Immunization Decision Support
The Forecaster

The Panorama Forecaster is a Decision Support Tool that validates recorded immunizations and recommends when future immunizations should be administered to a client.

Translating the Imms Manual to Panorama Forecaster

The Immunization Forecaster rules take information from the following sections of both the BC and YK Immunization Manuals:

- Immunization Schedules
- Special Populations
- Biological Products

What is the Forecaster?

The Panorama Forecaster is a Decision Support Tool that is composed of a complex set of rules to reflect both the BC and Yukon Immunization Manuals. The Forecaster validates recorded immunizations and recommends when future immunizations should be administered to a client.

The Forecaster recommends future immunizations for a client by considering certain information about the client, and a set of logical rules about the BC and YK Immunization Schedules which define when it is appropriate to administer immunizations. The rules take into consideration the age specific programs and interactions between vaccines.

BC/YK made the following decisions regarding forecaster:

- Forecasting schedules are for clients from birth to 19 years old.
- Immunization histories are validated / invalidated for clients of all ages.
- Forecasts for clients who are considered part of the 'Special Population' section of the Immunization Manual will be blank if the appropriate Risk Factor is applied to the client record (see Risk Factors section).

What the Forecaster is not:

The Forecaster is not a replacement for clinical judgement. The Forecaster is a decision support tool to assist clinicians in determining the appropriate immunizations for their clients. While the Forecaster aims to address the majority of clients, clinicians should consult the Immunization manual as necessary to confirm vaccine eligibility, particularly with unique clients or situations.

The Forecaster does not consider the following Panorama data / screens:
- Allergies
- Precautions
- Deferrals
- Consent
- TST Information
- Inactive client records

The Forecast Explained

There are two ways to view the same forecast for the client: Immunization Forecast by Agent/Antigen, and Immunization Forecast by Disease. Both sections will appear on the screen by default.

Immunization Forecast by Agent/Antigen section

The Immunization Forecast by Agent/Antigen is the list of recommended agents and antigens that form a client's future immunization schedule. The Forecast for any given agent or antigen includes the recommended Product and Dosage (if defined in the Immunization rules), and relevant date – Eligible, Due and Overdue.

Immunization Forecast by Agent/Antigen

Last Forecast Ran On: 2019 Mar 18

Forecast Status calculated as of: 2019 Mar 18

Immunizing Agent/Antigen	Forecasted Dose #	More Info	Volume	Brand	Eligible	Due	Overdue	Forecast Status
HB	1		0.5 mL		2012 Mar 23	2012 May 23	2012 Jun 23	Overdue
Pertussis	1	LOA			2012 May 04	2012 May 23	2012 Jun 23	Overdue
Men-C-C	1				2013 Mar 23	2013 Mar 23	2013 Apr 23	Overdue
MMRV		M			2019 Apr 15	2019 Apr 15	2019 Apr 15	Up To Date
Td (Diphtheria-d*)	2	EDS			2019 Apr 15	2019 Apr 15	2019 May 15	Up To Date
Polio	3				2019 Sep 02	2019 Sep 02	2019 Oct 02	Up To Date
HPV-9	1				2021 Mar 23	2022 Nov 23	2024 Mar 23	Up To Date

- The Forecaster reviews all required antigens for the client, given their immunization history, demographic profile, etc.
- It attempts to forecast immunizing agents, such that they include the most number of antigens in order to minimize the number of immunizations to be administered to a client (fewest numbers of pokes).
- Sometimes, some forecasted antigens are unable to be 'rolled up' into an agent. These leftover antigens will still be displayed in this table. They are still part of the forecast.
- The Forecaster will only forecast the next dose in the series, not all doses in the series. The dose number of the forecasted next dose will be displayed in the **Forecasted Dose #** column.
- When a client receives additional doses in a series (e.g. a third dose of Varicella), if the minimum intervals are satisfied, and no contraindicated interactions, the dose will be considered Valid; if not the dose will be considered Invalid.

Forecast by Agent/Antigen Definitions

1 These dates are defined in the BC and YK Immunization Manuals: The **Due Date** is the specific date recommended for the immunization program. The **Eligible Date** is the earliest clinically valid date on which a forecasted agent/antigen can be given (based on minimum intervals and minimum ages). The **Overdue Date** is the date when the child can be considered as late for their forecasted agent/antigen (more on this below).

2 **The Client's Forecast Status**
Eligible – The Eligible Date has been reached, but the Due Date is in the future.

