Appendix 3

In the Appendix:

Discussion of the ALERT IIS Forecaster

Description of Common Errors

ALERT IIS Forecaster Module

ALERT IIS contains a forecasting module that provides real-time recommendations of which vaccines should be given to a patient based on the patient's vaccination history and, in certain instances, based on patient comments.

Figure 1 - ALERT IIS forecast for a 2 month old.

By reading down the left side of the table, a clinician can quickly identify which vaccines should be given today. Since recommendations are made in real-time, the forecast will be updated as soon as historical or administered vaccinations are entered into the IIS.

The forecast includes five columns:

- **Vaccine Group** – This refers to the vaccine family that is recommended. For example, the DTP/aP group includes DTaP, DT and combination vaccines that contain DTaP.

- **Vaccine** – This column shows the specific formulation that is recommended. For example, Tdap will be displayed for a patient who is over age 7 years and has not received a Tdap vaccine.

- **Earliest Date** – This is the soonest date that a vaccine dose may be given, based on the minimum interval from the previous dose and the minimum age at which the next dose can be given. This may be helpful when vaccinating patients who are unlikely to return later for vaccination.

- **Recommended Date** – This date is when the patient has entered the age range identified on the annual routine immunization schedule created by the ACIP/AAP/AAFP. In general, this is when vaccines are routinely administered.

- **Past Due Date** – Typically, this date is 30 days past the end of the age range identified on the annual routine immunization schedule. This information is helpful to the clinician when the patient is behind on their immunizations. If necessary, immunizations that are past due can be prioritized for administration.

Vaccines that are currently recommended or past due are highlighted in green as shown in figure 1.

The vaccine groups listed in the first column are blue hyperlinks. When clicked, a pop-up will open that shows where the forecasted dose falls in a vaccine series. An example is shown in figure 2.

Series: HepA {Vaccine Group: HepA}

Dose	Min Age	Min Rec Age	Min Overdue Age	Min Valid Interval	Min Interval Between	Rec Interval Between	Overdue Interval Between	Max Age
1	1 Y	1 Y	19 M					
2	18 M	18 M	25 M		6 M	6 M	13 M	

Figure 2

Figure 3 - Updated ALERT IIS forecast after vaccine administration.

There are a few patient comments that affect the forecaster, for example immunity to a disease like varicella. In those cases, the forecaster will display a message in the forecast that explains why the vaccine is not being recommended.

Comments	{1 of 1} .. 02/28/2008 ~ Immunity: varicella (chicken pox)	

Vaccines Recommended by Selected Tracking Schedule

Select	Vaccine Group	Vaccine	Earliest Date	Recommended Date	Past Due Date
☐	DTP/aP	DTaP, NOS	03/16/2011	03/16/2011	03/16/2012
☐	HepA	HepA, NOS	07/25/2011	07/25/2011	02/25/2012
	HepB	HepB, NOS		Complete	
	Hib	Hib, NOS		Complete	
☐	Influenza-seasnl	Influenza, NOS	09/16/2007	08/01/2010	10/16/2007
	MMR	MMR		Complete	
☐	PneumoConjugate	PCV13	06/17/2008	06/17/2008	07/22/2008
☐	Polio	Polio, NOS	03/16/2011	03/16/2011	03/16/2012
	Varicella	Varicella		Immunity Recorded for Vaccine Group	
					Add Selected

Figure 4 - Patient comment shows immunity to varicella. Forecaster no longer recommends varicella vaccine. If the comment for this patient was "History of varicella," the forecaster would show the varicella group as "Contraindicated."

Other conditions in a patient's record may affect the forecaster. Doses that do not meet the minimum age or the minimum interval between doses may be ignored by the forecaster. These doses will be marked in the series column of the vaccine history as not valid. Clicking on the date of a dose that is marked not valid will open a pop-up box. At the top of the box, under the heading Explanation of Status, will be a short description of why the dose is invalid, see figure 5.

Explanation of Status

Vaccine group MMR has a minimum interval conflict with a dose from vaccine group Varicella.

Series: MMR {Vaccine Group: MMR}

Dose	Min Age	Min Rec Age	Min Overdue Age	Min Valid Interval	Min Interval Between	Rec Interval Between	Overdue Interval Between	Max Age
1	1 Y	1 Y	16 M		28 D			
2		4 Y	5 Y		28 D	28 D	2 M	

Figure 5 – an example of the reason a dose is invalid.

The ALERT IIS tracks doses marked as subpotent. Subpotent doses are vaccines that have been administered but may not have induced immunity because of mishandling, incorrect storage or some other issue. These doses show in the patient's history but are ignored by the forecaster. Repeat doses will be recommended in the patient's forecast. Clicking on the date of a subpotent dose will bring up a message about subpotent doses. See figure 7.

