Capturing and Implementing Business Rules & Decisions: *The Intellectual Capital of Your Organization*

AIRA Meeting – April 5, 2016

***by* Ronald G. Ross *and* Gladys S.W. Lam**

Co-Founders & Principals, Business Rule Solutions, LLC
BRSolutions.com

Executive Editor & Publisher, Business Rules Journal
BRCommunity.com

about Ronald G. Ross

Ronald G. Ross is Co-Founder and Principal of Business Rule Solutions, LLC (***BRSolutions.com***). BRS provides consulting, training and methodology supporting business analysis, business rules, decision engineering, business vocabulary, and rule management. His popular seminars, the first on business rules (starting 1996), are the longest-running in the industry.

Mr. Ross co-develops ***IPSpeak***™, BRS's landmark methodology, featuring numerous innovative techniques including the popular ***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 working in the field. 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.' He 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 for business rules and business models, including SBVR.

Mr. Ross is the author of ten professional books. His newest: ***Business Rule Concepts: Getting to the Point of Knowledge*** (2013), a 4th edition of his popular handbook, and ***Building Business Solutions: Business Analysis with Business Rules***, 2nd edition, with Gladys S.W. Lam (2015). An earlier work, *The Business Rule Book* (1994, 1997), was the seminal work in the field. Mr. Ross received his M.S. in information science from Illinois Institute of Technology, and his B.A. from Rice University.

tweets: @Ronald_G_Ross

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.

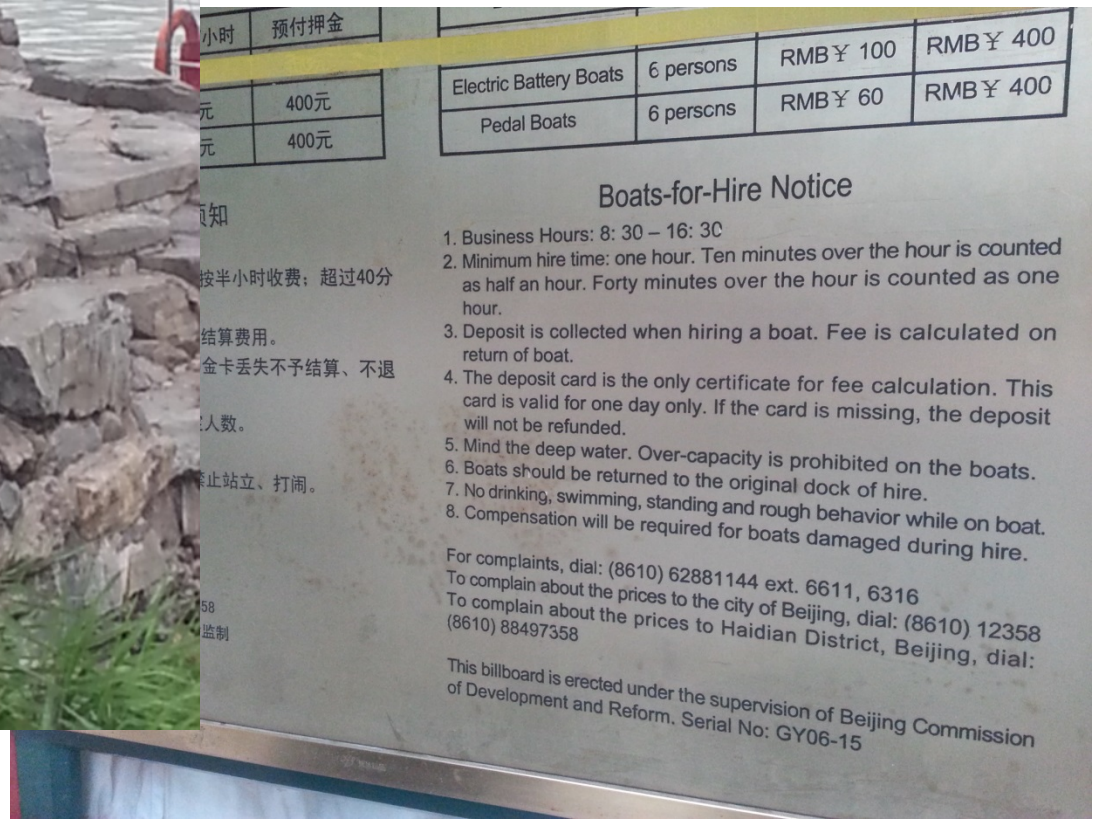
Ms. Lam is most recognized for her ability to identify the source of business issues, and for her effectiveness in developing pragmatic approaches to resolve them. She has gained a world-class reputation for fostering positive professional relationships with principals and support staff in projects.

Ms. Lam graduated from the University of British Columbia with a B.S. in Computer Science.

about Gladys Lam

tweets: @GladysLam

Summer Palace, Beijing



Electric Battery Boats	6 persons	RMB￥100	RMB￥400
Pedal Boats	6 persons	RMB￥60	RMB￥400

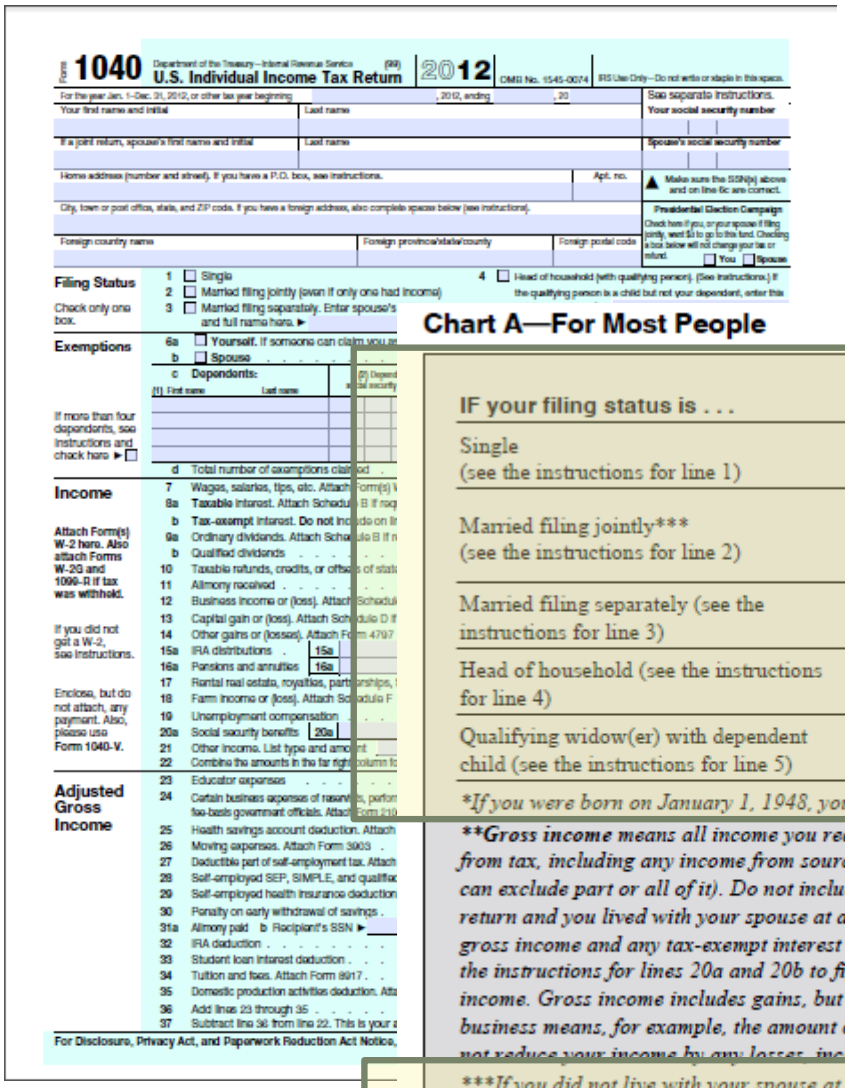
Boats-for-Hire Notice

1. Business Hours: 8: 30 – 16: 30
2. Minimum hire time: one hour. Ten minutes over the hour is counted as half an hour. Forty minutes over the hour is counted as one hour.
3. Deposit is collected when hiring a boat. Fee is calculated on return of boat.
4. The deposit card is the only certificate for fee calculation. This card is valid for one day only. If the card is missing, the deposit will not be refunded.
5. Mind the deep water. Over-capacity is prohibited on the boats.
6. Boats should be returned to the original dock of hire.
7. No drinking, swimming, standing and rough behavior while on boat.
8. Compensation will be required for boats damaged during hire.

