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Health Care Provider Knowledge of the Immunization Schedule and the Contraindications to Vaccinate

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HEALTH CARE PROVIDER KNOWLEDGE OF THE IMMUNIZATION SCHEDULE AND THE CONTRINDICATIONS TO VACCINATE

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ABSTRACT

The purpose to this study was to determine if the current knowledge of Kent county's health care providers contributed to the under immunization of children less than two years of age.

A survey, modified from a previous study done in Los Angeles, was distributed to Family Practice and Pediatrics offices within the greater Grand Rapids area. Several areas of health care provider knowledge were assessed. These included: (1) knowledge of the primary series immunization schedule in both a child on time and delinquent, (2) knowledge of timing between diptheria, tetanus, and pertussis boosters, and (3) knowledge of the contraindications to vaccinate.

The results showed an 89% correct response rate for knowledge of the immunization schedule and an 80% correct response rate for knowledge of the contraindications to vaccinate. Overall it was concluded that Kent county health care providers were sufficiently knowledgeable in both areas stated and, therefore, did not significantly contribute to the under immunization of young children.

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TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

Background to Problem

Immunization is a critical tool in the prevention of communicable diseases. It is a process in which a weakened or dead microorganism, suspended in solution, is injected into the body to induce immunity against disease. The use of these injections, called vaccines, has established control over highly fatal diseases that plagued the United States in the first half of the twentieth century. Vaccinations have led to the global eradication of smallpox, as well as the virtual elimination of poliomyelitis in the United States.[1] Over 98% of school-age children are fully immunized today in the United States, resulting in a decreased incidence of diphtheria, measles, mumps, pertussis, rubella, congenital rubella syndrome, and tetanus.[2] However, only 67% of two-year-old children are appropriately immunized on schedule.[3] Each of the 50 states is monitored by the National Immunization Survey (NIC), which is conducted by the Centers for Disease Control (CDC). This survey estimates vaccination coverage among children aged 19-35 months. While the immunization rates of two-year-old children falls behind that of school-age children, the immunization rates for 19-35 month old children has been on the rise.[4]

> "Michigan's statewide immunization levels for two-year-olds increased to 76% in 1996, up 15 percentage points from 1994, when it was reported that Michigan ranked last in the nation in childhood immunizations. The results of a Michigan Department of Community Health survey show[ed] that immunization levels for 19 to 35 month old children in Kent County are now 86.4%."[5]

Although Kent County immunization levels have increased significantly, Michigan Department of Community Health director James K. Haveman, Jr. states "...we've set our sights on achieving and maintaining a goal of full immunization protection for 100% of our youngest children."[5]

Due to the highly contagious nature of some vaccine-preventable diseases, children who are immunized earlier in life have a marked reduction in their risk of contracting these diseases. If only a small number of children have not received their vaccines on time, their likelihood of being exposed to a vaccine-preventable disease is remote. However, if a larger number of children are not immunized, the chance of being exposed to a vaccine-preventable disease increases. Poor immunization rates may result in the spread of serious illness among children.[1]

In recent years, the effects of underimmunized pre-school children have led to several measles epidemics across the United States, in cities including Los Angeles, Chicago, and Houston.[6] Although many factors contribute to the underimmunization of pre-school children, the "National Vaccine Advisory Committee (1991) has identified missed opportunity as one of the main reasons for the 1990 measles epidemic."[7] A missed opportunity (MO) is defined as a medical encounter during which a child is eligible for but fails to receive an immunization. MO's are a result of many barriers.[8] These barriers include, but are not limited to:

- Lack of knowledge by parents about the importance of vaccines and the seriousness of preventable diseases[9-12]
- The rapid advancement in vaccine development and changing guidelines to recommended vaccinations[2]
- A lack of consistent review of a child's immunization status and subsequent follow-up at each clinical encounter[2]

- Cost and/or inadequate insurance coverage of routine vaccinations[13]
- Physical barriers, such as lack of transportation or inadequate health clinic hours[14]
- Limited understanding of the immunization schedule by health care providers[15]
- Misconceptions about contraindications to vaccination by health care providers[15]

In response to the 1990 measles epidemic, the Advisory Committee on Immunization Practices (ACIP), the Committee on Infectious Diseases of the American Academy of Pediatrics (AAP), and representatives from the American Academy of Family Physicians (AAFP) developed a single immunization schedule. This new schedule, effective January 1995, combined and simplified immunization recommendations.[16] Although this schedule was intended to clarify immunization guidelines,[16] deficits in provider knowledge of the immunization schedule and deficits regarding contraindications to vaccination may lead to delayed immunizations.[15]

In order to address or correct for these misconceptions, the ACIP and the AAP developed guidelines regarding contraindications and precautions to immunizations. These guidelines were published along with the Standards for Pediatric Immunization Practices. The overall goal for the establishment of these guidelines was to address ways to overcome barrier issues as well as provide information about the true contraindications of giving immunizations. These standards have been integrated into immunization programs throughout the country. Standards Seven and Eighteen suggest that providers identify only valid contraindications to vaccination and receive ongoing education on current immunization recommendations.[2] The degree to which these guidelines are being

followed has not been determined. Consequently, the impact of potential misinterpretation or knowledge deficits about vaccine schedules and valid contraindications has not been ruled out as a significant source of low immunization rates among pre-school children.

Problem Statement

Since Kent County has not achieved the goal of having 100% of its children vaccinated, the barriers that may have contributed to this need to be examined. Several nationwide studies have been directed towards discovering reasons for low immunization rates.[7,8,17] However, only limited information is available concerning health care provider knowledge of the immunization schedule and the contraindications to vaccinations and how this affects the immunization status of children. Results from a Los Angeles study related provider knowledge deficits to missed opportunities and the underimmunization of children less than five-years-old.[15] Application of the survey from the Los Angeles study was used to evaluate whether Kent County health care providers' knowledge level of the immunization schedule and contraindications to vaccination is a source for the failure to achieve the proposed goal.

Purpose of the Study

The purpose of this study was to determine the level of knowledge of Kent County health care providers regarding the immunization schedule and contraindications to vaccination. If results reveal deficits in these areas, attention can be focused on provider education and quality improvement efforts. If results do not reveal deficits,

other barriers to achieving a 100% immunization rate in Kent County need to be identified and addressed.

Research Question

Do Kent County health care providers have knowledge deficits regarding the immunization schedule and contraindications to vaccine administration?

CHAPTER TWO

LITERATURE REVIEW

Overview

Immunizations should be an integral part of every child's comprehensive health care. The use of vaccinations is the best preventive method that is available to protect children from certain serious diseases.[2] Although over 98% of school-age children are fully immunized,[2] only 67% of two-year-old children receive immunizations on schedule.[3] In response to these statistics, the Childhood Immunization Initiative (CII) was implemented in 1993 to address these issues in the United States. The goals of this initiative were:

> "to eliminate by 1996 indigenous cases of diphtheria, tetanus (among children aged <15 years), poliomyelitis, *Haemophilus influenzae* type b (Hib) invasive disease (among children aged <5 years), measles, and rubella; reduce indigenous cases of mumps to <1600; and increase vaccination coverage levels to ≥90% among children aged two years for the most critical doses of each vaccine routinely recommended for children (except hepatitis B vaccine)."

Provisional 1996 data reported that overall five states achieved all six disease-elimination goals, 10 states achieved five goals, 23 achieved four goals, and 12 achieved three goals. "Despite these accomplishments in eliminating vaccine-preventable diseases, four of the six disease-elimination goals established by the CII were not achieved at the national level in 1996."[18]

In order to improve immunization rates, many guidelines and recommendations has been developed. For example, a single immunization schedule and the Standards for Pediatric Immunization Practices were efforts aimed at improving immunization rates.[2,16]

rapid vaccine advancements and schedule changes, lack of chart review and follow-up, cost, physical barriers, and inadequate provider knowledge of the immunization schedule and misconceptions regarding contraindications to vaccination. There have been numerous studies that have researched these barriers.[8,15-17] The results of these studies have suggested that these barriers need to be overcome to ensure that all children have adequate immunization levels along with guaranteeing that immunizations are given on schedule.

