Chapter Nine

Using the EHR to Improve Patient Health

Learning Outcomes

After completing this chapter, you should be able to:

◆ Document a well-baby checkup using a wellness form
◆ Explain the relationship between vitals signs and growth charts
◆ Create a pediatric growth chart
◆ Understand Body Mass Index
◆ Calculate Body Mass Index
◆ Understand immunization schedules
◆ Order immunizations for a child
◆ Describe how patients can be involved in their own health
◆ Discuss preventive care guidelines
◆ Understand how EHR preventive care systems work

Prevention and Early Detection

The value of an EHR increases as a practice uses it. As more of the patient’s health record is stored in a codified EHR, more can be done with it. As we have seen in previous chapters, data from past encounters can be used to improve patient care through disease management, trending, and creating graphs for patient education and counseling.

Still, it is always better to prevent a disease than to treat it. Thus far, you have learned how to use an EHR to document patient visits. In this chapter, we will discuss various ways in which preventive care, immunization, preventive screening, patients’ participation in their healthcare, education, and counseling can help people live longer, healthier lives.
Pediatric Wellness Visits

Whereas those of us who are adults may someday have an electronic health record, we may never have a completely codified personal health record, because too much of our medical history is isolated in paper records at medical offices that we no longer visit. Those who are just being born, however, have an excellent chance that their medical records are being created and stored electronically even today.

The care we receive in the early years is fundamental to lifelong health. Early screening, detection, education, and immunizations have all contributed to increased life spans of the population as a whole. Nowhere does this have more support than in the pediatric practice, where regular examinations are recommended for wellness visits, not just when the child is ill.

In the next exercises, you will use the Student Edition software to record a pediatric visit, create a different kind of graph called a growth chart, and learn about childhood immunizations. This is a lot of material to cover, and for that reason the pediatric visit will span several exercises.

Guided Exercise 54: A Well-Baby CheckUp

Case Study

Tyrell Williams is a six-month-old male who is brought by his mother to the pediatric clinic where he has always been seen. As a result, the clinic has a lifelong history of his care and growth.

Step 1

If you have not already done so, start the Student Edition software.

Click Select on the Menu bar, and then click Patient.

In the Patient Selection window, locate and click on Tyrell Williams, as shown in Figure 9-1.

Step 2

Click Select on the Menu bar, and then click New Encounter.

Use the date May 25, 2012, the time 11:00 AM, and the reason Well-Baby Check.

(You will need to scroll the drop-down list of reasons to find Well-Baby Check.)
Compare your screen to Figure 9-2 when it is correct click on the OK button.

**Step 3**
Locate and click on the Forms button on the Toolbar.

Notice that there are several pediatric forms. Because there are different developmental milestones and therefore different questions appropriate to different ages, pediatric clinics typically have a form for each age-appropriate visit. In an actual pediatric practice, there would be more forms than are shown in the Student Edition.

Locate and click on the form labeled “Pediatric 6 Month.”

**Step 4**
The pediatric form will be displayed. Take a moment to orient yourself. You will notice that there are quite a few tabs on the form.

Well-baby checkups are usually quite extensive, and involve the social history of the parents as well as of the baby. This form contains the items a practice might cover during a checkup for a six-month-old baby. In the interest of time, you will not enter data for every question, although you would during an actual pediatric wellness visit.

Whereas practices seeing patients with chronic illnesses might use several different forms for a patient visit, the designer of this pediatric form has tried to combine in one form all the elements required for a well-baby visit. For example, the form has a button for the chief complaint imbedded in the form, and the vital signs also are imbedded in the form. This type of design allows the nurses and pediatricians to move through the exam quickly, ensuring that nothing is forgotten or overlooked.

**Step 5**
Locate the finding in the form labeled “The Chief Complaint is:”

Click on the note button to the right of the finding (circled in red in Figure 9-4). The chief complaint dialog window will be invoked.

In the dialog window, type “6 month check up.”

Compare your screen to Figure 9-4, then click on the button labeled “Close the note form.”
Step 6
This form uses check boxes to record the findings. Notice that the letters “Y” and “N” are gray. When you click on a “Y” check box, the letter will turn red; clicking on a “N” check box will turn the letter blue.

The first thing the form asks is the source of information. Tyrell is accompanied by his mother. Click your mouse in the check box:
✓ Y “the mother”

Locate sleep patterns on the top right of the form and click on the check box:
✓ N Sleep patterns ABN

Locate and click the button labeled “Negs” (Auto Negative) in the Toolbar at the top of your screen.

Step 7
Complete the HPI by locating and clicking the check boxes indicated for the following findings about the patient’s feeding:
✓ Y Is the infant breast-feeding?
✓ N Any difficulties w/ breast-feeding?
✓ Y Is rice cereal introduced?
✓ Fruits: ______ oz/day
✓ Vegetables: ______ oz/day

Compare your screen to Figure 9-5.
Step 8
Locate and click on the tab labeled “Birth, Med/Surg Hx” at the top of the form.

Tyrell has no previous medical or surgical history. This is indicated by findings at the top of the middle and right columns, as shown in Figure 9-6. Locate and click on the following check boxes:

✓ Y No Significant PM Hx
✓ Y No Significant Surg Hx

Compare your screen to Figure 9-6.

Step 9
Locate and click on the tab labeled “FS Hx” at the top of the form.

