For much of modern history, physicians have made decisions about patient care by consulting their peers and by using rule-based approaches. Specialists have been consulted throughout history and became a necessity in the 1800s, as medicine became more complex. To reduce the need for consulting specialists for routine decision-making and to increase the likelihood that evidence-based medicine will be practiced, rule-based approaches have been developed.

Background: In many situations, evidence-based guidelines cannot provide definitive guidance on the appropriateness of diagnostic catheterization. One specialty benefit management company has taken a 2-step approach to address this ambiguity by evaluating the appropriateness of diagnostic catheterization orders using a rule-based decision support system, and then having reviewers provide input through the consult system of a non denial prior authorization program that involves peer discussion.

Objective: To describe the outcomes of a 2-step approach to evaluating the appropriateness of elective diagnostic catheterization orders.

Method: This program evaluation used data from elective diagnostic catheterization orders from 2015 that pertained to 1 health insurer’s Medicare Advantage plans. The classifications of orders by the rule-based system and the approval rates after review by the consult system are presented for these plans. Chi-square tests were conducted to examine whether classifications of the orders by the rule-based and consult systems were independent of plan type, specialty of the ordering physician, or state of residence of the patient.

Results: A total of 3808 orders for elective diagnostic catheterization in 2015 met the inclusion criteria. Inadequate initial justification was provided for 699 (18.4%) of the orders; after inquiry through the consult system, 509 (72.8%) of the remaining orders were approved. Among the 344 (9%) orders that were deemed potentially nonindicated according to the rule-based system, the consult system approved 298 (86.6%). Of the 2765 (72.6%) orders that were deemed potentially appropriate by the rule-based system, the consult system approved 2740 (99.1%). Chi-square tests did not show a significant association between plan type or physician specialty and the classification produced by the rule-based system or the consult system. The patients’ state of residence was significantly associated with the classification of orders for the rule-based system ($P < .001$), but not for the consult system.

Conclusion: Rule-based decision support can be combined with consult-based peer discussion to determine whether care is appropriate when guidelines are ambiguous. Poorly justified orders are often supportable after gathering information on the patient’s presentation.

Key Words: cardiac catheterization, decision support systems, prior authorization, rule systems, specialty benefit management
decision support systems have been used since the 1970s to help physicians make healthcare-related decisions.

To facilitate the practice of evidence-based medicine, multiple professional societies have established appropriateness criteria, which are rule-based algorithms for systematically assessing whether medical care is likely to be appropriate, inappropriate, or of uncertain appropriateness. The American College of Cardiology (ACC) established the ACC Foundation Appropriateness Criteria Working Group in 2005 to characterize the indications for which diagnostic studies are likely to affect a patient’s care in a positive way. Appropriateness criteria have been introduced by the ACC for many diagnostic modalities, including diagnostic catheterization, single-photon emission computed tomography (CT), cardiac magnetic resonance imaging, cardiac CT, cardiac radionuclide imaging, echocardiography, and stress echocardiography. As a byproduct of these efforts, decision support tools have been established to foster evidence-based care.

The lack of definitive guidance regarding appropriate use criteria is acknowledged within the preface to the ACC appropriate use criteria for diagnostic catheterization. Research on the use of decision support to assist physicians in ordering noninvasive imaging for suspected coronary artery disease has revealed that a substantial portion of orders cannot be addressed by appropriate use criteria. Uncertainty in appropriate use has also been shown to be a concern in an evaluation of coronary CT angiography orders.

Despite the existence of evidence-based guidelines, wide variation exists in actual clinical practice. Furthermore, substantial regional variation in diagnostic practices has been documented. To address this issue, prior authorization programs have been used to ensure that medical care is consistent with evidence-based practices. The prior authorization process requires ordering physicians to seek permission before delivering care and creates an opportunity for outside parties to deliver messages on evidence-based care.

The prior authorization program that is the subject of this study operates on a nondenial basis, as it modifies utilization by educating physicians rather than by restricting their activities. This educational approach has been shown to be more effective at reducing imaging utilization than a prior authorization program using denials. A study examining neuroimaging orders that were changed as a result of the program found that in more than 99% of the cases examined, the ordering physician did not request again the original order within 1 month after agreeing to change it. These findings suggest that the nondenial approach may be effective in managing utilization and that changes recommended by the program largely met the clinical needs.

