Primary Care Physicians’ Use of Screening Echocardiography

Andrew S. Bensky, MD; Wesley Covitz, MD; and Robert H. DuRant, PhD

ABSTRACT. Objective. To survey primary care physicians to understand their reasons for using echocardiography to screen for congenital heart disease in children and to assess their understanding of the costs associated with cardiology services.

Design. A questionnaire.

Participants. Eight hundred sixty-seven pediatricians and family physicians in our region were surveyed, 494 (57%) responded and 466 were used for the analysis.

Results. The majority of pediatricians and family physicians in our area do not know the relative costs associated with cardiology consultation and echocardiography. They also believe it likely that a cardiologist will routinely obtain an echocardiogram as part of their evaluation of a child with a murmur, although this is not the case. The availability and convenience of specialist appointments was found to significantly influence the decision to order an echocardiogram. Family physicians were significantly more likely than pediatricians to order an echocardiogram for a variety of clinical indications.

Conclusions. Improving primary care physicians’ knowledge of the costs associated with cardiology services and current cardiology practice patterns, in addition to improving the availability of cardiology referrals, may reduce the number of expensive and unnecessary echocardiograms. Pediatrics 1999; 103(4). URL: http://www.pediatrics.org/cgi/content/full/103/4/e40; echocardiography, heart murmur, congenital heart disease, cost-effectiveness.

ABBREVIATIONS. CXR, chest radiograph; ECG, electrocardiogram.

Since echocardiography became widely available, primary care physicians have had two primary options for the investigation of suspected congenital or acquired heart disease in the pediatric population: refer the child to a pediatric cardiologist or order an echocardiogram. Previous studies have shown that the performance of echocardiography is not cost-effective when compared with cardiology referral, especially when there is a significant cost differential between the two approaches. In addition, echocardiography has been shown to add little to the diagnosis of an innocent murmur if the child is evaluated by a pediatric cardiologist. Despite these studies, primary care physicians continue to order echocardiograms to exclude congenital heart disease.

There are many possible reasons why a primary care physician might use echocardiography as a screening tool. These include the belief that the cardiologist will order the study anyway, time delay for specialist appointments, the need to travel to see a specialist, family pressure for a quick diagnosis, and a lack of understanding about the relative cost of various cardiology services. The purpose of this study was to evaluate how important these reasons were to the primary care physicians in our area, and to see if there were differences between pediatricians and family physicians.

METHODS

A questionnaire was prepared to assess physicians’ approaches to a child with suspected heart disease and to determine their understanding of the costs of cardiology services. This questionnaire was mailed to 867 physicians in our area, 305 pediatricians and 562 family physicians, using a mailing list provided by our medical center’s outreach department. Those physicians who did not respond within 4 weeks to the initial mailing received a second mailing, which included another copy of the questionnaire. Of the 867 questionnaires sent out, responses were received from 494 physicians (57%). Of these, 28 were excluded because the respondents reported that they did not routinely see children in their practice or they were no longer in active practice, leaving 466 surveys available for analysis (Table 1).

The first two questions of the questionnaire asked for the physician’s estimation of the cost of a cardiology consultation (including an echocardiogram [ECG]), the only test we routinely order, and the cost of a complete echocardiogram, given five price ranges from less than $250 to greater than $1000. For the purposes of this study, cost referred to the charges for the particular services. The remaining questions were answered using a 5-point scale with responses ranging from very unlikely to very likely. A brief clinical scenario was provided, dealing with a healthy 5-year-old child with a grade II/VI systolic murmur. Physicians were asked about how likely they would order any laboratory tests, including chest radiograph (CXR), ECG, or echocardiogram, before considering a cardiology referral. They were then asked how they would proceed if an ECG and CXR were normal: order no further tests, a pediatric cardiology referral, or an echocardiogram. They were also asked to comment on how likely they felt it was that a cardiologist would order an echocardiogram as part of this child’s evaluation, and whether they would feel comfortable counseling the family without cardiology referral if the child was found to have a small ventricular septal defect using an echocardiogram.

