The Development of Pediatrics in the United States

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"Quality pediatric medical care embodies a scientific approach to health supervision... It should be readily available, efficiently rendered, and properly documented. Preventive care should be utilized to assure optimal physical, intellectual and emotional growth and development."

The American Academy of Pediatrics' (AAP) Standards of Child Health Care (1) opens with the above quote from Osborne and Thompson (2). The AAP states that: "Preventive pediatrics is the core of quality medical care for children... Major portions of the pediatrician's efforts need to be directed toward preventive pediatrics" (1). Such care includes prevention of accidents, substance abuse, and suicide; counseling and emotional guidance, sex education, genetics, and family planning; as well as proper dental care. According to the AAP, pediatric concerns encompass life from the prenatal period through adolescence.

Pediatrics as just described has been practiced in the United States only for the past two or three decades. The discipline was born and began to evolve more than 100 years ago. Why it was born and how it evolved are the subjects of this paper. Society's changing concept of childhood, interest in child welfare, and perception of the importance of the environment in child development were important factors. Crucial to the evolutionary process were the development of science and technology, the changing pattern of infant mortality, and the timely appearance of farsighted physicians. I believe that the rate-limiting step in this process has been the pediatrician's willingness to accept a changing role.

The 17th Century

In the 17th century, physicians rarely provided medical care for children. Mothers, grandmothers, and midwives tended to children's needs. When treated by physicians, children were viewed as miniature adults, for childhood was not recognized as a unique stage of life (3). There was little scientific basis to the therapeutics of this period. Colonial Americans believed that babies were born in sin and corruption, which caused their illnesses. Accordingly, emetics, purgatives, and bleeding were administered to "draw out the evil." The high mortality rate of children was accepted as inevitable (4).

Experimental science, however primitive, led to the description of several diseases. For example, Bard described diphtheria and Rush described cholera during this period. Several case reports were published and the prevalence in childhood of certain infectious diseases was noted (5). However, with the exception of smallpox, few genuine advances were made in the treatment of disease. In England, William Codogen (1711-1797) and George Armstrong (1715-1789) were a century ahead of their time with their advocacy of preventive medicine for children (6). In his Treatise on the Disorders of Childhood, Michael Underwood (1732-1820) wrote that childhood disease was being neglected.

While children's hospitals were first founded in Europe during this period, treatment there was primitive and most children were cared for at home. For example, Nicholas Culpeper, who wrote one of the first medical books (The English Physician, 1708), recommended treating worms in children by applying a salve to the navel. Parents who cared for their sick children at home received advice from almanacs, newspapers, and books such as William Buchan's Domestic Medicine (1769) which discussed 12 pediatric problems (6).

The difference in mortality between breast-fed and non-breast-fed infants was first reported in the latter half of the 18th century. Although Codogen and Underwood both published works on this subject, the issue remained dormant until the last part of the 19th century when it served as the springboard for modern pediatrics (3).

The 19th Century

Among the several significant developments in the first half of the 19th century was the medical renaissance in France. The French, by correlating clinical and pathologic findings, identified many new diseases and were able to group similar disease processes. Although these discoveries were an important foundation for future progress, they were mostly of academic importance. Diseases and therapeutics were poorly understood, and patients benefited little from the new knowledge. An exceptional physician, Pierre C.A. Louis (1787-1872) demonstrated that bleeding was ineffective in the treatment of pneumonia, but his report received little attention (3). Charles Michel Billard (1800-1832) was unique for the era inasmuch as he devoted his
work exclusively to the study of pediatric pathology. However, he and his contemporaries continued to view children as small adults and their studies were of disease in children rather than diseases of children.

In the United States, medical education moved from the apprenticeship system to medical schools where the majority of physicians were being trained by 1830 (3). However, instruction was more clinically oriented and less scientific than in the European system; Americans still traveled to Europe to study medicine. Through these students, immigrants, and the publication of European papers in American journals, the ideas and discoveries of European physicians spread to the United States. Initially the quality of American physicians actually declined with the move of medical education to medical schools, but the groundwork was laid for the brilliant future of institutional medical education.

In the first part of the 19th century, pediatrics was not taught as a separate specialty. In fact, children received attention in the medical schools only in conjunction with the study of internal medicine or obstetrics. Indeed, the term “pediatrician” was not coined until the last quarter of the century.

Children did receive much attention in the social sphere, for the concept of childhood was changing. The belief that children were imbued with sin and evil declined along with commitment to the puritan ethic. Children came to be considered as innocent, naive, and capable of being molded by their environment. The tragedy of a child’s death was reflected in the gravestones of the period. Children’s stones were no longer small, adult stones but were often engraved with pictures of angels, flowers, or lambs (3).

