Pediatric Environmental History Primer

Taking a good environmental history is critical to determining a child's physical surroundings and to addressing health conditions associated with environmental exposures. Diseases caused by environmental exposures may have nonspecific symptoms or manifest themselves as common medical problems, making environmental history taking vital for correct diagnosis.[1,2,3] According to the American Academy of Pediatrics' Pediatric Environmental Health, "questions about a child's environment are basic to a comprehensive pediatric health history."[4] However, few health care providers are trained in environmental history taking,[5,6,7,8] even though poor environmental quality is estimated to be directly responsible for approximately 25% of all preventable ill health in the world[9] and the total costs of environmentally-attributable diseases in American children are estimated at $54.9 billion annually.[10]

NEEF has created a user-friendly environmental history form for physicians and nurses treating pediatric patients, to allow environmental history taking to become a routine practice. The form and primer draw from the medical literature and current best practices. It is recommended that providers take the environmental history face-to-face, rather than having patients fill out the form themselves.

This primer contains background information on issues included in the form and recommendations health care providers can make to families to control or eliminate the hazards in their environment. More in-depth information can be found at http://www.neefusa.org/health.htm.

The purpose of the primer and accompanying environmental history form is to enable health care providers to address environmental conditions that may prevent a child from reaching optimum health and improve communication between health professionals and families on environmental exposure-related disease. Asking questions about a child's environment can also increase public awareness of environmental exposures.

Role of Health Care Provider

Health care providers play an "important role in detecting, treating, and preventing diseases caused by toxic exposure."[1] By taking an environmental history, health care providers can identify toxicants that may be present in a child's environment and counsel patients and their families about preventive measures and treatments to improve their child's health. In addition, health care providers can be instrumental in achieving wider health gains through advocacy of improvements in the communities in which they work. Although some families may be aware of possible connections between behavior, conditions in the home and school, and environmental exposure related illness, others are unaware of these linkages and the environmental history would be the first opportunity to make these connections. Even if families do not answer the questions accurately, the questions themselves suggest to families that there may be a connection between illness and the activity in question, and therefore may be motivation to change behavior in the future.

Integration into Clinical Practice

Health care providers should ask questions about a child's environment at both well-child visits and visits for illness. Taking an environmental history can also be helpful in exploring the causes of persistent or puzzling/nonspecific symptoms in a sick child.[11] An environmental history is relevant for all ages, from infants to adolescents.

At well-child visits, health care providers can inquire about environmental exposures, provide guidance on preventing or abating exposures, and guide families to resources, such as local and national organizations, that would provide help in improving the child's

environment. Pediatric Environmental Health suggests that "parents' answers can guide pediatricians in providing anticipatory guidance about preventing or abating exposures."[4] For visits with ill children, it is important to ask questions about the child's environment in making the differential diagnosis.

There are numerous clinical settings in which environmental history taking can be incorporated into clinicians' practice, ranging from well-child clinics, to subspecialty clinics, and including PED/ER, prenatal, adolescent, and school-based clinics. Health professionals can train residents and students on how to take an environmental history; and promote environmental history taking to additional health care providers by modeling history taking in the above settings.

When to Introduce Environmental Questions

Environmental questions should be introduced at the relevant period in a child's life and at the appropriate time of year. Once introduced, providers should continue asking environmental questions through adolescence. This is because "the risks children face vary in part by their developmental age, from the pre-natal period through adolescence."[12] Please refer to the table below from Pediatric Environmental Health for guidance on when to start introducing environmental questions.[4]

Home renovation, smoking, breast and bottle issues	Prenatal period
Environmental tobacco smoke, sun exposure, mold	When child is 2 months old
Poison exposures, including household pesticidesand lead poisoning	When child is 6 months old
Arts and crafts exposures	Preschool period
Occupational exposures, exposures from hobbies	When patient is a teenager
Lawn and garden products, lawn services, scheduled chemical applications	During spring and summer
Wood stoves and fireplaces, gas stoves	During fall and winter

Components of an Environmental History

Taking this history is the first step in the normal sequence of interaction of health care provider and patient: knowledge, diagnosis, intervention/treatment, counseling, and education/communication. After beginning with routine screening questions for all patients, providers should then consider sources of exposure; identification and handling of the hazard(s); and then provide follow-up, consultation, and recommendations for appropriate interventions.[2, 13]

Health care providers should ask about general potential exposures, as well as the most frequent or common environmental hazards in their patients' communities, usually a result of outdoor air pollution (industrial smokestacks, releases of chemicals, roadways heavily used by trucks, etc.) or seasonal climate factors. Health care providers should take into account the age of the child, the type of dwelling the child lives in, and the community or regional exposures that are most prevalent. Allergens and hazards vary in differing geographic and climatic areas of the country.