Parent Knowledge

Misunderstandings and lack of knowledge about immunizations by parents have been studied as one contributing factor to the underimmunization of children.[15] Since most parents today grew up in a time when vaccine-preventable diseases were not frequently encountered, they may be unaware of the serious effects of these diseases. A 1993 Gallop poll showed that 47% of parents of children under age five did not know that polio was contagious and 36% did not know that measles could be fatal.[9] Furthermore, misinformation on vaccine side effects, especially the Diphtheria-Tetanus-Pertussis (DTP) vaccine, has made parents hesitant to immunize children.

An important source of misunderstanding regarding adverse vaccine reactions may be the result of extensive media coverage, primarily from television programs. Due to an emphasis on the seriousness of vaccine side effects, without accurate contextual information on low occurrence rates, parents were less likely to get the DTP vaccine for their children.[10] While controversy continues to exist over adverse reactions,[19] these reactions are generally considered to be insignificant when compared to the benefits of

immunity.[1] Keusch (1994) recommends that parents be educated concerning the side effects of vaccines in order to reduce the misconceptions associated with them.[1]

In a review of research on the status of parent immunization knowledge and the contribution of health care systems in providing that knowledge, parent's knowledge of the recommended schedule for receiving vaccines was found to be deficient.[14,15] Many parents were unaware of the diseases for which the vaccines were given. Much of the information available to parents about immunizations emphasized school entry requirements only. These omissions may result in a delay of timely immunizations for younger children.[14]

In addition to parental misinformation, research has found that parents do not consider health care providers to be a significant source of information about vaccination.[14] Although parents did not consider health care providers to be a significant source of immunization information, a study in 1994 found that most health care providers use various methods to provide needed educational materials to parents. These methods include consent forms, videotapes, educational brochures, anticipatory guidance, and direct contact with a health educator.[20] The providers surveyed in this study were pediatricians. Pediatric providers, in general, have a higher commitment to providing comprehensive well-child care.[20] Since many parents use other health care specialties or groups (family practice, public health departments, etc.) besides pediatricians, application of the survey in these settings may show different results. Due to the cultural diversity in the United States, Standard Five suggests that providers supply information that is appropriate to that particular patient's culture. Also, educational materials should be available in varying reading levels and in multiple languages.[2] As a result of the

identification of this standard, attention has been directed towards increasing parent knowledge and decreasing misconceptions about vaccinations. This has served as a promising aid to increase overall vaccination rates.[20]

Vaccine Advancements and Schedule Changes

In the past, multiple schedules with variable information were the only available guidelines for health care providers to follow. These differences served as a source of confusion and a possible barrier to timely vaccine administration. As a result of this problem, incorporation of all current recommendations into a single schedule was developed by the Advisory Committee on Immunization Practices (ACIP), the Committee on Infectious Diseases of the American Academy of Pediatrics (AAP), and representatives of the American Academy of Family Physicians (AAFP). The goal of this schedule was to simplify and combine immunization guidelines in order to overcome this barrier.[16]

Scientists have discovered that some childhood immunizations do not offer life-long immunity. New vaccines such as Varicella-zoster, *Haemophilus influenzae* type b (Hib), and Hepatitis B have been developed. As a result, frequent revision of schedules has been necessary. Such changes have made it difficult for health care providers to apply current guidelines. Therefore, it is important for health care providers to continuously review professional publications concerning immunization schedule changes.[16]

Chart Review and Follow-up

"The National Childhood Vaccine Injury Act (NCVIA) requires that all health care professionals who administer immunizations must maintain permanent records of certain vaccines and toxoids. Records must indicate the date administered, vaccine manufacturer, lot number, name, address, and title of the person administering the vaccine."[16]

Research has shown that failure to comply with this act, along with the lack of consistent review of a child's immunization status, leads to decreased vaccination rates.[15,17,21] A study in Tennessee revealed that many one-year-olds attending a public health department clinic did not receive the measles vaccine. Factors that played a role in the nonvaccination of this group included haphazard record checks and careless secretarial procedures.[22] Patient charts from 1969-1971 were used to obtain the information for this study. Many new guidelines and recommendations have been developed since this time in response to measles outbreaks and low immunization rates throughout the United States.[2,16] Providers have more resources available concerning immunizations today than they did in the past.

In addition to reviewing charts in primary care offices, a child's immunization status also should be checked in other settings. For example, many inner-city children use emergency departments and acute health care clinics as their primary source of care.[23] Reviewing charts in all health care settings may help to increase vaccination rates.

In conjunction with inadequate chart review, a lack of consistent follow-up is also a problem. Although a child may be identified as having a deficient immunization status, action needs to be taken to ensure that the child will receive the needed vaccines. This action includes informing parents of their child's deficient status and implementing a

tracking system to follow that child.[17] A study in Arizona revealed that parents who were informed of their child's deficient immunization status were twice as likely to get that child vaccinated within a month as compared to parents who were not informed.[17] Since charts were not consistently reviewed, many parents were not informed of their child's immunization status. This study demonstrated an association between a lack of chart review and passage of knowledge to parents about their child's deficient immunization status to the failure to complete full immunization. Although a strong association was reported, this study is not of an experimental design and "one cannot be sure that simply informing patients of their immunization status will have the desired effect of improved follow-up."[17]

The use of posted notices or copies of the immunization schedule displayed in offices may help to remind staff and parents to inquire about a child's immunization status. Methods, ranging from sophisticated computer tracking systems to the posting of reminder cards on charts, may aid in the follow-up of underimmunized children.[24] The use of reminder cards in one study revealed that 12% of children did not receive a vaccination if the reminder card was attached and 49% did not receive a vaccination if the card was not attached. This study also found that when reminder cards were attached to charts the likelihood that needed vaccines were administered increased from 51% to 88%.[8] While this study showed impressive results, there were several limitations. The staff was aware of the study and also the marked charts made it easier to identify study patients. Also, staff knowledge may have led to increased efforts to screen and vaccinate children in the control groups. There may have been bias in the comparison of vaccination rates of study and control groups.[8]

Standards Four, Nine, Twelve, and Fourteen of the Standards for Pediatric Immunization Practices address the issues discussed above. They recommend that providers use all clinical encounters to screen for needed vaccines, administer vaccines when needed, use accurate and complete recording procedures, implement the use of a tracking system to follow underimmunized children, and review charts periodically to assess immunization levels of their patients. Increased compliance with these standards could help to increase immunization rates.[2]

Cost

"Immunization is a critical investment – one that not only prevents illness but also reduces cost, since it is estimated that for every $1 spent now on immunizations, $10 to $14 will be saved by preventing diseases in the future."[25] Lack of insurance coverage for routine childhood immunizations make the high cost of vaccinations a difficult barrier to overcome.[6] Cost as a barrier to vaccination has been the focus of several studies and most have concluded that inadequate or lack of insurance coverage leads to undervaccination of children.[8,13,26,27] A study conducted in New York investigated insurance status through chart reviews. The results concluded that that the incidence of undervaccination was two times as great for children who were covered by Medicaid and for those who had no insurance coverage versus children covered by private insurance.[28] Most of the sites used in this study were urban. Since only one rural site was studied, these results should not be applied to other rural settings. Also, information was obtained only from primary care practice sites. A random sample of the entire pediatric population was not performed therefore these results cannot be applied to the 7% of children in the United States who have no primary care provider.[29] In contrast, another study showed

that only 45% of children whose parents had complete insurance coverage by a large corporation were fully immunized by their second birthday.[30] This study implied that there was no direct correlation between immunization status and cost factors. Since this study obtained information from only one corporation, it would not be applicable to any other setting. It also would not address parents who do not work for a large corporation, but still have complete insurance coverage.

