About Ronald G. Ross

Ronald G. Ross is Co-Founder and Principal of Business Rule Solutions, LLC (BRSolutions.com). BRS provides consulting, training and mentoring in support of business analysis, business rules, decision engineering, concept modeling, and rule management.

Mr. Ross co-develops the landmark BRS methodology featuring numerous innovative techniques including the popular ConceptSpeak™, DecisionSpeak™, TableSpeak™ and RuleSpeak® (free on RuleSpeak.com, now also in Spanish, German, Dutch, and Norwegian). These are the latest offerings in a 40-year career that has consistently featured creative, business-driven solutions.

Mr. Ross is also Executive Editor and regular columnist of BRCommunity.com and its flagship on-line publication, Business Rules Journal. Sponsored by BRS, BRCommunity.com is a non-commercial vertical community for professionals. Mr. Ross was formerly Editor of the Data Base Newsletter from 1977 to 1998. Mr. Ross is recognized internationally as the ‘father of business rules.’

Mr. Ross has served as Chair of the annual Business Rules & Decisions Forum Conference since 1997, now part of the BBC Conference. He was a charter member of the Business Rules Group (BRG) in the 1980s and an editor of the two landmark BRG papers, “The Business Motivation Model: Business Governance in a Volatile World” (2000) and the “Business Rules Manifesto” (2003). He is also active in OMG standards development including SBVR.

Mr. Ross is the author of ten professional books. His newest are Business Rule Concepts: Getting to the Point of Knowledge 4th ed. (2013) and Building Business Solutions: Business Analysis with Business Rules 2nd ed. with Gladys S.W. Lam (2015). The Business Rule Book (1994) was the seminal work in the field. Mr. Ross holds an M.S. in information science from the Illinois Institute of Technology and a B.A. from Rice University.
About Gladys S.W. Lam

Gladys S.W. Lam is a world-renowned authority on applied business rule and decision techniques. She is Principal and Co-Founder of Business Rule Solutions, LLC (www.BRSolutions.com), the most recognized company world-wide in business rules and decision analysis. Ms. Lam is co-creator of IPSpeak™, the BRS methodology. She is Co-Founder of BRCommunity.com, a vertical community for professionals and home of Business Rules Journal. She co-authored Building Business Solutions: Business Analysis with Business Rules, with Ronald G. Ross.

Ms. Lam is widely known for her lively, pragmatic style. Ms. Lam is an internationally recognized expert on business rules and decision techniques. She speaks worldwide at conferences and other professional events. She co-presents interactive online seminars. She is also Executive Director of the Building Business Capability (BBC) Conference, which includes the Business Rules and Decisions Forum and is the official conference of the IIBA®.

Ms. Lam is a world-renowned expert on business project management, having managed numerous projects that focus on the large-scale capture, analysis and management of business rules and decisions. She works comfortably with senior executives providing insights and advice. She advises senior management of large companies on organizational issues and on business solutions to business problems. She is most effective with mentoring and training business analysts worldwide.

Ms. Lam is most recognized for her ability to identify the source of business issues, and for her effectiveness in developing pragmatic approaches to resolve them. She has gained a world-class reputation for fostering positive professional relationships with principals and support staff in projects.

Ms. Lam graduated from the University of British Columbia with a B.S. in Computer Science.
Business Capabilities: The Missing Piece
Business Capabilities: The Complete Picture

What makes business smart?
- Strategy
- Business concepts
- Business rules
- Operational business decisions
- Key performance indicators

Operational Knowledge

Intellect

Processes

Technologies

Information

People
Summer Palace, Beijing
**Example: Taxes**

**Chart A — For Most People**

<table>
<thead>
<tr>
<th>Filing Status</th>
<th>AND at the end of 2012 you were*</th>
<th>THEN file a return if your gross income** was at least...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>under 65</td>
<td>$5,750</td>
</tr>
<tr>
<td></td>
<td>65 or older</td>
<td>11,200</td>
</tr>
<tr>
<td>Married filing jointly</td>
<td>under 65 (both spouses)</td>
<td>$19,500</td>
</tr>
<tr>
<td></td>
<td>65 or older (one spouse)</td>
<td>20,650</td>
</tr>
<tr>
<td></td>
<td>65 or older (both spouses)</td>
<td>21,800</td>
</tr>
<tr>
<td>Married filing separately</td>
<td>any age</td>
<td>$3,800</td>
</tr>
<tr>
<td>Head of household</td>
<td>under 65</td>
<td>$12,500</td>
</tr>
<tr>
<td></td>
<td>65 or older</td>
<td>13,950</td>
</tr>
<tr>
<td>Qualifying widow(ers)</td>
<td>under 65</td>
<td>$15,700</td>
</tr>
<tr>
<td></td>
<td>with dependent child (see line 4)</td>
<td>16,850</td>
</tr>
</tbody>
</table>