KEY POINTS

- A significant portion of diagnostic catheterization orders are not addressed by the current appropriate use criteria, and there is substantial variation in physicians’ diagnostic practices.
- This study describes a 2-step approach to nondenial prior authorization used for evaluating the appropriateness of elective outpatient diagnostic catheterization orders.
- The consult system ensures that patients receive appropriate diagnostic tests, and the rule-based decision support system helps to triage orders so peer consults can be used judiciously.
- Overall, 3808 orders meeting inclusion criteria for patients with Medicare Advantage health plans were reviewed by the program.
- Of the 344 orders that were deemed potentially nonindicated by the rule-based system, the consult system approved 298 (86.6%).
- And of the 699 orders deemed to have inadequate initial justification by the rule-based system, the consult system approved 509 (72.8%).
- No significant association was found between the plan type or physician specialty and the classification produced by rule-based and consult-based systems.
- When guidelines are unclear, rule- and consult-based decision support can be used to determine the appropriateness of care.

Ensuring that patients are appropriately selected for cardiovascular diagnostics is one means for improving the quality of care. Our study examines the outcomes of a specialty benefit management company’s 2-stage approach toward ensuring appropriate selection through prior authorization. The company uses a rule-based decision support system to identify orders that are potentially appropriate and thus can be subjected to less-intensive review, and then has all the orders manually reviewed by its consult process. At minimum, every order is reviewed by a customer service representative. When needed, the consult process has nurses and physicians review the orders as well. When orders are not clearly appropriate after review by a customer service representative, nurse, and physician, the ordering physician is contacted and then engaged in a physician-led peer-to-peer consult.

This program evaluation is focused on orders for outpatient diagnostic catheterizations, because catheterization has the potential to cause harm. Diagnostic cardiac
catheterizations have been reported to have a complication rate ranging from 1.35% to 1.5%.\textsuperscript{15,16} Between 1993 and 2001, cardiac catheterization utilization increased by nearly 70%, a substantial change that cannot be explained by shifts in disease prevalence.\textsuperscript{17} Although the 2012 ACC appropriate use criteria might have changed practice patterns since then, there remains a wide range of circumstances in which the criteria are not able to provide definitive guidance regarding whether catheterization is appropriate.\textsuperscript{8}

Our study reports how the rule-based and consult-based components of a non denial prior authorization program were used to evaluate the appropriateness of diagnostic catheterization orders. Previous research has found that the impact of decision support systems on the ordering of radiologic procedures differed by physician specialty.\textsuperscript{18} Therefore, the analysis was stratified by the specialty of the ordering physician. State-based variation was explored in our study, because evidence shows that state-level differences exist in practice patterns.\textsuperscript{11} Variation between health maintenance organization (HMO) and preferred provider organization (PPO) utilization was also explored in our study, because variances have been found in previous analyses of data from the health plan studied.\textsuperscript{19}

**Method**

This program evaluation examined how orders for outpatient elective diagnostic cardiac catheterization were processed by a specialty benefit management company simultaneously using a rule-based and a consult-based system for evaluating orders. Prior authorization outcomes from the consult system were grouped according to the preliminary determination from the rule-based system. Additional subanalyses were performed to examine the impact of patient location and the ordering physician’s specialty on rule-based and consult-based system outcomes.

**Program**

**The rule-based decision support system.** To efficiently process orders, the prior authorization program uses a rule-based approach for making the preliminary determination of whether orders are potentially appropriate, potentially nonindicated, or inadequately justified. Ordering physicians provide supporting rationale for their orders to the non denial prior authorization program by selecting a series of criteria for justifying the order. The criteria may be selected on the specialty benefit management company’s website or by speaking with a customer service representative.

The criteria selections are then compared with a set of rules that have been defined by the specialty benefit management company using the scientific literature and expert consensus on good clinical practice. The sequence of responses submitted with an order may trigger a rule suggesting that medical care is either potentially appropriate or potentially nonindicated. Conversely, orders may trigger neither type of rule, and may thus appear to be inadequately justified. Regardless of the outcome of the rule-based system, all orders are sent to the consult system.