To address cost issues, Standard Three of the Standards for Pediatric Immunization Practices provides suggestions to overcome this barrier. For example, it is recommended that immunizations should be free of charge in public facilities and in private offices the charge should reflect only the cost of the vaccine and a reasonable administration fee.[2] Upon evaluation of how private and public health care facilities have adhered to this standard, researchers in Baltimore, Maryland found that only 25% of providers incorporated the cost of immunizations into well-child visits. Other facilities charged a flat rate ranging anywhere from $0 to $167, depending on if the parent was able to pay or if there was a third-party payer. The lowest charge at public sites was $9 as compared to the high cost of $73 at private sites.[20] Recent retrospective surveys in Baltimore verified that immunization levels in this city were similar to those reported by other large cities.[31] One limitation of this study was a low response rate. Also, the researchers defined a public health facility as any facility that receives public grant funds or publicly subsidized vaccines. This is not a uniform definition that can be applied to all public facilities in the United States.[20]

Another method that was designed to break the cost barrier was the implementation of the Vaccine for Children (VFC) program. This program provides free

or minimal cost vaccines to children. These vaccines are available at participating public and private facilities. Children are eligible to receive these vaccines if they are on Medicaid, have no insurance, or are an American Indian or Alaskan Native.[32] Even though some facilities may charge an administration fee (up to a set limit), this program states that a child cannot be denied immunization if their parent or legal guardian is unable to pay.[33] Enrolling in the VFC program and following the suggestions listed in Standard Three may help to increase immunization rates.

Physical Barriers

Inconvenient and rigid immunization practices may be a barrier for children to receive needed vaccines. Several studies have investigated these types of barriers. Common findings included: inconvenient office hours without offering weekend or extended hours, inaccessible office locations, appointment-only requirements, decreased availability of appointments, long waiting periods, refusal of immunization services on non-scheduled days, and stock shortages of vaccines.[14,20,22,34]

Potential physical barriers were evaluated by administering a household survey in Puerto Rico. Results revealed that families encountered difficulty in arranging for time off of work in order to attend clinics during open hours.[14] An obvious limitation of this study is the area in which it was conducted. The results may not be applicable to the United States. Also, only families that lived within three miles of clinics were interviewed. The population researched was not representative of the whole population.[14]

Several studies have researched other physical barriers as sources of the underimmunization of children. Some have identified the requirement of most clinics to make an appointment to receive a vaccination to be a significant barrier for parents.[14,20,34]

Another survey discovered that some clinics, due to lack of available appointments. are unable to see children until four to six weeks after the time due for a needed vaccine.[20] Other clinics, in which an appointment was not necessary, often refused to give immunizations simply because they were not offered on that day.[22] Many studies indicated that lack of transportation for poor families was a source of delay or missed opportunities.[14,20,34]

In response to these concerns, Standards One and Two of the Standards for Pediatric Immunization Practices provide measures to decrease these barriers. Standard One suggests that immunization services should be readily available. For example, in order to meet the needs of working parents, weekend clinics or extended office hours should be offered and vaccine administration should not be limited to certain days.[2] Standard Two suggests that the administration of vaccines should not have unnecessary prerequisites. Offering vaccines on a walk-in basis with minimal waiting periods should increase vaccination rates and reduce some physical barriers as a source of underimmunized children.[2]

Knowledge of Immunization Schedule

Limited understanding of immunization schedules by health care providers may serve as a potential barrier to receiving vaccines. Previously, the use of many schedules served as a source of confusion for providers in reference to when and in what order vaccines are to be administered. Also, the schedules were thought to be even more difficult to interpret when a child presents with a delinquent or interrupted immunization schedule. In an attempt to alleviate misconceptions about immunization schedules, a single schedule was created in 1995.[16] Although the purpose of this schedule was to clarify vaccination

requirements,[16] studies have shown that providers continue to have limited understanding concerning this schedule.[15]

Researchers in Los Angeles issued a survey to public and private health care providers. The purpose of the questionnaire was to evaluate provider knowledge of the immunization schedule. Results stated that one-third of the questions on immunization timing were answered incorrectly by physicians. Only 50% of providers knew which vaccines were needed for a five-month-old child, with even fewer knowing the appropriate vaccines needed for a twelve-month-old child. Provider lack of knowledge concerning the schedule may lead to missed opportunities and decreased immunization rates.[15] Although this study had a low response rate (32%) for private providers, the measured knowledge levels for these private providers was similar to those of the public providers.

Another study in Tennessee revealed that a delay in the administration of the DTP immunization series was due to confusion by some clinic staff regarding procedures for vaccinating children.[22] Since the time when this information was gathered (1969-1971), there have been many attempts to alleviate the misconceptions and confusion regarding immunization schedules including the development of a single immunization schedule[16] and the Standards for Pediatric Immunization Practices.[2]

To increase provider knowledge of the schedule, Standard Eighteen of the Standards for Pediatric Immunization Practices suggests that providers receive ongoing education and training regarding current immunization recommendations.[2] Although this standard is intended to assist providers, studies have indicated poor compliance with

these guidelines.[35] To increase utilization of the Standards, provider education needs to be incorporated into an active, ongoing process of quality improvement.[35,36]

Knowledge of Contraindications

Misconceptions regarding true contraindications to vaccine administration may lead to the underimmunization of children. Reluctant administration in the presence of mild illness[15] and failure to give multiple vaccines at the same visit[11] serve as barriers to timely immunizations. Fear of legal ramifications may be the reason why providers are hesitant to issue vaccines during certain illnesses.[21] A survey was conducted to determine the most common conditions in which a public or private provider would be unlikely to administer a vaccine. These conditions include: the convalescent phase of an illness, family history of an adverse event after immunization, family history of seizures, previous reaction with a temperature of less than 105°F, penicillin or antibiotic allergy, pregnancy of mother, history of nonspecific allergies, breast feeding infants, and a previous reaction with only soreness at the site. Withholding vaccines for the above conditions does not constitute a valid contraindication.[7] It is important to note that the questionnaire did not link invalid contraindications to specific vaccines. Also, comparisons cannot be made between the public and private providers in this study. The public health providers represented the entire state while the private providers represented only one county within that state.[7] Other studies have found that providers who were hesitant to administer vaccines in the presence of similar conditions contributed to delayed immunizations.[14,37-39] Standard Seven in the Standards for Pediatric Immunization Practices addressed this issue by creating a guide to

contraindications and precautions to immunizations. Use of this guide may help providers to recognize true contraindications.[2]

Following the current immunization schedule requires that several vaccines be administered at one visit. Providers may not want to give multiple vaccines due to a fear of imposing discomfort on the child.[24] A survey conducted in Minnesota found that most providers thought that three injections were too many for a child to receive at one visit. Although these providers did not want to give three injections at the same time, they thought it would be more convenient for parents and improve vaccination rates if all three were performed at that visit.[40] Another study performed in Florida reported that one-third of its measles cases could have been prevented if vaccines had been simultaneously administered.[21] Since this study used a telephone interview to obtain information, only those persons who had a telephone and were home at the time of the call were eligible for participation. The results in this study may have been underestimated and the number of vaccine-preventable measles cases in the community could have been higher.

