safety can impede students' ability to gain required procedural skills and to develop close relationships with patients. We strongly believe that educators should ensure that each clinical rotation is actually a course in a given discipline rather than simply a 1- or 2-month period of clinical involvement or observation of clinical care. Extensive didactics and the use of new tools for evaluating students' competence in each discipline should be required components of each clinical clerkship. The fourth year, then, should be a time to hone these new clinical skills and narrow down career choices.

Unfortunately, the current fourth year fails to prepare many students for more advanced responsibilities. In a 2009 survey, about one third of residency-program directors representing 10 medical specialties and 21 institutions indicated that interns struggled with the organization of medical knowledge and the application of that knowledge to patient care, professionalism related to assuming responsibility, their fund of medical knowledge, and the ability to work without supervision, among other issues. The researchers concluded that fourth-year students need to "expand their knowledge in both clinical and non-clinical domains."[2] Truncating the medical school experience would make it far more difficult to accomplish that goal.

To better prepare students for residency, we believe that more intensive clinical experiences in both outpatient and inpatient settings are needed and that innovative advising and mentoring programs should be created to enhance the transition to residency. Given the growing complexity of medicine, it seems counterproductive to compress the curriculum into 3 years, reducing both preclinical and clinical experiences. The limited opportunity for students to participate meaningfully in patient care during their undergraduate careers is the problem that needs correction; the solution is not to rush students into residency after allowing them even less involvement with patients.

The physician's role on the health care team is evolving. Teams of physicians, nurse practitioners, physician assistants, and pharmacists can develop new paradigms for delivering higher-quality clinical care, even with a predicted shortage of primary care physicians. Physicians may need even more advanced education — in health policy, public health needs, clinical research, and medical ethics — in order to lead such teams. But we believe that, at the very least, physicians will succeed as team leaders only if they first attain all the clinical competencies required by the Accreditation Council for Graduate Medical Education. That requires enhancement, not shortening, of medical school.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

An audio interview with Dr. Richard Schwartzstein about 3-year M.D. programs can be heard at NEJM.org.

From the Perelman School of Medicine, University of Pennsylvania, Philadelphia.

1. Emanuel EJ, Fuchs VR. Shortening medical training by 30%. JAMA 2012;307:1143-4.
2. Lyss-Lerman P, Teherani A, Aagaard E, Loeser H, Cooke M, Harper GM. What training is needed in the fourth year of medical school? Views of residency program directors. Acad Med 2009;84:823-9.
3. Eaglen RH, Arnold L, Girotti JA, et al. The scope and variety of combined baccalaureate-MD programs in the United States. Acad Med 2012;87:1600-8.
4. Page RC, Boulger JG. An assessment of the three-year medical curriculum. J Med Educ 1976;51:125-6.
5. Kettel LJ, Dinham SM, Drach GW, Barbee RA. Arizona's three-year medical curriculum: a postmortem. J Med Educ 1979;54:210-6.

DOI: 10.1056/NEJMp1306457

HISTORY OF MEDICINE

Autism at 70 — Redrawing the Boundaries

Jeffrey P. Baker, M.D., Ph.D.

This year's revision of the diagnostic criteria for autism is among the most contentious of any in the new *Diagnostic and Statistical Manual of Mental Disorders* (the fifth edition, or DSM-5), provoking widespread fears among parents and advocacy groups that children who have received a diagnosis of autism will lose their eligibility for services. Coincidentally, this year also marks the 70th anniversary of psychiatrist Leo Kanner's first clinical description of autism in 1943.[1] Though the DSM-5 definition explicitly refers to autism as a spectrum, in important ways it represents an effort to define the syndrome more sharply. In this respect, it reflects one of the central themes in the history of autism: a debate over where to set its boundaries.