FS Hx stands for Family and Social History. In pediatric visits, the parent's social habits and environment are seen as health factors that can affect the child. This page of the form is used to record findings about the family history, the child's environment, and the parents' behavioral habits. The Family Social History section is not asking if the baby uses tobacco, alcohol, or drugs, but if the parents do.

Locate and click on the check boxes indicated for the following findings:

Family History:
✓ Y No Significant Family Hx
Family Social History:
✓ Y Tobacco
✓ Y Alcohol
✓ N Drugs

Patient’s Social History:
✓ Y Exposure to cig. smoke at home
✓ Y Living with parents

Compare your screen to Figure 9-7.

> Figure 9-8 ROS finding recorded with Auto Negative.

**Step 10**
Locate and click on the tab labeled “ROS” at the top of the form.
Locate and click the button labeled “Negs” (Auto Negative) in the Toolbar at the top of your screen.
Complete the ROS by clicking the check boxes for the following findings:
✓ N GI Symptoms
✓ N Have you had exposure to tuberculosis?
✓ N Have you had exposure to lead?

Compare your screen to Figure 9-8.
Step 11

This form uses two tabs to record the physical exam.

Locate and click on the tab labeled “Px 1” at the top of the form. The first page of the Physical Exam form will be displayed.

The Px 1 tab allows the vital signs to be entered without leaving the form. Notice that there are several differences between pediatric and adult vital signs:

◆ Infant growth is measured in length not height.
◆ The temperature is measured in the ear (tympanic).
◆ The circumference of the head is also recorded.
◆ Blood pressure readings are not typically taken in healthy children under the age of three.

Enter the following measurements for Tyrell in the corresponding Vital Signs fields:

Temperature: 99
Respiration Rate: 40
Pulse: 128
Length (in): 27.5
Weight (kg): 8.7
Head Circumference (cm): 43.9

Click the button labeled “Negs” (Auto Negative) in the Toolbar at the top of your screen to record the rest of the physical exam findings for this page.

Compare your screen with Figure 9-9.
Step 12

Record the remainder of the physical exam.

Locate and click on the tab labeled “Px 2” at the top of the form. The second page of the Physical Exam form will be displayed.

Locate and click the button labeled “Negs” (Auto Negative) in the Toolbar at the top of your screen.

Locate and click the check box for the physical exam finding:

✓ Y Growth and Development WNL

Compare your screen with Figure 9-10.

Step 13

Locate and click on the tab labeled “Dx + Free Text” at the top of the form.

Unless the child is ill, the diagnosis for a well-baby checkup is the same for each child; therefore, the form designer has included an option to record it via the form, saving the clinician the time it would take to search the nomenclature.

Additionally, there are many possible areas of the exam in which the pediatrician may wish to record additional free text. In this form, the clinician can add notes to any area from this one tab. The type of finding and the section of the note in which it will appear have been clearly labeled for the clinician.

Locate and click on the check box for the diagnosis:

✓ Y Dx: Well Baby 6-month visit

Compare your screen to Figure 9-11.
Step 14

During well-baby visits, the pediatrician provides educational information to the mother about the child’s development, nutrition, immunizations, and safety.

Locate and click on the tab labeled “Education” at the top of the form.
Locate and click on the “Y” check box for each of the following to indicate that these points were covered during the visit:

✓ Y Nutrition
✓ Y Safety Guidelines
✓ Y Teething
✓ Y Dental Hygiene
✓ Y Stranger Safety

Compare your screen to Figure 9-12.

**Step 15**
Click on the Encounter tab at the bottom of your screen.

Click on the Print button on the Toolbar at the top of your screen to invoke the Print Data window.

Be certain there is a check mark in the box next to “Current Encounter” and then click on the appropriate button to either print or export a file, as directed by your instructor.

Compare your printout or file output to Figure 9-13. If there are any differences, other than page breaks, review the previous steps in the exercise and find your error.

If sufficient class time remains, you may continue with the next exercise.

**Understanding Growth Charts**

Childhood growth depends on nutritional, health, and environmental conditions. Changes in any of these influences how well a child grows and develops. A child’s vital signs can be compared against statistical information of the general population. The National Center for Health Statistics (NCHS) has created a set of graphs that are used to track the growth of the child and compare him or her to statistical information that has been gathered about the growth rate of babies in the general population. These are called growth charts.

Pediatric growth charts have been used by pediatricians, nurses, and parents to track the growth of infants, children, and adolescents in the United States since 1977. The 1977 growth charts were developed by the NCHS as a clinical tool for health professionals to determine if the growth of a child is adequate. The 1977 charts also were adopted by the World Health Organization (WHO) for international use.

Today, 16 pediatric growth charts are maintained and distributed by the Centers for Disease Control and Prevention (CDC), eight for boys and eight for girls. The charts were revised in 2000, when two new charts were added. The new charts are body mass index-for-age for boys and girls ages 2 to 20 years. Body Mass Index (BMI) is explained later.
Figure 9-13a Printed encounter note for Tyrell Williams 6-month checkup (page 1 of 2).
The CDC provides the following clinical growth charts:

Infants, birth to 36 months:

- Length-for-age and Weight-for-age
- Head circumference-for-age and Weight-for-length

Children and adolescents, 2 to 20 years

- Stature-for-age and Weight-for-age
- BMI-for-age

Figure 9-13b  Printed encounter note for Tyrell Williams 6-month checkup (page 2 of 2).
Preschoolers, 2 to 5 years

- Weight-for-stature

**What Is a Percentile?**

Figure 9-14 shows a blank paper form of one of the CDC growth charts. This form would be used by a clinic to manually record two graphs on one page.