**The consult system.** The prior authorization program operates a 3-tier model for performing consults on orders. All cardiac catheterization orders are initially reviewed by a customer service representative for information that might have been input improperly during the initial ordering process, which enhances the rate of immediate approvals. Although the consult system is used for every order, the vast majority of the orders deemed potentially appropriate by the rule-based system are approved by the customer service representative. If the customer service representative is unable to approve an order on the basis of the information initially provided, he or she refers the order to a nurse reviewer for further inspection. If the nurse reviewer is unable to obtain the necessary information to justify the order, or if a potential concern exists about the order, the order is passed to a consult physician for review.

If the consult physician cannot approve the order without further information, the consult physician engages in a peer-to-peer dialogue with the ordering physician that is centered on education, quality improvement, and understanding why the order was made. The discussion provides the consult physician with greater detail on the patient’s clinical situation and fills gaps that may exist in the information provided during the ordering process. The discussion is also intended to provide the ordering physician with the training necessary to make guidelines-based orders in the future and to work with the ordering physician through the process of interpreting the guidelines in the context of the current patient.

Unlike a system that provides immediate, automated feedback in cases of nonapproval, the discussion process enables prior authorization to consider the intricacies of the patient’s situation. Because the prior authorization program operates under a non denial model, the only requirement that the ordering physician must fulfill to receive approval is to engage in an educational peer-to-peer discussion with a physician contracted with the specialty benefit manager.

The peer-to-peer discussion has 5 potential outcomes. If the ordering physician (1) does not respond to the request for the meeting within 2 business days, authorization is not issued (ie, a no call back). If the meeting occurs, the ordering physician and consult physician may (2) reach a consensus that diagnostic catheterization is appropriate, (3) agree that a different study is appropriate,
Sample Selection

HealthHelp, the specialty benefit manager operating the nondenial prior authorization program studied, obtained a sample of all orders for elective diagnostic catheterization made during 2015 that pertained to the Medicare Advantage membership of Humana Inc., a healthcare company that provides medical and pharmacy benefit plans nationally. Exclusions were made for orders that pertained to individuals with health plans that used risk arrangements other than traditional full insurance (such as administrative services only) and for orders that pertained to individuals with health plans that were not an HMO or a PPO plan (such as private fee for service).

Measurement and Analysis

Each order had 3 possible outcomes from the rule-based decision support system and 5 possible outcomes from the consult system. The number of orders receiving each of the 15 potential combinations of the rule and consult outcomes were counted. The consult system outcomes were then consolidated into 2 groups—“approved” and “other outcome.” The consults that resulted in no call back, a change in the order, withdrawal of the order, or no consensus were included in the “other outcome” category to indicate that the consult process did not lead to a straightforward approval.

The frequencies of outcomes were arranged hierarchically, with the frequency of each consult outcome being grouped according to the initial outcome from the rule-based decision support system. Outcomes were then categorized according to whether they pertained to individuals with HMO or PPO plans, whether they pertained to orders placed by cardiologists or by noncardiologists, and by the state in which the patient resided. Chi-square tests were conducted to examine whether the classification of the order by the rule-based and consult systems were independent of the plan type, physician specialty, or state of residence.

Results

As shown in the Figure, the prior authorization program processed 4102 orders for elective outpatient diagnostic catheterization pertaining to patients with Medicare Advantage insurance from the national health insurance company in 2015. After exclusions were made, the study sample consisted of 3808 orders. Among these orders, 1254 (32.9%) came from individuals with an HMO plan and 2554 (67.1%) came from individuals with a PPO plan. The majority (2918; 76.6%) of the orders were made by cardiologists. Although the patients were dispersed nationally, 41.8% of the orders were from patients residing in 5 states, including Texas (10.7%), Louisiana (9.4%), Ohio (7.7%), Kentucky (7.6%), and Florida (6.4%). The remaining 58.2% of the orders involved patients from 38 additional states.