For complaints, dial: (8610) 62881144 ext. 6611, 6316
To complain about the prices to the city of Beijing, dial: (8610) 12358
To complain about the prices to Haidian District, Beijing, dial: (8610) 88497358

This billboard is erected under the supervision of Beijing Commission of Development and Reform. Serial No: GY06-15

example: taxes



Form **1040** Department of the Treasury—Internal Revenue Service (99) **U.S. Individual Income Tax Return** **2012** OMB No. 1545-0074 IRS Use Only—Do not write or staple in this space.

For the year Jan. 1–Dec. 31, 2012, or other tax year beginning , 2012, ending , 20

Your first name and initial | Last name | Your social security number

If a joint return, spouse's first name and initial | Last name | Spouse's social security number

Home address (number and street). If you have a P.O. box, see instructions. | Apt. no.

City, town or post office, state, and ZIP code. If you have a foreign address, also complete spaces below (see instructions).

Foreign country name | Foreign province/state/county | Foreign postal code

See separate instructions.

Make sure the SSN(s) above and on line 6c are correct.

Presidential Election Campaign

Check here if you, or your spouse if filing jointly, want $3 to go to this fund. Checking a box below will not change your tax or refund. ☐ You ☐ Spouse

Filing Status Check only one box.

1 ☐ Single
2 ☐ Married filing jointly (even if only one had income)
3 ☐ Married filing separately. Enter spouse's and full name here. ►
4 ☐ Head of household (with qualifying person). (See instructions.) If the qualifying person is a child but not your dependent, enter this

Exemptions

6a ☐ Yourself. If someone can claim you as
b ☐ Spouse
c Dependents:

(1) First name | Last name | (2) Dependent's social security

If more than four dependents, see instructions and check here ► ☐

d Total number of exemptions claimed

Income

Attach Form(s) W-2 here. Also attach Forms W-2G and 1099-R if tax was withheld.

If you did not get a W-2, see instructions.

Enclose, but do not attach, any payment. Also, please use Form 1040-V.

7 Wages, salaries, tips, etc. Attach Form(s) W-2
8a Taxable interest. Attach Schedule B if required
b Tax-exempt interest. Do not include on line 8a
9a Ordinary dividends. Attach Schedule B if required
b Qualified dividends
10 Taxable refunds, credits, or offsets of state and local income taxes
11 Alimony received
12 Business income or (loss). Attach Schedule C or C-EZ
13 Capital gain or (loss). Attach Schedule D if required. If not required, check here ►
14 Other gains or (losses). Attach Form 4797
15a IRA distributions 15a
16a Pensions and annuities 16a
17 Rental real estate, royalties, partnerships, S corporations, trusts, etc. Attach Schedule E
18 Farm income or (loss). Attach Schedule F
19 Unemployment compensation
20a Social security benefits 20a
21 Other income. List type and amount
22 Combine the amounts in the far right column for lines 7 through 21. This is your total income

Adjusted Gross Income

23 Educator expenses
24 Certain business expenses of reservists, performing artists, and fee-basis government officials. Attach Form 2106 or 2106-EZ
25 Health savings account deduction. Attach Form 8889
26 Moving expenses. Attach Form 3903
27 Deductible part of self-employment tax. Attach Schedule SE
28 Self-employed SEP, SIMPLE, and qualified plans
29 Self-employed health insurance deduction
30 Penalty on early withdrawal of savings
31a Alimony paid b Recipient's SSN ►
32 IRA deduction
33 Student loan interest deduction
34 Tuition and fees. Attach Form 8917
35 Domestic production activities deduction. Attach Form 8903
36 Add lines 23 through 35
37 Subtract line 36 from line 22. This is your adjusted gross income

For Disclosure, Privacy Act, and Paperwork Reduction Act Notice,

Chart A—For Most People

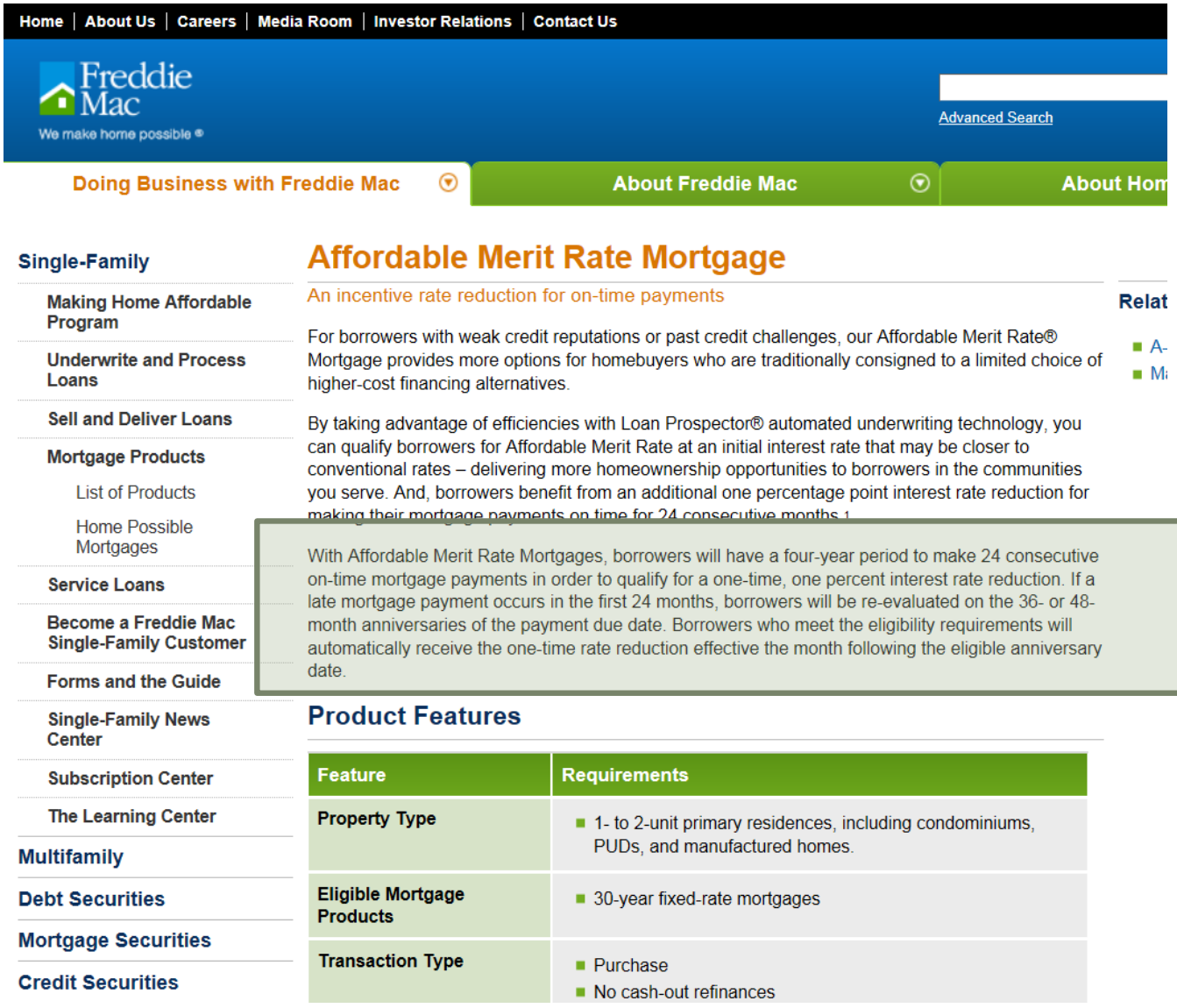
IF your filing status is . . .	AND at the end of 2012 you were* . . .	THEN file a return if your gross income** was at least . . .
Single (see the instructions for line 1)	under 65 65 or older	$9,750 11,200
Married filing jointly*** (see the instructions for line 2)	under 65 (both spouses) 65 or older (one spouse) 65 or older (both spouses)	$19,500 20,650 21,800
Married filing separately (see the instructions for line 3)	any age	$3,800
Head of household (see the instructions for line 4)	under 65 65 or older	$12,500 13,950
Qualifying widow(er) with dependent child (see the instructions for line 5)	under 65 65 or older	$15,700 16,850