![Figure 9-14 Boys birth to 36 months Length-for-age/Weight-for-age growth chart.](chart.png)
The age of the child is indicated horizontally across the top of the graph and the height and weight measurements are listed vertically down the sides of the graph. The curved blue lines printed across the face of the graph are called percentiles. The curved lines represent what percent of the reference population that the individual would equal or exceed. This graph includes the 5th through 95th percentiles; the CDC also has a version available that widens the spectrum by showing a 3rd and 97th percentile.

The patient’s weight and height measurements can be marked on the chart under each age for which readings are available. By finding the percentile line closest to the patient’s vitals, the clinician can assess the size and growth patterns of the individual as compared to other children in the United States.

For example, a two-year-old boy whose weight is at the 25th percentile weighs the same or more than 25 percent of the reference population of two-year-old boys but weighs less than 75 percent of the two-year-old boys.

**Guided Exercise 55: Creating a Growth Chart**

As you have learned in previous chapters, when vital signs are routinely entered in an EHR, those measurements can be used to create graphs. Most popular EHR systems have the ability to graph children’s measurements over an image of the CDC percentiles, similar to the paper form in Figure 9-14. Using the age of the patient, the EHR software determines if the graph should include the CDC growth chart. Because the growth charts are gender specific, the software also uses the child’s age and sex to determine which of the 16 growth charts to display.

Pediatric growth charts often are used for parent education during well-baby checkups. Graphing the height and weight measurements recorded in the EHR to create growth charts is useful in two areas: measuring the growth rate of children, and fighting obesity in our society by determining if a person’s weight is appropriate for their height.

In this exercise, you will create a growth chart for Tyrell Williams.

**Step 1**

If you are continuing from the previous exercise, proceed to step 3, otherwise click Select on the Menu bar, and then click Patient.

In the Patient Selection window, locate and click on **Tyrell Williams**, as shown in Figure 9-1.

**Step 2**

Again, click Select on the Menu bar and then click Existing Encounter.

Locate and click on the encounter dated **May 25, 2012**, at **11:00 AM**, as shown in Figure 9-15.
Step 3
Click on the word “Graph” on the Menu bar, then click “Length” as shown in Figure 9-16.

A pediatric growth chart will be displayed, as shown in Figure 9-17.

Step 4
Review the growth chart for Tyrell Williams displayed on your screen. The blue X marks the patient’s length at the various months, listed across the bottom of the graph. The curved lines represent the comparable growth rate as a percentage of the general population. This is the percentile described previously. Similar growth charts also can be generated for a child’s weight and head circumference.

Step 5
Print out Tyrell’s growth chart. Locate and click on the Print button in the upper left corner of the graph window to invoke the Print Data window.

In the left column of the Print Data window make sure there is a check mark in the box next to “Body length (0-2 years)” and then click on the appropriate button to either print or export a file, as directed by your instructor.

When your graph has printed successfully, click on the Exit button in upper right corner of the window displaying the growth chart.

This completes Exercise 55.
Body Mass Index

BMI stands for Body Mass Index. It is a number that shows body weight adjusted for height. BMI can be calculated with a simple math formula \( \frac{wt}{ht^2} \) that may be equally applied to either English or metric measurements (\( wt = \) pounds and \( ht = \) inches) or (\( wt = \) kilograms and \( ht = \) meters).

The CDC encourages pediatricians to replace use of the older weight-for-stature charts with the new BMI-for-age charts.\(^1\) There are several advantages to using BMI-for-age as a screening tool for overweight and underweight children. BMI-for-age provides a reference for adolescents, which was not available previously. Another advantage is that the BMI-for-age measure is consistent with the adult index, so BMI can be used continuously from two years of age to adulthood. This is important, as BMI in childhood is a determinant of adult BMI.

Because BMI changes substantially as children get older, BMI is gender specific and age specific for children ages 2 to 20 years. Adults of both genders age 20 years or older share the same BMI chart. Adult BMI falls into one of four categories: underweight, normal, overweight, or obese.

Guided Exercise 56: Graphing BMI

BMI can be easily calculated for adults using the EHR. In this exercise you are going to graph a patient’s BMI. The EHR software calculates the BMI for you and creates the graph in one operation.

Case Study

Sally Sutherland is a 48-year-old female with hypertension and borderline diabetes. She has been struggling with her weight and in Chapter 7 you created a graph of her weight gain. In this exercise, you are going to create a graph of Sally’s BMI.

Step 1

If you have not already done so, start the Student Edition software.

Click Select on the Menu bar, and then click Patient.

In the Patient Selection window, locate and click on Sally Sutherland, as shown in Figure 9-18.

\(^1\)Source: U.S. Department of Health and Human Services, Center for Disease Control web site http://www.cdc.gov.
Step 2

Again, click Select on the Menu bar and then click Existing Encounter.

Locate and click on the encounter dated 5/23/2012, at 10:00 AM, as shown in Figure 9-19.

Step 3

Click on the word “Graph” on the Menu bar, then click “Body Mass Index” as shown in Figure 9-20.

A graph of her BMI will be displayed, as shown in Figure 9-21.

Step 4

Compare your screen to Figure 9-21 and then print out Ms. Sutherland’s BMI graph.