As shown in Table 1, 72.6% of the orders overall were deemed potentially appropriate by the rule-based decision support system. Of the orders deemed potentially appropriate, less than 1% did not receive final approval by the consult system. Most of the orders originally deemed to be nonindicated or inadequately justified were eventually approved by the consult system, but a substantial proportion, especially among the potentially nonindicated orders, were not approved. Overall, only

Figure Participant Flow Diagram

<table>
<thead>
<tr>
<th>2015 Medicare Advantage elective diagnostic catheterization orders</th>
<th>N = 4102</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully insured patient orders</td>
<td>N = 4063</td>
</tr>
<tr>
<td>HMO or PPO patient orders</td>
<td>N = 3808</td>
</tr>
<tr>
<td>Non-HMO or non-PPO patient orders</td>
<td>N = 255</td>
</tr>
<tr>
<td>Other arrangement patient orders</td>
<td>N = 39</td>
</tr>
</tbody>
</table>

HMO indicates health maintenance organization; PPO, preferred provider organization.

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The rule and consult determinations were stratified by plan type (Table 1), physician specialty (Table 2), and the patient's state of residence (Table 3). Chi-square tests did not show a significant association between plan type \((P = .18)\) or physician's specialty \((P = .89)\) and whether an order was classified by the rule-based system as potentially appropriate, potentially nonindicated, or having inadequate initial justification. However, a significant association was found between the classification of the order by the rule-based system and the patient's state of residence \((P < .001)\). Chi-square tests also did not show a significant association between the determination of the consult and the plan type \((P = .10)\), the physician's specialty \((P = .57)\), or the patient's state of residence \((P = .73)\).

**Discussion**

Overall, the orders that were deemed potentially appropriate by the rule-based system were the most likely to be approved by reviewers, and the orders that were deemed to have inadequate initial justification were the least likely to be approved by reviewers. Although 27.4% of the overall orders were not designated as potentially appropriate by the rule-based system, only 6.9% of the total orders were not explicitly approved by the consult system. These findings suggest that if the prior authorization program did not implement a consult system or a nonenrollment model, a substantial number of patients who needed diagnostic catheterizations might not have received them.

Because rule-based appropriateness determinations can be made with minimal cost, and consult-based appropriateness determinations can require expensive physician time, the combination approach enables peer consults to be used judiciously. The ambiguity in the guidelines for diagnostic catheterization forces purely rule-based prior authorization programs to take a laissez-faire approach, with a greater number of patients receiving unnecessary catheterizations, or a conservative approach, with a greater number of patients not receiving the necessary catheterizations. By implementing a combination approach, the prior authorization program examined is conservative, while enabling patients to receive needed care.

A total of 72.6% of orders were deemed potentially appropriate by the rule-based system in 2015, which differs from the finding of a previous study that 35.3% of orders in 2010 and 2011 within New York State's Cardiac Diagnostic Catheterization Database were rated as appropriate.\(^2\) Several plausible reasons exist for this discrepancy, including that the New York study used data that preceded the publication of the ACC appropriate use criteria, and that the present study used a proprietary set of criteria that differed from those used by the New York study.\(^8\) Furthermore, because the consult process used by the prior authorization program has an educational focus, one would expect that physicians learn to order more appropriately over the years that the process has been in place.

The general directional finding that the prior authorization program was more likely to approve orders that were deemed potentially appropriate by rule-based criteria and less likely to approve other orders is consistent with previous research suggesting that the New York study used data that preceded the publication of the ACC appropriate use criteria, and that the present study used a proprietary set of criteria that differed from those used by the New York study.\(^8\) Furthermore, because the consult process used by the prior authorization program has an educational focus, one would expect that physicians learn to order more appropriately over the years that the process has been in place.

The rule and consult determinations were stratified by plan type (Table 1), physician specialty (Table 2), and the patient's state of residence (Table 3). Chi-square tests did not show a significant association between plan type \((P = .18)\) or physician's specialty \((P = .89)\) and whether an order was classified by the rule-based system as potentially appropriate, potentially nonindicated, or having inadequate initial justification. However, a significant association was found between the classification of the order by the rule-based system and the patient's state of residence \((P < .001)\). Chi-square tests also did not show a significant association between the determination of the consult and the plan type \((P = .10)\), the physician's specialty \((P = .57)\), or the patient's state of residence \((P = .73)\).

