records were reabstracted. Across all items of the abstraction document, the  $\kappa$  statistics<sup>29</sup> for the abstractors ranged from 0.74 to 0.90, with a mean of 0.83.

## STATISTICAL ANALYSIS

The goal of the analysis was to determine which of the potential predictors were useful in predicting actual screening behavior. The unit of analysis was the physician and the outcome measure was the proportion of eligible sampled women who had received a screening mammogram in the previous 2 years. Separate analyses were performed for women aged 40 to 49 and 50 to 80 years, owing to the different recommendations for mammography for women in these age groups. Analyses using either mammography within the past year or within each physician's stated interval for rescreening low-risk women yielded similar results and are not reported. Mammograms

ordered for diagnostic rather than screening purposes, including mammograms ordered to follow up a previous abnormality, were not considered to be screening mammograms (ie, a patient undergoing such a mammogram was excluded from the numerator and denominator unless the patient had also received a screening mammogram in the 2-year period). We age-adjusted each physician's results to match the overall age distribution of the patients. Younger patients were divided into 5 age strata at 2-year intervals and older patients were divided into 6 age strata at 5-year intervals. We performed an arcsine square root transformation on these age-adjusted proportions for variance stabilization.<sup>30</sup> However, significance estimates were only minimally altered by this transformation and regression results will be reported using untransformed proportions to make the coefficients more interpretable.

For each of the 2 patient age groups, 4 measures derived from case scenario responses in that age range were tested for their predictive value. These 4 measures were the mean strength of the recommendation to have a mammogram and the mean recommended interval of time until the next mammogram for cases with history of breast cancer in a first-degree relative and for those with no family history of breast cancer. In addition, using case scenario responses for each of the 2 patient age groups, physicians were clustered in 2 ways on the basis of their mean strength recommendation and their mean rescreening interval. Cluster analyses of physician responses to case scenarios were carried out using the Ward method with squared euclidean distance as the metric.<sup>31</sup>

To reduce the probability of reporting a spurious correlation owing to screening many predictors, we used a split-half design and required variables to be significant at  $P < .05$  in both halves. Bivariate associations were tested with Student  $t$  tests, Pearson product moment correlations, or Spearman rank correlations as appropriate to the predictor. The 2 predictors that we had reason to believe a priori should be significant (estimated proportion of patients screened and estimated proportion of visits scheduled for health maintenance) were not subjected to this split-half test; only significance at  $P < .05$  using the entire sample was required for them to be considered significant. Significant factors were used as potential predictors in stepwise linear regressions. Categorical variables were recoded as dummy variables in the regressions, with significance assessed by an  $F$  test for the entry of the entire group of dummy variables. For consistency, all measures of association reported herein will be for the entire population of physicians.

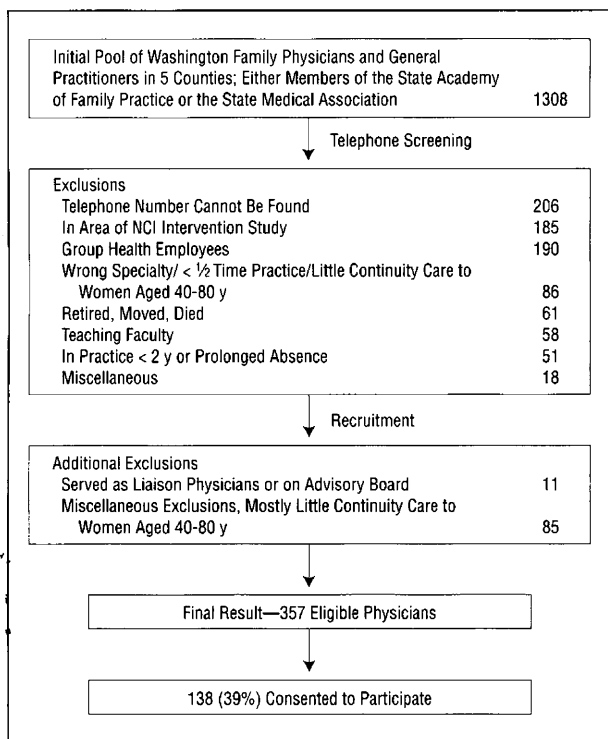
## RESULTS

Medical record abstraction data were available for 132 physicians. Of the 6272 younger patients abstracted, 4300 (69%) met the criteria for inclusion in our study specified previously; 5258 (68%) of the 7726 older patients abstracted also met these criteria. The mean number of younger patients included per practice was 33 (range, 3-65) and the mean for older patients was 40 (range, 2-85).