Locate and click on the Print button in the upper left corner of the graph window to invoke the Print Data window.

In the left column of the Print Data window make sure there is a check mark in the box next to “Body Mass Index” and then click on the appropriate button to either print or export a file, as directed by your instructor.

When your graph has printed successfully, click on the Exit button in upper right corner of the window displaying the BMI graph.

Figure 9-19 Select existing encounter for May 23, 2012 10:00 AM.

Figure 9-20 Select Body Mass Index from the Graph menu.

Figure 9-21 Graph of Sally Sutherland’s Body Mass Index.
Critical Thinking Exercise 57: Adult BMI Categories

The CDC provides a free online BMI calculator. You will need access to the Internet for this exercise.

**Step 1**
Start your web browser, and type the following URL in the address:

www.cdc.gov/healthyweight/assessing/bmi/index.html

**Step 2**
Locate and click on “Adult BMI Calculator.”

**Step 3**
As mentioned previously, there are four categories of adult BMI. At her most recent visit, Sally Sutherland’s measurements were:
Height: 5 feet 0 inches
Weight: 168 lbs.

Enter Sally’s data, following the on-screen instructions.

When Sally’s category is displayed, write the category on your printout of her BMI graph and give it to your instructor. If your BMI graph has been printed to a file, report Ms. Sutherland’s category to your instructor separately.

**Step 4**
Because BMI is a useful measurement for adults as well, you may have an interest in seeing how you measure up.

Repeat step 1.

**Step 5**
Locate and click on “Adult BMI Calculator” if you are at least 20 years old.

If you are not yet 20, locate and click on the “Children and Teen BMI Calculator.”

Follow the on-screen instructions.

The Importance of Childhood Immunizations

Immunization slows down or stops disease outbreaks. Vaccines prevent disease in the people who receive them and protect those who come into contact with unvaccinated individuals.

Although it is true that newborn babies are immune to many diseases because they have antibodies they obtained from their mothers, the duration of this
immunity may last only a month to about a year. If a child is not vaccinated and is exposed to a disease germ, the child’s body may not be strong enough to fight the disease. Before vaccines, many children died from diseases that vaccines now prevent.

Through childhood immunization, we are now able to control many infectious diseases that were once common in this country, including polio, measles, diphtheria, pertussis (whooping cough), rubella (German measles), mumps, tetanus, and Haemophilus influenzae type b (Hib).2

One of the things a pediatrician does during the first two years of well-baby checkups is to compare the child’s immunization history against a recommended schedule of immunizations. At regular intervals, the well baby will receive one or more vaccines. By the age of two years, the child is then protected against a vast array of diseases that once caused the death of many children.

When the pediatrician uses an EHR system, the information from all previous immunizations is readily at hand. The clinician can then easily order the next scheduled vaccines appropriate to the patient’s age and vaccine history.

Health maintenance systems, such as the one shown in Chapter 2, Figure 2-24, automatically calculate and display the next recommended immunizations. The Student Edition software does not have that feature, but the EHR system you will use in a medical office quite likely will.

**Guided Exercise 58: Reviewing and Ordering Vaccines**

In this exercise, you will use the Manage tab to verify what immunizations the child has had, and in a subsequent step you will order vaccines that are required.

**Case Study**

Before concluding Tyrell Williams’s six-month checkup, the clinic will compare his immunization records with the immunization schedule recommended by the CDC and administer any vaccines for which he is due.

**Step 1**

If you have not already started the Student Edition software, do so at this time.

Locate and click Select on the Menu bar, and then click Patient.

In the Patient Selection window, locate and click on **Tyrell Williams** as you have previously (see Figure 9-1).

**Step 2**

Click Select on the Menu bar, and then click Existing Encounter.

---

2Ibid.
Position your mouse pointer on the first encounter in the list, dated 5/25/2012 11:00 AM and click on it (as shown in Figure 9-15).

![Figure 9-22 Patient Management Vaccines tab history for Tyrell Williams.](image)

**Step 3**

Locate and click on the tab labeled “Manage” at the bottom of your screen. Click on the tab in the left pane labeled “Vaccines.”

The vaccine list can be sorted in two ways. If you click the mouse on the column header labeled “Finding,” the vaccines are sorted into groups, allowing you to see easily how many doses have been given of each vaccine. If you click the mouse on the column header for date, the list will be reordered so that you can see exactly which vaccines were administered during each well-baby checkup.

Click the mouse on the column header labeled “Finding” so that the vaccines are sorted by type. Compare your screen to Figure 9-22.

**Immunization Schedules from the CDC** Immunizations must be acquired over time. Vaccines cannot be given all at once. Several require repeated applications over a period of time, and some such as the measles vaccine, cannot be given to children under the age of one year. Therefore, the CDC and state health departments have designed a schedule to immunize children and
adolescents from birth through 18 years. The Recommended Immunization Schedules for Persons Aged 0 through 18 Years are approved by the (CDC) Advisory Committee on Immunization Practices, the American Academy of Pediatrics, and the American Academy of Family Physicians.

Figure 9-23 shows the immunization schedule recommended by the CDC for children age 0 to 6 years old. Age categories are shown across the top of the schedule. The full names of recommended vaccine combinations are shown down the left column. An abbreviation for the vaccine name is shown within the grid under the ages at which it should be administered.

