PEDIATRICS

Science and Profession

The practice of pediatrics begins with birth. Most babies are born healthy and require only routine medical attention. Many hospitals, however, have a neonatology unit for babies who are born prematurely, who have disease conditions or birth defects, or who weigh less than 5.5 pounds (even though they may be full-term babies). All these infants may require short-term or prolonged care by pediatricians in the neonatology unit.

The problems of premature babies usually center on the fact that they have not fully developed physically, although other factors may also be involved, such as the health and age of the mother, undernourishment during pregnancy, lack of prenatal care, anemia, abnormalities in the mother's genital organs, and infectious disease. A past record of infertility, stillbirths, abortions, and other premature births may indicate that a pregnancy will not go to full term.

Low birth weight in both premature and full-term babies is directly related to the incidence of disease and congenital defects and may be indicative of a low intelligence quotient (IQ). Between 50 and 75 percent of babies weighing under 3 pounds, 5 ounces are mentally disabled or have defects in vision or hearing. Recent studies also indicate

an increase in neurological problems such as attention-deficit hyperactivity disorder and autism in these children.

Because the lungs are among the organs that develop late in pregnancy, many premature infants are unable to breathe on their own. Some premature babies are born before they have developed the sucking reflex, so they cannot feed on their own.

Hundreds of congenital diseases can be present in the neonate. Some are apparent at birth; some become evident in later years. Some may be life-threatening to the infant or become life-threatening in later years. Others may be harmless.

The child may be born with an infection passed on from the mother, such as rubella (German measles) or human immunodeficiency virus (HIV), the virus that causes acquired immunodeficiency syndrome (AIDS). Rubella may also infect the child in the womb, causing severe physical deformities, heart defects, mental disability, deafness, and other conditions. Genital herpes affects about 1,500 newborns in the United States each year and may cause serious complications. A herpes infection during the second or third trimester of a woman's pregnancy may increase the chance of preterm delivery or cesarean section. Group beta strep (GBS) infections are another serious problem for one of every 2,000 newborns in the United States. GBS may cause sepsis (blood infection), meningitis, and pneumonia.

Among the most prevalent congenital birth defects is cleft lip, which occurs when the upper lip does not fuse together, leaving a visible gap that can extend from the lip to the nose. Cleft palate occurs when the gap reaches into the roof of the mouth.

Various abnormalities may be present in the hands and feet of neonates. These can be caused by congenital defects or by medications given to the pregnant mother. Arms, legs, fingers, and toes may fail to develop fully or may be missing entirely. Some children are born with extra fingers or toes. In some children, fingers or toes may be webbed or fused together. Clubfoot is relatively common. In this condition, the foot is twisted, usually downward and inward.

Many congenital heart defects can afflict the child, including septal defects (openings in the septum, the wall that separates the right and left sides of the heart), the transposition of blood vessels, the constriction of blood vessels, and valve disorders.

Congenital disorders of the central nervous system include spina bifida, hydrocephalus, cerebral palsy, and Down syndrome. Spina bifida is a condition in which part of a vertebra (a bone in the spinal column) fails to fuse. As a result, nerves of the spinal cord may protrude through the spinal column. This condition varies considerably in severity; mild forms can cause no significant problems, while severe forms can be crippling or life-threatening. In hydrocephalus, sometimes called "water on the brain," fluid accumulates in the infant's cranium, causing the head to enlarge and putting great pressure on the brain. This disorder, too, can be life-threatening.

Cerebral palsy is caused by damage to brain cells that control motor function in the body. This damage can occur before, during, or after birth. It may or may not be

accompanied by mental disability. Many children with cerebral palsy appear to be mentally disabled because they have difficulty speaking, but, in fact, their intelligence may be normal or above normal. Down syndrome is one of the most common congenital birth defects, affecting 1 in 200 infants born to mothers over age thirty-five. It is caused by an extra chromosome passed on to the child. The distinct physical characteristics of Down syndrome include a small body, a small and rounded head, oval ears, and an enlarged tongue. Mortality is high in the first year of life because of infection or other disease.