In order to improve the number of fully immunized children, providers need to adhere to the requirements of the schedule. Standard Eight of the Standards for Pediatric Immunization Practices indicates that the administration of several vaccines at one time is safe and effective. Evidence suggests that immunization coverage can possibly be raised by 9% to 17% if providers simultaneously administer vaccine doses to eligible children at each visit.[2]

Summary

The above barriers have been identified as possible explanations for the underimmunization of children. Although each barrier is a potential source of decreased

immunization rates, the combination of all these barriers may play the greatest role. For each underimmunized child, several barriers may act together to prevent the administration of needed vaccines. The Standards for Pediatric Immunization Practices have been the most useful tool to help identify barriers and provide manners in which to overcome them.[2] Providers and parents need to be proactive concerning the vaccination of children. Joint efforts by both are necessary in order to guarantee that all children are protected.

Most of the research has focused on barriers including parent unawareness, cost, physical barriers, and a lack of follow-up of underimmunized children. These have each proved to be a significant source of low immunization rates. Most attention is usually focused on parental responsibility. Measures are more often aimed at what can be done to get children into offices to receive vaccinations rather than on the factors that may serve as barriers while the child is in the office. Although children may be coming in to receive vaccines, parent and community efforts have been expended if a provider does not know what vaccinations to give and when. Since there is limited research regarding provider knowledge of the schedule and valid contraindications to vaccination and how this may be related to the underimmunization of children, this is an area that needs to be researched further. Our study will determine if deficits in provider knowledge of the schedule and contraindications to vaccination need to be addressed in Kent County as one of the possible causes for the failure to reach the proposed goal.

CHAPTER THREE

METHODS

Study Design

A survey, adapted from a previous study done in Los Angeles, was chosen for this study. The purpose of this survey was to determine health care provider knowledge of immunization schedules and contraindications to vaccine administration. According to Fink and Kosecoff 1985, a survey can be used for this purpose of collecting information directly. The data from survey research can obtain "provider descriptions of attitudes, values, habits and background characteristics".[41] Therefore, survey evaluation of provider knowledge assisted us in answering our research question.

Generally, there are two types of surveys used- questionnaires and interviews. Questionnaires have been used consistently in studies that evaluate barriers to low immunization rates.[7,14,15,34] Other factors for choosing this research design include: cost, access to a larger sample size, respondent anonymity can be preserved, and the respondent may feel less apprehension or pressure.[41]

Study Site and Subjects

A survey of health care providers, defined as Medical Doctors (MD's), Doctors of Osteopathy (DO's), Physician Assistants (PA's) and Nurse Practitioners (NP's) in Kent county was attempted. To identify health care providers of interest, a list of area family practice and pediatric health centers from the 1998-99 Ameritech Greater Grand Rapids yellow pages was used and potential participants were contacted by phone. This first

contact was used to determine if these providers met the study criteria of administering vaccines to children under five years old and to further identify if there are other health care providers in their practice who routinely give/ order vaccinations. This single stage sampling procedure included all physicians and health care providers who met the above criteria. Permission to conduct this survey was obtained from each individual office requirements.

Following sample determination, the self-administered questionnaire was delivered to each participant. Each health care provider was asked to allow approximately fifteen minutes to answer all of the questions and was given one to two weeks to finish the survey at their own convenience. These administration guidelines were determined as a result of the significant limitation of the original study conducted in Los Angeles of a very low response rate from private physicians to the mailed survey.[15] Consequently, in an attempt to increase response rate, we decided to deliver the questionnaire in person. Only one questionnaire was given to each participant and this represented the current knowledge of health care providers at one point in time only (cross-sectional).

Instrument and Validity

The questionnaire for this survey was obtained from a previous study done in Los Angeles. A modified version of the original questionnaire was used, incorporating current immunization recommendations. Permission has been granted to use the original survey scenarios (see Appendix A). Validity was determined through pre-testing outside of their target area. We also pre-tested our updated survey to five physicians from

another nearby county.

Content. To begin with, demographic information of providers was be obtained and includes job title (i.e.- MD, DO or RN), year of professional school graduation and U.S/ foreign school attendance. Next, practice characteristics such as volume of pediatric visits per week and volume of diptheria, tetanus, pertussis/acelluar pertussis (DTP/DtaP), measles-mumps-rubella (MMR), oral/inactivated poliovirus vaccine (OPV/IPV), *Haemophilus influenzae* type b (Hib) and Hepatitis type B vaccine administration was asked. The minimum number of vaccines given per week in order for providers to maintain competence was determined by questioning several area physicians who routinely give immunizations. Consensus from four area pediatricians and eight area family practice physicians concluded that any provider who has children in their patient population should maintain competency. Health care providers who do not see any pediatric patients two years old or younger were excluded from data collection.

The bulk of the survey, however, contained questions developed to assess health care provider knowledge on immunization schedules and contraindications to vaccine administration. Three scenarios were presented. These scenarios focused on children at different ages with different immunization deficits. Each scenario requires participants to answer the following questions: (1) Which immunization would you administer at that visit? (2) When would you schedule the child for a subsequent visit? and (3) Which immunization should be given at that next visit (Appendix A)? These questions were designed to assess (1) the primary series for children on time with their immunizations, (2) the primary series for children behind with their immunizations, and (3) timing between primary series and booster immunization.[15] In addition, we incorporated a

question into the scenarios that addressed the 1997 recommendations for the Hib and Hepatitis B vaccine schedules.[42]

The second series of questions assessed health care provider knowledge of contraindications to vaccine administration. Six scenarios were presented. Each one presented a basically healthy child who has only one minor illness symptom. Only one of the six scenarios actually had a valid contraindication to vaccine administration. Each participant was given a list of immunizations and asked which ones he/she would administer given the condition of the scenario (Appendix A).[15]

Procedure

Data was collected following survey completion. As stated in the cover letter (see Appendix A), consent for permission to use this data was implied by completion of the questionnaire. Also, as noted in the cover letter, all participants were assured confidentiality. The survey did not ask for a name and, following completion of data collection, the list of study participants was destroyed. Additional contents of the cover letter addressed the federal government requirements to explain the purpose of the survey, its possible benefits, offered an answer to any inquires and instructed the participant that he/she is free to withdrawal consent.[41]

Data Analysis

Following data collection, the surveys were evaluated for correct responses based on the 1998 American Academy of Pediatrics (AAP) recommended schedule and guide to contraindications and precautions to immunizations (Appendix B). This data was entered

and analyzed on SPSS 8.0 for Windows. First, frequency distributions for all variables were produced. There were nine items in the analysis assessing knowledge of the immunization schedule. Six items were analyzed assessing knowledge of immunization contraindications. We reported the meal overall score for questions answered correctly for each group of items. Ninety-five percent confidence intervals were reported by provider group and for overall scores. In addition, Chi square analyses for differences were used to compare responses among the different provider groups. Finally, Ordinary Least Square Regression with backward stepwise elimination was used to examine which variables had a significant impact on the provider's score.

CHAPTER FOUR

RESULTS

Descriptive Characteristics

Table 1 (Appendix C) describes the characteristics of family practice and pediatric providers with respect to the volume of pediatric visits and the volume of diphtheria, tetanus, and pertussis (DTP)/diphtheria and tetanus toxoids and acellular pertussis (DTaP), measles, mumps, and rubella (MMR), *Haemophilus influenzae* type b (Hib), oral poliovirus vaccine (OPV)/inactivated poliovirus vaccine (IPV), and Hepatitis B vaccinations administered weekly. The pediatric providers averaged more pediatric visits and immunizations versus family practice. Among the family practice providers, midlevel practitioners (physician assistants (PA) and nurse practitioners (NP)) averaged more pediatric visits per week, although family practice midlevel providers averaged similar numbers of immunizations of each type given weekly. Doctors of osteopathy (DO) in family practice averaged the fewest pediatric visits per week along with the fewest immunizations given, in spite of being the largest sample size. Family practice medical doctors (MD) and DO's averaged ten years since graduating from medical school and family practice midlevel providers averaged five years since graduation. Pediatric MD's averaged sixteen years since graduation from a medical school. Almost all of the providers surveyed, 98% working in family practice and 93% in pediatrics, were graduates of United States medical schools.