Yellow bars within the grid indicate the ideal interval at which a particular series should be completed. Blue bars indicate the ages that should be given special attention if the series has not been completed. The fact that colored bars extend over multiple age categories indicates the flexibility that is built into the recommended schedule.

For example, the chart shows that the CDC recommends that infants should receive the first dose of Hepatitis B vaccine (HepB) soon after birth and ideally before hospital discharge. The second dose would be administered at least 4 weeks after the first dose. The third dose should be given at least 16 weeks after the first dose and at least 8 weeks after the second dose. The last dose in the vaccination series (third or fourth dose) should not be administered before the age of 24 weeks.

Step 4

Compare the vaccine list on your screen to the CDC schedule, as shown in Figure 9-23. Notice the following:

Tyrell was born November 10, 2011.
He had his first dose of Hepatitis B (HepB) before leaving the hospital on 11/11/2005.

He had his second dose during his 2-month checkup on 01/10/2012.

He could receive his third dose during this visit or at his 12-month visit.

Compare his DTaP (Diphtheria, Tetanus, Pertussis) vaccines to the CDC schedule.

- He had his first dose of DTaP during his 2-month checkup on 01/10/2012.
- He had his second dose during his 4-month checkup on 03/14/2012.
- He is due for his third dose during this visit.

Compare his Haemophilus influenzae type B (Hib) doses to the CDC schedule.

- He had his first dose of Hib during his 2-month checkup on 01/10/2012.
- He had his second dose during his 4-month checkup on 03/14/2012.
- He is due for his third dose during this visit.

Compare his IPV (Inactivated Polio Virus) doses to the CDC schedule.

- He had his first dose of IPV during his 2-month checkup on 01/10/2012.
- He had his second dose during his 4-month checkup on 03/14/2012.
- He is due for his third dose during this visit.

Compare his Pneumococcal Conjugate (PCV) doses to the CDC schedule.

- He had his first dose of PCV during his 2-month checkup on 01/10/2012.
- He had his second dose during his 4-month checkup on 03/14/2012.
- He is due for his third dose during this visit.

Of the vaccines remaining on the CDC schedule, he is too young for the Varicella vaccine as well as the Measles, Mumps, Rubella (MMR) vaccine, which is not administered before 12 months.

He is old enough for a flu shot, but the office visit occurs in May and annual flu shots are not available until fall.

**Step 5**

Now that the clinician has a clear picture of the patient’s immunization needs, they can be ordered and administered.

Locate and click on the Forms button on the Toolbar.

Locate and click on the form labeled “Pediatric 6 Month.” as you did in Exercise 54. If you need assistance, refer to Figure 9-3.

**Step 6**

Locate and click on the tab labeled “Immunizations” at the top of the form.
Figure 9-24 Pediatric 6-month form—Immunization tab.

Locate the section labeled “Vaccines at 6 Months” and click the check box for each of the following:

✓ Y DTaP (dose 3)
✓ Y Haemophilus influ B (dose 3)
✓ Y IPV (dose 3)
✓ Y Pneumococcal Conjugate (dose 3)

Compare your screen to Figure 9-24.

Locate and click on the tab labeled “Encounter” at the bottom of your screen.

**Alert**

Do not close or exit the encounter until you have a printed copy in your hand. You will lose your work if you exit before printing.

**Step 7**

Click on the Print button on the Toolbar at the top of your screen to invoke the Print Data window.

Be certain there is a check mark in the box next to “Current Encounter” and then click on the appropriate button to either print or export a file, as directed by your instructor.
Tyrell Williams

Student: your name or id here
Patient: Tyrell Williams: M: 11/10/2011: 5/25/2012 11:00AM

Chief complaint
The Chief Complaint is: 6 month check up.

History of present illness
Tyrell Williams is a 6 month old male. Source of patient information was mother.
No constipation. A normal number of wet diapers per day.

Past medical/surgical history
Reported History:
Past medical history - No significant past medical history.
Surgical / Procedural: Prior surgery - No significant surgical history.
Exposure: No exposure to tuberculosis.
Environmental Exposure: No exposure to lead.
Dietary: Infant is breast-feeding.
Pediatric: No difficulty breast-feeding, rice cereal introduced, with pureed fruit
introduced, and with pureed vegetables introduced.

Personal history
Habits: An abnormal sleep pattern.
Home Environment: Lives with parents and the living environment has secondhand
tobacco smoke.

Family history
Family medical history - No significant family history

Tobacco use
Not using drugs.

Review of systems
Systemic: No systemic symptoms.
Head: No head symptoms.

Eyes:
Otolaryngeal: No ear symptoms, no nasal symptoms, and no throat symptoms.
Cardiovascular: No cardiovascular symptoms.
Pulmonary: No pulmonary symptoms.
Musculoskeletal: No musculoskeletal symptoms.
Psychological: No psychological symptoms.
Skin: No skin symptoms.

Physical findings
Vital Signs:
Vital Signs/Measurements            Value                     Normal Range
Tympanic membrane temperature       99 F                      99 - 101
RR                                  40 breaths/min            36 - 44
PR                                  128 bpm                   110 - 175
Weight                              8.7 kg                    6.1 - 10
Body length                         27.5 in              25.6 - 29.1
Head circumference                  43.9 cm                   42 - 47

General Appearance:
° Alert. ° Well hydrated. ° Active.

Head:
Injuries: ° No cephalohematoma.
Appearance: ° No skull molding was seen. ° Fontanelle was normal.