Cystic fibrosis is one of the most serious congenital diseases of Caucasian children. Because the lungs of children with this disease cannot expel mucus efficiently, it thickens and collects, clogging air passages. The mucus also becomes a breeding ground for bacteria and infection. Other parts of the body, such as the pancreas, the digestive system, and sweat glands, can also be impaired. A common congenital disorder among African American children is sickle cell disease. It causes deformities in red blood cells that clog blood vessels, impair circulation, and increase susceptibility to infection.

One of the major problems of infancy is sudden infant death syndrome (SIDS), in which a baby that is perfectly healthy, or only slightly ill, is discovered dead in its crib. In 2010 in the United States, over 2,000 infant deaths were reported as SIDS. The cause is not known. The child usually shows no symptoms of disease, and autopsies reveal no evidence of smothering, choking, or strangulation. Research indicates that rebreathing of carbon dioxide as well as exposure to secondhand cigarette smoke and other forms of indoor air pollution may greatly increase the risk of SIDS.

Infectious diseases are more prevalent in childhood than in later years. Among the major diseases of children (and often adults) throughout the centuries have been smallpox, malaria, diphtheria, typhus, typhoid fever, tuberculosis, measles, mumps, rubella, varicella (chickenpox), scarlet fever, pneumonia, meningitis, and pertussis (whooping cough). In more recent years, AIDS and hepatitis have become significant threats to the young.

Certain skin diseases are common in infants and young children, such as diaper rash, impetigo, neonatal acne, and seborrheic dermatitis, among a wide variety of disorders. Fungal diseases of the skin occur often in the young, usually because of close contact with other youngsters. For example, tinea pedis (athlete's foot), tinea cruris (jock itch), and tinea corporis (a fungal infection that occurs on nonhairy areas of the body) are spread by contact with an infected playmate or by the touching of surfaces that harbor the organism. Similarly, parasitic diseases such as head lice, body lice, crabs, or scabies are easily spread among playmates. Some skin conditions are congenital. Between 20 and 40 percent of infants are born with, or soon develop, skin lesions called hemangiomas. They may be barely perceptible or quite unsightly; they generally resolve by the age of seven.

One form of diabetes mellitus arises in childhood, insulin-dependent diabetes mellitus (IDDM) or type 1. In the healthy individual, the pancreas produces insulin, a hormone

that is responsible for the metabolism of blood sugar, or glucose. In some children, the pancreas loses the ability to produce insulin, causing blood sugar to rise. When this happens, a cascade of events causes harmful effects throughout the body. In the short term, these symptoms include rapid breathing, rapid heartbeat, extreme thirst, vomiting, fever, chemical imbalances in the blood, and coma. In the long term, diabetes mellitus contributes to heart disease, atherosclerosis, kidney damage, blindness, gangrene, and a host of other conditions.

Cancer can afflict children. One of the most serious forms is acute lymphocytic leukemia. Its peak incidence is between three and five years of age, although it can also occur later in life. Leukemic conditions are characterized by the overproduction of white blood cells (leukocytes). In acute lymphocytic leukemia, the production of lymphoblasts, immature cells that ordinarily would develop into infection-fighting lymphocytes, is greatly increased. This abnormal proliferation of immature cells interferes with the normal production of blood cells, increasing the child's susceptibility to infection. Before current treatment modalities, the prognosis for children with acute lymphocytic leukemia was death within four or five months after diagnosis.

In addition to the wide range of diseases that can beset the infant and growing child, there are many other problems of childhood that the parent and the pediatrician must face. These problems may involve physical and behavioral development, nutrition, and relationships with parents and other children.

Both parents and pediatricians must be alert to a child's rate of growth and mental development. Failure to gain weight in infancy may indicate a range of physical problems, such as gastrointestinal, endocrine, and other internal disorders. In three-quarters of these cases, however, the cause is not a physical disorder. The child may simply be underfed because of the mother's negligence. The vital process of bonding between mother and child may not have taken place; the child is not held close and cuddled, is not shown affection, and thus feels unwanted and unloved. This is seen often in babies who are reared in institutions where the nursing staff does not have time to caress and comfort infants individually.