Immunization Schedule Battery Scores

Table 2 (Appendix C) describes percentages of correct responses for both family

practice and pediatric providers regarding knowledge of the immunization schedule. For all providers surveyed, 89% of questions were answered correctly. Mean overall scores for correctly answered questions were 79% for family practice MD's, 88% for family practice DO's, and 89% for family practice midlevel practitioners. Pediatric MD's answered 87% of questions correctly and pediatric midlevel providers scored 100%.

For questions related to administering vaccinations to a child who is up-to-date on immunizations, all providers answered 87% of questions correctly. Pediatric providers, both MD's and midlevels, scored the highest at 100%. Midlevel family practice providers scored the lowest, only answering 83% of questions correctly. Family practice MD's and DO's scored 85% and 92%, respectively.

For questions related to administering vaccinations to a child who is not up-to-date on immunizations, 83% of questions were answered correctly by all providers. Once again, midlevel pediatric providers answered 100% of questions accurately. Family practice MD's had the lowest number of correct questions at 76%. Family practice DO's answered 88% of the questions correctly and midlevel family practice providers scored 88%.

For the scenario related to knowledge of timing between DTP/Hib boosters, 86% of all providers surveyed had correct responses. As above, pediatric midlevel practitioners scored 100% for this scenario. MD's working in family practice answered 76% of questions correctly. Family practice DO's scored 85% and family practice midlevel providers scored 84% for correct responses to these questions.

Immunization Contraindications Battery Scores

Table 3 (Appendix C) illustrates percentages of correct responses regarding

contraindications to vaccine administration. Overall, 80% of all providers answered questions related to contraindications correctly. Family practice DO's had the highest overall percentage (86%) of correct responses among all providers surveyed. Midlevel family practice providers scored the lowest at 74%. Family practice MD's answered 76% of overall questions correctly. Pediatric MD's and midlevel practitioners averaged 81% and 75%, respectively.

Regarding the contraindication of administering vaccinations to a child with a fever of 99.9°F and a runny nose, all providers surveyed answered this question correctly, except for midlevel family practice providers who scored 83%. Testing resulted in an overall score of 97% in this category for all providers tested.

In reference to the contraindication of administering vaccinations to a child with mild diarrhea and no fever, all family practice DO's and pediatric providers would give the needed immunizations resulting in a score of 100%. Family practice MD's scored 94% regarding this contraindication and midlevel family practice providers answered 91% of questions correctly. Overall average of this category for correct responses from all providers surveyed was 97%.

The contraindication of otitis media with no fever yielded an overall correct response rate of 93% for all providers surveyed. Family practice DO's and midlevel pediatric practitioners both scored 100% for this category. Lowest correct response rate was 83% for midlevel family practice providers. MD's in family practice and pediatrics scored 88% and 92%, respectively. For all providers in this category, the average score for questions answered correctly was 93%.

An overall correct response rate of 54% was obtained from providers in all

categories when presented with the contraindication of administering vaccinations to a child with an upper respiratory infection and fever of 102.5°F. None of the midlevel pediatric practitioners answered this question correctly, although there was only a sample size of two in this division. Pediatric MD's scored only 23% for this contraindication question. In the family practice category, MD's answered correctly 53% of the time. Family practice DO's had a correct response rate of 75% and family practice midlevel providers scored 50% on this question.

Regarding the contraindication of administering vaccinations to a premature baby who currently weighs less than ten pounds, 89% of all providers surveyed answered the question correctly. Midlevel pediatric practitioners scored the highest with a score of 100%. Family practice MD's scored the lowest with a correct response rate of 82%. Pediatric MD's answered the question accurately 92% of the time. Family practice DO's and midlevel providers scored 93% and 83%, respectively, for this contraindication question.

In reference to the contraindication of whether or not to administer vaccinations to a child with a vague egg allergy (sometimes develops a rash after eating eggs), pediatric MD's had the highest correct response rate of 77%. Midlevel pediatric providers scored 50% on the question. In the family practice category, MD's scored the lowest at 41% with DO's and midlevels scoring 50% for answering the question correctly. Overall average correct response rate for all providers regarding this contraindication question was 53%.

Overall, concerning all contraindication scenarios presented, all providers surveyed inappropriately deferred immunizations 20% of the time. In each provider

category, the percentage of inappropriately deferred immunizations are as follows: family practice MD's 24%, family practice DO's 14%, family practice midlevel providers 26%, pediatric MD's 19%, and pediatric midlevel providers 25%.

Multivariate Analyses

Using an ordinary least squares regression model with backward stepwise elimination, we examined which variables had a significant impact on the provider's scores. For all providers, results indicated that the number of DTP/DTaP, OPV/IPV, and Hepatitis B vaccinations administered had the most significant impact on the overall score. Model interpretation revealed that when all other variables are held constant, a one DTP/DTaP vaccination increase will increase the provider's score 1.442 percentage points. Also, when all other variables are held constant, a one OPV/IPV increase will decrease the provider's score 2.903 percentage points.

CHAPTER FIVE

DISCUSSION AND IMPLICATIONS

Discussion of Findings

A study by Wood et al surveyed private physicians and public health department physicians and nurses, within the inner city of Los Angeles, to determine their knowledge of the immunization schedule and contraindications to vaccination.[15] Our study, utilizing a modified version of the same survey used in Wood's study, focused on family practice and pediatric providers (medical doctors (MD), doctors of osteopathy (DO), physician assistants (PA), and nurse practitioners (NP)) in Kent county of Grand Rapids, Michigan. The purpose of this discussion is to briefly review Wood's findings, to review ours, and to see which implications can be made based on these findings.

In Wood's study, significant deficits in the knowledge of the immunization schedule were found among private providers as well as physicians and nurses working in public health clinics. "Physicians incorrectly answered one-third of questions regarding timing such as the timing of the primary series for DTP or OPV or the timing of the MMR vaccine. Only approximately 50% of providers correctly determined the appropriate immunizations due for a five-month-old child."[15] There were even greater deficits regarding needed immunizations for a 12-month-old child behind in her immunizations. Our results, as shown in Table 2 (Appendix C), do not show as significant a deficit as the above study. The providers in our study incorrectly answered, on average, only one-tenth of the questions presented to them regarding needed immunizations. For each separate scenario (child up-to-date, child behind in immunizations, and timing between DTP/Hib boosters), results again did not show

significant deficits. In reference to each category of providers surveyed. family practice MD's, as compared to family practice DO's and midlevel providers, showed the greatest deficit in knowledge of the immunization schedule, with approximately one-fourth answering questions accurately. Pediatric MD's averaged similar percentages as the latter two categories. Pediatric midlevel providers scored 100% on all three scenarios. but this is explained by the sample size of only two.

Excluding the pediatric midlevel providers, overall there was no significant difference between family practice and pediatric practitioners. In each separate scenario, pediatric providers scored higher than providers working in family practice. These results are explained by the fact that pediatric providers see a greater number of pediatric patients and administer a higher number of immunizations, as compared to family practice. Also, it may be that pediatric practitioners are more apt to remain current regarding new immunization programs and guidelines since it is their specialty. We must also include that we cannot completely and accurately assess a provider's ability to keep children up-to-date on immunizations simply based on their responses to these three scenarios. We do not have the capabilities to assess which immunizations each provider would give at future visits.