---

**Table 1** Rule and Consult Determinations, by Plan

<table>
<thead>
<tr>
<th>Rule or consult determinations</th>
<th>HMO, N (%)</th>
<th>PPO, N (%)</th>
<th>Total, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule determination: potentially appropriate(^a)</td>
<td>920 (73.4)</td>
<td>1845 (72.2)</td>
<td>2765 (72.6)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>906 (98.5)</td>
<td>1834 (99.4)</td>
<td>2740 (99.1)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^a)</td>
<td>14 (1.5)</td>
<td>11 (0.6)</td>
<td>25 (0.9)</td>
</tr>
<tr>
<td>Rule determination: inadequately nonindicated(^a)</td>
<td>98 (7.8)</td>
<td>246 (9.6)</td>
<td>344 (9.0)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>84 (85.7)</td>
<td>214 (87.0)</td>
<td>298 (86.6)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^a)</td>
<td>14 (14.3)</td>
<td>32 (13.0)</td>
<td>46 (13.4)</td>
</tr>
<tr>
<td>Rule determination: potentially inappropriate (^a)</td>
<td>2765 (72.6)</td>
<td>2765 (72.6)</td>
<td>2765 (72.6)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>906 (98.5)</td>
<td>1834 (99.4)</td>
<td>2740 (99.1)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^a)</td>
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<td>11 (0.6)</td>
<td>25 (0.9)</td>
</tr>
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</tr>
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</tr>
<tr>
<td>Consult determination: other outcome(^a)</td>
<td>14 (14.3)</td>
<td>32 (13.0)</td>
<td>46 (13.4)</td>
</tr>
</tbody>
</table>

\(^a\)Percentages in the rule determination rows represent the percentage of catheterization orders with a given rule determination, and are organized by plan type. In contrast, percentages in the consult determination rows represent the percentage of catheterization orders with a given consult determination, of all the consults with the designated rule determination and plan type.

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**Table 2** Rule and Consult Determinations, by Ordering Physician’s Specialty

<table>
<thead>
<tr>
<th>Rule or consult determinations</th>
<th>Cardiology, N (%)</th>
<th>Noncardiology, N (%)</th>
<th>Total, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule determination: potentially appropriate(^a)</td>
<td>2118 (72.6)</td>
<td>647 (72.7)</td>
<td>2765 (72.6)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>2099 (99.1)</td>
<td>Majority</td>
<td>2740 (99.1)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^a)</td>
<td>19 (0.9)</td>
<td>&lt;10(^b)</td>
<td>25 (0.9)</td>
</tr>
<tr>
<td>Rule determination: inadequately nonindicated(^a)</td>
<td>267 (9.2)</td>
<td>77 (8.7)</td>
<td>344 (9.0)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>230 (86.1)</td>
<td>Majority</td>
<td>296 (86.6)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^a)</td>
<td>37 (13.9)</td>
<td>&lt;10(^b)</td>
<td>46 (13.4)</td>
</tr>
<tr>
<td>Rule determination: potentially inappropriate (^a)</td>
<td>533 (18.3)</td>
<td>166 (18.7)</td>
<td>699 (18.4)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>383 (71.9)</td>
<td>126 (75.9)</td>
<td>509 (72.8)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^a)</td>
<td>150 (28.1)</td>
<td>40 (24.1)</td>
<td>190 (27.2)</td>
</tr>
</tbody>
</table>

\(^a\)Percentages in the rule determination rows represent the percentage of catheterization orders with a given rule determination, and are organized by plan type. In contrast, percentages in the consult determination rows represent the percentage of catheterization orders with a given consult determination, of all the consults with the designated rule determination and plan type.

\(^b\)Other outcome indicates the consult led to no call back, a change in the order, withdrawal of the order, or no consensus; a catheterization is authorized when there is no consensus, but not in the other 4 scenarios.

---

261 (6.9%) of the 3808 orders were not approved by the consult system.

The rule and consult determinations were stratified by plan type (Table 1), physician specialty (Table 2), and the patient’s state of residence (Table 3). Chi-square tests did not show a significant association between plan type \((P = .18)\) or physician’s specialty \((P = .89)\) and whether an order was classified by the rule-based system as potentially appropriate, potentially nonindicated, or having inadequate initial justification. However, a significant association was found between the classification of the order by the rule-based system and the patient’s state of residence \((P < .001)\). Chi-square tests also did not show a significant association between the determination of the consult and the plan type \((P = .10)\), the physician’s specialty \((P = .57)\), or the patient’s state of residence \((P = .73)\).
with the medical literature. A study examining the concurrence between the classification of transthoracic echocardiographs using the 2007 and 2010 ACC appropriate use criteria and the precertification decisions made by 2 radiology benefit managers found general concordance.\cite{22} The 2 radiology benefit managers preauthorized the majority of orders that met the 2007 or 2010 ACC appropriate use criteria, and they did not preauthorize the majority of orders that were deemed inappropriate by those criteria.\cite{21}