The next scenario involved a 3-year-old child with a murmur, and whose insurance carrier placed certain restrictions on where tests could be obtained and which specialists were covered by the plan. Respondents were asked how these insurance restrictions would alter their evaluation of the child. The last scenario involved a 12-year-old girl with chest pain, anxious parents, a normal cardiac examination and ECG, and a mildly abnormal CXR. Respondents were told that a satellite cardiology clinic would be held in their community in 3 weeks. They were asked to comment on how likely they were to order an echocardiogram rather than wait for a clinic evaluation. They were then asked if their decision to order the echocardiogram would be influenced if the clinic was held in 2 days rather than 3 weeks. Finally, the physicians were asked to comment on the likelihood that they would order an

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During the 3-year period beginning in January 1995, we interpreted 209 echocardiograms in children >1 month of age ordered by primary care physicians before cardiology consultation. A variety of indications were provided, but the majority (n = 139) of the studies were ordered for the evaluation of a murmur. Of these, 117 (84%) were normal. Positive findings in the other 22 studies included ventricular septal defect, atrial septal defect, bicuspid aortic valve, and mitral valve prolapse. Thirteen of the 22 children with an abnormal echocardiogram were referred to our center for cardiology evaluation. All echocardiograms ordered by primary care physicians for other common indications including the evaluation of chest pain, syncope, possible mitral valve prolapse, or palpitations (n = 41) were normal. During 1997, our group evaluated 806 new outpatients [mt1 month of age. Echocardiograms were obtained on 61 of these patients (7.6% of the total), and 51 of these studies (84%) revealed structural or functional heart disease.

In our center and in our regional clinics, the cost of a new cardiology evaluation including an ECG is less than $250, with the exception of those visits coded at the highest level of complexity. The cost of a complete pediatric echocardiogram in our area ranges from $750 to $1270 (attributable to varying technical charges), with an average cost of $965. Only 152 of the respondents (33%) correctly estimated the cost of the initial consultation to be less than $250. Two hundred sixty-four (57%) placed the cost between $250 and $500, whereas the remainder estimated the cost to be more than $500. As far as estimating echocardiography costs, only 26 respondents (6%) correctly answered that they were greater than $750. The majority (n = 328, 70%) felt that the cost was less than $500. Only 8 respondents (2%) estimated both echocardiography and consult costs in the correct price range. In addition, 268 of the respondents (58%) estimated that cardiology consultation was more or equally as costly as an echocardiogram.

When asked about the evaluation of a healthy 5-year-old child with a murmur, 44% of the respondents said that it was unlikely or very unlikely that they would obtain a cardiology referral without ordering any tests first. Family practitioners were significantly more likely than pediatricians (P < .001) to include an echocardiogram as part of this initial evaluation, with 40% reporting that they were more than likely to do so compared with only 8% of pediatricians. The physicians’ response to the questions about cost did not significantly correlate with their likelihood of ordering an echocardiogram in this setting. A majority of both pediatricians (63%) and family physicians (82%) felt that it was likely or very likely that a cardiologist would obtain an echocardiogram as part of the office evaluation of this child. When asked if they would follow the child without referral if an echocardiogram they obtained revealed a small ventricular septal defect, only 29% of the pediatricians and 21% of the family physicians said they were likely to do so.

In the second scenario the physicians were given the additional information that the child’s insurance company would pay for tests done locally, but not for a local pediatric cardiology consultation. Pediatric cardiology consultation would be covered at a center 90 minutes away. In this scenario, a higher percentage of both pediatricians (28%) and family

| TABLE 1. Demographic Variables of the Respondents to the Survey |
|------------------------|------------------------|------------------------|
|                        | Family Practice | Pediatrics | Total |
| Number                 | 270            | 196        | 466   |
| Male                   | 239            | 121        | 360   |
| Female                 | 31             | 75         | 106   |
| Average year training completed | 1983          | 1982       | 1982  |

RESULTS

During the 3-year period beginning in January 1995, we interpreted 209 echocardiograms in children >1 month of age ordered by primary care physicians before cardiology consultation. A variety of indications were provided, but the majority (n = 139) of the studies were ordered for the evaluation of a murmur. Of these, 117 (84%) were normal. Positive findings in the other 22 studies included ventricular septal defect, atrial septal defect, bicuspid aortic valve, and mitral valve prolapse. Thirteen of the 22 children with an abnormal echocardiogram were referred to our center for cardiology evaluation. All echocardiograms ordered by primary care physicians for other common indications including the evaluation of chest pain, syncope, possible mitral valve prolapse, or palpitations (n = 41) were normal. During 1997, our group evaluated 806 new outpatients [mt1 month of age. Echocardiograms were obtained on 61 of these patients (7.6% of the total), and 51 of these studies (84%) revealed structural or functional heart disease.