Even though some providers would not give certain vaccinations at a particular office visit, and were subsequently not given credit for their answers (according to our guidelines used for correcting the surveys), this does not mean that they would not give the needed immunizations at the child's next visit. The 1998 Recommended Childhood Immunization Schedule (Appendix B), which was current when this study was conducted, has many timing variations for administering vaccinations, and this may be

confusing for some providers. Also, for a child that is behind on immunizations, a provider may choose to only give certain vaccinations at that visit in order to avoid subjecting the child to multiple injections. Currently, there is a vaccine called Tetramune, which combines the diphtheria, tetanus, and pertussis (DTP) and *Haemophilus influenzae* type b (Hib) vaccines. Whether or not an office or clinic has the Tetramune vaccine available could influence a provider's decision on what vaccinations to give at that visit. If the combined vaccine is not available, the child would receive two injections versus one. If there are multiple vaccinations due at a visit, as was the case in some of the scenarios, the provider may elect not to give certain immunizations so as not to cause excess discomfort for the child. It is extremely important for patients to trust their providers, even more so for children. Some of the providers surveyed may have chosen not to give some of the vaccinations needed for the child presented in the scenario, due to the reasons listed above, even if they knew they would still be deficient in their immunizations.

In Wood's study, significant deficits were also found regarding contraindications to vaccination. "Public health nurses were more likely than physicians to defer immunizations inappropriately in the presence of a minor illness. One-half of the providers would defer immunizations for a child with mild diarrhea and over one-half would defer immunizations when the child has a temp of 99.9°F, which is within the range of normal temperatures."[15] Our results regarding knowledge of contraindications to vaccination, on average, did not show as significant deficits as the providers surveyed in Wood's study. All categories of providers surveyed in our study showed similar results, with midlevel practitioners being slightly more apt to inappropriately defer

immunizations. Overall, when presented with the scenarios in the survey, providers inappropriately deferred immunizations only 20% of the time.

Only two scenarios regarding contraindications to vaccination revealed significant deficits in our study. If a child presented with an upper respiratory infection with fever of 102.5°F (but not ill-appearing), approximately one-half of providers surveyed would defer immunizations, although, according to the AdHoc Working Group for the Development of Standards for Pediatric Immunization Practices[2], this is not a true contraindication. Since this guide was used to determine correct responses, it may have contributed to the results obtained. Many providers may use different guidelines and recommendations to determine if they would administer vaccinations when presented with a scenario such as this. Also, our study does not have the capability to determine when a provider would bring the child back to receive the needed immunizations.

The other scenario that showed significant deficits in a provider's knowledge of true contraindications to vaccination was that of a child who develops a rash sometimes when she eats eggs. Approximately one-half of providers surveyed would not give the needed immunizations, specifically the measles, mumps, and rubella (MMR) vaccine, at that visit. The source we used regarding true contraindications states that only an anaphylactic reaction to egg ingestion is a true contraindication to receiving the MMR vaccine.[2] Many providers may be unwilling to take a chance in administering the vaccine when faced with this scenario. This dilemma poses a greater problem than the scenario discussed previously. In the above, the child will ultimately recover and the immunizations will eventually be given, even if they are late in being administered. With

this present scenario, a child may never receive the needed vaccine, due to the provider's inadequate knowledge of true contraindications to vaccination.

Differences between results of our study and Wood's study could be due to several factors. First, both studies were conducted in different areas. Wood's study was conducted in inner city Los Angeles and our study was conducted in Kent County of Grand Rapids, Michigan. The demographics of these two areas are very different. Our study was issued in an area where immunizing children has been a top priority and where several programs have been implemented to increase the immunization rates. It is uncertain as to whether similar programs have been active in the inner city of Los Angeles. Second, in Wood's study, private physicians and public health department physicians and nurses were surveyed. We used only private family practice and pediatric providers. We did not survey public health departments and since these are the only places where nurses make independent decisions concerning vaccine administration, we did not include nurses in our study. Another factor that may have contributed to the differences in results is the percentage of providers who attended United States medical schools. Almost all of our respondents attended United States medical schools, whereas only approximately 50% of the providers surveyed in Wood's study attended medical schools in the United States. Any one or combination of the above factors may have contributed to the difference in study results.

Application to Medicine

Since immunization is a critical tool in the prevention of communicable diseases, it is imperative that all children receive needed vaccinations. There are many factors which can contribute to the under immunization of children, including a provider's level

of knowledge of the immunization schedule and also their knowledge of true contraindications to vaccination. Since previous studies have implicated these two factors as contributors to the under immunization of children. we felt that research regarding these factors was warranted in our community.

Limitations

Many factors limited the validity of our study. First, out of the total number of surveys distributed 36% of the pediatric providers and 50% of the family practice providers responded for a total response of only 46%. Due to the refusal of health care providers to complete the survey within the allotted time limited our sample size. Second, the hypothetical situations presented in our questionnaire may not accurately reflect a true clinical picture, thus, making answers invalid.[15] Third, Michigan's aggressive immunization initiatives directed at educating health care providers could be active in some institutions and not in others; therefore, results could be biased. Fourth, the use of convenience sampling rather than randomization of the entire health care provider population in Kent county excludes those who do not advertise in the Ameritech yellow pages. As a result, accuracy of results may be altered and, therefore, are unable to conclusively determine provider knowledge deficits. Finally, due to lack of cultural variability in the Kent county area, extrapolation of results from this survey to other areas may not be possible.

Suggestions for Further Research/Modifications

As mentioned previously, due to limited resources, we only surveyed private family practice and pediatric providers. This area could be studied further by extending

the sample size to include public clinics and health departments, as well as including nurses who routinely administer immunizations to children. This would give a more accurate assessment of what role the factors surveyed contribute to Kent County immunization rates. It would also be beneficial to administer this survey in areas where there is greater cultural diversity among providers.

The survey itself could also be improved. Some of the questions may be confusing and they could be extended in order to interpret provider knowledge of the immunization schedule further. Also, the sources used to assess correct responses could be updated and broadened, since many providers are using different resources to guide their decisions regarding vaccine administration.

Conclusion

Our study implicated that overall providers are sufficiently knowledgeable in the immunization schedule and contraindications to vaccination. There were certain areas that could be improved to possibly increase immunization rates in Kent County, mostly regarding true contraindications. We suspect however, that overall, this factor is not a significant contributor to the immunizations rates in Kent County. There are many other factors that need to be considered, such as those discussed in chapter two, in order to reach the goal of full immunization protection for 100% of our children. It must be stated that even though not all children are immunized in Kent County, most of the unimmunized children will be protected through herd immunity. Even so, measures still need to be taken to ensure that all children receive needed vaccinations. The Standards for pediatric immunization practices[2] should be widely distributed to all providers in order to eliminate the factors that were the focus of this study. In order to increase the

chances of a successful adoption of these guidelines, provider education must be an ongoing and active process of quality improvement.[35,36]

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APPENDIX A

Shriners Hospitals
for children
P. O. Box 31356, Tampa, Florida 33631-3356 (813) 281-0300

April 2, 1998

Lisa Huffstutter
1336 Leonard NW #2
Grand Rapids, MI 49504

Lisa,

You are free to use the questionnaire I developed in your surveys. Please keep me informed of how the study progresses.

Good Luck.

Sincerely,

[redacted]

David L Wood, MD, MPH
Director of Clinical Outcomes Management

Dear survey participant:

We are Physician Assistant students at Grand Valley State University who are in the process of completing our Master's degree. In order to satisfy all of the requirements, we are conducting a research project designed to examine a possible barrier to the under immunization of children who are 2-years-old or younger.