Vaccine Group	Date Admin	Series	Vaccine [Trade Name]	Dose	Owned?	Reaction	Hist?	Edit
Immunization Record								
DTP/aP	03/27/2007	1 of 5	DTaP-HepB-IPV [Pediarix ®]		No		Yes	✎
	07/31/2007	2 of 5	DTaP-IPV/Hib [Pentacel ®]	Full	No			✎
	11/09/2008	3 of 5	DTaP, NOS [DTaP, NOS ®]	Full	No			✎
	11/10/2010	4 of 5	DTaP-IPV [Kinrix ®]	Full	No			✎
	01/05/2011	NOT VALID	DTaP-HepB-IPV [Pediarix ®]	Full	No			✎
HepA	02/09/2008	1 of 2	HepA, NOS [HepA, NOS ®]	Full	No			✎
	01/09/2011	2 of 2	HepA, NOS [HepA, NOS ®]	Full	No			✎
HepB	01/27/2007	1 of 3	HepB, NOS [HepB ®]		No		Yes	✎
	03/27/2007	2 of 3	DTaP-HepB-IPV [Pediarix ®]		No		Yes	✎
	01/05/2011	3 of 3	DTaP-HepB-IPV [Pediarix ®]	Full	No			✎
Hib	07/31/2007	1 of 2	DTaP-IPV/Hib [Pentacel ®]	Full	No			✎
	01/09/2011	2 of 2	Hib-PRP-T [ActHib ®]	Full	No			✎
Influenza-H1N1	09/15/2009		Influenza-H1N1-09, NOS		No		Yes	✎
Influenza-seasnl	09/21/2007	1 of 2	Influenza, NOS		No		Yes	✎
	01/05/2011	2 of 2	Influenza, seasonal, injectable pfree [Fluzone Pres-Free ®]	Full	No			✎
MMR	01/27/2008	1 of 2	MMR [MMR II ®]	Full	No	Yes		✎
PneumoConjugate	03/09/2007	1 of 4	PCV7 [Prevnar7 ®]	Full	No			✎
	03/27/2007	NOT VALID	PCV7 [Prevnar7 ®]	Full	No			✎
	07/10/2007	2 of 4	PCV13 [Prevnar13 ®]	Full	No			✎
	09/21/2007	3 of 4	PCV7 [Prevnar7 ®]		No		Yes	✎
Polio	03/27/2007	1 of 4	DTaP-HepB-IPV [Pediarix ®]		No		Yes	✎
	07/31/2007	2 of 4	DTaP-IPV/Hib [Pentacel ®]	Full	No			✎
	11/10/2010	3 of 4	DTaP-IPV [Kinrix ®]	Full	No			✎
	01/05/2011	4 of 4	DTaP-HepB-IPV [Pediarix ®]	Full	No			✎
Rotavirus	03/30/2007	1 of 2	Rotavirus, Monovalent [Rotarix ®]		No		Yes	✎
	05/09/2007	SUBPOTENT?	Rotavirus, Monovalent [Rotarix ®]	Full	No			✎
	05/10/2007	2 of 2	Rotavirus, Monovalent [Rotarix ®]		No		Yes	✎
TBTest	01/12/2011		TBTest, NOS [TBTest ®]	Full	No			✎

Figure 6 - This record shows several items of particular interest to a clinician. The fifth administered dose of Pediarix and second dose administered dose of PCV7 show as not valid. The first dose of MMR has a reaction recorded. The second administered dose of rotavirus is marked as subpotent.

Doses flagged as potentially subpotent are typically flagged because the vaccine that was administered has expired or has been stored or administered incorrectly. The Advisory Committee for Immunization Practices(ACIP) states:

Vaccines that have been mishandled (e.g., inactivated vaccines and toxoids that have been exposed to freezing temperatures) or that are beyond their expiration date should not be administered. If mishandled or expired vaccines are administered inadvertently, they should not be counted as valid doses and should be repeated, unless serologic testing indicates a response to the vaccine. (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5102a1.htm)

Potentially subpotent doses will be listed on the immunization record, but will not be counted in the forecast (i.e., a dose suspected of being subpotent will be reforecast as a dose that is still needed). These doses can be counted for school law purposes, however. For more information, please call the ALERT Help Desk at (800) 980-9431.

Figure 7 – Message describing subpotent doses.