Participating physicians were a mean ( $\pm$ SD) of 46 ( $\pm$ 10) years of age and had been in practice for 17 ( $\pm$ 10) years. Twenty-eight percent were women. Further information about their practice settings and a summary

of their mammography policies are summarized in **Table 1**. A mean ( $\pm$ SD) of 50% ( $\pm$ 17%) of eligible younger patients in each of the practices had received a screening mammogram in the past year (range, 10%-84%). For older women, the corresponding figures were 65% ( $\pm$ 16%) (range, 14%-98%).

The predictors meeting our criteria for bivariate significance are listed in **Table 2**. For younger patients, both of the predictors about which we had a priori hypotheses—estimated proportion of patients screened and estimated proportion of visits scheduled for health maintenance—were significantly, though modestly, correlated with actual performance. There were 2 other significant predictors: physician sex and practice configuration.



**Figure 1.** Physician recruitment process. NCI indicates National Cancer Institute.

The percentage of younger patients screened using mammography was greater for female physicians (60%) than for male physicians (46%). Screening also increased with the complexity of the practice configuration—43% for physicians in solo practice, 50% for physicians in a single-specialty group, and 57% for physicians in a multispecialty group.

For older patients, there were 3 significant predictors: sex, estimated proportion of patients with Medicare, and one measure derived from case scenario responses (the mean rescreening interval for women aged 50 to 80 years with a first-degree relative having breast cancer). As for younger patients, the percentage of patients screened was greater for female physicians (73%) than for male physicians (62%). Also, physicians' estimates of the proportion of Medicare patients in their practice were negatively related to screening rates for older patients. We computed the correlation between these estimates and the proportions of sampled patients in the physicians' practices who were at least 65 years of age. This correlation was highly significant ( $r=0.57$ ,  $P<.001$ ), indicating that physicians' estimates were reasonably accurate. Finally, for the case scenario-derived variable, shorter rescreening intervals were associated with higher screening rates.

In the aggregate, physicians' predictions of the percentage of patients who had received a mammogram within the previous 2 years were slightly high for younger patients (mean predicted percentage, 56%; mean actual percentage, 50%) and older patients (mean predicted percentage, 71%; mean actual percentage, 64%). However, this near-concordance disappeared when the data were analyzed at the level of the individual physician. For younger patients, these predictions were modestly, though

**Table 1. Descriptors of Physicians and Their Mammography Policies**

| Factor  | No. (%) of Patients |
|---|---------------------|
| <b>Physicians and practice characteristics</b>                |                     |
| Board certified   | 105 (80)            |
| <b>Practice configuration</b>                                 |                     |
| Solo  | 34 (26)             |
| Single-specialty group  | 69 (53)             |
| Multispecialty group  | 27 (21)             |
| In private practice   | 118 (89)            |
| Have diagnosed breast cancer in practice                      | 125 (95)            |
| Have checklist or flowsheet for mammography prompting         | 53 (41)             |
| Have system separate from chart to track preventive services  | 89 (67)             |
| <b>Mammography policies</b>                                   |                     |
| Frequency of mammograms, women aged 40-49 y                   |                     |
| Every year  | 20 (15)             |
| More than every 1 to every 2 y                                | 99 (72)             |
| More than every 2 y   | 19 (14)             |
| Frequency of mammograms, women aged 50-80 y                   |                     |
| Every year  | 103 (75)            |
| More than every 1 to every 2 y                                | 32 (22)             |
| More than every 2 y   | 3 (2)               |
| Frequency of clinical breast examinations, women aged 40-49 y |                     |
| Do not routinely do   | 1 (1)               |
| Every year  | 99 (79)             |
| Every 2 y   | 25 (20)             |
| Frequency of clinical breast examinations, women aged 50-80 y |                     |
| Every year  | 120 (94)            |
| Every 2 y   | 8 (6)               |
| Routinely screen women aged                                   |                     |
| >80 y   | 102 (80)            |
| <40 y with no risk factors                                    | 60 (46)             |
| <40 y with risk factors                                       | 119 (92)            |

significantly, predictive of screening rates; for older patients, there was no significant correlation (**Figure 2**).