Nonetheless, multiple studies have shown that decision support tools are unable to ascertain the appropriateness of a substantial portion of orders for diagnostics.\cite{9,10} UnitedHealthcare ran a prospective multicenter cohort study in which physicians ordering noninvasive imaging for suspected coronary artery disease were required to go through a decision support tool instead of prior authorization.\cite{9} The researchers found that of 472 tests in the study, 20% of orders were of uncertain appropriateness and 11% were not addressed by the appropriate use criteria.\cite{9} In a second study, the appropriateness of 251 patients’ coronary CT angiography orders made by an academic medical center in 2007 were evaluated; 10% were deemed to have uncertain appropriateness and 46% were not classifiable.\cite{10}

In contrast to these studies, the rule-based system in the present study determined that 9.0% of orders were potentially nonindicated and 18.4% of orders had inadequate initial justification, which is a slightly lower rate of inappropriateness and ambiguity (Table 2). Although some of the difference may be because the orders were for different indications in each of the studies, another possibility is that the educational consult process used by the prior authorization program increased the quality of the orders.

The lack of a significant difference in the appropriateness of orders between cardiologists and noncardiologists is consistent with the literature in the field of radiology. Previous research has found no evidence that the appropriateness of single-photon emission CT orders varies by physician specialty.\cite{23} Although one study has shown that a decision support system for radiology had a greater impact on the appropriateness of orders by some specialties immediately after implementation, the relative rate of appropriateness by specialty in the years after implementation was not reported by the study.\cite{18}

The interstate variation in physician ordering behavior shown in the present study is consistent with the findings that the Dartmouth Atlas Project has been demonstrating for more than a decade.\cite{24} Because physicians learn practice behaviors during their residencies and tend to continue their practices near where they were trained, geographic practice pattern variations persist. Nondenial prior authorization has the potential to provide physicians with supplemental educational materials that may shift ordering behaviors. Nonetheless, in the case of diagnostic catheterization, some state variation has persisted.

### Limitations
This study has several limitations that affect the degree to which the findings of this study can be compared with others. The findings of this study represent the program at a steady state, and thus conclusions cannot be drawn as to how the program might have enhanced appropriateness over time.

In addition, the rule-based system used a set of proprietary criteria that are based on published evidence but do not directly replicate professional society guidelines. Thus, the outcomes of the rule-based system might have been different if particular versions of professional society guidelines had been used.

### Table 3: Rule and Consult Determinations, by Patient’s State of Residence

<table>
<thead>
<tr>
<th>Rule or consult determinations</th>
<th>Texas, N (%)</th>
<th>Louisiana, N (%)</th>
<th>Ohio, N (%)</th>
<th>Kentucky, N (%)</th>
<th>Florida, N (%)</th>
<th>Other states, N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule determination: potentially appropriate(^a)</td>
<td>303 (74.4)</td>
<td>289 (80.5)</td>
<td>183 (62.7)</td>
<td>205 (70.4)</td>
<td>184 (75.7)</td>
<td>1601 (72.2)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>Majority</td>
<td>Majority</td>
<td>Majority</td>
<td>Majority</td>
<td>Majority</td>
<td>Majority</td>
</tr>
<tr>
<td>Consult determination: other outcome(^b)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>17 (1.1)</td>
</tr>
<tr>
<td>Rule determination: potentially nonindicated(^c)</td>
<td>67 (16.5)</td>
<td>47 (13.1)</td>
<td>67 (22.9)</td>
<td>51 (17.5)</td>
<td>43 (17.7)</td>
<td>424 (19.1)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>47 (70.1)</td>
<td>36 (76.6)</td>
<td>51 (76.1)</td>
<td>35 (68.6)</td>
<td>32 (74.4)</td>
<td>308 (72.6)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^b)</td>
<td>20 (29.9)</td>
<td>11 (23.4)</td>
<td>16 (23.9)</td>
<td>16 (31.4)</td>
<td>11 (25.6)</td>
<td>116 (27.4)</td>
</tr>
<tr>
<td>Rule determination: inadequate initial justification(^d)</td>
<td>37 (8.1)</td>
<td>23 (6.4)</td>
<td>42 (14.4)</td>
<td>35 (12)</td>
<td>16 (6.6)</td>
<td>191 (8.8)</td>
</tr>
<tr>
<td>Consult determination: approved</td>
<td>Majority</td>
<td>Majority</td>
<td>Majority</td>
<td>Majority</td>
<td>Majority</td>
<td>164 (85.9)</td>
</tr>
<tr>
<td>Consult determination: other outcome(^b)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>&lt;10(^d)</td>
<td>27 (14.1)</td>
</tr>
</tbody>
</table>