Kanner did not so much define as portray autism, in the course of a series of memorable case histories drawn from the

Defining Autism—From Kanner to the DSM-5

Leo Kanner, "Autistic Disturbances of Affective Contact" (1943): describes 11 children with "extreme autistic aloneness," delayed echolalia, and an "anxiously obsessive desire for the maintenance of sameness"; many have extraordinary memory skills

1950–60s: autism widely regarded as early presentation of childhood schizophrenia, an emotional disturbance rooted in parent–child psychodynamics; no consistent definition

1970s: decline of psychogenic paradigm; autism understood as biologic in origin and no longer incompatible with mental retardation

DSM-III (1980): defines infantile autism as a pervasive developmental disorder (distinct from schizophrenia) involving three domains: "lack of responsiveness to other people (autism), gross impairment in communicative skills, and bizarre responses to various aspects of the environment, all developing within the first 30 months of age"

DSM-III-R (1987): provides a more complex definition of autistic disorder that requires meeting 8 of 16 criteria among the three domains of social interaction, communication, and restricted interest or activities; drops requirement for early onset in life and provides new category, "Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS)," for children meeting some but not all diagnostic criteria for autistic disorder

DSM-IV (1994) and DSM-IV-TR (2000): further refinement of increasingly complex criteria for autistic disorder; number of pervasive developmental disorders expanded to five, including Asperger's disorder and Rett's syndrome

DSM-5 (2013): autism spectrum disorder defined in terms of two categories: "persistent impairment in reciprocal social communication and social interaction" plus "restricted, repetitive patterns of behavior," both present from early childhood; Asperger's disorder, PDD-NOS, and other subcategories such as atypical autism are eliminated; diagnosis requires specifying presence or absence of accompanying intellectual disability, language impairment, or associated medical or genetic condition

records of more than 120 children seen in his Johns Hopkins child psychiatry clinic. Over the course of 15 years, he eventually identified two features that he believed all his patients had in common: profound "autistic aloneness" and an "obsessive insistence on the preservation of sameness." His case histories are replete with vignettes of what we now think of as classic autistic behavior: children who appeared oblivious to the presence of others, lost in a bizarre world of ritual and strange relations to objects. Many could perform extraordinary feats of memory: one child could recite all 25 questions and answers of the Presbyterian catechism by 3 years of age. And the parents, Kanner noted, were almost as distinctive as the children. Many were highly intelligent, though better at relating to concepts than to people. Kanner went so far as to describe such parents as "successfully autistic."[2]

For the remainder of his career, Kanner sought to keep his syndrome distinct from other psychiatric and neurologic diagnoses (see box). Child psychiatrists after the Second World War were applying the diagnosis of schizophrenia to children at ever earlier ages and interpreting its origins in psychoanalytic terms. The word "autistic" had been invented to describe the schizophrenic patient's rejection of reality. Psychoanalysts argued that autism represented an infant's response to an emotionally cold and distant mother. So popular was this interpretation of autism as a form of psychotic withdrawal that the second edition of the DSM mentioned autism only in the context of childhood schizophrenia, defined in psychodynamic descriptive terms so vague as to encompass a wide range of emotional disturbances. On another front, Kanner also sharply distinguished autism from mental retardation. Many of the nonverbal children whom Kanner described had carried the diagnosis of "feeble minded." This label was widely and casually dispensed to children in mid-20th-century institutions, many of whom underwent only minimal psychological testing. In crowded and underfunded residential environments, children with autism and those with mental retardation often ended up seeming quite similar.

For more than 30 years, professionals debated the appropriate categorization of autism. For a time, Kanner seemed to join the schizophrenia camp, highlighting the coldness of the children's family environments. Yet Kanner never used the phrase "refrigerator mother." His own observations centered more on fathers, and he eventually rejected psychodynamic explanations in favor of his original assertion that autism was "inborn." He turned out to be less prescient with respect to autism and intellectual disability. Kanner firmly believed that autism was incompatible with mental retardation, on the basis of the lack of dysmorphic features in his patients, the remarkable feats of memory demonstrated by so many, and his belief that cognitive testing did not indicate their true abilities. More sophisticated testing would eventually show that children with autism had scattered intellectual

functioning, marked by islets of ability as well as deficits. Once mental retardation and autism were no longer considered mutually exclusive, autism began to be described in children with syndromes such as tuberous sclerosis or congenital rubella.