We next studied how well we could predict physicians' screening behavior with these predictors (**Table 3**). For younger patients, 3 of the 4 variables remained significant, with the estimated proportion of visits for health maintenance dropping out. The adjusted  $R^2$  of the resulting model was 0.25. For older women, all 3 variables were significant ( $R^2$  [adjusted]=0.21).

Finally, to determine the "best" that could be done to predict behavior with our data, we carried out stepwise regressions using all predictors significant bivariate at  $P<.05$  without splitting the sample. For younger women, the resulting model contained 4 predictors: sex, practice configuration, estimated proportion of patients with Medicaid, and cluster membership based on recommended interval to next mammogram in case scenario responses for women aged 40 to 49 years ( $R^2$  [adjusted]=0.35). For older women, the model contained 5 predictors: sex, proportion of patients with Medicare, estimated cost of a mammogram, a belief that lack of insurance coverage was an important barrier to mammography, and the mean recom-

**Table 2. Significant Predictors of Physicians' Mammography Screening Rates**

| Predictor  | Correlation Coefficient* | P     |
|--|--------------------------|-------|
| Women aged 40-49 y   |                          |       |
| Estimated proportion   |                          |       |
| Of women screened  | 0.23                     | .012  |
| Of visits for health maintenance                                 | 0.26                     | .004  |
| Physician sex  | 0.36                     | <.001 |
| Practice configuration   | 0.29                     | .004  |
| Women aged 50-80 y   |                          |       |
| Physician sex  | 0.35                     | <.001 |
| Estimated proportion of Medicare-eligible patients               | -0.29                    | .001  |
| Rescreening interval with breast cancer in first-degree relative | -0.27                    | .002  |

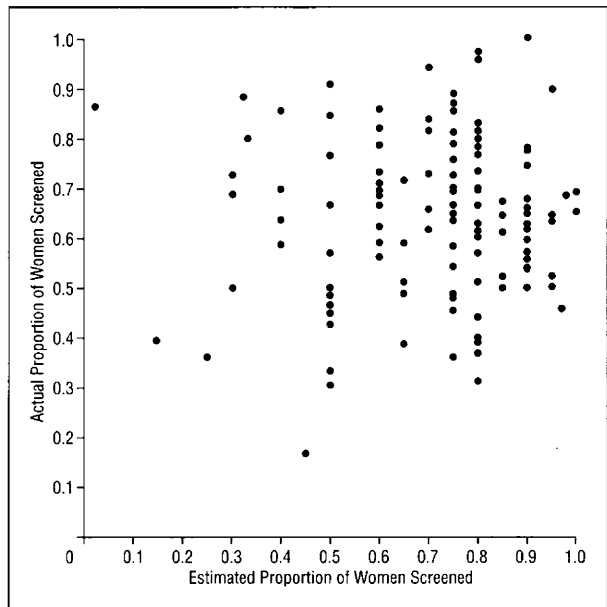
\* Pearson correlation coefficient except multiple correlation coefficient for practice configuration, which was dummy coded for solo, single-specialty group, and multispecialty group.

mended interval to next mammogram in case scenarios of women aged 50 to 80 years who had no family history of breast cancer ( $R^2$  [adjusted]=0.32).

### COMMENT

Overall, we found that sizable proportions of eligible women had been screened, consistent with recent findings on the use of mammography in Washington State.<sup>3</sup> However, we were unable to find any predictors or combination of predictors explaining enough of the variation among physicians to serve as a useful estimator of physician performance. In particular, physician self-report had little or no validity, confirming the findings of Montano and Phillips.<sup>20</sup> This is especially troubling as self-report is so widely used as a surrogate measure of physician performance.