Neck:
Appearance: ° Neck was not swollen.
Suppleness: ° Neck demonstrated no decrease in suppleness.

Eyes:
General/bilateral:
Extraocular Movements: ° Normal.
Pupils: ° Normal.

Ears:
General/bilateral:
Outer Ear: ° Auricle normal.
External Auditory Canal: ° External auditory meatus normal.
Tympanic Membrane: ° Normal.
Tyrell Williams

Nose:
- General/bilateral:
  - Discharge: ° No nasal discharge seen.
- External Deformities: ° No external nose deformities.

Oral Cavity:
- ° Normal.

Pharynx:
- ° Normal.

Lungs:
- ° Clear to auscultation.

Cardiovascular:
- Heart Rate And Rhythm: ° Normal.
- Heart Sounds: ° Normal.
- Murmurs: ° No murmurs were heard.
- Arterial Pulses: ° Equal bilaterally and normal.
- Venous Filling Time: ° Normal.

Abdomen:
- Auscultation: ° Bowel sounds were normal.
- Palpation: ° Abdomen was soft. ° No mass was palpated in the abdomen.
- Liver: ° Normal to palpation.
- Spleen: ° Normal to palpation.
- Hernia: ° No umbilical hernia was discovered.

Genitalia:
- Penis: ° Normal.
- Testes: ° No cryptorchism was observed.

Musculoskeletal System:
- General/bilateral: ° Normal movement of all extremities.
- Hips: ° General/bilateral: ° Hips showed no abnormalities.

Neurological:
- ° System: normal.

Skin:
- ° General appearance was normal. ° Showed no erythema. ° No cyanosis. ° Not dry.
- ° No exfoliation was seen.

Growth And Development:
- ° Shy with strangers.

Assessment
- ° Normal routine history and physical well-baby (birth - 2 yr)

Vaccinations
- ° Received dose of polio virus vaccine, inactivated (Salk)
- ° Received dose of DTaP vaccine
- ° Received dose of haemophilus influenzae B vaccine, PRP-T conjugate (4 dose schedule), for intramuscular use
- ° Received dose of pneumococcal conjugate vaccine, polyvalent, IM use

Counseling/Education
- ° Discussed safety practices
- ° Discussed stranger safety
- ° Discussed nutritional needs
- ° Discussed concerns about teething
- ° Discussed concerns about dental hygiene.

► Figure 9-25b Printed encounter note for Tyrell Williams with immunizations (page 2 of 2).

Compare your printout or file output to Figure 9-25. If it is correct, hand it in to your instructor. If there are any differences, review the previous steps in the exercise and find your error.

Chapter 9 | Using the EHR to Improve Patient Health 367
Critical Thinking Exercise 59: Determine Your Adult Immunizations

The CDC also publishes a recommended immunization schedule for adults. Because adult immunizations are different from those you had as a child, you may have an interest in seeing what you need as an adult. You will need access to the Internet for this exercise.

Step 1
The CDC provides a free online service to determine you adult immunization needs.

Start your web browser, and type the following URL in the address:

www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm

Step 2
Locate and click on the link “Adolescent & Adult Vaccine Quiz,” and then on the link “Take the Quiz.”

Step 3
Follow the on-screen instructions.

Step 4
Optionally, you may print out your immunization schedule. You do not have to turn it into your instructor.

Patients’ Involvement in Their Own Healthcare

Patients must become involved in their own healthcare to effectively manage and prevent diseases. One such example was the immunization quiz you completed in Exercise 59. Other examples are the use of patient-specific graphs, growth charts, and BMI that are useful in patient education and counseling. Doctors Wenner and Bachman discussed in Chapter 1, the concept of giving the patient a copy of the exam note at the conclusion of the visit. One effect of that is to stimulate compliance by giving the patient written documentation of the diagnosis, therapy, and plan of care discussed during the visit. The other effect is that it improves the patient’s recollection of the clinician’s advice.

Patient-Entered Data Graphs

Patients can also be engaged in their own healthcare by measuring their own blood pressure at home and keeping a log that they bring to the doctor’s office when they have a checkup. Although vital signs such as blood pressure readings from quarterly office visits can be graphed by the EHR software, as you have done in Chapter 7, it is also possible for patients with home computers who keep their daily blood pressure log on a computer to create a graph themselves or to bring the log as a computer file when they have their checkup and let the clinician graph it.

Dr. Allen Wenner provides a spreadsheet template to patients who have Microsoft Excel on their home computers. The template is available on his web
site or on a diskette. He encourages them to record their daily blood pressure in an Excel workbook instead of on paper, and to bring or e-mail a copy of the workbook file when they come to his office.

During the patient’s office visit, the clinician and the patient discuss the graph of the daily blood pressure readings compared with the regimen of blood pressure medicine. The physician tells the patient what are the parameters of control, for example, 140/90 for most patients and 130/80 for diabetics. The patient also can view the graph at home as he builds it with his own data. Following the graph on his home computer, the patient knows whether the therapy is working.

Figure 9-26 shows a graph created in Excel by Dr. Wenner and his patient. Notice during the Hyzaar treatment that the patient’s blood pressure is tending higher than 140 over 90. The graph indicates the medication needs to be changed. After the doctor shows the patient how to read the graph during the office visit, the patient understands the normal and abnormal range. The patient knows when to call the physician for advice rather than wait until the next appointment. This shared information results in shared decision making. The interaction is transformed from one of gathering information to one of managing the patient’s problem. Patients can now look actively at issues of the illness, the treatment regime, and the desired outcome.

