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Attention-Deficit/Hyperactivity Disorder: The Short and Long of It

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The modern history of the study of attention-deficit/hyperactivity disorder (ADHD) seems to have begun with Charles Bradley's 1937 report on the use of benzedrine (Bradley 1937). This chance finding from his work on the study of headache following pneumoencephalography set in motion a series of clinical explorations that persist to this day. Whether called minimal brain dysfunction (MBD), hyperkinetic child syndrome, or ADHD, this complex syndrome has proven to be a clinical puzzle for which there are some but not entirely satisfactory solutions. Even Bradley found that only about 75% of his 30 patients (21 boys and 9 girls; age 5–14), ''suffering from a variety of behavior disorders,'' had ''some'' to ''spectacular'' improvement and could not account for the variability in response. And, Bradley could not answer questions about whom and why individuals responded differently to this novel treatment nor could he answer questions with respect to follow-up of these children and their long-term outcomes. Now, some 75 years later and after literally hundreds of treatment and other studies, do we actually have more answers to these important questions? Perhaps recent findings are at least moving us in the right direction.

Of course, Bradley was not the first to consider ADHD as a clinical entity. In all likelihood ADHD (in one form or another) has been around for as long as there have been humans or, perhaps, even before. Dennis Cantwell (1939–1997), the beloved UCLA Professor and ADHD expert enjoyed reciting portions of Heinrich Hoffman's 1844 poem about a boy named ''Fidgety Phil'' in order to make this case. There is also the critical 1902 *Lancet* case report by George Still (Still 1902) in which he described some 43 children who had problems with attention and self-regulation, as well as significant behavior problems of varying sorts. And, there were the stories of children affected by the encephalitis lethargica pandemic of 1915–1926 (see review by Vilensky 2007) who had a postencephalitic syndrome characterized by significant behavior changes. No doubt, there were many cases long before. But in the end, most case reports and even clinical trials are relatively brief and cover short periods of time with little or no long-term follow-up. As a result, we know little about what happens to these children, whoever they might be.

In their classic studies, Weiss and Hechtman (1986 and 1993) reported from their data and from first-hand accounts of the lives of children affected by hyperactivity and how it impacted them as they grew into adulthood. Their work and the few other follow-up studies (see Barkley 2006) have suggested highly variable outcomes with a significant probability of a less than optimal life course for many individuals. The reasons for this variability have largely been unclear, as has the role of treatment and other factors in affecting long-term clinical outcomes.

This complex state of affairs may be in the process of changing. A few recent long-term follow-up studies may be starting to bring some order to the process. In a Norwegian study of 257 children who had been in psychiatric hospitals, at the time of a 17- to 39-year follow-up ($\bar{x} = 28$ years), Mordre and colleagues (Mordre et al, 2012) found that 19% of individuals received a disability pension but that only one diagnosis was specifically associated with receiving a subsequent pension and that was ADHD. Indeed, 30% of the children previously diagnosed with ADHD were receiving a pension. But can this outcome be modified by treatment? Well, in an even more remarkable study, Lichtenstein and his colleagues (2012) examined a cohort of 25,656 patients who had a diagnosis of ADHD and were born not later than 1990. They then linked this Swedish dataset to two other national databases: the Prescribed Drug Register and the National Crime Registry. They were then able to determine that taking ADHD specific medications significantly reduced the risk for have been convicted of a crime or being suspected of committing a crime. And, this treatment effect appeared to be quite specific as a similar relationship did not exist for other disorders (including oppositional defiant disorder and conduct disorder); nor did this effect exist for other medications, such as selective serotonin reuptake inhibitors. So, perhaps the course of ADHD may be altered with treatment. But is this enough for us to know?

An exceptional and elegant study lead by Rachel Klein (Klein et al, 2012) offers another critical piece to this puzzle. 135 men diagnosed with ADHD in childhood (without conduct disorder) and 136 men without childhood-onset ADHD were part of a follow-up study with this report on the examination at year 33. Compared with their peers, the ADHD probands were more likely to have a variety of problems, including poorer economic and social adaptation. Tragically, there were also significantly worse dreadful outcomes, including development of conduct symptoms, incarceration, and early death. What is striking is that many of the problems faced by the children with ADHD were evident by adolescence and presumably amenable to early and persistent interventions to moderate the morbidity. These findings are consistent with those from another New York ADHD cohort (initially over 750 youth) followed for 37 years (Brook et al, 2013). In addition to significant psychiatric and behavior problems, when these ADHD children became

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adults, they had high rates of impaired general physical health, role limitations due to physical health, and limitations in physical functioning.

So what does this tell us? First of all, children with ADHD do grow up. And when they reach adulthood, many of the problems they experienced in childhood persist. Even those who no longer meet ADHD diagnostic criteria may have residual symptoms that are significant and impairing. This is now well-established. But it is also clear that some individuals with ADHD are at greater risk for long-term adverse outcomes. Clearly, comorbidity and lack of continuing treatment are markers for that risk. Ongoing treatment for ADHD and comorbidity appears to make a significant difference. But for all too long, the focus has been on relatively short-term treatment studies and programs. Longer-term interventions are rare, in part due to the bifurcation of the care system between pediatric and adult care; this means that many patients are lost in the transition or cared for by clinicians not familiar with this common, childhood-onset disorder. In short, ADHD is a chronic illness. And, like many chronic diseases with a childhood onset, individuals with ADHD later have a tremendous impact on the public health with higher rates of accidents and injuries (to themselves and others), higher rates of unintended pregnancy, more involvement in crime and substance abuse, and lower economic achievement, not to mention much higher utilization of healthcare resources.

The data now tell a very compelling story that leads to the striking, irrefutable conclusion that a short-term, acute-care model for the treatment of ADHD is not succeeding. And it will not succeed. It is time to stop being so short-sighted and re-orient ADHD treatment to a chronic disease model such as those applied to diabetes, hypertension, and asthma. It is only with an integrated treatment and care system for this high-prevalence, high-impact disorder, that there will be successful outcomes for these patients and a significant impact on the broader public health. Short-term gains in the acute-treatment model are lost due the lack of adequate long-term care. The time has come to develop chronic disease management programs for ADHD. And that is the short and long of it!

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