Up to Date: Not yet Eligible/Due for a specific agent - "Due in the future"

Due: Time period between the Due Date and the Overdue Date

Overdue: After a certain time period, generally one month from the due date, forecasted agents/antigens are considered "Overdue." Overdue also considers minimum intervals: if a client is behind on their immunizations, his/her status will remain "Up to Date" until the minimum interval has passed, then it will become "Overdue."

3 **Extra Dose Safe (EDS):** An extra antigen included in the forecast to support the provision of an agent (e.g. A client is complete for Diphtheria, but needs Tetanus. Td will be forecasted with Diphtheria-d as EDS because this is the only Agent available to provide the missing antigen). 'EDS' will be displayed in the **More Info** column in such cases. The extra antigens will also be listed within the brackets and marked with an asterisk beside the forecasted agent.

4 **Mixed Dose Number:** A Mixed Dose Number is the situation where a client has received a different number of doses of the antigens in an agent. (e.g. A client with a single dose of Hep B at birth, being forecasted for Hexa will be a Mixed dose number because it is forecasting the second

dose of Hep B, but the first of all other antigens). This is indicated with an 'M' in the **Forecasted Dose #** column.

5 **Leftover Forecasted Antigens:** Single Antigens that are still required, but did not get Rolled Up into a recommended agent in the forecast. 'LOA' will be displayed in the **More Info** column.

Immunization Forecast by Disease section

Immunization Forecast by Disease is the list of recommended Antigens against the diseases for which the client is not yet protected. It uses the same immunization rules that the Forecast by Agent section uses (based on the BC and Yukon Immunization Manuals). It presents the forecast at the Antigen level rather than rolling them up to Agents. Once the Forecaster produces a list of Antigens forecasted for the client, it then associates each of these to the disease for which they provide protection.

Immunization Forecast by Disease

Last Forecast Ran On: 2019 Mar 18

Forecast Status calculated as of: 2019 Mar 18

Filter by Disease Group:
Vaccine Preventable Disease Disease Group

Disease ▲	Forecasted Antigen ⇕	Forecasted Dose # ⇕	Eligible ⇕	Due ⇕	Overdue ⇕	Forecast Status ⇕
Hepatitis B	HB	1	2012 Mar 23	2012 May 23	2012 Jun 23	Overdue
Human papillomavirus infection	HPV-9	1	2021 Mar 23	2022 Nov 23	2024 Mar 23	Up To Date
Measles	Measles	1	2019 Apr 15	2019 Apr 15	2019 May 16	Up To Date
Meningococcal disease (invasive)	Men-C-C	1	2013 Mar 23	2013 Mar 23	2013 Apr 23	Overdue
Mumps	Mumps	2	2019 Apr 15	2019 Apr 15	2019 Apr 15	Up To Date
Pertussis	Pertussis	1	2012 May 04	2012 May 23	2012 Jun 23	Overdue
Poliomyelitis	Polio	3	2019 Sep 02	2019 Sep 02	2019 Oct 02	Up To Date
Rubella	Rubella	1	2019 Apr 15	2019 Apr 15	2019 May 16	Up To Date
Tetanus	Tetanus	2	2019 Apr 15	2019 Apr 15	2019 May 15	Up To Date
Varicella	Varicella	1	2019 Apr 15	2019 Apr 15	2022 Apr 15	Up To Date

Refresh Forecast

How is a client's Immunization forecast kept up-to-date?

The Forecaster runs each time a client is created or if the following changes are made:

- Date of Birth updated
- Gender updated
- Risk Factor added, end dated or removed
- Special Consideration (Exemption or Contraindication) added, end dated or removed
- Immunizations (either administered or historical) are added/deleted/updated to a client's record