It is less surprising that demographics, practice descriptors, risk-preference measures, and stated importance of various factors had such modest predictive value. The general lack of predictive power of the policy information derived from the case scenarios is consistent with some of the previous results for this technique and could result from either physicians' elicited policies (to virtually always recommend screening mammography), not reflecting their true policies, or from the cases not accurately modeling the situations in which physicians actually decide whether to recommend mammography.<sup>26</sup> It was expected that female physicians would screen higher proportions of their patients given that mammography is a women's health care issue and one female physicians must personally face. The higher proportions of younger women screened as the practice configuration increased in complexity could come from larger organizations being more likely to have guidelines encouraging mammography use, programs independent of the physicians for this, or both, but it is unclear why this should not also have been true for older women. It does not seem likely to be owing to the greater availability of on-site mammography in larger clinics as distance to the nearest mammography unit did not predict performance.



**Figure 2.** Scatterplot of estimated vs actual proportions of female patients aged 50 to 80 years having a screening mammogram within the previous 2 years.

**Table 3. Regression Results Predicting the Proportion of Physicians' Patients Screened in the Past 2 Years**

| Predictor (Reference Category)   | B* (SE)         | P†    |
|--|-----------------|-------|
| Women aged 40-49 y   |                 |       |
| Sex (female)   | .133 (.03)      | .0000 |
| Estimated proportion of patients screened in past 2 y                                  | .0015 (.00053)  | .005  |
| Practice configuration   |                 |       |
| Solo   | — (—)           | .002  |
| Single-specialty group   | .066 (.032)     | .043  |
| Multispecialty group   | .143 (.038)     | .0003 |
| Constant   | .575 (.066)     | .0000 |
| Women aged 50-80 y   |                 |       |
| Sex (female)   | .094 (.028)     | .001  |
| Estimated proportion of patients with Medicare   | -.0024 (.00091) | .01   |
| Interval to next mammogram for women having a first-degree relative with breast cancer | -.25 (.077)     | .002  |
| Constant   | 1.35 (0.16)     | .0000 |

\* Unstandardized regression coefficient.

† By F test (for removal) for practice configuration and Student t test for all other variables.

While physicians' policies were to strongly recommend mammography (mean strength of recommendation on a 7-point scale, 6.34 for women aged 40-49 years and 6.31 for women aged 50-80 years), they were a bit more circumspect when asked to directly estimate the proportions of their patients screened within the past 2 years. The actual mean screening rates were only slightly lower than the estimated mean rates, but the estimates had little to no correlation with actual performance.

What reasons could there be for this poor correspondence between policies, estimates, and actual practice? The policy measures suggest that the physicians did, in fact, intend to screen most or all of their female pa-

tients, but their estimates of practice suggest that they were aware that their policies were not always translated into practice. This could occur because they were not always triggered to raise the issue or because other, more immediate, problems kept pushing mammography off the agenda for any particular visit. Patient preferences and noncompliance undoubtedly explain some of this discrepancy as well, although we considered a documented refusal to have a mammogram as equivalent to having had one. For physicians who have strongly endorsed a policy, barriers and enabling factors rather than their policies probably become the major determinants of their actions.

We cannot be certain how generalizable these findings are. While our response rate for physicians was only 39%, one might expect that volunteers would be more, not less, likely to accurately estimate their behaviors. For cases in which there are wide policy disagreements, it seems likely that policy measures will be more strongly related to actual performance,<sup>22,23</sup> even if poorly calibrated, because those who do not believe in something will be unlikely to do it while those who do believe in it will be more likely to do it. Hence, better correspondence might be expected if there are geographic areas in which physicians less overwhelmingly endorse the use of screening mammography.

In the future, the use of physician survey data as surrogate measures of actual performance, particularly for preventive services, should be accompanied by efforts to validate these measures with data about actual performance at the individual physician level. For individual physicians, our findings reemphasize the importance of measuring actual performance for quality assurance because they may not know what they really do.

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