*If you were born on January 1, 1943, you are considered to be age 65 at the end of 2012.

**Gross income means all income you received in the form of money, goods, property, and services that is not exempt from tax, including any income from sources outside the United States or from the sale of your main home (even if you can exclude part or all of it). Do not include any social security benefits unless (a) you are married filing a separate return and you lived with your spouse at any time in 2012 or (b) one-half of your social security benefits plus your other gross income and any net-capital gains is more than $25,000 ($32,000 if married filing jointly). If (a) or (b) applies, see the instructions for line 20a and 20b to figure the taxable part of social security benefits you must include in gross income. Gross income includes gains, but not losses, reported on Form 4797 or Schedule D. Gross income from a business means, for example, the amount on Schedule C, line 7, or Schedule F, line 9. But in figuring gross income, do not reduce your income by any losses, including any loss on Schedule C, line 7, or Schedule F, line 6.

***If you did not live with your spouse at the end of 2012 (or on the date your spouse died) and your gross income was at least $3,500, you must file a return regardless of your age.**
Example: Mortgages

Affordable Merit Rate Mortgage

An incentive rate reduction for on-time payments

For borrowers with weak credit reputations or past credit challenges, our Affordable Merit Rate® Mortgage provides more options for homebuyers who are traditionally consigned to a limited choice of higher-cost financing alternatives.

By taking advantage of efficiencies with Loan Prospector® automated underwriting technology, you can qualify borrowers for Affordable Merit Rate at an initial interest rate that may be closer to conventional rates – delivering more homeownership opportunities to borrowers in the communities you serve. And, borrowers benefit from an additional one percentage point interest rate reduction for making their mortgage payments on time for 24 consecutive months.

With Affordable Merit Rate Mortgages, borrowers will have a four-year period to make 24 consecutive on-time mortgage payments in order to qualify for a one-time, one percent interest rate reduction. If a late mortgage payment occurs in the first 24 months, borrowers will be re-evaluated on the 36- or 48-month anniversaries of the payment due date. Borrowers who meet the eligibility requirements will automatically receive the one-time rate reduction effective the month following the eligible anniversary date.

Product Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Type</td>
<td>1- to 2-unit primary residences, including condominiums, PUDs, and manufactured homes.</td>
</tr>
<tr>
<td>Eligible Mortgage Products</td>
<td>30-year fixed-rate mortgages</td>
</tr>
<tr>
<td>Transaction Type</td>
<td>Purchase, No cash-out refinances</td>
</tr>
</tbody>
</table>
Example: Immunization

Before administering a vaccine dose, providers might need to verify that all previous doses were administered after the minimum age and in accordance with minimum intervals (Table 1). In clinical practice, vaccine doses occasionally are administered at intervals less than the minimum interval or at ages younger than the minimum age. Doses administered too close together or at too young an age can lead to a suboptimal immune response. However, administering a dose a few days earlier than the minimum interval or age is unlikely to have a substantially negative effect on the immune response to that dose. Vaccine doses administered ≤4 days before the minimum interval or age are considered valid; however, local or state mandates might supersede this 4-day guideline.† (Day 1 is the day before the day that marks the minimum age or minimum interval for a vaccine.) Because of the unique schedule for rabies vaccine, the 4-day guideline does not apply to this vaccine (5). Doses of any vaccine administered ≥5 days earlier than the minimum interval or age should not be counted as valid doses and should be repeated as age appropriate. The repeat dose should be spaced after the invalid dose by the recommended minimum interval (Table 1). For example, if the first and second doses of Haemophilus influenzae type b (Hib) were administered only 14 days apart, the second dose would be invalid and need to be repeated because the minimum interval from dose 1 to dose 2 is 4 weeks. The repeat dose should be administered ≥24 weeks after the invalid dose (in this case, the second). The repeat dose is counted as the valid second dose.