Public concern for the welfare of children not only emerged from the growing concepts of stewardship and philanthropy in the 1800s, but was also stimulated by the belief that environment affected children’s development. Society sought to improve the environment in order to benefit children both physically and morally.

In the mid 19th century, 62% of all deaths in the United States occurred in children less than five years old. Infant mortality was as high in 1850 as it had been in 1789 (3). Cities became more crowded as large numbers of people moved there from rural areas and as new immigrants arrived. With crowding and worsening hygienic conditions in the cities, infant mortality increased: one third of city children less than five years old died. These statistics gave impetus to the social movement known as “child saving,” and later these same statistics became the raison d’être of pediatrics.

The increased interest in children during the 19th century was demonstrated in several ways. In earlier times, homeless children who were dependent on public support were bound out at young ages to serve apprenticeships, freeing the public of their support. During the 1800s, the age at which children could be bound out was raised and orphanages were established to be homes for these children. It was believed that proper morals and conduct could be taught to institutionalized children. However, there were far too few orphanages, and many infants and children lived in almshouses where the mortality rate for foundling infants less than one year old approached 97% (3). This dreadful mortality rate was one impetus for the establishment of children’s hospitals which, like adult hospitals, were originally founded for the poor. Normal children were not the only ones to benefit from increased public interest. Several schools and institutions for the deaf, mute, blind, and retarded were organized in the 1800s.

With these developments in the concept of the child, child labor practices came under review. However, because child labor was economically beneficial and socially productive, even attempts to make education mandatory were unsuccessful until the end of the century.

The Society for the Prevention of Cruelty to Children (SPCC) was founded in 1874. Note that the Society for the Prevention of Cruelty to Animals (SPCA) had been founded eight years earlier. In fact, the officials of SPCA, which was the only organization willing to deal with abused children, were instrumental in the founding of the SPCC.

Most early measures to improve the lot of children were instituted by private lay organizations; physicians did not become involved until later in the century. However, several significant advances in medicine did occur during the early 19th century. Benjamin Waterhouse introduced the smallpox vaccine to the United States and was its chief proponent. By 1855, vaccination was compulsory in some parts of the country. Classic reports on hemophilia and meningitis were written during this period. The first children’s hospital in the United States, the Children’s Hospital of Philadelphia, was founded in 1855, and by the end of the century 24 children’s hospitals existed in this country (3). While these advances were important, the child mortality rate changed very little.

The improvement in child health which began in the last part of the 19th and early 20th centuries was largely due to improvements in hygiene and diet and the increased availability of clean, pure milk. Diarrhea was the number one killer of children, and much of the pediatricians’ efforts was devoted to its prevention. Because they believed that the type of milk that infants drank was related to the incidence of diarrhea, pediatricians were strong proponents of breast-feeding, boiling or modifying cow’s milk, and, at the end of the century, “certifying” and pasteurizing milk. These doctors were nicknamed “baby feeders” by their medical colleagues (7), but as the improving methods of collecting vital statistics demonstrated, their interventions in the milk supply did indeed save lives (8).

Society’s changed attitude toward children and their excessively high mortality rate along with the strength, wisdom, and foresight of such doctors as Abraham Jacobi (1830-1919) and Job Lewis Smith (1828-1897) gave birth to the pediatric specialty. Jacobi, a German immigrant, set up medical practice in the Bowery section of Manhattan in 1853. Although he treated both children and adults, he realized that “there are anomalies and diseases which are met in the infant and child only” (9). In 1857, Jacobi began lecturing about pediatrics at New York’s College of Physicians and Surgeons and in 1860 was appointed Professor of Infantile Pathology and Therapeutics at New York Medical College. Jacobi helped found the American Journal of Obstetrics and Diseases of Women and Children, established the pediatric section of the American Medical Association in 1880, and served as the first president of the American Pediatric Society.
Job Lewis Smith, Jacobi's contemporary, has been called the "forgotten pioneer" of pediatrics (10). Like Jacobi, Smith practiced in the slums of New York City and was aware of the area's high infant mortality rate and poor hygienic conditions. He held the positions of Clinical Professor of Diseases of Children at Bellevue Hospital Medical College and attending physician at the New York Foundling Asylum where he introduced the practice of wet nursing. Only when breast-feeding was not available would Smith advocate substituting boiled or pasteurized cow's milk.