**If you were born on January 1, 1948, you are considered to be age 65 at the end of 2012.*

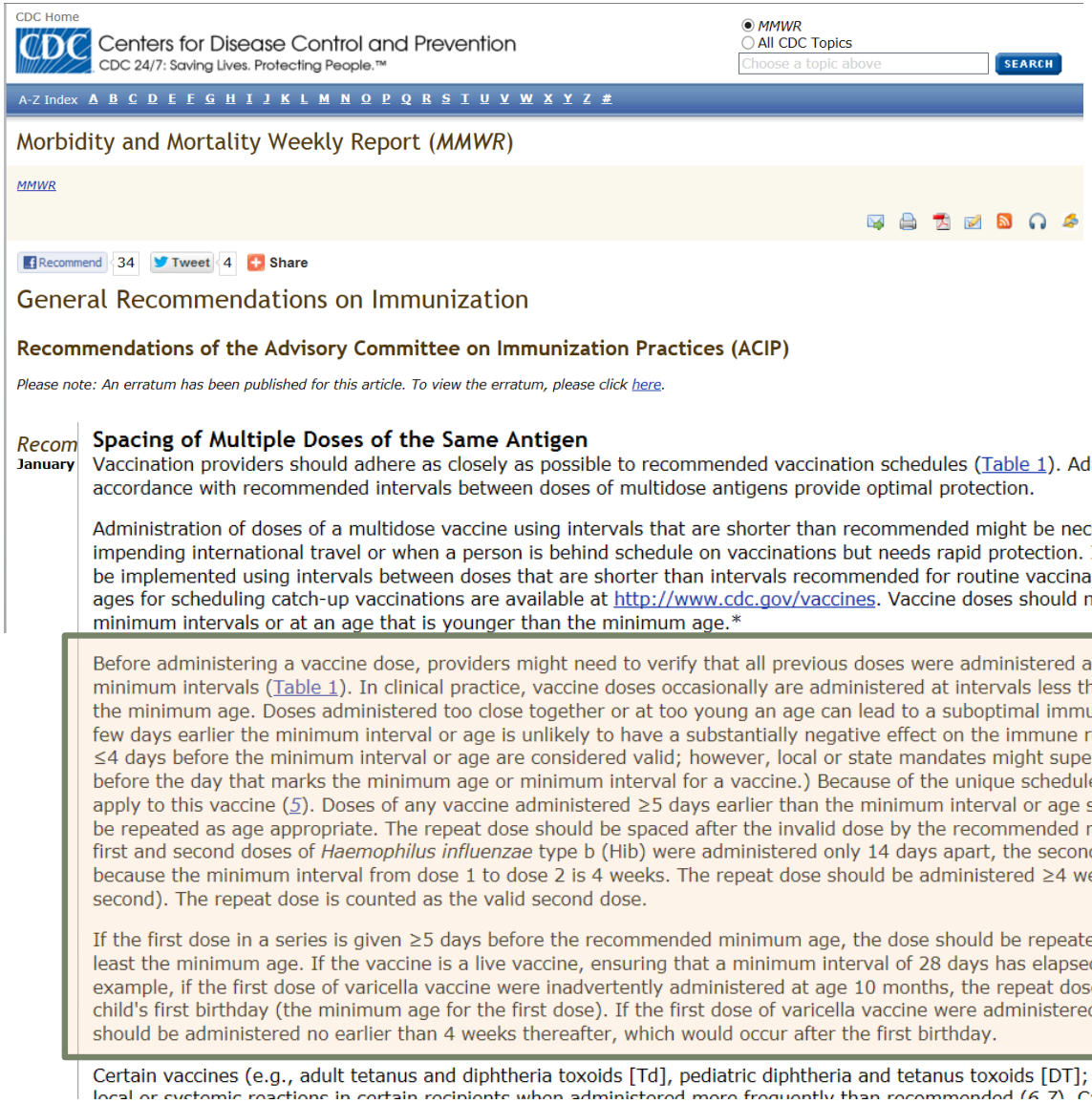
*****Gross income** means all income you received in the form of money, goods, property, and services that is not exempt from tax, including any income from sources outside the United States or from the sale of your main home (even if you can exclude part or all of it). Do not include any social security 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 tax-exempt interest is more than $25,000 ($32,000 if married filing jointly). If (a) or (b) applies, see the instructions for lines 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 8949 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 9.*

****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 $3,800, you must file a return regardless of your age.*

example: mortgages



example: immunization



CDC Home

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

MMWR
All CDC Topics
Choose a topic above
SEARCH

A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

Morbidity and Mortality Weekly Report (*MMWR*)

MMWR

Recommend 34 Tweet 4 Share

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.

Recom
January

Spacing of Multiple Doses of the Same Antigen

Vaccination providers should adhere as closely as possible to recommended vaccination schedules (Table 1). Administration at recommended ages and in accordance with recommended intervals between doses of multidose antigens provide optimal protection.

Administration of doses of a multidose vaccine using intervals that are shorter than recommended might be necessary in certain circumstances, such as impending international travel or when a person is behind schedule on vaccinations but needs rapid protection. In these situations, an accelerated schedule can be implemented using intervals between doses that are shorter than intervals recommended for routine vaccination. The accelerated or minimum intervals and ages for scheduling catch-up vaccinations are available at http://www.cdc.gov/vaccines. Vaccine doses should not be administered at intervals less than these minimum intervals or at an age that is younger than the minimum age.*

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 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 ≥4 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 on or 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 28 days has elapsed from the invalid dose is recommended. For example, if the first dose of varicella vaccine were inadvertently administered at age 10 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 recipients when administered more frequently than recommended (6,7). Careful record keeping, maintenance of patient

No jet-powered cars.

me

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

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

Gene Weng

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

Casper Yeow

No campfires on a car roof.

J John Jones

No car explosions allowed in the area.

Johannes van Schalkwyk

to be discussed

- what is a business rule
- why business rules
- audience participation
- case study
- conclusions

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 overdrawn 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.

business rules

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:

subject vocabulary

Can a vaccine dose administered be evaluated and why?

Vaccination Expired?	Dose Condition Indicated? Yes	Dose Condition Indicated? No
Yes	Vaccine dose administered cannot be evaluated	Vaccine dose administered cannot be evaluated
No	Vaccine dose administered cannot be evaluated	Vaccine dose administered can be evaluated

Definition:

Vaccination Expired means Vaccination Date > Lot Expiration Date

decision tables

why business rules

1. communication

are we communicating?

"The single biggest problem in communication is the illusion that it has taken place."

George Bernard Shaw

Acks Ryan Folster

RuleSpeak, free on www.RuleSpeak.com

should finish date be actual finish date or forecast finish date?

	Name	Rule Statement	Status
	Show all	contains finish date	Show all
	Series 001	A patient series must be considered completable if the finish date is less than the maximum age date of the last target dose.	Proposed
	Series 002	A complete patient series must be considered to be the earliest completing if the actual finish date is before the actual finish date for all other candidate patient series.	Proposed
	Series 004	The actual finish date of a complete patient series must be the latest date administered of a vaccine dose administered with an evaluation status "valid."	Proposed
	Series 008	A patient series must be considered to finish earliest if the patient series can be completed and the forecast finish date is earlier than the forecast finish date in all other candidate patient series.	Proposed

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. knowledge retention

"More than 60% of all our staff who know our tribal knowledge will retire in the next 3 years."

manager, insurance company

Lost your developers and you're clueless how a business capability works?