If the first dose in a series is given ≥5 days before the recommended minimum age, the dose should be repeated or on after the date when the child reaches at least the minimum age. If the vaccine is a live vaccine, ensuring that a minimum interval of 26 days has elapsed from the invalid dose is recommended. For example, if the first dose of varicella vaccine were inadvertently administered at age 16 months, the repeat dose would be administered no earlier than the child’s first birthday (the minimum age for the first dose). If the first dose of varicella vaccine were administered at age 11 months and 2 weeks, the repeat dose should be administered no earlier than 4 weeks thereafter, which would occur after the first birthday.

Certain vaccines (e.g., adult tetanus and diphtheria toxoids [Td], pediatric diphtheria and tetanus toxoids [DT]; and tetanus toxoid) produce increased rates of local or systemic reactions in certain populations when administered more frequently than recommended (6-10). Careful record keeping, assistance of patient,
To Be Discussed

- What is a business rule
- Why business rules
- Audience participation
- Decision analysis and decision tables
- Case study
What is a Business Rule?
Is this a business rule?

Provide a feature to handle electronic funds transfer.
Is this a business rule?

Provide a feature to handle electronic funds transfer.

Requirement
Is this a business rule?

Customer provides account id.
System displays account.
Is this a business rule?

Customer provides account id.
System displays account.

Use case statements
Is this a business rule?

If the overdrawn flag is set to ‘yes’, reject transaction.
Is this a business rule?

If the overdraft flag is set to ‘yes’, reject transaction.

System if/then statement
Definition

Business Rule: Criterion used in business operations to
- Guide behavior
- Make decisions
Requirement
Provide a feature to handle electronic funds transfer

Business Rule
Every employee expense reimbursement must be processed through electronic funds transfer.
Use Case Statement

Customer provides account id.
System displays account.

Business Rule

A customer must have a valid account.
System if/then statement
If the overdrawn flag is set to ‘yes’, reject transaction.

Business Rules

1. An account must not be overdrawn.

2. An account may be considered overdrawn only if cash withdrawal is greater than the current balance of the account.
Business Rule Statement

A vaccine dose administered must be considered an allowable vaccine if all the following are true:

- The vaccine type of the vaccine dose administered is one of the allowable vaccine types.
- The date administered is on or later than the allowable vaccine type begin age date.
- The date administered is earlier than the allowable vaccine type end age date.
Subject Vocabulary

Business Rule

The vaccine lot number must be reported for every vaccination event.

Definitions

Vaccination Event: administration of one Vaccine to a Patient

Vaccination Encounter: an interaction between a Provider and Patient resulting in one or more Vaccination Events

Provider: a medical practitioner (e.g., physician, nurse) who administers an immunization – i.e., conducts a Vaccination Event

Patient:

Vaccine:

Vaccine Lot Number:
## Decision Tables

Can a vaccine dose administered be evaluated and why?

<table>
<thead>
<tr>
<th>Vaccination Expired?</th>
<th>Dose Condition Indicated?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Vaccine dose administered cannot be evaluated</td>
<td>Vaccine dose administered cannot be evaluated</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>Vaccine dose administered cannot be evaluated</td>
<td>Vaccine dose administered can be evaluated</td>
</tr>
</tbody>
</table>

Definition:

Vaccination Expired means Vaccination Date > Lot Expiration Date
Why Business Rules?
1. Communicating
No jet-powered cars.

No car is allowed if it has a peacock on the top.

No peacock is allowed if it has a car at the bottom.

A vehicle must not carry a Christmas tree on its roof if it’s on fire.

No campfires on a car roof.

No car explosions allowed in the area.
Should finish date be **actual** finish date or **forecast** finish date?