\(^a\)Percentages in rule determination rows represent the percentage of catheterization orders with a given rule determination, and are organized by plan type. In contrast, percentages in consult determination rows represent the percentage of catheterization orders with a given rule determination, of all the consults with the designated rule determination and plan type.

\(^b\)Other outcome indicates the consult led to no call back, a change in the order, withdrawal of the order, or no consensus; a catheterization is authorized when there is no consensus, but not in the other 4 scenarios.

\(^c\)Cells with <10 people have been redacted to protect privacy.

\(^d\)Percentages in rule determination rows represent the percentage of catheterization orders with a given rule determination, and are organized by plan type. In contrast, percentages in consult determination rows represent the percentage of catheterization orders with a given rule determination, of all the consults with the designated rule determination and plan type.
Finally, orders for diagnostic catheterizations are made for a heterogeneous set of reasons. It is possible that there was variation among health plans, states, or medical specialties regarding the reasons for which diagnostic catheterizations were being ordered.

Conclusions

When physician reviewers evaluate orders as a part of a non denial prior authorization program, they are able to obtain the information necessary to determine whether care of uncertain appropriateness should be approved. Because published guidelines suggest that there are many situations in which the need for diagnostic catheterization is ambiguous, the peer-to-peer consults that occur within non denial prior authorization provide a valuable opportunity for 2 physicians to work together to explore what is best for each patient. The consult process plays an important role in ensuring that all patients receive the necessary and most appropriate diagnostic tests, whereas the rule-based decision support system enables orders to be triaged so that peer consults may be used in a judicious manner. In this study, the vast majority of orders sent to peer consultation, whether for inadequate or modified neuroimaging requests after collaborative consultation.

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References


STAKEHOLDER PERSPECTIVE

Standardized Documentation Can Improve Diagnostic Testing Decisions for Patients with Cardiovascular Disease

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The American Heart Association (AHA) predicted in 2011 that approximately 100 million Americans would have a form of cardiovascular disease (CVD) by 2030; however, by 2015, that prediction was already reached—15 years earlier than estimated. A 2017 updated report from the AHA predicted that more than 130 million Americans—45% of the total US population—will have CVD. The 2017 AHA projections for Americans by 2035 are staggering:

- 123.2 million will have high blood pressure
- 24 million will have coronary artery disease
- 11.2 million will have a stroke
- 7.2 million will have atrial fibrillation

Beyond the human toll, the adverse impact on the US healthcare system, and on the nation’s economy in general, will be profound. In 2016, the total cost of CVD in the United States was $555 billion; by 2035, that cost will skyrocket to $1.1 trillion.

The medical costs related to CVD far exceed the medical costs attributed to most other health disorders, including Alzheimer’s disease. In addition to the direct costs of medical care and prescription drugs, the cost of diagnostic testing in CVD is enormous and is growing steadily. These tests and technologies include extensive bloodwork surveillance, echocardiography, cardiac magnetic resonance and computed tomography angiography, nuclear scanning, and cardiac catheterization.

Cardiac catheterization has always been the gold standard for CVD diagnostic testing. Although invasive and associated with defined risks, cardiac catheterization provides precise anatomic and physiologic information that can quickly influence the patient’s care.

Powell and colleagues provide a thoughtful study on the importance of evaluating the appropriateness of physician orders for patients to undergo elective diagnostic cardiac catheterization. The approach described in the study combines rule-based decision support with a consult-based peer discussion to determine whether the order for diagnostic cardiac catheterization was appropriate. Unlike the more common system of nonapproval, the altruistic goal of this approach is to engage the ordering physician in a peer-to-peer discussion, leading to the approval, as well as education regarding improved documentation and more judicious ordering in the future.