The Forecaster also runs each time a client reaches a pre-specified date/age milestone (i.e. 2 years old, 7 years old, 17 years old) and/or when a specific age or date of birth is indicated for an Agent (i.e. Forecaster will rerun when the client turns 8 months old due to the maximum age for Rotavirus).
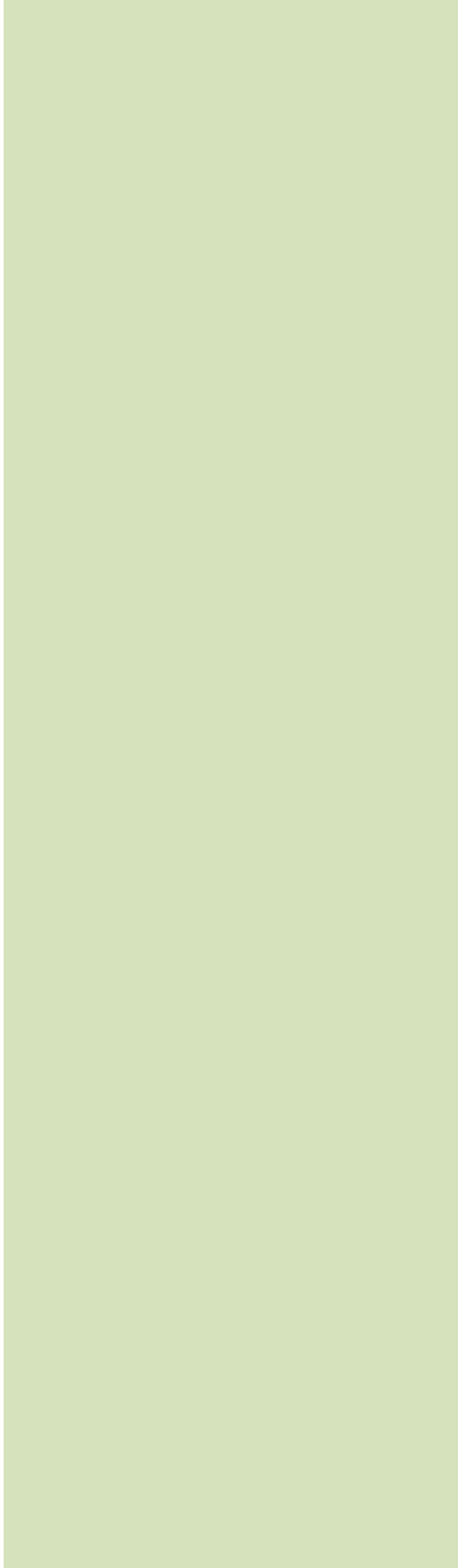
Forecast by Disease Definitions

1 Eligible, Due and Overdue Dates

These dates are defined in the same way as for Immunization Forecast by Agent/Antigen as described above.

2 The Client's Forecast Status

These statuses are again defined in the same way as for Immunization Forecast by Agent/Antigen.

3 Antigen and Dose Number

Dose numbering works in the same way as Forecast by Agent/Antigen, but without the need to consider Mixed Dose numbers. That is because it simply counts and numbers Antigens.

4 Disease

The disease that the forecasted Antigen protects against.

5 Filter by Disease Group

The system allows for groups of diseases to be defined. Right now, only the Vaccine Preventable Disease (VPD) group has been configured. In the future, subgroups of VPD may be defined, which would allow the users to view forecasts only for these diseases.

Imms History Definitions

① **Estimated Date:** Indicates that the date of the immunization was entered as estimated (Refer to *Historic Immunizations Documentation Standard*). The Forecaster will treat the dose no differently than doses without the Estimated flag.

② **Revised Dose Number:** Indicates that the user revised the system-generated dose number; which automatically sets the status of the dose to Valid (override).

③ **Override Status:** Indicates that the user has overridden the dose status assigned by the Forecaster. This is separate from **Revised Dose Number** above.

Status can be changed from Valid to Invalid; or from Invalid to Valid. The change can also be reversed by choosing to change the status back to 'Set by Forecaster'.

④ **Invalid Status:**
Doses are marked as Invalid when the antigen dose has broken a clinical rule and is not effective:
- A minimum interval is not met
- A minimum age is not met
- An Interaction rule applies with another vaccine received
- Another user chose to override the validation and mark the dose as Invalid. These doses have a status of Invalid (override)

Invalid doses will not be counted towards the series when planning future doses. However, invalid doses may be considered when calculating minimum intervals for planned doses (typically this affects live antigens only).

The Imms History Explained

Special Cases:

Grade Based Schedules

The Forecaster works with age, not grades. In order to accommodate Grade Based Schedules (for Gr. 6 and Gr. 9), the following ages have been defined for each grade:

Grade 6	Grade 9
Minimum Date = 10 yrs	Minimum Date = 10 yrs
Due Date = 10 yrs + 8 mos	Due Date = 13 yrs + 8 mos
Overdue Date = 12 yrs	Overdue Date = 15 yrs

Twinrix Rapid Dosing Schedule

In order to maintain accurate validation of HepA and HepB vaccinations, the Forecaster could not accommodate rules to support Twinrix administered through the rapid dosing schedule. These doses will be marked as Invalid in Panorama – users should assess the spacing and override the dose to Valid as required.
In addition, clients receiving Junior Twinrix will not be forecasted on the rapid dosing schedule – the Forecast will be for a regular HepB (and HepA if the client meets the criteria) schedule.

Repeat Series

Clients who are repeating a vaccine series (i.e. Hepatitis B or post-HSCT), the first dose of the new series will need to be revised to dose 1. You do not need to do anything for dose 2 or beyond.