It is very important to ask about all environments in which a child spends a significant amount of time, including home, school, daycare, cars, school buses, recreational facilities, and work. In addition, providers should ask about additional residences where the child sleeps or spends significant amounts of time, such as at camp, at the homes of other family members/friends, and college dorms (for 17-18 year olds).

The information provided below is intended to supplement the general questions listed in the Pediatric Environmental History Form. Recommendations health care providers can make to families to control or eliminate the hazards in their environment are included under each category.

General Housing Characteristics and Indoor Home Environment

Depending on the age and type of the home, environmental hazards such as radon, friable asbestos, mold growth from flooding or leaks, and lead paint dust may be present. Homes built before 1978, the year in which the Federal government banned the addition of lead to residential paint

and similar materials, may contain lead paint and dust. The amount of lead in paint is even greater in homes built before 1950.[14] Some of these hazards may be released during renovation of a home. Children enrolled in Medicaid must have a blood lead level screening at 12 and 24 months or 36 to 72 months if they were not previously screened. For children not on Medicaid, depending on the environmental health history and state and local government guidelines, providers may recommend that children be tested for elevated blood lead levels.[4] Providers should ask about the age of the family's home and screen the child regardless of Medicaid status if they live in a house built before 1950.

Certain home heating sources may release carbon monoxide, particulate matter, or other respiratory hazards that should be considered. Molds may proliferate if water gets into indoor environments and is not cleaned up promptly. They may also be found in garbage pails, air conditioners, and humidifiers.

For indoor air pollution, the two best approaches to reducing indoor air pollution are source control and ventilation. For mold, the emphasis should first be on controlling leaks and floods that come from faucets, roofing, and plumbing problems. Items that become too moldy to clean should be discarded. Providers can recommend the use of HEPA filters in household vents and reducing use of candles, wood-burning stoves, and fireplaces. An extensive list of interventions for controlling and eliminating indoor air pollution and mold is available in *Environmental Management of Pediatric Asthma: Guidelines for Health Care Providers* (http://www.neefusa.org/health/asthma.htm).

Environmental Tobacco Smoke

Cigarette smoke contains many toxic chemicals and irritants. Children exposed to tobacco smoke have increased asthma exacerbations and other problems including lower respiratory infections and ear infections. Infants have an increased risk for sudden infant death syndrome. Simply "smoking outside" is not enough to limit the harm to children from tobacco smoke. Smoke settles in clothes, hair, car upholstery, and furniture. Providers should inquire about the child's exposure to secondhand smoke or if the child smokes him/herself. This also includes asking about use of tobacco in other forms, such as chewing tobacco. Providers should recommend that parents quit smoking, choose smoke-free childcare and social settings, and if guardians choose to smoke, not to smoke near the child.

Air Pollution/Outdoor Environment

This category covers a wide range of toxic chemicals and pollutants, whether from industrial or vehicle pollution outdoors, or from the use of wood stoves, volatile organic compounds, or other substances indoors. Industry, businesses (e.g., auto repair shops, dry cleaners), landfills, hazardous substance spills, and/or farms, where pesticides may be used, may be located in the community where a provider practices or where the family lives and may release hazardous substances.

Combustion by–products (e.g. nitrogen dioxide) and other pollutants can be respiratory irritants. Solvents and other chemicals can be found in building materials and can volatize during the 1-2 year period after new construction. Diesel exhaust from school buses can worsen asthma.

Health care providers can recommend that children reduce their outdoor activity level when ozone or particulates are high and that children should stay away from the exhaust pipe of idling school buses. If the outdoor environment in the area where the family lives exacerbates significant health problems, such as severe asthma, the family may want to consider moving to a new location, if possible.