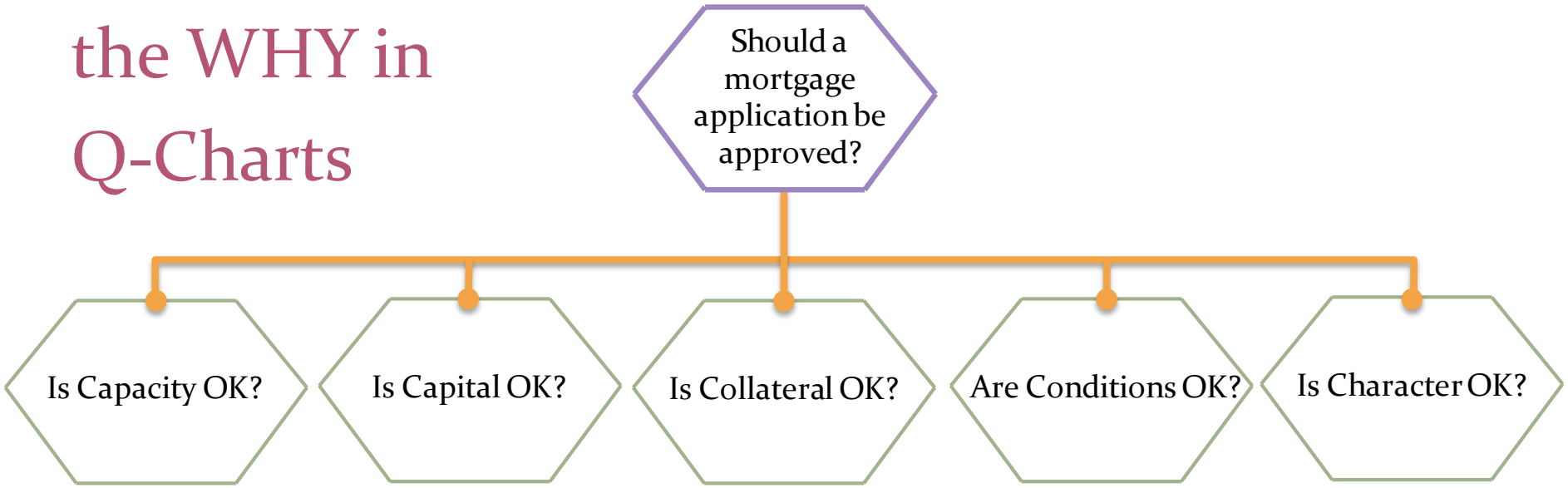
You're not managing the business rules.

3. knowing why

the WHY challenge

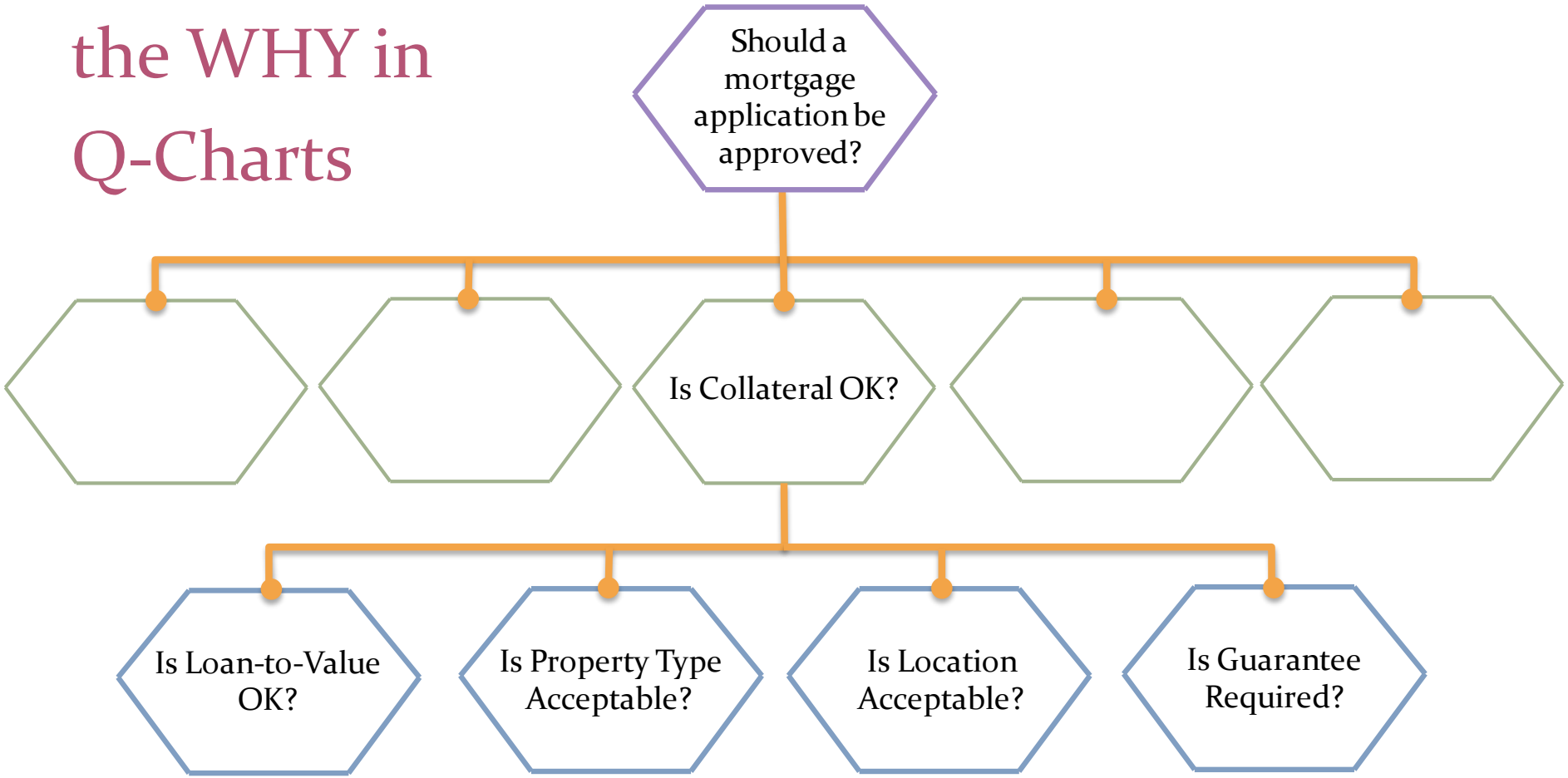
Why was my mortgage application rejected?