Of the 3808 orders reviewed, 699 (18.4%) were determined to have inadequate initial justification. Adding a peer-to-peer educative system, 509 (72.8%) were subsequently approved. In addition, among 344 (9%) orders that were deemed potentially nonindicated, the educative approach approved 298 (86.6%). Powell and colleagues appropriately point out that the success of this study protected a substantial number of patients who were in need of diagnostic catheterization, but who might otherwise have been denied it. Ensuring judicious ordering while protecting patients who need care is truly a win-win approach.

PATIENTS: The first and foremost responsibility of patients is to become educated regarding the current CVD crisis in the United States. There has not been a change in our gene pool to account for the rapidly increasing percentage of Americans with heart disease. CVD can be prevented, or at least mitigated, by the initiation of lifestyle changes at all ages. Childhood obesity has become an epidemic. According to the Centers for Disease Control and Prevention, the percentage of children and adolescents affected by obesity has more than tripled in the United States since the 1970s.

Although genetics plays a key role in heart disease, poor eating habits, lack of exercise and sleep, and increased stress contribute to lifelong metabolic and structural heart problems that lead to and/or worsen CVD. More community outreach and educational programs are paramount.

With the prospects of 45% of the population having CVD, the need for diagnostic testing will rise logarithmically. Despite great advances in noninvasive cardiac testing, diagnostic cardiac catheterization will likely remain the gold standard for evaluating heart disease. As with any invasive procedure, complications from diagnostic cardiac catheterization procedures can occur. Al-
though occurring in less than 1% of patients, complications may involve bleeding, injury to blood vessels, stroke, allergic reactions, and renal damage. Doing the right procedure at the right time for the right reason is key to judicious, appropriate, and successful testing for patients.

**PROVIDERS:** Of note, the study by Powell and colleagues found no significant differences in the appropriateness of orders between cardiologists and other providers when prescribing diagnostic cardiac catheterizations. Poor documentation by providers remains pervasive. The success of electronic medical records (EMRs) and computerized physician order entry, in terms of improving documentation and patient safety, is still evolving at best. I have personally been asked to perform coronary artery bypass surgery on patients who did not have coronary artery disease documented in their EMR. No doubt, many orders for diagnostic cardiac catheterization have incomplete documentation as well: education, training, and feedback are the key here.

Billions of dollars are being spent in the United States on EMR systems; however, launching a complex software program is not enough. There is no such thing as being finished in providers’ continuing education on the importance of proper documentation, ordering, and billing. To have the resources they need to deliver the care they desire for their patients, providers must learn they need to hit all the right marks and check all the right boxes. When facing a peer-to-peer review, they must view the experience as an educational opportunity.

**PAYERS:** Considering the AHA’s predictions regarding the future of CVD in the United States, it is hard to imagine there will be enough money to provide quality healthcare to all Americans. The United States can, and should, look at the success of other nations, but even there, the issues are more complex than the type of payment model that exists in other countries. There are cultural, societal, and political differences that make the American healthcare system more complex and, perhaps, more difficult to fix.

Nevertheless, we must start somewhere. Payers rely on providers and patients to do the right thing, and vice versa. When lifestyle changes and medical therapy are not enough, invasive diagnostic testing may be needed. With CVD accounting for approximately 17% of healthcare expenditures today, and rising rapidly, we simply cannot afford to spend a single dollar on unnecessary testing, particularly when that testing can cause harm.

Much work is being done on clinical pathways and best practice guidelines. EMR systems provide further opportunity to standardize care documentation. Using a rule-based approach for decisions to pay for care is an established and appropriate method, offered in one form or another by payers for many years. Powell and colleagues expand on the rule-based approach by streamlining a 3-step process that starts with a customer service representative, continues with a nurse reviewer, and if needed, a consult physician, all with a focus to approve appropriate testing and care by giving feedback and education to the provider.

Ideally, proper documentation should occur at the source—the interface between the provider and the patient. Until then, using the educative feedback method discussed in this article goes a long way toward aligning the goals of payers, providers, and patients.

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