<table>
<thead>
<tr>
<th>Name</th>
<th>Rule Statement</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series 001</td>
<td>A patient series must be considered completable if the <strong>finish date</strong> is less than the maximum age date of the last target dose.</td>
<td>Proposed</td>
</tr>
<tr>
<td>Series 002</td>
<td>A complete patient series must be considered to be the earliest completing if the <strong>actual finish date</strong> is before the actual finish date for all other candidate patient series.</td>
<td>Proposed</td>
</tr>
<tr>
<td>Series 004</td>
<td>The actual finish date of a complete patient series must be the latest date administered or a vaccine dose administered with an evaluation status “valid.”</td>
<td>Proposed</td>
</tr>
<tr>
<td>Series 008</td>
<td>A patient series must be considered to finish earliest if the patient series can be completed and the <strong>forecast finish date</strong> is earlier than the forecast finish date in all other candidate patient series.</td>
<td>Proposed</td>
</tr>
</tbody>
</table>
Better RFPs

Implementers often receive poorly structured content, producing significant problems in interpretation and completeness.

“We elicit business rules, express them in RuleSpeak®, and include them in RFPs. Implementers love it.”

Paul Franz

Reference: RuleSpeak® 3.0 (free download)  
http://www.brsolutions.com/b_ipspeakprimers.php
Business rules are about business communication; people communicating with people, often displaced in time, place & function.
2. Accelerating Projects
Benefit 2: Accelerate Projects

User Stories

Shared Understanding

Level of Detail

User Stories: You Don’t Have to Be Agile to Use Them! by Angela Wick
http://www.batimes.com/angela-wick/user-stories-you-don-t-have-to-be-agile-to-use-them.html
“We documented 75% savings in projects by having the business rules defined in advance and made available to the projects at the start.”

manager

large Insurance company
3. Knowledge Retention
“More than 60% of all our staff who know our tribal knowledge will retire in the next 3 years.”

Manager, insurance company
4. Compliance
Compliance people don’t really want to know HOW you do what you do.

They want to know WHY you get the results you do.

“We have finally found an approach that really works: compliance = interpretation & traceability of business rules.”

*compliance manager*

*financial company*
Audience Participation
No driving without a license.

Not ambiguous!
Original rule:
A team must have a manager.

Ask: What does “to have” mean?

- Be managed by a manager?
- Be sponsored by a manager?
- Be approved by a manager?
Original rule:
A team must have a manager.

Revised rule:
A team must be managed by a manager.
Original rule:
An order must not be shipped if the outstanding balance exceeds credit authorization.

Ask: Outstanding balance of what?

Ask: Credit authorization of what?
Original rule:
An order must not be shipped if the outstanding balance exceeds credit authorization.

Missing meanings:
customer places order
customer has credit authorization
customer holds account
account has outstanding balance

Revised rule:
An order must not be shipped if the outstanding balance of the account held by the customer that placed the order exceeds the credit authorization of the customer.
Original rule:
An order must not be shipped if the outstanding balance exceeds credit authorization.

Revised rule:
An order must not be shipped if the outstanding balance of the account held by the customer that placed the order exceeds the credit authorization of the customer.
Original rule:
A customer may make a withdrawal only if their account is active.

Ask: What about pre-authorized third parties?

What about the bank itself?
What about automated payment system?
Original rule:
A **customer** may make a withdrawal only if their account is active.

Revised rule:
A withdrawal for an account may be made only if the account is active.

Ask about ambiguity
Original rule:
A project must be considered active if it has manager, a budget, or a sponsor.

Ask: How many?

- At least one?
- Exactly one?
- What if the threshold changes to “any 2 of the 3”?
Original rule:
A project must be considered active if it has manager, a budget, or a sponsor.

Revised rule:
A project must be considered active if at least one of the following is true:
- It has a manager.
- It has a budget.
- It has a sponsor.

Ask about ambiguity
Decision Analysis & Decision Tables
Externalize Business Rules
Wash Up

Is it a work day?

- yes: Wear Suit
- no: Wear Jeans

Is it cold?

- yes: Wear Sweater
- no: Wear Silk Blouse

Is it raining?

- yes: Wear Rain Coat
- no: Am I late?

- yes: Drive Car
- no: Take Bus

Process: Get Ready to Go to Work
Process: Get Ready to Go to Work

- Wash Up
- Is it a work day?
  - yes: Wear Suit
  - no: Wear Jeans
- Is it cold?
  - yes: Wear Sweater
  - no: Wear Silk Blouse
- Is it raining?
  - yes: Wear Rain Coat
  - no: Am I late?
    - yes: Drive Car
    - no: Take Bus
Determine what to wear

Is it a work day?