Forecasting is a complex process requiring many decisions, both dependent and independent. Figure 8 shows a diagram that illustrates pieces of the computer forecasting algorithm needed to come up with vaccine recommendations.
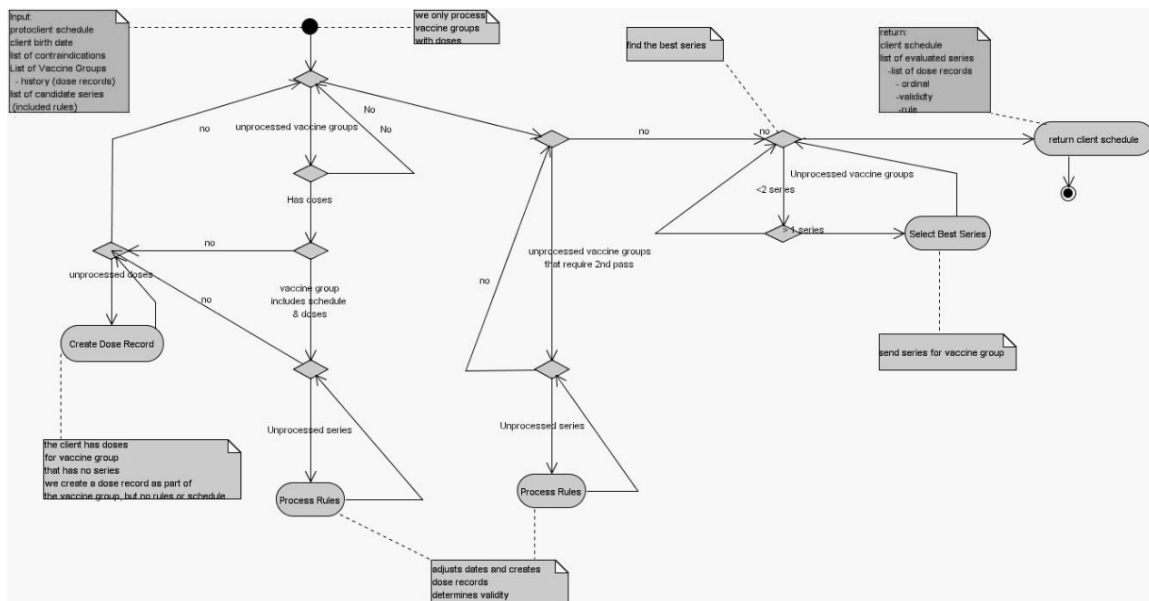

Figure 8 – Partial diagrammed process for forecasting decisions

Although computer-generated vaccine recommendations are extremely useful to clinicians, they do not substitute for medical judgment. Forecasts in the ALERT IIS should always be reviewed by a clinician familiar with immunization recommendations.

The ALERT IIS forecaster is a table-driven system, which makes it flexible and easy to update as immunization recommendations change. ALERT IIS staffs strive to make the system's forecaster as accurate as possible; however, there are some places where system administrators know the forecaster will not display recommendations correctly. In general, these issues will affect only a small percentage of patients.

The most common issues are described below.

Pneumococcal Conjugate

In 2010, the ACIP recommended that pneumococcal conjugate 7 valent (PCV7) vaccine be replaced with pneumococcal conjugate 13 valent (PCV13) vaccine. The committee also recommended that children under the age of five years who received a complete series of PCV7 receive a booster dose of PCV13. In order to correctly forecast the PCV13 booster, the vaccine history will show the final dose of PCV7 as not valid (figure 9). The dose is actually acceptable, but invalidating it forces the forecast of a dose of PCV13. When the hyperlink on the invalid dose is clicked, the explanation states that the dose is not valid for this dose in the series as shown in figure 10.

PneumoConjugate	03/04/2009	1 of 4	PCV7	Full	No	
	05/08/2009	2 of 4	PCV7	Full	No	
	07/10/2009	3 of 4	PCV7	Full	No	
	01/13/2010	NOT VALID	PCV7	Full	No	
Polio	03/04/2009	1 of 4	DTaP-HepB-IPV	Full	No	
	05/08/2009	2 of 4	DTaP-IPV/Hib	Full	No	
	07/10/2009	3 of 4	DTaP-HepB-IPV	Full	No	
Varicella	01/13/2010	1 of 2	Varicella	Full	No	