Similarly, later in childhood, failure to grow at a normal rate can be caused by malnutrition or psychological factors. It could also be attributable to a deficiency in a hormone that is the body's natural regulator of growth. If this hormone is not released in adequate supply, the child's growth is stunted. An excess of this hormone may cause the child to grow too rapidly. Failure to grow normally may also indicate an underlying disease condition, such as heart dysfunction and malabsorption problems, in which the child does not get the necessary nutrition from food.

The parent and pediatrician must also ensure that the child is developing acceptably in other areas. Speech and language skills, teething, bone development, walking and other motor skills, toilet habits, sleep patterns, eye development, and hearing have to be evaluated regularly.

Profound mental disability is usually evident early in life, but mild to moderate disability may not be apparent until the child starts school. Slowness in learning may be indicative of mental disability, but this judgment should be carefully weighed, because the real reason may be impaired hearing or vision or an underlying disease condition. The diagnosis of neurological disorders, such as autism and attention-deficit hyperactivity disorder (ADHD), has greatly increased in recent years and poses a special challenge to both parents and pediatricians.

The battery of diseases and other disorders that may beset a child remains more or less constant throughout childhood. Puberty, however, begins hormonal changes that trigger new disease threats and vast psychological upheaval. As early as eight years of age in girls and after ten or eleven years of age in boys, the body begins a prolonged metamorphosis that changes the child into an adult. Hormones that were previously released in minimal amounts course throughout the body in great quantities.

In boys, the sex hormones are called androgens. Chief among them is testosterone, which is secreted primarily by the testicles. It causes the sexual organs to mature and promotes the growth of hair in the genital area and armpits and on the chest. Testosterone also enlarges the larynx (voicebox), causing the voice to deepen.

Girls also produce some testosterone, but estrogens and other female sex hormones are the major hormones involved in puberty. They cause the sexual organs to mature, the hips to enlarge and become rounded, hair to grow in the genital area and armpits, the breasts to enlarge, and menstruation to begin.

Many disease conditions can arise in association with the hormonal changes that occur during puberty, such as breast abnormalities and genital infections. Far and away the most common medical disorder at this time, however, is acne. Acne is a direct result of the rise in testosterone that occurs during puberty. About 85 percent of teenagers experience some degree of acne, and about 12 percent of these will develop severe, deep acne, a serious condition that can leave lifelong scars.

Important psychological changes also occur during puberty. The personality can be altered as the developing child begins to crave independence. Ties to the family weaken, and the teenager becomes closer to his or her peer group. Sexual feelings can be strong and difficult to repress. In modern Western society, this is usually the time when the teenager may begin to experiment with tobacco, alcohol, drugs, or other means of achieving a “high,” although in some groups the use of these substances begins much earlier. Substance abuse is a major problem throughout society, but it is particularly devastating among young people.

Sexual activity among teenagers is widespread and, combined with inadequate education about health issues and limited access to care, has led to significant medical problems. The incidence of sexually transmitted infections (STIs) is higher among teenagers than any other group. Teenage pregnancy is one of the most challenging issues in modern society.

If the pregnant teenager who continues her pregnancy is from a disadvantaged family background, she is even more likely than other teen mothers to receive little or no prenatal care. Risks of delayed or absent prenatal care can include a fetus that is not properly nourished. Additional risks can arise from a mother who smokes, drinks alcohol, or takes drugs throughout the pregnancy. In these cases, the child often may be born prematurely, with all the physical problems that premature birth involves. Hospital care of these infants is extremely costly, as is the maintenance of the mother and child if the baby survives.

Another important issue of teenage sexuality is the rapid spread of HIV, both as a sexually transmitted infection and as an infection passed from mother to baby.

Famous First

The nation's first nursing school based on Florence Nightingale's principles, the Training School for Nurses, opened at Bellevue in 1873. Sister Helen Bowdin of the All Saints Sisterhood in London was the first Superintendent. Sister Bowdin remained a faithful All Saints sister, later nursing for the community in South Africa.

Source: http://allsaintssisters.org/Who/OurHistory.aspx

Diagnostic and Treatment Techniques

Pediatrics is one of the widest-ranging medical specialties, embracing virtually all major medical disciplines. Some pediatricians are generalists, and others specialize in certain disease areas, such as heart disease, kidney disease, liver disease, or skin problems.