The Status Explained

There are three places in the Client Immunization record that will show more information about the status of a dose – the first is the View Immunization – Status Details, where a status is always shown, both for the agent and all of its antigens:

On the Immunization Profile screen there also is an "Antigen Count" section which counts antigens broken down by valid and invalid dose counts.

The third place to look, for Invalid doses, would be the Invalid Immunization Reasons section. This section also describes the reason why the specific antigen(s) were marked as Invalid.

① Immunization Status

Valid: The dose is Valid, and indicates that the validation has been set by the Forecaster

Valid (override): Indicates that a user chose to override the status to Valid

Invalid: The dose is Invalid, and indicates that the validation has been set by the Forecaster

Invalid (override): indicates that a user chose to override the status to Invalid

Invalid (dose invalidated): indicates that the Invalidate Immunization function (Central Support Team functionality) was used to invalidate this dose.

② Invalid Reasons

Client administered with same agent on same day: if two doses of the same Agent/Antigen are given on the same day, and one dose is Valid, the other dose is Invalid. All the antigens within the Invalid dose will have this reason.

Additional dose resulting from use of a multi-antigen agent: if the Antigen did not meet the "same day invalid" criteria above; and if the antigen was forecasted last time as Extra Dose Safe (EDS), or was recorded as Invalid with EDS reason last time.

Administered date is less than or greater than eligibility date: if neither of the above two reasons are given, then the dose will have this reason. This is what will be seen most often – meaning that either a minimum interval, minimum age or maximum age was not met.

Special Cases Continued:

Seasonal Forecasting for Influenza

The Influenza rules in Panorama are adjusted for the seasonal availability and delivery of the Influenza vaccine. If the next forecasted date does not fall within the flu season (Oct 1 to May 1), then the next forecasted date will be adjusted to Oct 1 of the next flu season.

iPHIS Data Conversion for BC and Yukon

Immunization records were converted from iPHIS to Panorama for BC Health Authority Clients in June 2013; and for Yukon clients on November 29th 2014.

Immunization details that were documented in iPHIS are available in the Comments of each immunization record in Panorama. Click the date hyperlink of any dose to see the comments.

Risk Factors

Certain Risk Factors will impact the Forecaster by either forecasting clients for additional Antigen(s) or causing a blank forecast.

A blank forecast with the presence of one of the Risk Factors listed here indicates that the clinician needs to determine the appropriate immunization schedule. Immunizations recorded for these clients will still have validation rules applied.

Risk Factors that impact the Forecaster will have a (*) at the end of the Risk Factor name.

Note: The Risk Factor response must be set to 'Yes' in order to impact the forecaster.

Refer to the table to determine whether a Risk Factor triggers additional Antigen(s) to be forecasted, or for the forecast to be blank.

[1] Clients with any one of the Neonate risk factors plus Low Birth Weight - under 2000g risk factor need to have their birth dose of HB recorded in history before dose 2 will be forecasted. i.e. Clients need to have either the "Neonate born to Hep B positive or high risk mom" or "Neonate with other risk for Hep B" AND "Low Birth Weight - under 2000g" Risk Factors in order for them to fall into this special forecasting schedule.

[2] If a Yukon client relocates to BC, the Risk Factor should be end dated so that the Forecaster reflects the BC schedule.

Risk Factor	Extra Antigens	Blank Forecast
Chronic Medical Condition - Bleeding Disorders(*) Chronic Medical Condition - Cardiac Disease(*) Chronic Medical Condition - CSF Leak(*) Chronic Medical Condition - Diabetes Mellitus(*) Chronic Medical Condition – Respiratory – Asthma(*) Chronic Medical Condition – Respiratory - Pulmonary Disease(*) (NOTE: NOT Cystic Fibrosis) Special Population – Indigenous under 19 yrs (*) Special Population - Chronic Salicylate Therapy(*) Special Population - High risk for pneumococcal(*) Special Population - Low Birth Weight - under 2000g(*) [1] Special Population - MSM(*) Special Population - Neonate born to Hep B positive or high risk mom(*) [1] Special Population - Neonate with other risk for Hep B(*) [1] Special Population - Yukon Resident(*) [2]	✓	
Chronic Medical Condition - Cystic Fibrosis(*) Chronic Medical Condition - Kidney Disease dialysis requirement unknown(*) Chronic Medical Condition - Kidney Disease not requiring dialysis(*) Chronic Medical Condition - Kidney Disease requiring dialysis(*) Chronic Medical Condition - Liver Disease - Hepatitis B(*) Chronic Medical Condition - Liver Disease - Hepatitis C(*) Chronic Medical Condition - Liver Disease - Other - Specify(*) Chronic Medical Condition - Malignancies/Cancer(*) Chronic Medical Condition - Malignancies/Cancer - Carcinoma of Head/Neck(*) Chronic Medical Condition - Malignancies/Cancer - Tcell Lymphoma(*) Chronic Medical Condition - Sickle Cell Disease(*) Immunocompromised - Cochlear Implant (Candidate or Recipient) (*) Immunocompromised - Congenital Acquired Immunodeficiency(*) Immunocompromised - Congenital or Acquired, or Functional Asplenia(*) Immunocompromised - HIV(*) Immunocompromised - Other - Specify(*) Immunocompromised - Transplant Candidate or Recipient - HSCT (Hematopoietic Stem Cell Transplant) (*) Immunocompromised - Transplant Candidate or Recipient - Islet Cell(*) Immunocompromised - Transplant Candidate or Recipient - Solid Organ / Tissue(*) Immunocompromised - Treatment - Long-Term Corticosteroid Use(*) Immunocompromised - Treatment - Other - Specify(*) Substance Use - Injection Drug Use(*)		✓