The American Pediatric Society had its first scientific meeting in 1889, but membership was restricted to only the elite of pediatrics. (It was not until the Society for Pediatric Research [1931] and the American Academy of Pediatrics [1930] were founded that young academicians and "rank and file" pediatricians were organized.) The original constitution of the APS states that "the society has for its object the advancement of the physiology, pathology, and therapeutics of infancy and childhood" (11). Areas of health maintenance and preventive care were not addressed until the first decade of the 20th century. The APS was busy dealing with the more pressing matters of infant mortality from diarrhea and infection and defining the pediatrician's role in medicine and society.

Gradually it was accepted that better sewage systems, pure air and water, clean milk, food inspection, and the care and education of prospective mothers were important keys to child health. Pediatricians and public health advocates were working together. Between 1880 and 1900 the infant mortality rate in New York City fell from 288 to 189 deaths per 1,000 live births (3). This significant improvement in the infant mortality rate resulted mostly from better feeding and hygiene. Other than the development of diphtheria antitoxin in 1897 and the technique of lumbar puncture procedure and spinal fluid analysis, no important clinical advances emerged before the turn of the century.

Knowledge of the high infant mortality associated with artificial feeding was not new in the 19th century. In ancient Rome it was recorded that women would free themselves from nursing their own infants whenever they could (12). Since Bible times it had also been recognized that wet nursing was the best alternative to a mother nursing her own child (13). However, as children and childhood became more important during the 19th century, fewer mothers wanted their children wet nursed. Generally wet nurses were women who had given birth out of wedlock and were considered "neither moral, clean, nor temperate" (14). In addition, as the country became industrialized, more women worked away from home which resulted in more women requiring an alternative to breast-feeding and fewer women interested in being wet nurses as they found employment in industry. Hospitals and asylums with large numbers of infants were unable to find sufficient numbers of wet nurses (12). Dry nursing, feeding of cow's milk from a bottle, was the only alternative.

In the 18th century, pap, a mixture of boiled water and bread, had had some success as a form of artificial feeding. Undoubtedly the boiling which sterilized it and not its nutritive value made pap more successful than cow's milk. In A Treatise on the Disorders of Childhood, Michael Underwood wrote that he could not understand the practice of using pap for artificial feeding and suggested that animal milk would be a more appropriate substitute for human milk. On the basis of his own analyses, he recommended cow's milk, boiled and diluted with water, as the food of choice for infants not breast-fed.

Nineteenth century physicians did not understand why many infants did poorly when they were fed cow's milk. Most believed that the chemical elements of cow's milk were difficult for human infants to digest. Therefore, many physicians and scientists attempted to modify cow's milk to resemble human milk more closely. The first empiric modifications gave way to more scientific chemical reformulations. In 1885, Arthur V. Meigs actually developed a modified cow's milk that closely resembled human milk, but because he opposed the germ theory of disease, he refused sterilization of his formula, and his formula failed.

Thomas M. Rotch, who became the first Professor of Pediatrics at Harvard, developed the "percentage" method of infant feeding, which was based on the work of Philipp Biedert (1847-1916) (3). The percentage method was to modify cow's milk for each individual infant at each stage of life. The complex mathematics needed to prepare the formula for each child precluded wide acceptance of this method. Abraham Jacobi advocated boiling cow's milk before feeding, but most of his contemporaries felt that heat altered milk, making it more indigestible. Not until Pasteur's work became known in the United States was the heating of milk accepted as beneficial.

At least as basic as the need to modify cow's milk was the need to have wholesome milk from the start. In large cities like New York City, milk was often diluted, contaminated, or adulterated. Adding chalk or plaster of paris to milk to improve its color and mask its poor quality was common practice. In addition, milk cows were often owned by distilleries which had distillery wastes (swill) available for feed. The cows were kept in filthy sheds, and the "swill milk" obtained from these cows was often dirty and of poor quality.

Initial improvements in this situation came from the temperance movement. In the course of his work, Robert Hartley, who headed a temperance campaign in New York City, discovered the unsanitary conditions of the milk cows. As a result of his expose and the public's response, the New York Board of Medicine appointed a committee in 1848 to investigate (15), although little was done to correct the problem for another 40 years.

Henry L. Coit (1854-1917), a New York physician, became aware of the need for clean milk in 1887 as he watched his son die of diphtheria. He searched frantically until he found one small dairy outside of New York City that would provide him with pure, clean milk. He decided to make such milk available to all children and established the first criteria for certifying milk as wholesome. The milk had to be uniform in nutritive values, reliable in its "keeping" qualities, and free from pathogenic bacteria (3). The first bottle of certified milk was commercially available in 1892. In 1893, Nathan Strauss, a philanthropist, established milk stations where certified milk could be dispensed to the public. Subsequently, local government became involved, and in 1897, Rochester, New York, became the first city to have municipally operated milk sta-
tions. Over a period of 20 years, the milk stations became child health stations where education on hygiene, feeding, and infant care was dispensed along with the milk.