Doctors and nurses specializing in neonatology, including advanced practice nurse practitioners with specialty certification in pediatrics or neonatology, have radically improved the survival rates of premature and low-weight babies. In neonatal care of the premature, the infant may have to be helped to breathe, fed through tubes, and otherwise maintained to allow it to develop.

Infectious diseases passed from the mother to the newborn child are a particular challenge. In some cases, such as with GBS and herpes infections, appropriate antibiotics and antiviral agents can be given. In others, such as with babies born with HIV, support measures and medications that help prevent the progress of the disease are the only procedures available.

Many birth defects and deformities can be repaired or at least ameliorated. Disorders such as cleft lip or palate, deformities of the skeletal system, heart defects, and other physical abnormalities often can be remedied by surgery. Certain structural malformations may require prosthetic devices and/or physical therapy.

The treatment of spina bifida depends on the seriousness of the condition; surgery may be required. With hydrocephalus, medication may be helpful, but most often a permanent shunt is implanted to drain fluids from the cranium. Before this technique was developed, the prognosis for babies with hydrocephalus was poor: More than half died, and a great many suffered from mental disability and physical impairment. Today, 70 percent or more live through infancy. Of these, about 40 percent have normal intelligence; the others are mentally disabled and may also have serious physical impairment.

There are no cures for cerebral palsy, but various procedures can improve the child's quality of life, exercise and counseling among them. Neither is there a cure for Down syndrome. If mental disability is profound, the child may have to be institutionalized. When a child with Down syndrome can be cared for at home in a loving family, his or her life can be improved.

SIDS continues to be a problem both in hospitals and in the home. The American Academy of Pediatrics' Back to Sleep campaign, in which parents are encouraged to place babies on their backs for sleeping, has been extremely successful, however, and has resulted in a decrease in the incidence of SIDS by 70 to 80 percent.

Managing the infectious diseases of childhood is one of the major concerns of pediatric providers, who are often called on to treat infections, for which they have a wide variety of antibiotics and other agents. Pediatric providers also seek to prevent infectious diseases through immunization. Medical authorities now recommend routine vaccination of all children in the United States against diphtheria, tetanus, pertussis, measles, mumps, rubella, poliomyelitis, pneumococcal pneumonia, *Hemophilus influenzae*, varicella, and hepatitis Aand B. Vaccines are also available against rabies, influenza, cholera, typhoid fever, plague, and yellow fever; these vaccines can be given to the child if there is a danger of infection. Vaccines for diphtheria, tetanus, and pertussis are generally given together in a combination called DTaP. Measles, mumps, and rubella vaccines are also given together as MMR. Repeated doses of some vaccines are necessary to ensure and maintain immunity.

Skin disorders of childhood, including teenage acne, are usually treated successfully at home with over-the-counter remedies. As with any disease, however, a severe skin disorder requires the attention of a trained provider.

Patients with diabetes mellitus type 1 are dependent on insulin throughout life. It is necessary for the pediatrician or attending nurse to teach both the parent and the patient how to inject insulin regularly, often several times a day. Furthermore, patients must monitor their blood and urine constantly to determine blood sugar levels. They must also adhere to stringent dietary regulations. This regimen of diet, insulin, and constant monitoring is often difficult for the child to learn and accept,

but strict adherence is vital if the patient is to fare well and avoid the wide range of complications associated with diabetes.

Other serious conditions are now considered to be treatable. Modern pharmacology has greatly improved the prognosis of children with leukemia. Similarly, many children with growth disorders can be helped by treatments of growth hormone.

Medications and other treatment modalities for the mental disorders of childhood have improved in recent years. Mentally disabled children can often be taught to care for themselves, and some even grow up to live independently. Children with behavioral problems may be helped by clinicians specializing in child psychology or psychiatry.

The problems of sexuality, sexually transmitted infections, and pregnancy among teenagers have provoked a nationwide response in the United States among medical and sociological professionals. Safer-sex programs have been launched, and clinics specializing in counseling for teenage girls are in operation to stem the rise in teenage pregnancies.