Recent statistics obtained through the Kent County Public Health Department revealed that the percentage of children between the ages of 19-35 months- old who are up-to-date on their immunizations is now 86.4%. Although Kent County's goal of 100% immunization appears to be drawing closer, there are still unidentified barriers preventing achievement of this goal.

The purpose of the attached survey is to evaluate whether the current knowledge of health care providers regarding the recommended 1998 immunization schedule, as well as understanding of the contraindications to vaccine administration, serve as a barrier to the immunization of Michigan's children. If, upon completion of this study, current provider knowledge is found to be a contributing factor, concentration on provider education and clarification of vaccine schedules and valid contraindications can be initiated. Elimination of any barrier to the complete immunization of the state's youngest children will bring us closer to Kent County's goal of 100%.

Completion of this survey will indicate that you have given consent to use your responses for this study. Your name will not be asked on the survey and the list of all survey participants will remain confidential. In addition, you are free to withdraw consent at any time. Any inquiries regarding the survey results and/or study design can be obtained by contacting Lisa Huffstutter at (616) 458-6833.

Thank you for taking the time to participate in this study. Your input will be valuable in determining the current understanding of health care providers and identifying potential barriers to the complete immunization of Kent County's children.

Sincerely,

Kelly Beschoner, Diane Kassuba
and Lisa Huffstutter

Please answer the following questions as completely as possible.

Demographics

1. Job Title:

Medical Doctor — Doctor of Osteopathy
Physician Assistant — Nurse Practitioner

2. Year of Professional School Graduation: _____

3. Location of Professional School:

United States — Other: (please specify)_____

Practice Characteristics

1. What is the approximate number of pediatric patients (≤ 2 years old) seen in your practice per week? _____

2. What is the approximate number of each of the following vaccines used in your practice per week?

DTaP / DTP _____

Hib _____

MMR _____

OPV / IPV _____

Hepatitis B _____

Scenarios

Listed below are 4 scenarios in which a child may present in your practice. For each situation please answer the questions that follow. The immunizations which you may or may not choose to give include: DTP / DTaP, Hib, OPV / IPV, Hep B, or MMR.

A. A 5-month-old girl has had 1 DTP, 1 OPV, 1 Hib at 2 months of age and 2 Hep B at birth and 1 month of age.

1. What would you give now? _____

2. When would you schedule the next visit? _____

3. What would you give at that next scheduled visit? _____

B. A 9-month-old boy has had 2 DTP, 2 OPV, 2 Hib at 3 and 6 months of age and 1 Hep B at 2 months of age.

1. What would you give now? _____

2. When would you schedule the next visit? _____

3. What would you give at that next scheduled visit? _____

C. A 12-month-old girl has had 2 DTP, 2 OPV, 2 Hib and 2 Hep B at 4 and 9 months of age.

1. What would you give now? _____

2. When would you schedule the next visit? _____

3. What would you give at that next scheduled visit? _____

D. A little girl is brought into you office. She is behind in her immunizations and, other than the symptom or sign listed below, she is well. She has no other contraindications for immunization. For each scenario is listed the immunizations due at that visit; please circle the immunizations you would give.

1. Fever of 99.9°F and a runny nose.	DTP°	Hib	Polio*	MMR	Hep B
2. Mild diarrhea with no fever.	DTP°	Hib	Polio*	MMR	Hep B
3. Otitis media, no fever. Antibiotics are started at this visit.	DTP°	Hib	Polio*	MMR	Hep B
4. An upper respiratory infection with a fever of 102.5°F; however she is not ill appearing.	DTP°	Hib	Polio*	MMR	Hep B
5. Child was a premature baby and currently weighs < 10 lbs.	DTP°	Hib	Polio*		Hep B
6. Is suspected of having an allergy to eggs (mother reports that she gets a rash sometimes when she eats eggs)	DTP°	Hib	Polio*	MMR	Hep B

* OPV / IPV
° DTaP / DTP

APPENDIX B

Recommended Childhood Immunization Schedule
United States, January - December 1998

Vaccines[1] are listed under the routinely recommended ages. Bars indicate range of acceptable ages for immunization. Catch-up immunization should be done during any visit when feasible. Shaded ovals indicate vaccines to be assessed and given if necessary during the early adolescent visit.

Age ▶ / Vaccine ▼	Birth	1 mo	2 mos	4 mos	6 mos	12 mos	15 mos	18 mos	4-6 yrs	11-12 yrs	14-16 yrs
Hepatitis B[2,3]	Hep B-1										
		Hep B-2			Hep B-3					Hep B[3]	
Diphtheria, Tetanus, Pertussis[4]			DTaP or DTP	DTaP or DTP	DTaP or DTP		DTaP or DTP[4]		DTaP or DTP	Td	
H influenzae type b[5]			Hib	Hib	Hib	Hib					
Polio[6]			Polio[6]	Polio	Polio[6]				Polio		
Measles, Mumps, Rubella[7]						MMR			MMR[7]	MMR[7]	
Varicella[8]						Var				Var[8]	

Approved by the Advisory Committee on Immunization Practices (ACIP), the American Academy of Pediatrics (AAP), and the American Academy of Family Physicians (AAFP).

Table 2. – Guide to Contraindications and Precautions to Immunizations*

True Contraindications and Precautions	Not True (Vaccines May Be Given)
General for All Vaccines (DTP/DTaP, OPV, IPV, MMR, Hib, HBV)1	
Anaphylactic reaction to a vaccine contraindicates further doses of that vaccine Anaphylactic reaction to a vaccine constituent contraindicates the use of vaccines containing that substance Moderate or severe illnesses with or without a fever	Mild to moderate local reaction (soreness, redness, swelling) following a dose of an injectable antigen Mild acute illness with or without low-grade fever Current antimicrobial therapy Convalescent phase of illnesses Prematurity (same dosage and indications as for normal, full-term infants) Recent exposure to an infectious disease History of penicillin or other nonspecific allergies or fact that relatives have such allergies
DTP/DTaP	
Encephalopathy within 7 d of administration of dose of DTP Precaution: Fever of ≥40.5°C (105°F) within 48 h after vaccination with a dose of DTP2 Precaution: Collapse or shocklike state (hypotonic-hyporesponsive episode) within 48 h of receiving a prior dose of DTP2 Precaution: Seizures within 3 d of receiving a prior dose of DTP2 (see footnote # regarding management of children with a personal history of seizures at any time) Precaution: Persistent, inconsolable crying lasting ≥3 h, within 48 h of receiving a dose of DTP2	Temperature of <40.5°C (105°F) following a previous dose of DTP Family history of convulsions3 Family history of an adverse event following DTP administration Family history of sudden infant death syndrome
OPV4	
Infection with HIV or a household contact with HIV Known altered immunodeficiency (hematologic and solid tumors; congenital immunodeficiency; and long-term immunosuppressive therapy) Immunodeficient household contact Precaution: Pregnancy2	Breast-feeding Current antimicrobial therapy Diarrhea
IPV	
Anaphylactic reaction to neomycin or streptomycin Precaution: Pregnancy2	None identified
MMR4	
Anaphylactic reactions to egg ingestion and to neomycin5 Pregnancy Known altered immunodeficiency (hematologic and solid tumors, congenital immunodeficiency, and long-term immunosuppressive therapy) Precaution: Recent (within 3 mo) immunoglobulin administration2	Tuberculosis or positive for purified protein derivative (PPD) of tuberculin Simultaneous tuberculosis skin testing6 Breast-feeding Pregnancy of mother of recipient Immunodeficient family member or household contact Infection with HIV Nonanaphylactic reactions to eggs or neomycin
Hib	
None identified	None identified
HBV	
None identified	Pregnancy

Footnotes to Table 2. – Guide to Contraindications and Precautions to Immunizations

*This information is based on the recommendations of the Advisory Committee on Immunization Practices (ACIP) and those of the Committee on Infectious Diseases (Red Book Committee) of the American Academy of Pediatrics (AAP). Sometimes these recommendations vary from those contained in the manufacturers' package inserts. For more detailed information, providers should consult the published recommendations of the ACIP, the AAP, the American Academy of Family Physicians, and the manufacturers' package inserts.