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Panorama

Yukon Updates

Dose Numbers for Yukon Clients

During data conversion, all Yukon Clients < 19 years of age had dose numbers assigned automatically by the Forecaster.

For adults (i.e. those ≥ 19 years of age), all dose numbers were converted as "revised". This is to reflect the iPHIS dose number when only the last dose of a series was entered into iPHIS. At present, the Forecaster is only applied for clients under the age of 19 years old, so the revised doses numbers do not currently interfere with Forecaster. The act of revising the dose does override the validation step performed by the Forecaster rules to valid; this means that doses that should be marked invalid due to violated minimum intervals or interaction rules will not be invalidated. Careful review of a Client's Immunization Details should be done to ensure clinical judgment is applied, especially in these cases.

A record can be updated to work better with the Forecaster by removing the revised dose # when not required i.e. dose numbers are sequential.

- Example 1: Dose #1, #2, #3 – remove all revised dose numbers by "Updating" entry, then "Undo Dose Revision". Enter a Revised Dose Comment, Add then Save. The validation status will automatically default to "Set by Forecaster".
- Example 2: Dose # 2, #3 – leave #2 as is, remove revised dose number for dose #3 only as dose #1 is not recorded.

Reminder:

For ALL Yukon Panorama clients, the **Special Population – Yukon Resident** Risk Factor must be assigned in order to ensure Yukon clients fall into the correct Yukon-based rules. For this risk factor, users should either set no start date or the start date should equal date of birth.

Yukon-Related Schedule Updates (only apply to Yukon Residents)

Antigen	Schedule Change Details
Hep A	Hep A is not provided for Aboriginal clients, so forecasting for Yukon residents who may have the Special Population – Aboriginal Risk Factor will not occur. This risk factor is not currently used for Yukon clients.
HPV-9	As of July 28th, 2017 the Yukon HPV schedule has been updated to reflect the direction in the Yukon Immunization Manual. The schedule for HPV-9 in Yukon and BC are similar so the selection of the risk factor "Special Population – Yukon Resident" will not create changes with the exception of forecasts for select populations (MSM, other high risk males). Yukon Residents who are male and born prior to 2006 will not be forecast for any HPV-9 doses regardless of their status in these select populations.
Influenza	Influenza is publicly funded for all residents but forecasting will only occur up to 19 years of age for Yukon residents (as forecasting is only provided for those < 19 years of age in general in Panorama). Note that the flu season for forecasting is Oct 1 to May 1, so if a dose is given outside of this timeframe (i.e. in the summer months), the dose will be validated, and the next dose will be forecasted for Oct 1 to ensure coverage within the next flu season.
MMR and Varicella vs MMRV	Yukon forecasts both the 1st and 2nd dose of MMR and VAR separately. MMRV can be provided for the 2nd dose if the 2nd dose of MMR has not already been given when VAR is due at 4-6 years.
Pertussis Campaign	At the time of data conversion form iPHIS, if the client was administered "TdaP" between 2011-Sep-01 and 2013-Apr-29, and born between 1998-01-01 and 2004-12-31, the Tdap immunizations status is set to "Invalid (Override)" and Reason for Invalidation to "Other". The comment section will have the following message: "Imms marked invalid for Forecasting as vaccine administered as part of the Yukon Pertussis Campaign in 2011-2013." As of March 2015, the schedule was revised to consider Tdap doses valid given to a client 10 years of age or older. Users are to change the validation status to valid (select: Set by Forecaster) for any clients with invalid doses of Tdap due to the previous schedule.

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