Autism finally appeared as a separate category in the DSM-III. Published in 1980, the revised manual differed from its predecessors in providing "objective" lists of criteria for diagnosing mental illness. It identified three essential features of autism: lack of interest in people, gross impairment in communication, and "bizarre responses" to aspects of the environment, all developing in the first 30 months of life. Though it acknowledged that autism was a "pervasive developmental disorder," the main thrust of the DSM-III was to emphasize its distinctiveness from schizophrenia. Autism's boundary with mental retardation, on the other hand, remained porous and was not explicitly addressed in the criteria.

Until the present, subsequent DSM editions have generally moved in the direction of greater diagnostic flexibility and expansion. This trend reflected a growing conviction in the research community that autism represented a spectrum with varying degrees of aloofness and cognitive ability. In 1987, the DSM-III-R dropped the age-at-onset requirement and offered a new category, "Pervasive Developmental Disorder, Not Otherwise Specified" (PDD-NOS), to encompass children who did not meet the full criteria for autistic disorder. Although the DSM-IV introduced more specific language in its 1994 criteria, its definition of autism was still more inclusive than that of the DSM-III. Asperger's disorder also appeared for the first time, encompassing children without language delays or cognitive impairment. As autism surveillance and services improved in the 1990s, these changes helped to fuel a tremendous surge in cases that has continued to this day.[3]

The dramatic rise in the prevalence of autism has generated great controversy. Some have seen it as evidence of an epidemic provoked by vaccines or another environmental trigger. Others see it in positive terms: children with autism are now being identified and deemed eligible for services. Yet it's hard to contest the fact that expansion of the definition has confounded the task of researchers. It has created a wide umbrella encompassing a tremendous range of patients, varying greatly in cognitive and social abilities as well as associated genetic or neurologic conditions. Determining what kinds of therapy work, and how much is needed, has become very challenging.

The DSM-5 criteria will not solve these problems, but they do represent a move toward a more rigorous definition of autism. The new manual eliminates PDD-NOS, Asperger's disorder, and the other autism subcategories in favor of a single "autism spectrum disorder." Three domains are reduced to two, and there is less flexibility in choosing from diagnostic checklists: a child must meet all three subcategories within social communication and two of four within rigid or repetitive behavior. Children who have deficits only in social communication will be considered to have "social communication disorder."[4]

In historical perspective, the DSM-5 can be seen as an effort to demarcate the autism "spectrum" much as Kanner sought to emphasize the distinctiveness of autism itself. The new definition will no doubt generate controversy, with various advocates contesting the "real" definition of autism. That may be the wrong way to frame the question. A broad definition can be seen as qualifying more children for services but may complicate the hard research required to actually help these children. For example, investigations of the genetics of autism have so far had their richest yield among children who also have severe intellectual disability and phenotypic abnormalities, not the kind of children described so memorably by Kanner.[5] Rather than argue over the true definition of autism, it may be more helpful to ask what definition is appropriate for the task at hand.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

From the Trent Center for Bioethics, Humanities, and History of Medicine, Duke University School of Medicine, Durham, NC.

1. Kanner L. Autistic disturbances of affective contact. Nervous Child 1943;2:217-50.
2. Eisenberg L, Kanner L. Childhood schizophrenia; symposium, 1955. VI. Early infantile autism, 1943-55. Am J Orthopsychiatry 1956; 26:556-66.
3. Grinker RR. Unstrange minds: remapping the world of autism. New York: Basic Books, 2007.
4. Ozonoff S. Editorial perspective: Autism spectrum disorders in DSM-5 — an historical perspective and the need for change. J Child Psychol Psychiatry 2012;53:1092-4.
5. Johnson CP, Myers SM, American Academy of Pediatrics Council on Children With Disabilities. Identification and evaluation of children with autism spectrum disorders. Pediatrics 2007;120:1183-215.

DOI: 10.1056/NEJMp1306380