Fast Fact

What's the age limit for a child being cared for by pediatric medical practitioners? It's an issue that has been studied. In 2017, the American Academy of Pediatrics made it official: cutting off care at 21 may not work for everyone.

Source: pediatrics.aappublications.org

Perspective and Prospects

Pediatrics affects virtually every member of society. Diseases that once raged through populations of all ages are now being controlled through the mass immunization of children. Some diseases of childhood are not yet controllable by vaccines, but research in this area is ongoing.

Childhood health is directly related to economics. Middle-class and upper-class children have ready access to professional care for any problems that may arise. The medical and psychological needs of disadvantaged children, however, especially those who live in inner cities, are often neglected. Many of these children are not being immunized fully and remain susceptible to diseases that are no longer a problem among the middle and upper classes.

In an effort to improve the medical care of disadvantaged children, some vaccines are being made available at low or no cost to inner-city families. Programs educate parents and teachers about the need for a child to receive the full dosage of vaccine. Computerized records allow authorities to keep track of the immunization status of individual children and to alert their parents when a follow-up inoculation is due.

The psychological problems of inner-city children, as well as children who live in disadvantaged rural areas, are at least as serious as the bodily diseases that threaten them. They may live in a universe of violence, deprivation, and drug addiction, and they might lack a stable family environment and opportunities for advancement. Pediatric providers at all levels can advocate for these youth by becoming involved in medical, psychological, and sociological outreach programs to help disadvantaged children.

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Conversation With . . .
KRISTENE K. GRAYEM

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President-Elect
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Kristene K. Grayem has been a nurse for twenty-nine years and is currently Vice President of Population Health Management at Akron Children's Hospital in Akron, Ohio.

1. What was your individual career path in terms of education/training, entry-level job, or other significant opportunity?

I liked helping people and wanted a career where I could have a family and flexibility, so I entered nursing, which allows that. I earned a bachelor's degree in nursing (BSN) from the University of Akron. During my last semester, I worked with a preceptor in pediatrics and fell in love with pediatric nursing and the medical environment. I started as a staff nurse in the neonatal intensive care unit (NICU) at Akron Children's Hospital.

I have spent my entire career in the same organization. While in the NICU, I returned to school and received my master's degree in nursing (MSN) on a clinical nurse specialist (CNS) and pediatric primary care nurse practitioner (PNP) track. I was the first person to hold either role in my hospital's NICU. As a pediatric nurse practitioner, I cared for sub-intensive care patients—kids with chronic diseases such as respiratory problems.

Among my leadership roles, I served as a manager in our NeuroDevelopmental Center, in which we brought together neurology, physiatry, developmental pediatrics, and neuropsychology under one umbrella. We had a number of children with chronic conditions who needed those combined services. We formed a number of multidisciplinary clinics in the center, such as a cerebral palsy clinic. This allowed the kids to be seen by multiple specialists in one location.

Over time, my administrative roles increasingly moved into the area of ambulatory care, which is care delivered outside a hospital in outpatient settings. I worked with nurses and other health care professionals to develop and oversee outpatient facilities and programs.

Nationally, we have a movement toward value-based care and population health. This means the emphasis is on preventing illness, and the shift in payment is moving from a fee for service model—where we get paid for the things we do for patients—to being paid for keeping populations healthy. My current role allows me to lead my hospital in this shift. We have begun to partner with the community to address the social determinants of health –conditions in the environment that occur outside of health care such as employment, social support, housing, and transportation.

After serving on several of its task forces and its board of directors, I've recently become president-elect of the American Academy of Ambulatory Care Nursing, the only national organization committed to advancing the art and science of this nursing specialty. The organization has enhanced my personal and professional growth, and provided me with access to numerous resources, practice standards, and leadership education.

2. What are the most important skills and/or qualities for someone in your profession?

When I think of the skills that are important for nurses in the ambulatory care setting, I think of three C's: compassion, communication, and critical thinking. These nurses are the link between patients, families, caregivers, medical professionals, and the community. It is important that they have strong communication skills to make all of these connections and advocate for their patients. Being compassionate allows the nurse to feel a connection to patients and have sympathy for what they are going through. Ambulatory care nurses respond rapidly to high volumes of patients in a short span of time. Critical thinking skills allow the nurse to quickly assess the patients' situations and anticipate their needs.