This is an example of patients using technology to improve blood pressure management. Research has shown that controlling blood pressure will reduce stroke, heart attack, and vascular disease. Nearly 200 medications are approved for use. There is a combination of drugs that will work for most patients without
side effects. Currently in the United States, only about one-third of hypertensive patients have their illness under good control. A number of reasons contribute to this, but increased patient involvement can improve their health.

**Preventative Care Screening**

The U.S. Preventive Services Task Force is an independent panel of experts in primary care and prevention that systematically reviews the evidence of effectiveness and develops recommendations for clinical preventive services. The task force recommendations about preventive services are based on age, sex, and risk factors for disease.

Research has shown that the best way to ensure that preventive services are delivered appropriately is to make evidence-based information readily available at the point of care. As far back as 1990 EHR systems were developed to compare patient information in a medical office computer with age, sex, and risk factors. The system generated a list of preventive care measures individualized to the patient based on the U.S. Preventive Services Task Force guidelines at the point of care. The task force recommendations have now been incorporated in EHR systems from several vendors.

“Evidence-based guidelines” means analyzing scientific evidence from current research and studies to determine the effectiveness of preventive services. The guidelines recommend both for and against certain measures, including screening, counseling, and preventive medications. However, the guidelines are not set in stone. They vary not only by age and sex but change at recommended intervals based on the individual patient. For example, a blood test measuring total cholesterol and high-density lipoprotein (HDL-C) is recommended every five years for a male over 35, but the interval shortens to every two years if the patient has additional risk factors such as high blood pressure, abnormal lipid levels on previous tests, or a family history of cardiovascular disease before age 50.

Using data in the EHR, the computer is able to find the appropriate guideline based on the patient’s age and sex, add to it based on the patient’s problem list and history findings, and then reduce the intervals based on abnormal values of previous test results. The system then generates a guideline unique to the patient and delivers it to the clinician’s computer screen. Using this information, the clinician can order tests, discuss important health care options, and recommend lifestyle changes to the patient at the point of care.

Preventive care screening programs, such as the health maintenance program shown in Chapter 2, Figure 2-24, makes effective use of the EHR to present the provider with recommended tests for early detection and immunizations for prevention.

---

Real-Life Story

Quality Care for Pediatric and Adult Patients

By Alison Connelly, P.A.

Alison Connelly is a physician assistant in a large multispecialty group in New York City. She was instrumental in setting up the preventative screening guidelines and designing many of the forms used in the EHR at her practice. Her group has eight clinics and 350 employees.

Our practice implemented EHR and uses many of the options the system offers. These include the electronic prescription system, document imaging, a Medcin-based EHR called OmniDoc™, the referral system, and Quality Care Guidelines (the health maintenance, preventative screening component of our EHR).

The document imaging component is terrific! That was actually what got doctors who were resistant to adopting the EHR to start using the system, because they could access their results and reports instantly. Now that we are on the imaging system, any type of patient results that comes in is immediately scanned in so that doctors do not have to wait. This is especially useful in the off-site clinics. We have eight locations. Previously, a document would come in and it could float around for a couple of weeks before it got to the proper clinician, but now as soon as it arrives it is scanned and the clinicians have immediate access to the results on the report on the computer.

A little more than half our total providers use OmniDoc to enter their own exam notes, but all of the pediatric clinicians use it. We created multiple forms for pediatrics based on age and what the milestones and programs for that visit are. We have forms for well-baby visits at 2 months, 4 months, 6 months, 1 year, 15 months, 2 years, and so on. We also created one comprehensive pediatric form for all types of sick visits.

The pediatricians use the growth charts to ensure the pattern of the child's growth is appropriate and follows a trend. The vitals are automatically plotted on the growth chart after they are entered.

We use the Quality Care Guidelines module for age, sex, and disease-specific clinical reminders, primarily in the adult population. I will explain more about that later. Although the guideline system can be used for child immunization scheduling, we were not able to get rid of the manual immunization sheet in each chart.

I initially set up a system that would track immunizations from the encounters. We created multiple codes for each vaccine and every series—for example, MMR1, MMR2, HIB1, and HIB2. This allowed us to capture the right instance of the vaccine in the series. You also can set up OmniDoc to update the guidelines as vaccines are ordered, but I have not done that.

Our providers are still using the immunization sheet in the chart. There are several reasons for that. First was immunization history. We have about 150,000 visits a year and we did not have the manpower to go back and enter the old immunization records manually. With 380 employees, I also was afraid that manual entry could introduce errors. I could not come up with a method to validate the data if we did it that way, so we went forward entering only new immunizations.

The second reason was consistency. The pediatricians did not want to use the guideline system for some patients and not all of them. If a new patient started here when they were born and had all the vaccines administered here, the computer had an accurate record. However, if the patient already had an immunization record in the chart, or if the patient received some shots elsewhere, the guideline system would not be up to date. So, for vaccines it turned out that pediatric providers did not use it that frequently.

The third reason we did not use the guideline system for immunizations was because of CIR, the Citywide Immunization Registry. In New York City, we have to use CIR to report every vaccine we give to children between birth and 18 years old. So, in addition to putting it on the encounter, we have to send it into the city. If that were computerized, it would be much better; we could eliminate double entry by recording it in the EHR and then transmitting it to the city registry.