Wear Suit

Is it cold?

Wear Sweater

Is it raining?

Wear Rain Coat

Wear Silk Blouse

Wear Jeans

Determine means of transportation

Am I late?

Drive Car

Take Bus

Wear Suit
Wash up → Determine what to wear → Determine means of transportation

Result using a decisioning approach
Q-COE
Q-COE:

Question, Considerations, Outcomes, Exceptions
What decision needs to be made?

Example of decision analysis

1. Wash up
2. Determine what to wear
3. Determine means of transportation
What decision needs to be made?

Decision: What outfit to wear?

<table>
<thead>
<tr>
<th>Question</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>What outfit to wear?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceptions</td>
</tr>
</tbody>
</table>
What are all the potential outcomes?

Decision: What outfit to wear?

Potential Outcomes: Suit, jeans, sweater, silk blouse, raincoat
What considerations should I base the decision on?

Decision: What outfit to wear?

Potential Outcomes: Suit, jeans, sweater, silk blouse, raincoat

Considerations:
1. Is it a work day?
2. Is it cold?
3. Is it rainy?
Develop decision logic

1. Identify decision
2. Identify outcomes
3. Identify considerations
   
3a. Articulate consideration questions
3b. Identify consideration answers
3c. Structure decision rules
A suit must be worn on a work day.
A pair of jeans must be worn on a day that is not a work day.
A sweater must be worn on a cold day.
A silk blouse must be worn on a day that is not a cold day.
A rain coat must be worn on a rainy day.

Articulate consideration questions
Is it a work day?  ➔ yes / no
Is it cold?  ➔ yes / no
Is it raining?  ➔ yes / no

Identify consideration answers

Structure decision rules

Decision table(s)

<table>
<thead>
<tr>
<th></th>
<th>Suit</th>
<th>Jeans</th>
<th>Sweater</th>
<th>Silk Blouse</th>
<th>Rain Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
<td>Y</td>
<td>N</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cold</td>
<td>-</td>
<td>-</td>
<td>Y</td>
<td>N</td>
<td>-</td>
</tr>
<tr>
<td>Rainy</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Y</td>
</tr>
</tbody>
</table>

Business rule statement(s)

A suit must be worn on a work day.
A pair of jeans must be worn on a day that is not a work day.
A sweater must be worn on a cold day.
A silk blouse must be worn on a day that is not a cold day.
A rain coat must be worn on a rainy day.

Combination of business rule statement(s) and decision table(s)
A suit must be worn on a work day.
A pair of jeans must be worn on a day off.
A sweater must be worn on a cold day.
A silk blouse must be worn on a hot day.
A rain coat must be worn on a rainy day.

Combination of business rule statement(s) and decision table(s)

<table>
<thead>
<tr>
<th></th>
<th>Cold</th>
<th>Hot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Day</td>
<td>Suit &amp; Sweater</td>
<td>Suit &amp; Silk blouse</td>
</tr>
<tr>
<td>Day Off</td>
<td>Jeans &amp; Sweater</td>
<td>Jeans &amp; Silk blouse</td>
</tr>
</tbody>
</table>

A rain coat must be worn on a rainy day.
Concept model: operational business concepts and their relations basic to operational business knowledge as represented by a structured business vocabulary
The quality of your decision logic depends on the precision of your answers.

Identify consideration answers

- work day / day off
- cold / hot
- rainy / sunny

- How is work day defined?
- Is a half day of work considered a work day?
- What is cold?
  - 60 degrees?
  - 50 degrees?
- What is rainy?
  - Is occasional light drizzle considered rainy?
- warm?
- drizzle? shower? thunderstorm?

Additional answers means more rules
A suit must be worn on a work day.

A pair of jeans must be worn on a day off.

A sweater must be worn on a cold day.

A silk blouse must be worn on a hot day.

A rain coat must be worn on a rainy day.

A umbrella must be used on a drizzly day.

A rain coat must be worn on a showery day.

A pair of rain boots must be worn on a stormy day.

A skirt must be worn on a half day.

A cotton blouse must be worn on a warm day.
Concept model: operational business concepts and their relations basic to operational business knowledge as represented by a structured business vocabulary
What exceptions are within scope?