the WHY in Q-Charts



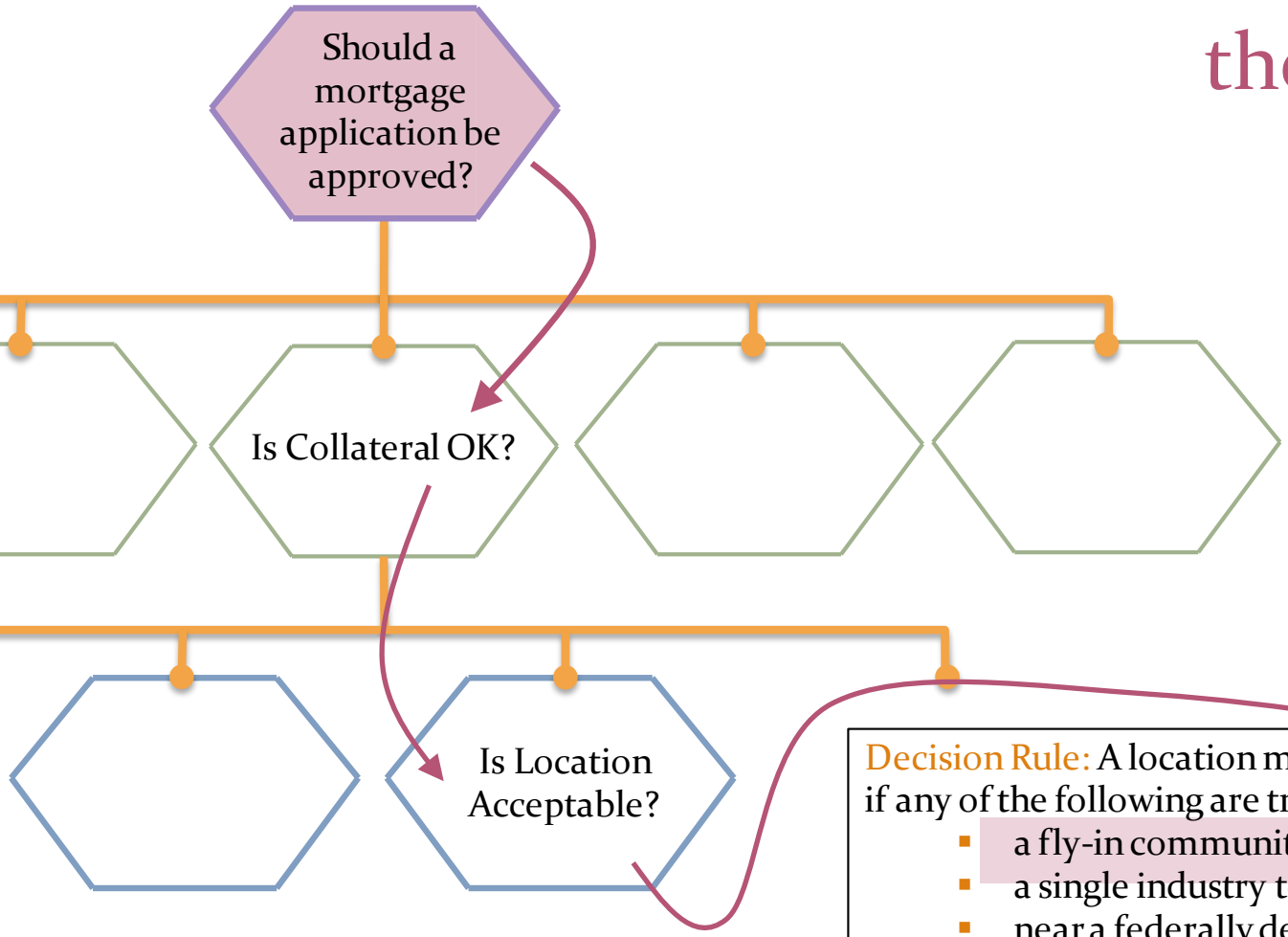
"5 C's of Credit Analysis"
http://www.mbda.gov/node/438

the WHY in Q-Charts



Reference: *DecisionSpeak* – free on http://www.brsolutions.com/b_ipspeakprimers.php

the WHY trace



Decision Rule: A location must be considered *unacceptable* if any of the following are true. The location is:

- a fly-in community
- a single industry town
- near a federally designated hazard waste area.

Decision Rule: A location must be considered a fly-in community if any of the following are true. It:

- lacks rail and water connections
- relies entirely on bush aviation
- is served primarily by ice or gravel road for part of the year.

A WHY button should be part of every business solution.

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!

These items may or may not be available at all times, and sometimes not at all and other times all the time.

Menu Item in Restaurant
Ft. Bragg, NC

… not inscrutable!

Regardless of anything to the contrary in this booklet, if your medical insurance terminates for any reason including death, you … may elect within 30 days … to continue such medical insurance.

From the booklet "Group Insurance for I-14 Employees"
Consolidated Group Trust, The Hartford

… not impossible!

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?

ask about ambiguity

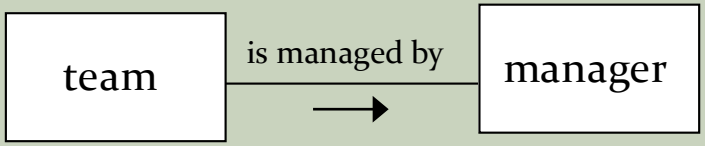
original rule:

A team must have a manager.

revised rule:

A team must be managed by a manager.

concept model



ask about ambiguity

original rule:

An order must not be shipped if the outstanding balance exceeds credit authorization.

Ask: Outstanding balance of what?

↳ order? ...customer? ...account? ...shipment?

Ask: Credit authorization of what?

↳ order? ...customer? ...account? ...shipment?

ask about ambiguity

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.

ask about ambiguity

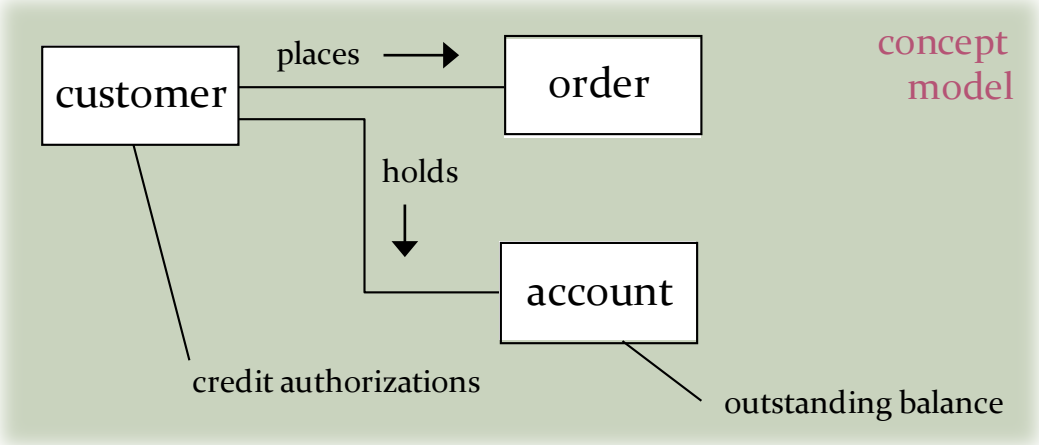
2

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.



ask about ambiguity

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?

ask about ambiguity

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”?

ask about ambiguity

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

case study

immunization rules for children

translating ACIP recommendations

Advisory Committee on Immunization Practices (ACIP)

Clinical Immunization Recommendations

CDS Engine

specification

Morbidity and Mortality Weekly Report (*MMWR*)

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
Andrew T. Kroger, MD[1]
Ciro V. Sumaya, MD[2]
Larry K. Pickering, MD[1]
William L. Atkinson, MD[1]
[1]*National Center for Immunization and Respiratory Diseases*
[2]*Texas A&M Health Science Center, College Station, Texas*

The material in this report originated in the National Center for Immunization and Respiratory Diseases, Anne Schuchat, MD, Director.

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: aok2@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-15]). 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 1991;40[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 vaccination rates---assessment and feedback of provider-based vaccination coverage information. MMWR 1996;45:219--20); linkage of vaccination services and those of the Supplemental Nutrition Program for Women, Infants, and Children (WIC program) (CDC. Recommendations of the Advisory Committee on Immunization Practices: programmatic strategies to increase vaccination coverage by age 2 years---linkage of vaccination and WIC services. MMWR 1996;45:217--8); adolescent immunization (CDC. Immunization of adolescents: recommendations of the Advisory Committee on Immunization Practices, the*

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.

imprecise

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 sche

for additional injections. On

vaccination in the United Sta

use of OPV as the only vacci

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?

imprecise

nature of sources

- increase precision
- eliminate inconsistency
- drill down on decision logic
- fill gaps

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 sche
for additional injections. On
vaccination in the United Sta
use of OPV as the only vacci

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.