Food and Water Contamination

Source of water and food can play a role in the amount of coliform bacteria and nitrates (from well water, for example) or pesticides to which a child is exposed. Water from the tap may contain lead from the pipes carrying the water or the solder in the pipes. Providers should recommend water testing for coliform bacteria, other microbials, lead, arsenic, and pesticides. If the water contains lead, parents should be advised to run water for 2 minutes if it has been standing in the pipes, or until cold.[4] Formula reconstituted with tap water may expose infants to lead.[15] Furthermore, pound for pound in comparison to adults, children eat more food, which may expose them to higher concentrations of pesticides from fruits and vegetables, depending on their source

(e.g. organic, farmer's market, supermarket, own garden). Certain fish may contain high amounts of mercury, which could be harmful to fetuses and children, therefore providers should be aware of any fish advisories and advise their patients accordingly.

Toxic Chemical Exposures

Children can be exposed to pesticides applied inside and outside of the home. Providers should recommend that pesticides and other chemicals be placed out of children's reach. Furthermore, providers should recommend that least toxic methods of pest control should be employed first.[16] A child can be exposed to arsenic by coming into contact with wooden play structures or desks made of CCA-treated wood.[17,18] Health care providers can recommend that children wash their hands after playing on treated wood to remove any arsenic on their hands.[19] A sealant should be applied to any pressure treated wood structure at least on a yearly basis.[20]

Occupations and Hobbies

Parents' occupational exposures, such as those from working in agriculture, in factories with heavy metals, or in construction work, can be transported to the child and be a hazard for them.[4,21,22] Parents should be advised to shower and change clothes at the workplace before returning home.

Some recreational activities may expose children to certain hazards, such as toluene from the glue used in model building, or lead from shooting at an indoor firing range.[23] Additional hobbies that may present possible environmental hazards include arts and crafts activities and supplies, such as artists' paint, stained glass making, and furniture refinishing.[24]

Exposure to the Outdoor Environment

Chronic conditions such as childhood obesity, asthma, and attention-deficit disorder are becoming increasingly prevalent in children and adolescents.[25] Children are at risk of becoming the first generation to have a shorter lifespan than their parents if lifestyle-related behaviors remain the same.[26] Television, video games, the internet, and a demanding school and extracurricular schedule have offered little time for free outdoor play time. Exposure to the outdoor environment may benefit the healthy development of a child. Being outdoors can (a) increase levels of physical activity in children,[27] (b) reduce childhood stress,[28] (c) aid in healthy childhood development[29], and (d) serve as a coping mechanism for attention-deficit disorder.[30] The Centers for Disease Control and Prevention encourages children to get at least 60 minutes of physical activity most days of the week, preferably daily.[31] The American Academy of Pediatrics recommends that pediatricians advise parents and caregivers to allow their child free, unstructured play time outdoors as much as possible and limit total screen time to 2 hours a day.[27,32] While outdoors, children should be protected from excessive sun exposure.[33]

Health Related Questions

Providers can ask questions about developmental history (e.g., infants crawling on the floor, walking, getting into objects) to assist with the differential diagnosis.

Resources

For specific information on environmental issues and sources of pollution in your area, contact the state environmental department or local public health or environmental programs. Consult Environmental Protection Agency's (EPA) Envirofacts program (www.epa.gov/enviro/index_java.html) as a starting point in identifying environmental factors by zip code or map. Additional information on environmental exposures can be obtained from a variety of sources, including EPA's Office of Indoor Air Quality (http://www.epa.gov/iaq/), Office of Children's Health Protection (http://yosemite.epa.gov/ochp/ochpweb.nsf/homepage), and the Air Quality Index (http://www.airnow.gov). These sites link to further resources which may be of assistance.

For children already diagnosed with asthma, it is suggested to use the Environmental Management of Pediatric Asthma: Guidelines for Health Care Providers. A list of websites, educational resources, and handouts for patients are available at http://www.neefusa.org/health.htm.

References

[1]Agency for Toxic Substances and Disease Registry. United States Department of Health and Human Services, Public Health Service. Obtaining an exposure history. Atlanta, Georgia. *Am Fam Physician.* 1993 Sep 1;48(3):483-91.

