

# Improving Diagnostic Performance in Pediatrics: Three Steps Ahead

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There is an urgent need to develop interventions to improve diagnostic performance—both with respect to quality and safety—on a scale commensurate with the public health impact of diagnostic errors.<sup>1</sup> There is now a solid—and growing—body of evidence showing that diagnostic errors occur with substantial frequency in inpatients, outpatients, and even children.<sup>2–4</sup> The causative factors contributing to diagnostic errors are both complex and increasingly understood across multiple contexts. Cognitive factors—related to both lack of and misapplication of knowledge as well as faulty cognition—contribute substantially to diagnostic errors as do factors related to the flawed “nonsystem” that is the US health care system.<sup>5,6</sup> There is also an increasing focus on the interactions between individuals (teamwork) and between individuals and the “nonsystem” that lead to suboptimal diagnostic performance.<sup>7,8</sup>

Much of the focus on diagnostic safety and quality has been in acute care settings, such as emergency departments, inpatient wards, and intensive care units. Some of this focus is a natural outgrowth of the foundational studies in patient safety that launched the movement, including the landmark Harvard Medical Practice Study.<sup>9,10</sup> Not only did these studies shine a light on the substantial frequency of diagnostic error, but they also demonstrated the validity of retrospective chart review in identifying adverse health care events. Also, the relatively encapsulated period, acuity, and extensive documentation

associated with acute care visits create a convenient and pragmatic context for studying diagnostic error.

However, most health care in the United States is not delivered in acute care settings. Especially in pediatrics, most contact that individuals have with the health care “nonsystem” is in primary care settings and studies to improve diagnostic performance must begin to shift to these settings. Fortunately, this issue contains 3 articles that constitute a major step forward in pragmatically improving diagnostic performance in pediatric primary care.<sup>11–13</sup> The Reducing Diagnostic Errors in Pediatric Primary Care project was a national collaboration within the American Academy of Pediatrics Quality Improvement Innovation Network that employed codified Quality Improvement Collaborative (QIC) methodologies to attempt to improve the diagnostic performance in 3 areas in pediatrics: hypertension, depression, and missed or delayed action on laboratory tests. These 3 topics have substantial face validity as early targets for improvement, given multiple descriptions of underdiagnosis of hypertension and depression and the fact that missed and/or delayed action on laboratory studies continues to be a source of diagnostic errors. The ambitious breadth of this study deserves commendation—43 practices were initially randomized to participate in this project, and 30 or 31 (depending on the area of focus) practices were included in the data analysis. Further, the fact that the study was conducted in primary care clinics, not only major academic children’s hospitals, is fundamental in considering the generalizability of the findings. The step-wedge cluster-randomized trial described was an excellent study design to analyze the implementation and effectiveness of previously known and well-described best practices that have been previously implemented ineffectively, especially concerning the diagnosis and management of hypertension and the diagnosis of depression.

The authors show that the well-described yet complex QIC methodology improved—sustainably—the diagnosis and management of elevated blood pressure and the diagnosis of depression during the study period. The intervention did not reduce the rate of missed or delayed action on a subset of abnormal laboratory test results when comparing the control and intervention periods, although there did appear to be an improvement at later



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time points. The authors rightly point out the need for a more robust study of the sociotechnical work system in which appropriate laboratory test follow-up occurs<sup>14</sup>. Appropriate follow-up of diagnostic testing information in primary care, acute care, and across transitions of care is the low-hanging fruit of diagnostic safety that remains enigmatically hard to harvest. We are relatively reliable at ensuring appropriate action—that is, the correct action is taken much of the time. However, highly reliable and relatively reliable are not the same, and we must design and study interventions to produce highly reliable systems that achieve nearly perfect rates of follow-up. Such high rates may not be possible in other areas of diagnostic safety, but diagnostic test follow-up is a system problem that requires a systematic fix.

We must also discuss what it means to improve diagnostic performance and the reality that all interventions have both intended and unintended consequences. Two Reducing Diagnostic Errors in Pediatric Primary Care projects (focused on depression and hypertension) centered on decreasing the rate of missed diagnosis largely by improving sensitivity. It remains unclear whether simply reducing the rate of missed and/or delayed diagnosis is analogous to improving the diagnosis of a condition—that is, if one increases sensitivity alone (decreases the miss rate) without increasing specificity, what is the overall benefit? It is very clear from studies in other settings that “more diagnosis” is not better—instead, interventions to improve diagnosis address both columns of the proverbial 2×2 contingency table to be maximally effective. Measures of diagnostic performance should have a balance measure (in keeping with good quality improvement principles).<sup>14</sup> It is reasonable and likely effective that interventions to improve diagnosis of often asymptomatic or reticently discussed diagnoses (like hypertension and depression, respectively) might primarily do so by improving sensitivity, especially at the screening stage. It is key, however, to ensure that the diagnostic pathways that follow allow for increasing specificity to avoid overdiagnosis- and overtreatment-related harms.

These 3 articles represent 3 important steps forward—from defining, describing, and measuring diagnostic error to improving diagnostic performance. The studies show that improving diagnostic performance will

require collaboration among quality improvement experts, implementation scientists, researchers, and interdisciplinary care teams. Most importantly, however, these studies demonstrate that diagnostic performance can be sustainably improved. This result is exciting and welcome news that should spawn a proliferation of similar interventions across the country. After all, our patients cannot wait.

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