From a practical standpoint, the guideline system worked much better for adults in our practice. An adult population has more things that have to be monitored and more of the patients have chronic diseases than do children. In addition to the preventive health measures recommended by age and sex, we have special guidelines for the following conditions:

- Diabetes
- HIV
- Hypertension
- Hyperlipidemia
Renal failure  
Ischemic heart disease  
Anemia  
Asthma

Using the guideline system, we are able to make sure, for example, that a diabetes patient has a hemoglobin A1C done every three months.

The guideline system uses patient data that is updated either manually or automatically. Many of the items on the guidelines are tests, and it is possible to have the electronic lab system update them with orders and results. However, the interface to our local lab company never worked consistently, so most of our guideline data is updated via the encounter. I created a section of the encounter that is labeled “QC Guidelines,” which contains the factors that are followed. These are marked by the clinician, then our system automatically updates the guideline when the encounter is processed.

The other update process we use is related to our document image system, which updates the patient data when we scan images. For instance, we actually capture the mammogram referral and the mammogram result. When a mammogram result comes in, it is scanned and we update our system. This does three things: it stores an image of the results, it updates the patient data for the guideline, and it updates the managed care referral portion of the EMR.

We also run reports off the EHR data using the guideline system. In the case of the mammogram, this allows us to reconcile patients that are referred out with results we received back.

We can then follow up with patients that just never went for their appointment.

I work in the HIV clinic and use both the guideline system and custom forms I designed for the EHR. While I write my notes in OmniDoc, I pull up the guidelines; it is a great monitor.

Because HIV has a lot of clinical guidelines to follow, clinicians can become very focused on HIV and overlook the normal orders that would be done based on age and sex, such as a mammogram or a fecal occult blood test. From that standpoint, the guideline system is very helpful, because it produces a complete list of recommendations for the patient’s age and sex as well as any diseases the patient may have. I use it almost like a checklist that I go down to make sure I do not forget anything.

I also created forms in our EHR system specific for the HIV clinic that monitors certain clinical guidelines we have to follow and information such as the percentage of pills taken per week and the number of hours slept a night. I used an option in the form designer to make those fields required. The clinician cannot exit the form until those questions are answered.

The EHR system is great, but if it becomes more sophisticated we could do so much more. I like the idea that it could automatically update guidelines when results are received or automatically send vaccine data to the immunization registry. Similarly, we have to report sexually transmitted diseases within a certain time frame. If we could do that electronically when we received the lab result as well, it would be great.
Chapter Nine Summary

In this chapter you learned to create a pediatric growth chart. You also learned about pediatric forms and to document a well-baby checkup using a wellness form.

The baby’s length, weight, and head circumference are measured on each visit. These measurements can be plotted on a graph called a growth chart that compares the individual’s growth to statistical information from the general population. Lines on the chart called percentiles represent the percentage of the population that was the same size at the same age. A child who is at the 50th percentile weighs the same or more than 50% of the reference population at that age.

For older children, the CDC now recommends using Body Mass Index (BMI). BMI is a number (wt/ht²) that represents body weight adjusted for height. BMI can be calculated with inches and pounds or meters and kilograms. BMI is gender specific and age specific for children, but a single BMI chart is used for adults of both genders. The CDC has replaced the older weight-for-stature charts with the new BMI charts.

Immunizations must be acquired over time. Vaccines cannot all be given at once. CDC recommended immunizations are aligned with the well-baby visit intervals. You learned how to compare a child’s immunization history to the schedule recommended by the CDC (or state health department) to determine what is required each visit.

Disease prevention through periodic screening and early detection also can save lives. Preventive guidelines, also known as health maintenance guidelines, can be generated by an EHR system. Tailored by the computer, these guidelines recommend tests and preventative measures based on the patient’s age and sex, but then dynamically modify the recommendations based on past history and problems unique to the individual. Using this information, the clinician can order tests, discuss important healthcare options, and recommend lifestyle changes to the patient at the point of care.

<table>
<thead>
<tr>
<th>Task</th>
<th>Exercise</th>
<th>Page #</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to document a well-baby visit</td>
<td>54</td>
<td>343</td>
</tr>
<tr>
<td>How to create growth charts</td>
<td>55</td>
<td>356</td>
</tr>
<tr>
<td>How to calculate Body Mass Index</td>
<td>56</td>
<td>358</td>
</tr>
</tbody>
</table>
Testing Your Knowledge of Chapter 9

1. List at least three factors the EHR can use to create patient specific preventive screening or health maintenance guidelines.
2. Describe how to create a child's growth chart in the EHR.
3. Why are childhood immunizations important?
4. Describe how to change the order in which vaccines are displayed in patient management.

Give the full name for the following acronyms:

5. DTaP ____________________________
6. HepB ____________________________
7. BMI ____________________________
8. What are “evidence-based” guidelines?
9. Name the organization that developed pediatric growth charts.
10. What is a growth chart percentile?
11. Adult BMI falls into one of four categories—name them.
12. Review your graph of Sally Sutherland's BMI. Which category does she fall into?
13. At what age is the first dose of HepB recommended?
14. Name the taskforce that develops preventive screening guidelines.
15. You should have produced two narrative documents of patient encounters, one growth chart, and one BMI graph. If you have not already done so, hand these in to your instructor with this test. The printed encounter notes and graphs will count as a portion of your grade.