3. What do you wish you had known going into this profession?

I talked with many individuals before entering the profession, so I do not think there is anything I wish I had known. Through my research, I decided to go the BSN route even though many diploma schools of nursing existed at the time. Sometimes there are reasons to do a two-year-degree such as if you work for an organization that will pay for you to earn a four-year degree. Nationally, a big push is underway for nurses to earn four-year degrees.

4. Are there many job opportunities in your profession? In what specific areas?

Overall, there are a lot of nursing positions. However, it can be a challenge at times for new graduates entering the pediatric market. Because of the nursing shortage, most pediatric organizations have developed a pipeline or feeder system for hiring nurses. If you're interested in pediatrics, nursing school is a great time to explore that opportunity early on.

Because 85 percent of health care occurs in the ambulatory setting, more and more opportunities are opening up for ambulatory care nurses. Settings are varied, such as hospital-based outpatient clinics/centers, solo/group medical practices, telehealth call centers, university hospitals, community hospitals, military and VA settings, managed care/HMOs/PPOs, colleges/educational institutions, patient homes, and freestanding facilities. Many ambulatory care nurses work from home and provide care to patients and families remotely. Ambulatory care nurses provide services ranging from wellness and prevention to illness and end-of-life care. Patients span all populations and age groups.

5. How do you see your profession changing in the next five years, how will technology impact that change, and what skills will be required?

As I mentioned, we are moving from fee-for-service to value-based pay. The adult care world already has been living in that space for a while. In conjunction, the ambulatory care nurse's role is constantly expanding. Ambulatory care has become increasingly complex as health care continues to shift from the inpatient to the outpatient setting. In the next five years there will be a greater focus on care coordination and transition management (CCTM). The registered nurse will play a key role in filling CCTM needs because patients can so easily fall through the cracks in today's health care system. Nurses are the health care providers who will help them navigate safely and get back home.

As the focus on decreasing health care costs continues, ambulatory care nurses will need to continue to bring care closer to where their patients and families live and work. Technology will play a major role in making that happen. It will not be feasible or sustainable to take the current in-person model to every neighborhood.

For pediatrics, this shift means we have a unique opportunity to influence young patients about how to take care of themselves, as well as to educate their parents and families. A big piece of pediatrics is teaching: discussing healthy environments and changes you can make to protect your health. We have the opportunity to think longterm about health and teach young people how to prevent diseases from forming now and worsening into adulthood.

6. What do you enjoy most about your job? What do you enjoy least about your job?

I love pediatric ambulatory care nursing! I love the changing environment and the population health shift we are experiencing, with the goal of keeping people healthy and out of the hospital. As a pediatric nurse practitioner, I have found that this model lines up perfectly with my training and personal philosophy. If we begin to use health care resources to prevent diseases from occurring in the first place, we will be a healthier population overall. I love helping patients and families reach their full potential. I love educating them about their conditions and how to manage them. I love helping them coordinate their care, teaching them to navigate the health care system, and advocate for themselves. I love helping others, and I appreciate the respect that our profession has with the public.

We have a unique opportunity to influence young people on how to take care of themselves as well as influence their parents and families. Pediatrics is both about disease prevention and disease management. The percentage of disease prevention is just much greater in pediatrics than in adults, and the proportion of disease management is significantly less in pediatrics than when dealing with adults.

What I like least about my job is the volume of work that occurs in the ambulatory care setting. Sometimes it feels like there is always more work than time to get it done, and I do not like feeling that I don't have enough time to give patients and families what they need.

7. Can you suggest a valuable "try this" for students considering a career in your profession?

Because it's difficult to shadow a nurse due to the privacy laws that protect patients and families, spend time talking with experienced nurses and asking them any questions you may have. If you enter nursing school, think about working as a nurse's aide in a setting where you think you may want to practice nursing. This will give you exposure to the profession and allow you to learn what it may be like to practice in that particular setting.