Decision: What outfit to wear?

Potential Outcomes: Suit, jeans, sweater, silk blouse, raincoat

Considerations:
1. Is it a work day?
2. Is it cold?
2. Is it rainy?

Exceptions:
1. Halloween
Immunization Rules for Children
Translating ACIP Recommendations

Advisory Committee on Immunization Practices (ACIP)

Clinical Immunization Recommendations

CDS Engine

MIND THE GAP
Morbidity and Mortality Weekly Report (MMWR)

General Recommendations on Immunization

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Please note: An erratum has been published for this article. To view the erratum, please click here.

Recommendations and Reports
January 28, 2011 / 60(RR02):1-60

Prepared by
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Corresponding preparer: Andrew Kroger, MD, National Center for Immunization and Respiratory Diseases, 1600 Clifton Rd., MS E-52, Atlanta, GA 30333. Telephone: 404-639-1958; Fax: 404-639-8828; E-mail: aokz@cdc.gov.

Summary
This report is a revision of the General Recommendations on Immunization and Updates the 2006 statement by the Advisory Committee on Immunization Practices (ACIP). CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP); MMWR 2006;55(No. RR-12). The report also includes revised content from previous ACIP recommendations on the following topics: adult vaccination (CDC. Update on adult immunization recommendations of the Immunization practices Advisory Committee (ACIP). MMWR 1999;48(No. RR-12)); the assessment and feedback strategy to increase vaccination rates (CDC. Recommendations of the Advisory Committee on Immunization Practices: programmatic strategies to increase
Nature of Sources

Poliomyelitis Prevention in the United States

Updated Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Summary

These recommendations of the Advisory Committee on Immunization Practices (ACIP) for poliomyelitis prevention replace those issued in 1997. As of January 1, 2000, ACIP recommends exclusive use of inactivated poliovirus vaccine (IPV) for routine childhood polio vaccination in the United States. All children should receive four doses of IPV at ages 2, 4, and 6–18 months and 4–6 years. Oral poliovirus vaccine (OPV) should be used only in certain circumstances, which are detailed in these recommendations. Since 1979, the only indigenous cases of polio reported in the United States have been associated with the use of the live OPV. Until recently, the benefits of OPV use (i.e., intestinal immunity, secondary spread) outweighed the risk for vaccine-associated paralytic poliomyelitis (VAPP) (i.e., one case among 2.4 million vaccine doses distributed). In 1997, to decrease the risk for VAPP but maintain the benefits of OPV, ACIP recommended replacing the all-OPV schedule with a sequential schedule of IPV followed by OPV. Since 1997, the global polio eradication initiative has progressed rapidly, and the likelihood of poliovirus importation into the United States has decreased substantially. In addition, the sequential schedule has been well accepted. No declines in childhood immunization coverage were observed, despite the need for additional injections. On the basis of these data, ACIP recommended on June 17, 1999, an all-IPV schedule for routine childhood polio vaccination in the United States to eliminate the risk for VAPP. ACIP reaffirms its support for the global polio eradication initiative and the use of OPV as the only vaccine recommended to eradicate polio from the remaining countries where polio is endemic.
All children should receive four doses of IPV at ages 2, 4, and 6--18 months and 4--6 years. Oral poliovirus vaccine (OPV) should be used only in certain circumstances, which are detailed in these recommendations.

- 2 and 4 – months or years?
- up to, or up to and including (through), 18 months and 6 years
- vaccination at 2 or 4 months? what about +/- 1 day? +/- 5 days? +/- 30 days? what is the threshold?
- Increase precision
- Eliminate inconsistency
- Drill down on decision logic
- Fill gaps
All children should receive four doses of IPV at ages 2, 4, and 6--18 months and 4--6 years. Oral poliovirus vaccine (OPV) should be used only in certain circumstances, which are detailed in these recommendations.