interpret to

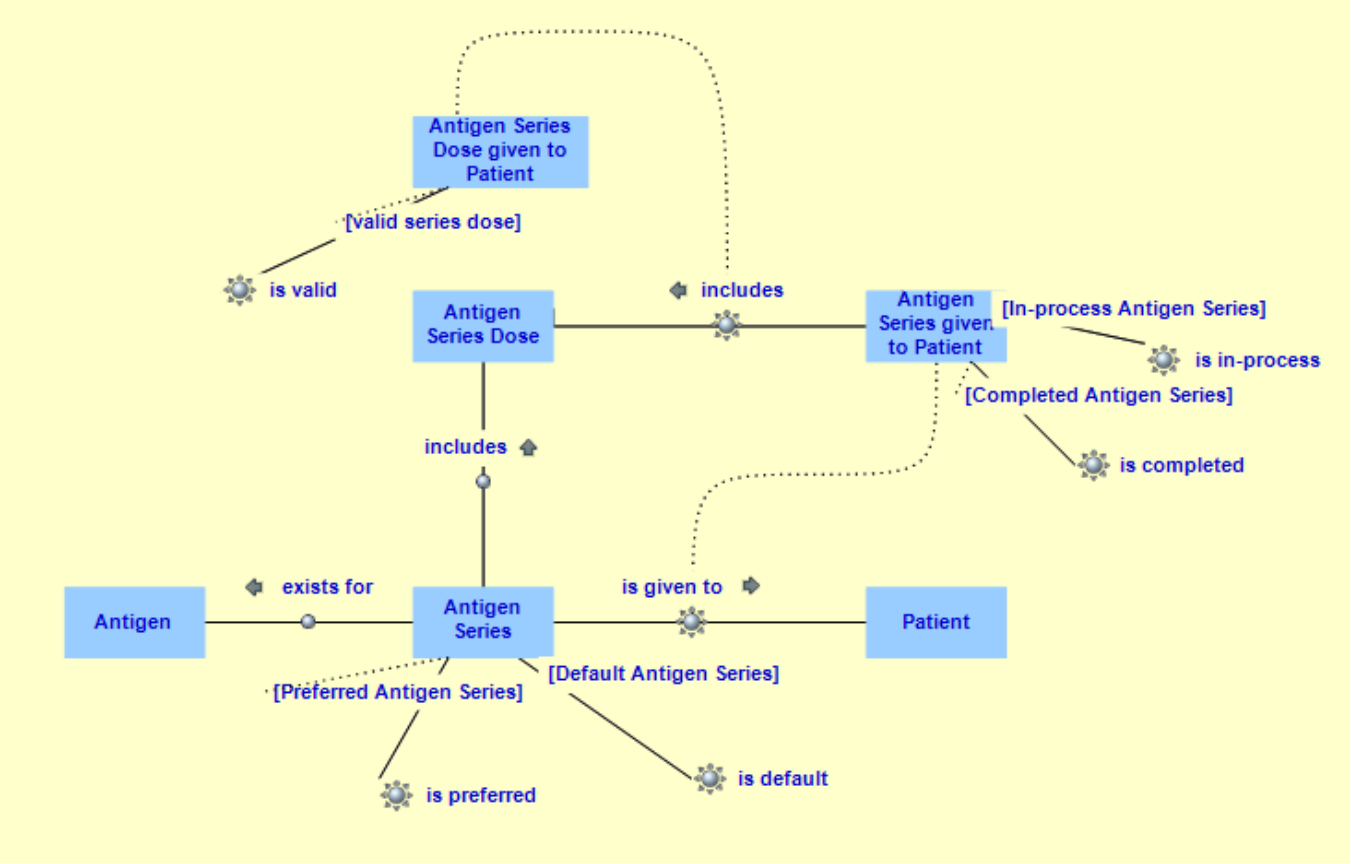
date ranges of

- 0 through 2 months
- 2 months + 1 day through 4 months
- 6 months through 18 months
- 4 years through 6 years

minimum age
maximum age

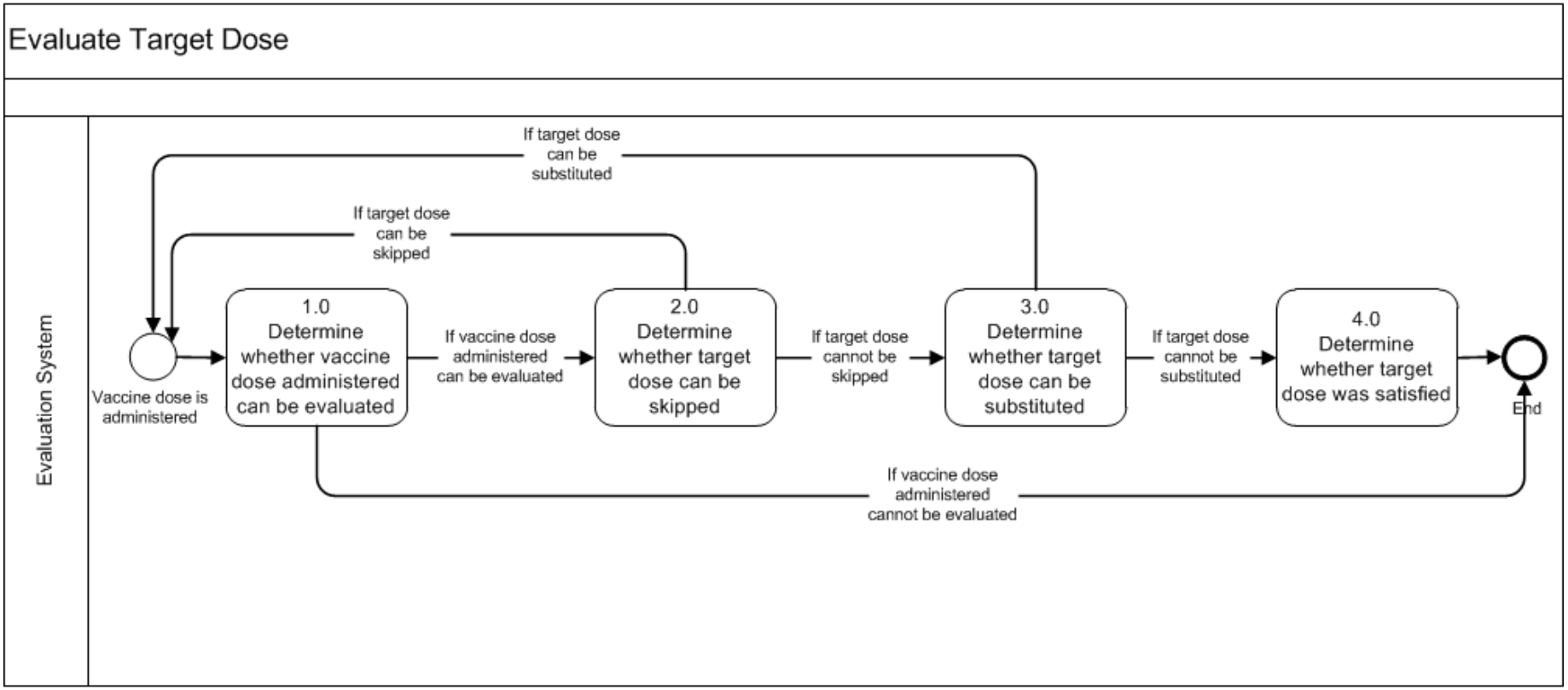
imprecise

concept model (structured business vocabulary)