1DTP indicates diphtheria and tetanus toxoids and pertussis vaccine; DTaP, diphtheria, tetanus, and acellular pertussis vaccine; OPV, oral poliovirus vaccine; IPV, inactivated poliomyelitis vaccine; MMR, measles, mumps, rubella vaccine; Hib, *Haemophilus influenzae* b vaccine; HBV, hepatitis B vaccine; and HIV, human immunodeficiency virus.

2Although not a contraindication, this should be carefully reviewed. The benefits and risks of administering a specific vaccine to an individual under the circumstances should be considered. If the risks are believed to outweigh the benefits, the immunization should be withheld; if the benefits are believed to outweigh the risks (for example, during an outbreak or foreign travel), the immunization should be given. Whether and when to administer DTP to children with proven or suspected underlying neurologic disorders should be decided on an individual basis. It is prudent on theoretical grounds to avoid vaccinating pregnant women. However, if immediate protection against poliomyelitis is needed, OPV, not IPV, is recommended.

3Acetaminophen given prior to administering DTP and thereafter every 4 h for 24 h should be considered for children with a personal or family history of convulsions in siblings or parents

4There is a theoretical risk that the administration of multiple live virus vaccines (OPV and MMR) within 30 d of one another if not given on the same day will result in a suboptimal immune response. There are no data to substantiate this.

5Persons with a history of anaphylactic reactions following egg ingestion should be vaccinated only with extreme caution. Protocols have been developed for vaccinating such persons and should be consulted (*J Pediatr.* 1983; 102:196-199, and *J Pediatr.* 1988; 113:504-506).

6Measles vaccination may temporarily suppress tuberculin reactivity. If testing cannot be done the day of MMR vaccination, the test should be postponed for 4 to 6 wk.

APPENDIX C

TABLE 1: Description of Family Practice and Pediatric Providers

	Family Practice			Pediatrics	
Practice Characteristics	MD's (n=18)	DO's (n=28)	Midlevel (n=12)	MD's (n=12)	Midlevel (n=2)
No. Pediatric visits/wk in the clinic	24 ± 13	11 ± 3	33 ± 35	96 ± 49	70 ± 14
No. of DTP administered in the clinic	11 ± 10	5 ± 2	11 ± 12	34 ± 5	29 ± 5
No. of MMR administered in the clinic	9 ± 11	3 ± 1	8 ± 11	19 ± 6	13 ± 11
No. of Hib administered in the clinic	11 ± 10	5 ± 2	11 ± 12	28 ± 8	26 ± 2
No. of OPV/IPV administered in the clinic	11 ± 10	4 ± 2	11 ± 13	33 ± 7	22 ± 4
No. of HepatitisB administered in the clinic	10 ± 11	3 ± 2	9 ± 10	39 ± 11	28 ± 9
Provider Characteristics					
Mean (SD) years since grad.	10 ± 5	10 ± 5	5 ± 4	16 ± 12	10 ± 13
% of graduates from US Medical Schools	98			93	

TABLE 2: Knowledge of the Immunization schedule by Family Practice Compared to Pediatrics

Mean % of Correct Scores

	Family Practice			Pediatrics				
	MD's (n=18)	DO's (n=28)	Midlevel (n=12)	MD's (n=13)	Midlevel (n=2)	Total (n=73)	Chi-Square** *1 df****	P-Value
Mean Overall Score (k=9)		88(85, 91)	89(84, 94)	87(80, 94)	100	89(86, 92)	4.118	0.128
Primary series Child on time (k=3)	85(80, 89)	92(87, 96)	83(77, 90)	100	100	87(84, 89)	****	1.000
Primary series Child late (k=3)	76(69, 83)	88(85, 91)	81(74, 87)	87(82, 91)	100	83(80, 85)	9.833	0.002
DTP/DtaP booster (k=3)	76(71, 81)	85(81,88)	84(79, 89)	91(88, 94)	100	86(84, 88)	1.33	0.249

* Number in parenthesis, 95% confidence intervals for the estimate
** Chi-Square test compares Family Practice and Pediatrics categories
***Mean Overall test statistic has 2 df associated with it
****No test statistic indicates use of Fisher's Exact Test

TABLE 3: Percentage of Providers who would appropriately administer immunizations due in an otherwise well child with common health problems

	Family Practice			Pediatrics				
	MD's (n=18)	DO's (n=28)	Midlevel (n=12)	MD's (n=13)	Midlevel (n=2)	Total (n=73)	Chi-Square** *1 df*	P-value
Mean % of correct Answers on overall Battery (k=6)	76(72, 80)	86(84, 88)	74(68, 80)	81(79 83)	75(67, 83)	80(79, 82)	***	1.000
	% answering correctly							
Would give immun. to a child with:								
Fever of 99.9 F and runny nose	100	100	83(72, 95)	100	100	97(95, 99)	***	1.000
Mild Diarrhea With no fever	94(88, 100)	100	91(83, 100)	100	100	97(95, 99)	***	1.000
Otitis media No fever	88(80, 96)	100	83(72, 95)	92(85, 100)	100	93(90, 96)	***	1.000
Upper Res. Infection W/ fever 102.5 F	53(40, 65)	75(67, 83)	50(35, 65)	23(11, 35)	0	54(48, 60)	8.909	0.003
Premature baby Still < 10 lb	82(72, 92)	93(88, 98)	83(72, 95)	92(85, 100)	100	89(85, 93)	***	1.000
A vague egg allergy	41(29, 53)	50(40, 60)	50(35, 65)	77(65, 89)	50(0, 100)	53(47, 59)	3.212	0.073

* Number in parenthesis, 95% confidence intervals for the estimate
** Chi-Square test compares Family Practice and Pediatrics categories
***No Test Statistic indicates the use of Fisher's Exact Test

April 14, 1999

Received from Chris Van Ryn and Joel Weizel, this date, their thesis in Physician Assistant Studies to be sent to UMI for publication.

Marlene Cook
Library Office Coordinator

Reference Schedule: Winter 1999

(Jan. 11-April 30, excluding March 8-12)

	Mon.	*Tues.*	*Wed.*	*Thurs.*	*Fri.*	*Sat.*	*Sun.*
9-11	*LL*	*DMu*	*NS*	*LL*	*DMu*	*Closed*	*Closed*
11-1	*NS*	*RV*	*MJ*	*RV*	*RB*	*Closed*	*Closed*
1-3	*NT*	*CG*	*NT*	*CG*	*MJ*	*Rotate*	*Rotate*
3-5	*DMo*	*KW*	*DMo*	*RB*	*LB*	*Rotate*	*Rotate*
5:30-9	*LB*	*AM*	*KW*	*Rotate*	*Closed*	*Closed*	*Closed*

LB–5.5 *RB–4.0* *CG–4.0* *MJ–4.0* *LL–4.0* *DMo–4.0*
DMu–4.0 *NS–4.0* *NT–4.0* *RV–4.0* *KW–5.5*

AM will work Tuesday 1-9 and not work Friday, so there will be no adjunct after 2:00 Friday.

Thursday evening rotation will include: RB, MJ, DMo, DMu, NS, RV. It will start January 14 and end on April 29, skipping March 11 (spring break), for a total of 15 Thursday evenings.

Weekend rotation will include: LB, RB, DMo, DMu, LL, NS, RV, KW. Weekends will start January 16 and end April 25.