**Minimum age**

**Maximum age**

- 0 through 2 months
- 2 months + 1 day through 4 months
- 6 months through 18 months
- 4 years through 6 years
Concept Model (Structured Business Vocabulary)

<table>
<thead>
<tr>
<th>Antigen</th>
<th>a foreign (non-self) substance which can cause an immune response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigen Series</td>
<td>one possible path to achieve presumed immunity against a disease</td>
</tr>
<tr>
<td>Antigen Series Dose</td>
<td>the measured quantity of a medicine or other therapeutic agent to be taken at one time or in a period of time</td>
</tr>
<tr>
<td>Antigen Series Dose given to Patient</td>
<td>an Antigen Series Dose given to a patient</td>
</tr>
<tr>
<td>Antigen Series given to Patient</td>
<td>an Antigen Series given to a patient</td>
</tr>
</tbody>
</table>
Process Model

Evaluate Target Dose

1.0 Determine whether vaccine dose administered can be evaluated
2.0 Determine whether target dose can be skipped
3.0 Determine whether target dose can be substituted
4.0 Determine whether target dose was satisfied
Q-Chart

- Was the target dose satisfied?
  - Was the vaccine dose administered at a valid age?
  - Was the vaccine dose administered at a valid interval?
  - Was the vaccine dose administered in conflict?
  - Did the patient receive an allowable vaccine?
  - Is the patient’s gender one of the required genders?
    - Did the patient receive an preferable vaccine?
<table>
<thead>
<tr>
<th>Question</th>
<th>Considerations</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| **Was the target dose satisfied?** | Was the vaccine dose administered at a valid age?  
Was the vaccine dose administered at a valid interval?  
Was the vaccine dose administered in conflict?  
Did the patient receive a preferable vaccine?  
Did the patient receive an allowable vaccine?  
Is the patient’s gender on of the required genders? | • the target dose is satisfied  
• the target dose is not satisfied |

**Exceptions**
## Decision Table

<table>
<thead>
<tr>
<th>considerations</th>
<th>yes</th>
<th>no</th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the vaccine type of the vaccine dose administered one of the allowable vaccine types?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowable vaccine type begin age date ≤ date administered &lt; allowable vaccine type end age date?</td>
<td>yes</td>
<td>-</td>
<td>no</td>
</tr>
<tr>
<td>Outcomes</td>
<td>The patient received an allowable vaccine.</td>
<td>The patient did not receive an allowable vaccine.</td>
<td>The patient did not receive an allowable vaccine.</td>
</tr>
</tbody>
</table>
A vaccine dose administered must be considered an allowable vaccine if all the following are true:

- The vaccine type of the vaccine dose administered is one of the allowable vaccine types.
- The date administered is on or later than the allowable vaccine type begin age date.
- The date administered is earlier than the allowable vaccine type end age date.
## Business Rule Groups

<table>
<thead>
<tr>
<th>Name</th>
<th>Rule Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DATE RULES</strong></td>
<td></td>
</tr>
<tr>
<td>1 Overarching Date Rules</td>
<td>The computed date of adding any number of years to an existing date must be calculated by incrementing the year while holding the month and day constant.</td>
</tr>
<tr>
<td>2 BR 341</td>
<td>The computed date of adding any number of months to an existing date must be calculated by incrementing the month (and year, if necessary) while holding the day constant.</td>
</tr>
<tr>
<td>3 BR 342</td>
<td></td>
</tr>
<tr>
<td>4 BR 343</td>
<td>The computed date of adding any number of weeks or days to an existing date must be calculated by adding the total days to the existing date.</td>
</tr>
<tr>
<td>5 BR 344</td>
<td>The computed date of subtracting any number of days from an existing date must be calculated by subtracting the total days from the existing date.</td>
</tr>
<tr>
<td>6 BR 345</td>
<td>A computed date which is not a real date must be moved forward to first day of the next month.</td>
</tr>
<tr>
<td><strong>Min/Max Date Rules</strong></td>
<td></td>
</tr>
<tr>
<td>7 Interval Date Rules</td>
<td></td>
</tr>
<tr>
<td>14 BR 361</td>
<td>The patient’s Absolute Minimum Interval Date must be calculated as the patient’s Reference Dose Date plus the Absolute Minimum Interval.</td>
</tr>
<tr>
<td>15 BR 362</td>
<td>The patient’s Minimum Interval Date must be calculated as the patient’s Reference Dose Date plus the Minimum Interval.</td>
</tr>
<tr>
<td>16 BR 363</td>
<td>The patient’s earliest recommended interval date must be calculated as the patient’s date of birth plus the Earliest Recommended Interval.</td>
</tr>
<tr>
<td>17 BR 364</td>
<td>The patient’s latest recommended interval date must be calculated as the patient’s date of birth plus the Latest Recommended Interval.</td>
</tr>
<tr>
<td>18 BR 365</td>
<td>The patient’s latest minimum interval date must be the latest date of all calculated Minimum Interval Dates for a given Target Dose.</td>
</tr>
<tr>
<td><strong>Skip Target Dose Date Rules</strong></td>
<td></td>
</tr>
<tr>
<td>19 BR 352</td>
<td>The patient’s First Dose Begin Age Date must be calculated as the patient’s Date of Birth plus Substitute Dose First Dose Begin Age.</td>
</tr>
<tr>
<td>20 BR 353</td>
<td>The patient’s First Dose End Age Date must be calculated as the patient’s Date of Birth plus Substitute Dose First Dose End Age.</td>
</tr>
</tbody>
</table>
The deliverables all fit together; the concept model serves as the ‘glue’.
Vision