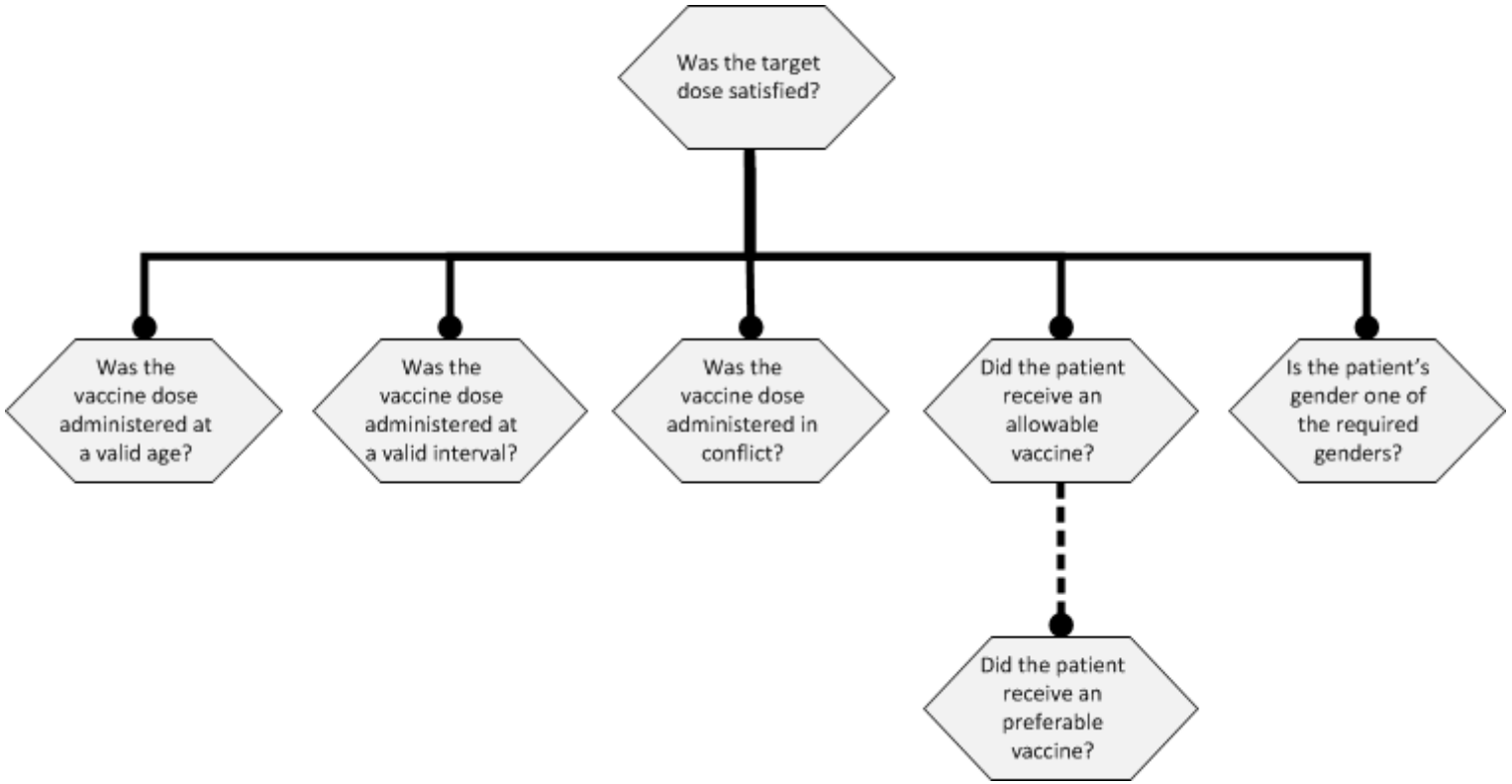


Antigen	a foreign (non-self) substance which can cause an immune response
Antigen Series	one possible path to achieve presumed immunity against a disease
Antigen Series Dose	the measured quantity of a medicine or other therapeutic agent to be taken at one time or in a period of time
Antigen Series Dose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

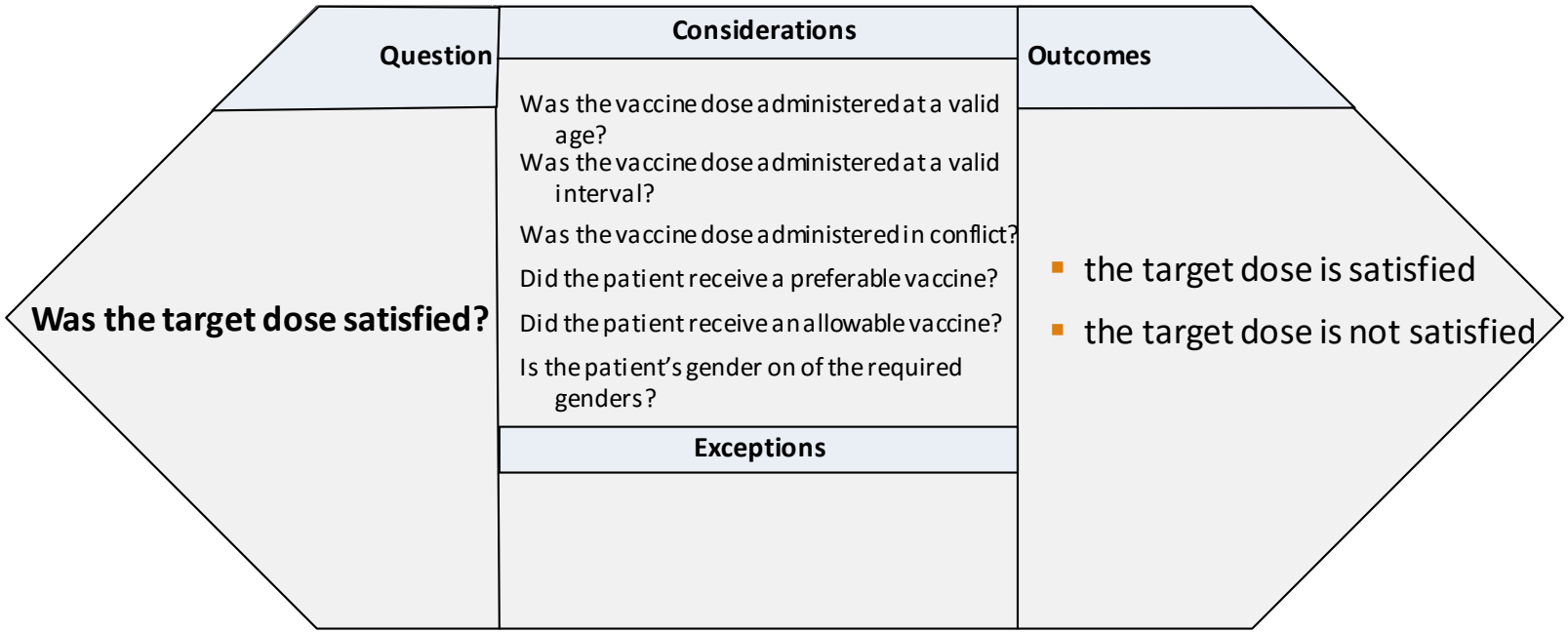
process model



Q-Chart



Q-COE



decision table

considerations			
Is the vaccine type of the vaccine dose administered one of the allowable vaccine types?	yes	no	yes
Allowable vaccine type begin age date ≤ date administered < allowable vaccine type end age date?	yes	-	no
outcomes	The patient received an allowable vaccine.	The patient did not receive an allowable vaccine.	The patient did not receive an allowable vaccine.