[2]Goldman RH, Peter JM. The occupational and environmental health history. *JAMA.* 1981 Dec 18;246(24):2831-6.

[3]Goldman LR. The clinical presentation of environmental health problems and the role of the pediatric provider. What do I do when I see children who might have an environmentally related illness? *Pediatr Clin North Am.* 2001;48:1085-1098.

[4]American Academy of Pediatrics Committee on Environmental Health. *Pediatric Environmental Health 2nd ed.* Etzel RA, Ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003. Chapter 4.

[5]American Academy of Pediatrics website. Pediatricians' Perception of the Impact of Environmental Hazard and Counseling Practices Regarding Environmental Health. Available at http://www.aap.org/research/periodicsurvey/ps42bexs.htm.

[6]Kilpatrick N, Frumkin H, Trowbridge J, Escoffery C, Geller R, Rubin I, et al. 2002. The environmental history in pediatric practice: a study of pediatricians' attitudes, beliefs, and practices. *Environ Health Perspect.* 110: 823-827.

[7]Kipen HM, Craner J. Sentinel pathophysiologic conditions: an adjunct to teaching occupational and environmental disease recognition and history taking. *Environ Res.* 1992 Oct;59(1):93-100.

[8]McCurdy L, Roberts J, Rogers B, Love R, Etzel R, Paulson J, Witherspoon N, Dearry A. Incorporating Environmental Health Into Pediatric Medical and Nursing Education. *Environmental Health Perspectives.* Dec 2005;112(17):1755-1760.

[9]WHO. *Fact sheet 170.* Geneva, Switzerland: WHO, 1997.

[10]Landrigan PJ, Schechter CB, Lipton JM, Fahs MC, Schwartz J. Environmental Pollutants and Disease in American Children: Estimates of Morbidity, Mortality, and Costs for Lead Poisoning, Asthma, Cancer, and Developmental Disabilities. *Environ Health Perspect.* 2002; 110(7):721-728.

[11]Balk S, Walton–Brown S, Pope A. *Environmental History-Taking.* Children's Environmental Health Network. 1999. Available at: http://www.cehn.org/cehn/trainingmanual/pdf/manual-envhist.pdf.

[12]Dunn AM, Burns C, Sattler B. Environmental Health of Children. *Journal of Pediatric Health Care.* Sept-Oct 2003;17(5): 223-231.

[13]The National Environmental Education Foundation (NEEF). *Environmental Management of Pediatric Asthma: Guidelines for Health Care Providers.* Washington, DC: NEEF. Draft - March 2005.

[14]Centers for Disease Control and Prevention. Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Atlanta: CDC; 2002. Available at http://www.cdc.gov/nceh/lead/CaseManagement/caseManage_main.htm.

[15]Baum CR, Shannon MW. The lead concentration of reconstituted infant formula. *J Toxicol Clin Toxicol.* 1997;35(4):371-5.

[16]American Academy of Pediatrics Committee on Environmental Health. *Pediatric Environmental Health 2nd ed.* Etzel RA, Ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003. Chapter 24, p. 347.

[17]Stilwell D, Toner M, Sawhney B. Dislodgeable copper, chromium and arsenic from CCA-treated wood surfaces. Sci Total Environ. 2003 Aug 1;312(1-3):123-31.

[18]Hemond HF, Solo-Gabriele HM. Children's exposure to arsenic from CCA-treated wooden decks and playground structures. *Risk Anal.* 2004 Feb;24(1):51-64.

[19]Kwon E, Zhang H, Wang Z, Jhangri GS, Lu X, Fok N, Gabos S, Li XF, Le XC. Arsenic on the hands of children after playing in playgrounds. *Environ Health Perspect.* 2004. Oct: 112(14):1375-80.

[20]Environmental Protection Agency. Evaluation of the Effectiveness of Coatings in Reducing Dislodgeable Arsenic, Chromium, and Copper from CCA Treated Wood Interim Data Report. EPA Report EPA/600/R-05/050. May 2005. Available at http://www.epa.gov/oppad001/reregistration/cca/sealant_study.pdf.