Coit had little faith in public opinion and in elected officials. He felt that if the movement to certify all milk were to succeed, physicians had to be its prime proponents (16). Initially, philanthropists and physicians were the primary advocates for certified milk, but so successful were their efforts that by the early 20th century only the railroads were regulated more closely than the dairy industry.

The changing social and economic climate of the 1800s allowed the government to become involved in public health and in the regulation of the dairy industry. For example, during this period, cholera and smallpox epidemics spread through New York City, and the death rate rose. In response, a group of public-minded citizens formed a committee to deal with these problems that in New York were ultimately taken over by city government when the Metropolitan Board of Health was established in 1866.

In 1882, spurred by the arrival of several cholera-laden ships in New York harbor, the Board established a bacteriologic laboratory capable of evaluating milk for contamination. Not until 1913, however, did the Board require that all milk be pasteurized. By the beginning of the 20th century, with the cooperation of scientists, social reformers, and legislators, the age-old problem of finding a safe alternative to breast-feeding was on its way to being solved.

The 20th Century

In the first quarter of the 20th century, infant mortality continued to decline as pediatrics and social and governmental programs flourished. The major therapeutic advance of this era was the development of treatment and prophylaxis for diphtheria. Through research in physiologic chemistry, principles of fluid, electrolyte, and acid-base balance were developed and parenteral fluid replacement was initiated.

Pediatricians faced the challenge of decreasing the death rate due to prematurity, the most common cause of which was maternal infection. In order to improve infant survival, improvements in the care of pregnant women and the establishment of neonatal units in hospitals were required. The removal of deliveries from the home to the hospital also necessitated establishment of "well baby" nurseries in the hospital. By the 1920s, for the care of premature infants, incubators were developed and special nutritional protocols established.

The national interest in child health did not wane. In 1904, four women formed the National Child Labor Committee, and the Children's Bureau of the Federal Department of Labor was established in 1912. The top priority of the Children's Bureau was to promote birth registration in order to compile accurate morbidity and mortality statistics. However, older children also received increased attention, and by 1911 nine states had laws requiring the medical examination of school children.

The climactic event of this period was the Sheppard-Towner Act (1921) which provided federal funds for states to establish programs for birth registration, maternal hygiene, infant welfare centers, and education for mothers, mothers' helpers, and midwives. The act expired in 1929 and was made part of the Social Security Act of 1935, but children did not yet have full rights protected by the law: "Nothing in this act shall be construed as limiting the power of a parent or guardian or person standing in loco parentis to determine what treatment shall be provided for a child" (17). Today over 30 federal programs provide finances for health care of mothers and children.

In 1926, Borden S. Veeder published Preventive Pediatrics, which he defined as the science dealing with the child—normal growth, physical and mental development, and the prevention of abnormal conditions. Pediatric education changed considerably. Prior to 1910, students went to Europe to obtain an adequate education in pediatrics, but in the succeeding 25 years almost every major city in the United States established a children's hospital and almost every medical school had a department of pediatrics. In 1914, one in every 1,000 physicians was a pediatrician; by 1934, the number had risen to one in 200 (18).

In the second quarter of this century, fluid and electrolyte therapy improved, antimetabolites were first used successfully for the treatment of leukemia, and the discovery of antibiotics led to a further decline in the morbidity and mortality from infectious diseases. However, neonatal mortality still did not decline because of an increasing number of infant deaths from prematurity. Only in the past 30 years has there been great improvement in premature infant survival.

The American Academy of Pediatrics and the Society for Pediatric Research stimulated investigators to share ideas and promoted wider dissemination of knowledge about childhood health. The Academy, which was founded by a group of physicians angered by the American Medical Association's stand against the Sheppard-Towner Act, represented organized pediatrics' first movement into the child welfare arena.

The pediatrics specialty has continued to change. In 1952, accidents replaced infectious diseases as the leading cause of death in American children (19). In addition to accidents, the New Morbidity includes the many psychosocial and behavioral issues that affect both growth and development. Pediatricians are devoting more and more attention to these areas as well as to perinatal and adolescent medicine. In the past 100 years, they have evolved from "baby feeders" to physicians with the knowledge and ability to care for children from the time before birth through adolescence, managing problems ranging from infectious diseases to psychosocial issues. Advances of medical science and technology as well as changes in societal values have been essential to this evolution.

References

6. Abt IA. A survey of pediatrics during the past 100 years. IMJ 1940;77:485-94.

Additional Sources