Vaccines Recommended by Selected Tracking Schedule

Select	Vaccine Group	Vaccine	Earliest Date	Recommended Date	Past Due Date
☐	DTP/aP	DTaP, NOS	01/03/2010	01/10/2010	08/01/2010
☐	HepA	HepA, NOS	07/13/2010	07/13/2010	02/13/2011
	HepB	HepB, NOS		Complete	
	Hib	Hib, NOS		Complete	
☐	Influenza-seasnl	Influenza, NOS	02/08/2010	09/01/2010	01/11/2011
☐	MMR	MMR	02/10/2010	01/01/2013	01/01/2014
☐	PneumoConjugate	PCV13	03/10/2010	03/13/2010	05/01/2010
☐	Polio	Polio, NOS	01/01/2013	01/01/2013	01/01/2014
☐	Varicella	Varicella	04/13/2010	01/01/2013	01/01/2015
					Add Selected

Figure 9

Explanation of Status

Trade-named vaccine is not acceptable for this dose in the series.
The patient's age and vaccination history allowed for certain doses in the series to be skipped; however, the skip did not occur due to other validation issues.

Series: PCV13 {Vaccine Group: PneumoConjugate}

Dose	Min Age	Min Rec Age	Min Overdue Age	Min Valid Interval	Min Interval Between	Rec Interval Between	Overdue Interval Between	Max Age
1	42 D		3 M		28 D	2 M		5 Y
2	70 D	4 M	5 M		28 D	2 M	3 M	5 Y
3	98 D	6 M	7 M		28 D	2 M	3 M	5 Y
4	12 M	12 M	16 M		56 D	2 M	3 M	5 Y
5	12 M	12 M	16 M		56 D	2 M	3 M	5 Y

Figure 10

Polio

On August 7, 2009, the ACIP changed its recommendations for the final dose of polio vaccine. Previously, as long as the fourth dose of polio was given 4 weeks after the third dose, it was counted as the final dose in the polio series. The ACIP now recommends that the final dose of polio be given no earlier than age 4 years.

Oregon implemented this recommendation on January 1, 2010, however the decision was made not to invalidate all of the final polio doses given before January 1, 2010. The compromise implemented in ALERT IIS is that the fourth dose of polio will be forecast no earlier than four years of age. If a child receives the fourth dose prior to age four, the ALERT IIS will not mark the dose "not valid" and will not forecast an additional dose. See figures 11 and 12.

Current Age: 2 years, 10 months, 5 days				Patient's date of birth - 02/28/2010				

Patient Notes (0)   *view or update notes*

Add New Imms	Add Historical Imms	Edit Patient	Reports	Print Record	Print Confidential Record

Immunization Record

Vaccine Group	Date Admin	Series	Vaccine [Trade Name]	Dose	Owned?	Reaction	Hist?	Edit
Polio	02/26/2010	1 of 4	Polio-Inject [IPOL ®]		No		Yes	🖉
	04/30/2010	2 of 4	Polio, NOS				Yes	🖉
	07/22/2010	3 of 4	Polio, NOS				Yes	🖉

Vaccines Recommended by Selected Tracking Schedule

Select	Vaccine Group	Vaccine	Earliest Date	Recommended Date	Past Due Date
☐	DTP/aP	DTaP, NOS	12/12/2009	12/31/2009	01/31/2010
☐	HepA	HepA, NOS	10/31/2010	10/31/2010	05/31/2011
☐	HepB	HepB, NOS	10/31/2009	10/31/2009	01/31/2010
☐	Hib	Hib, NOS	01/31/2011	01/31/2011	01/31/2011
☐	Influenza-seasnl	Influenza, NOS	04/30/2010	08/01/2012	05/31/2010
☐	MMR	MMR	10/31/2010	10/31/2010	02/28/2011
☐	PneumoConjugate	PCV13	10/31/2011	10/31/2011	10/31/2011
☐	Polio	Polio, NOS	10/31/2013	10/31/2013	10/31/2014
☐	Varicella	Varicella	10/31/2010	10/31/2010	02/28/2011

Add Selected

Figure 11 – An example of the forecast for a child under age 4 years who has received three doses of polio.

Figure 12 – The forecast for the same child after the fourth dose of polio is administered before the fourth birthday.

Spacing Between Doses Using Combination Vaccines

Spacing between vaccine doses is extremely important for optimal immune response. When patients get behind on immunizations there is a tendency to attempt to give needed doses as soon as possible, however minimum spacing must be maintained. Vaccine doses given too close together may not provide protection against disease.

An error that is occurring frequently happens when a child has received a birth dose of hepatitis B vaccine followed by doses of PediarixÒ vaccine. When PediarixÒ is administered on schedule at two months, four months and six months, the dose given at four months will show as "not valid" for hepatitis B. The dose at six months will complete the hepatitis B series. See figure 13.

When a patient comes in a bit late for the four month shots and then on time for the doses at six months, this may cause both the third and fourth doses of hepatitis B vaccine to be invalid, since there must be at least 8 weeks between the last invalid dose and the final dose of the hepatitis B series, see figure 14.