[21]Whelan EA, Piacitelli GM, Gerwel B, Schnorr TM, Mueller CA, Gittleman J, Matte TD. Elevated blood lead levels in children of construction workers. *Am J Public Health.* 1997 Aug;87(8):1352-5.

[22]Piacitelli GM, Whelan EA, Sieber WK, Gerwel B. Elevated lead contamination in homes of construction workers. *Am Ind Hyg Assoc J.* 1997 Jun;58(6):447-54.

[23]Goldberg RL, Hicks AM, O'Leary LM, London S. Lead exposure at uncovered outdoor firing ranges. *J Occup Med.* 1991 Jun;33(6):718-9.

[24]Babin A, Peltz P, Rossol M. Children's Art Supplies Can be Hazardous. New York: Center for Safety in the Arts. 1988.

[25]Perrin JM, Bloom SR & Gortmaker SL. 2007. The increase of childhood chronic conditions in the United States. *JAMA,* 297(24): 2755-59.

[26]Ludwig, DS. 2007. Childhood obesity – the shape of things to come. *NEJM,* 357(23): 2325-27.

[27]American Academy of Pediatrics – Policy Statement. Council on Sports Medicine and Fitness, and Council on School Health. 2006. Active healthy living: prevention of childhood obesity through increased physical activity. *Pediatrics,* 117(5): 1834-42.

[28]Wells NM & Evans GW. 2003. Nearby nature: a buffer of life stress among rural children. *Environment and Behavior,* 35(3): 311-330.

[29]American Academy of Pediatrics- Clinical Report. Ginsburg KR, et al. 2007. The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics,* 119(1): 182-191.

[30]Kuo FE & Taylor AF. 2004. A potential natural treatment for attention-deficit/ hyperactivity disorder: evidence from a national study. *A J of Public Health,* 94(9): 1580-86.

[31]The Centers for Disease Control and Prevention. Parks and Trails. Atlanta: CDC. 2008. Available at http://www.cdc.gov/Features/ParksAndTrails/.

[32]American Academy of Pediatrics – Committee on Public Education. 2001. Children, adolescents, and television. *Pediatrics,* 107(2): 423.

[33]American Academy of Pediatrics – Policy Statement. Committee on Environmental Health. 1999. Ultraviolet light: a hazard to children. *Pediatrics,* 104(2): 328-333.

Additional References

Balk SJ. The environmental history: asking the right questions. *Contemp Pediatr.* 1996;13:19-36.

Butterfield PG, Lindeman CA, Valanis BG, Spencer PS. Design of a questionnaire: occupational and environmental risks for Parkinson's disease. *AAOHN J.* 1995 Apr;43(4):197-202.

Byrnes K. Conducting the pediatric health history: a guide. *Pediatr Nurs.* 1996 Mar-Apr;22(2):135-7.

Etzel RA, Crain EF, Gitterman BA, Oberg C, Scheidt P, Landrigan PJ. Pediatric environmental health competencies for specialists. *Amb Pediatr.* 2003; 3: 60-63.

Marshall L, Weir E, Abelsohn A, Sanborn MD. Identifying and managing adverse environmental health effects: 1. Taking an exposure history. *CMAJ.* 2002 Apr 16;166(8):1049-55. Review.

Paranzino GK, Buckler G. Taking an exposure history. *Nurs Spectr* (Wash D C). 1998 Apr 20;8(8):12-4. Review.

Thompson JN, Brodkin CA, Kyes K, Neighbor W, Evanoff B. Use of a questionnaire to improve occupational and environmental history taking in primary care physicians. *J Occup Environ Med.* 2000 Dec;42(12):1188-94.

Twining S. The occupational and environmental health history: guidelines for the primary care nurse practitioner. *Nurse Pract Forum.* 1995 Jun;6(2):64-71.

Velez-McEyoy, M. Occupational and environmental exposure history - historia cli'nica de riesago ocupacional y ambiental. *AAOHN J.* 2004 Apr;52(4):146-148.

National Environmental Education Foundation
Knowledge to live by

4301 Connecticut Avenue, Suite 160 • Washington, DC 20008 • Tel. (202) 261-6475 • health@neefusa.org • http://www.neefusa.org