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| TABLE 2. Kruskal Wallis Analysis of Variance of Differences Between Likelihood of Ordering an Echocardiogram and Practice Type |
|------------------------|------------------------|------------------------|
| Diagnosis              | Pediatrics | Family Practice | P     |
| Mean*                  | SD         | Mean Rank       | Mean* | SD         | Mean Rank | .001 |
| Chest pain             | 1.54       | 0.77            | 189   | 2.06       | 0.90      | 266   | <.001|
| Syncope                | 1.77       | 1.02            | 164   | 2.89       | 1.21      | 284   | <.001|
| Abnormal CXR           | 2.39       | 1.44            | 163   | 3.78       | 1.14      | 284   | <.001|
| Abnormal ECG           | 2.23       | 1.28            | 170   | 3.36       | 1.18      | 280   | <.001|
| R/O MVP                | 2.44       | 1.41            | 164   | 3.77       | 1.13      | 284   | <.001|

Abbreviations: CXR, chest radiograph; ECG, electrocardiogram.

* Scale ranged from 1 (very unlikely) to 5 (very likely).
practitioners (57%) replied that they would be likely to include an echocardiogram as part of their initial evaluation than in the first scenario.

When considering the evaluation of the child with chest pain, significantly more family physicians (63%) than pediatricians (34%, $P < .001$) were likely to order an echocardiogram rather than wait 3 weeks for a cardiology evaluation. Respondents were likely ($r = 0.43, P < .001$) to reconsider the decision to order the echocardiogram if the child could be seen by the cardiologist in 2 days, although the association was stronger for pediatricians ($r = 0.61, P < .001$) than family physicians ($r = 0.27, P < .001$).

When asked about several problems without the use of descriptive scenarios, family physicians were significantly more likely to order echocardiograms to evaluate syncope, an abnormal ECG, an abnormal CXR, and possible mitral valve prolapse than were pediatricians (Table 2).

DISCUSSION

Our survey results provide insight into the decision-making of primary care physicians as they evaluate possible congenital heart disease. In the model proposed by Danford et al., the assumptions that would make the use of echocardiography a more cost-effective strategy than cardiology referral would include inexpensive echocardiograms, expensive cardiology referrals, and the indiscriminate use of echocardiography by cardiologists. Although these assumptions are not true in our area, and presumably are not elsewhere, many primary care physicians in our area believe that they are. The majority of those physicians responding to our survey significantly underestimated the cost of echocardiography, believing it to be cost-equivalent to cardiology consultation. Respondents also strongly believe that a pediatric cardiologist will routinely obtain an echocardiogram on new referrals, when analysis of our practice pattern showed that this was not the case.

Insurance companies seem to play a role in the choice of treatment of the child with suspected heart disease. If local specialists are not covered by an insurance plan because of contractual relationships, physicians report they are more likely to use local echocardiograms as part of their evaluation. This practice would be counter-productive to the insurance company’s cost savings strategy.

The responses to our survey also indicate that the ready availability of specialist appointments may be an important factor in the evaluation of heart disease in children. If seeing a cardiologist imparts a time delay to diagnosis, or adds the expense and inconvenience of travel, physicians may be more likely to use echocardiography. Parental pressure for a rapid diagnosis may play an important role in this decision.

Finally, family practitioners seem to be more inclined than pediatricians to use echocardiography to evaluate children with suspected heart disease. The reasons behind this type of practice bias are not clear. Possibilities include fewer opportunities to evaluate children with heart disease and to work with pediatric cardiologists during training, as well as different approaches to suspected heart disease in adults and children.

A limitation of this study was that only 57% of the physicians surveyed returned their surveys by mail. Although this response rate is higher than for many mailed surveys, it is possible that response bias may have been introduced.

Although costs of cardiology services and cardiology practice patterns likely vary in different parts of the country, certain aspects of our study should apply to all areas. Our survey suggests that improved physician education about their region’s cost of cardiology services and cardiology practice patterns, as well as an improvement in the availability of specialist appointments, may help to reduce the number of expensive and often unnecessary echocardiographic studies.

REFERENCES

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