Immunization Record

Vaccine Group	Date Admin	Series	Vaccine [Trade Name]	Dose	Owned?	Reaction	Hist?	Edit
DTP/aP	01/10/2012	1 of 5	DTaP-HepB-IPV [Pediarix ®]	Full				
	03/12/2012	2 of 5	DTaP-HepB-IPV [Pediarix ®]	Full				
	06/08/2012	3 of 5	DTaP-HepB-IPV [Pediarix ®]	Full				
HepB	11/01/2011	1 of 3	HepB-Peds [Engerix-B Peds ®]	Full				
	01/10/2012	2 of 3	DTaP-HepB-IPV [Pediarix ®]	Full				
	03/12/2012	NOT VALID	DTaP-HepB-IPV [Pediarix ®]	Full				
	06/08/2012	3 of 3	DTaP-HepB-IPV [Pediarix ®]	Full				
Polio	01/10/2012	1 of 4	DTaP-HepB-IPV [Pediarix ®]	Full				
	03/12/2012	2 of 4	DTaP-HepB-IPV [Pediarix ®]	Full				
	06/08/2012	3 of 4	DTaP-HepB-IPV [Pediarix ®]	Full				

Vaccines Recommended by Selected Tracking Schedule

Select	Vaccine Group	Vaccine	Earliest Date	Recommended Date	Past Due Date
☐	DTP/aP	DTaP, NOS	12/02/2012	12/08/2012	06/01/2013
☐	HepA	HepA, NOS	11/01/2012	11/01/2012	06/01/2013
	HepB	HepB, NOS		Complete	
☐	Hib	Hib, NOS	11/01/2012	11/01/2012	11/01/2012
☐	Influenza-seasnl	Influenza, NOS	05/01/2012	09/01/2012	06/01/2012
☐	MMR	MMR	11/01/2012	11/01/2012	03/01/2013
☐	PneumoConjugate	PCV13	11/01/2012	11/01/2012	03/01/2013
☐	Polio	Polio, NOS	11/01/2015	11/01/2015	11/01/2016
☐	Varicella	Varicella	11/01/2012	11/01/2012	03/01/2013

Figures 13 and 14 – The third dose of hepatitis B shows as not valid but the fourth completes the series (above). In figure 14 below, the fourth dose was given too soon after dose three making both invalid.

Figure 14

Spacing Between Doses of Intranasal Influenza Vaccine and Other Live Vaccines.

Most live vaccines need to be administered on the same day or at least 28 days apart. If live vaccines are not given on the same day or at least 28 days apart, only the vaccine given first will be counted as valid. Frequently, providers are administering live, intranasal flu vaccine too soon after MMR or Varicella vaccines, or are not waiting 28 days after the intranasal flu vaccine is administered to give MMR and Varicella. In these cases, the vaccine given second must be repeated, as shown in Figure 15.

Current Age: 4 years, 10 months, 29 days

Patient Notes (0)   *view or update notes*

Add New Imms	Add Historical Imms	Edit Patient	Reports	Print Record	Print Confidential Record

Immunization Record

Vaccine Group	Date Admin	Series	Vaccine [Trade Name]	Dose	Owned?	Reaction	Hist?	Edit
Influenza-seasnl	09/22/2010	1 of 2	FLU-Nasal [FluMist ®]	Full				🖉
MMR	10/08/2010	NOT VALID	MMRV [Proquad ®]	Full				🖉
Varicella	10/08/2010	NOT VALID	MMRV [Proquad ®]	Full				🖉

Vaccines Recommended by Selected Tracking Schedule

Select	Vaccine Group	Vaccine	Earliest Date	Recommended Date	Past Due Date
☐	DTP/aP	DTaP, NOS	02/12/2008	03/01/2008	04/01/2008
☐	HepA	HepA, NOS	01/01/2009	01/01/2009	08/01/2009
☐	HepB	HepB, NOS	01/01/2008	01/01/2008	04/01/2008
☐	Hib	Hib, NOS	04/01/2009	04/01/2009	04/01/2009
☐	Influenza-seasnl	FLU-Nasal	10/20/2010	09/01/2012	11/17/2010
☐	MMR	MMR	11/05/2010	11/05/2010	11/05/2010
☐	PneumoConjugate	PCV13	01/01/2010	01/01/2010	01/01/2010
☐	Polio	Polio, NOS	02/12/2008	03/01/2008	04/01/2008
☐	Varicella	Varicella	11/05/2010	11/05/2010	11/05/2010
					Add Selected

Figure 15