Immunization Practicable Body of Knowledge

CDC

ACIP

IIS Community

AIRA/MIROW

Awardees

IIS Vendors

Electronic Health Record Vendors

IIS Consultants

Medical Community

Immunization Information Systems Support Branch
Program Operations Branch
Education Information Partnership Branch
National Immunization Survey
Vaccine Supply and Assurance Branch

Vision
Business Terms

Terms are defined in glossary
A patient’s minimum age date must be calculated as the patient’s date of birth plus the minimum age.

Traceability to reference source:
- Reference Source: Spacing of Multiple Doses of the Same Antigen
- Reference Source: General Recommendations on Immunizations
- Reference Source: Recommendations of the Advisory Committee on Immunization Practices (ACIP)
Publication
The following process model, attribute table and decision table are used to evaluate age at administration:

### TABLE 4-1: AGE ATTRIBUTES

<table>
<thead>
<tr>
<th>Attribute Type</th>
<th>Attribute Name</th>
<th>Assumed Value if empty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccine</td>
<td>Dose Administered Date</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Calculated Date (CALCDTAGE - 1)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Maximum Age Date</td>
<td>12/31/2999</td>
</tr>
<tr>
<td></td>
<td>Calculated Date (CALCDTAGE - 4)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Minimum Age Date</td>
<td>01/01/1900</td>
</tr>
<tr>
<td></td>
<td>Calculated Date (CALCDTAGE - 5)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Absolute Minimum Age Date</td>
<td>01/01/1900</td>
</tr>
</tbody>
</table>

### TABLE 4-2: WAS THE VACCINE DOSE ADMINISTERED AT A VALID AGE?

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>RULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the Date Administered &lt; absolute minimum age date?</td>
<td>No</td>
</tr>
<tr>
<td>Is the Absolute minimum age date ≤ Date Administered &lt; minimum age date?</td>
<td>No</td>
</tr>
<tr>
<td>Is the Minimum age date ≤ Date Administered &lt; maximum age date?</td>
<td>No</td>
</tr>
<tr>
<td>Is the Date Administered &gt; maximum age date?</td>
<td>No</td>
</tr>
<tr>
<td>Is this the first target dose?</td>
<td>No</td>
</tr>
<tr>
<td>Is the evaluation status of the previous vaccine dose administered &quot;not valid&quot; due to age or interval recommendations?</td>
<td>No</td>
</tr>
</tbody>
</table>

| OUTCOMES | |
|----------|-----------------
| No. The vaccine dose administered was not administered at a valid age. Evaluation reason is "too young." | |
| No. The vaccine dose administered was not administered at a valid age. Evaluation reason is "too young." | |
| Yes. The vaccine dose administered was administered at a valid age. Evaluation reason is "grace period." | |
| Yes. The vaccine dose administered was administered at a valid age. Evaluation reason is "grace period." | |
| Yes. The vaccine dose administered was administered at a valid age. | |
| No. The vaccine dose was administered after the maximum age and is extraneous. Evaluation reason is "too old." | |
Summary: Goal for Knowledge

- Governance & Research
- Operations
- IT technology

- Business rules
- Decision structures
- Decision tables
- Subject vocabulary

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2nd edition, 2015

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