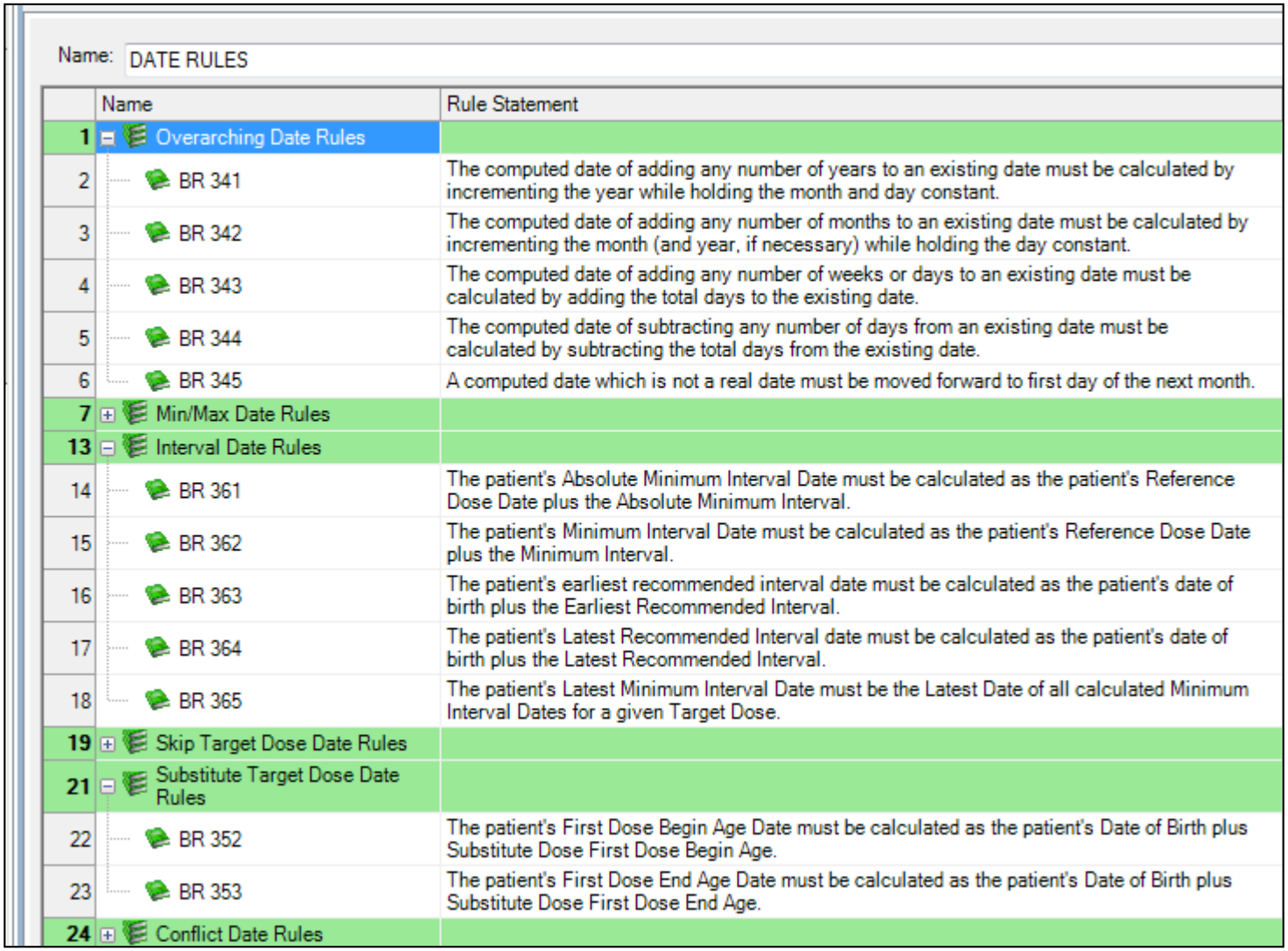
business rule statements

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.

expressed in *RuleSpeak®*
http://www.rulespeak.com/en/

business rule groups

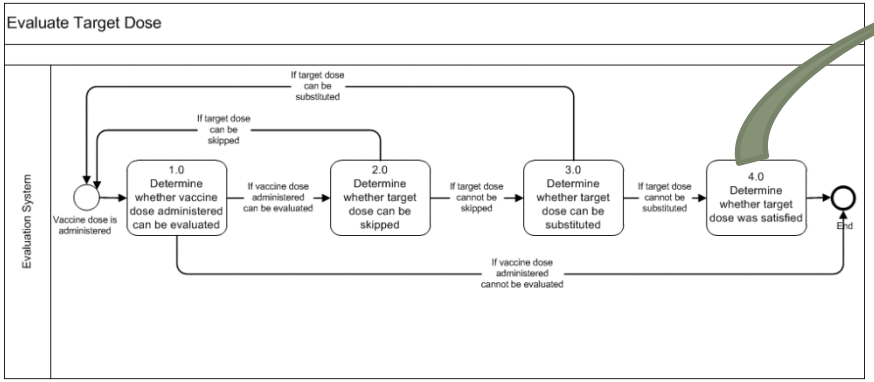


Name: DATE RULES

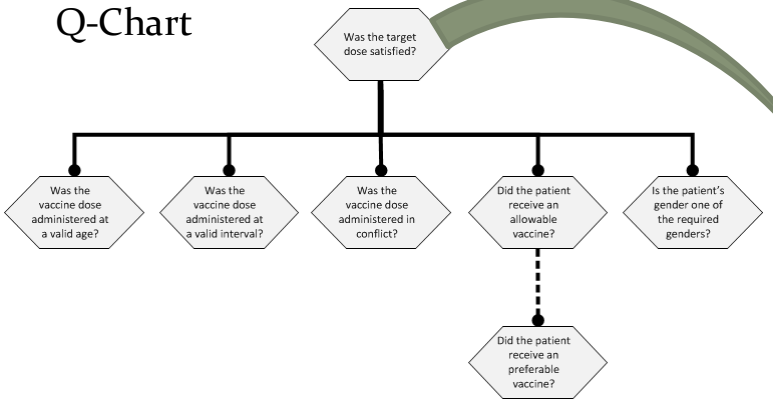
	Name	Rule Statement
1	Overarching Date Rules	
2	BR 341	The computed date of adding any number of years to an existing date must be calculated by incrementing the year while holding the month and day constant.
3	BR 342	The computed date of adding any number of months to an existing date must be calculated by incrementing the month (and year, if necessary) while holding the day constant.
4	BR 343	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.
5	BR 344	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.
6	BR 345	A computed date which is not a real date must be moved forward to first day of the next month.
7	Min/Max Date Rules	
13	Interval Date Rules	
14	BR 361	The patient's Absolute Minimum Interval Date must be calculated as the patient's Reference Dose Date plus the Absolute Minimum Interval.
15	BR 362	The patient's Minimum Interval Date must be calculated as the patient's Reference Dose Date plus the Minimum Interval.
16	BR 363	The patient's earliest recommended interval date must be calculated as the patient's date of birth plus the Earliest Recommended Interval.
17	BR 364	The patient's Latest Recommended Interval date must be calculated as the patient's date of birth plus the Latest Recommended Interval.
18	BR 365	The patient's Latest Minimum Interval Date must be the Latest Date of all calculated Minimum Interval Dates for a given Target Dose.
19	Skip Target Dose Date Rules	
21	Substitute Target Dose Date Rules	
22	BR 352	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.
23	BR 353	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.
24	Conflict Date Rules	

step 2: the destination

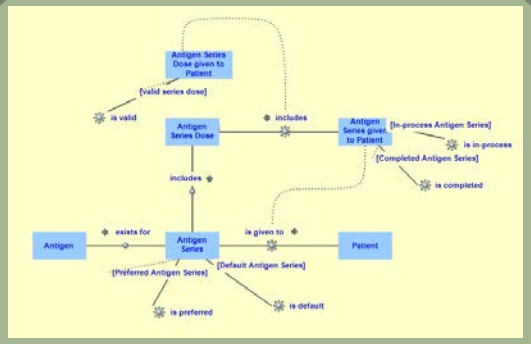
process model



Q-Chart

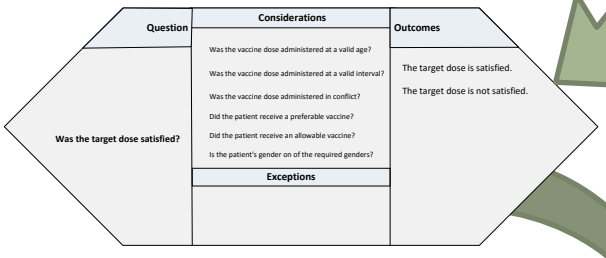


concept model



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

Q-COEs



the deliverables all fit together … the concept model serves as the 'glue'

decision tables

business rules

Rule	Statement	Status
BR 341	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.	Operational
BR 342	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.	Operational
BR 343	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.	Operational
BR 344	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.	Operational
BR 345	A computed date which is not a real date must be moved forward to first day of the next month.	Operational
BR 351	The patient's Skip Target Dose Trigger Age Date must be calculated as the patient's Date of Birth plus the Skip Target Dose Trigger Age.	Proposed
BR 352	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.	Proposed
BR 353	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.	Proposed
BR 354	The patient's Maximum Age Date must be calculated as the patient's Date of Birth plus the Maximum Age.	Proposed

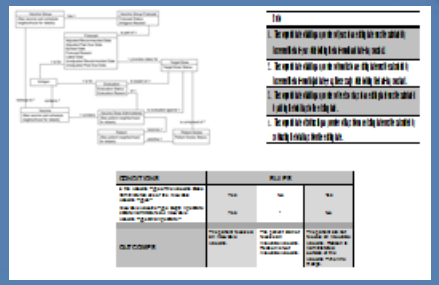
management

CDC

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

ACIP

Medical Community



Immunization Practicable Body of Knowledge

IIS Community

AIRA/MIROW

Awardees

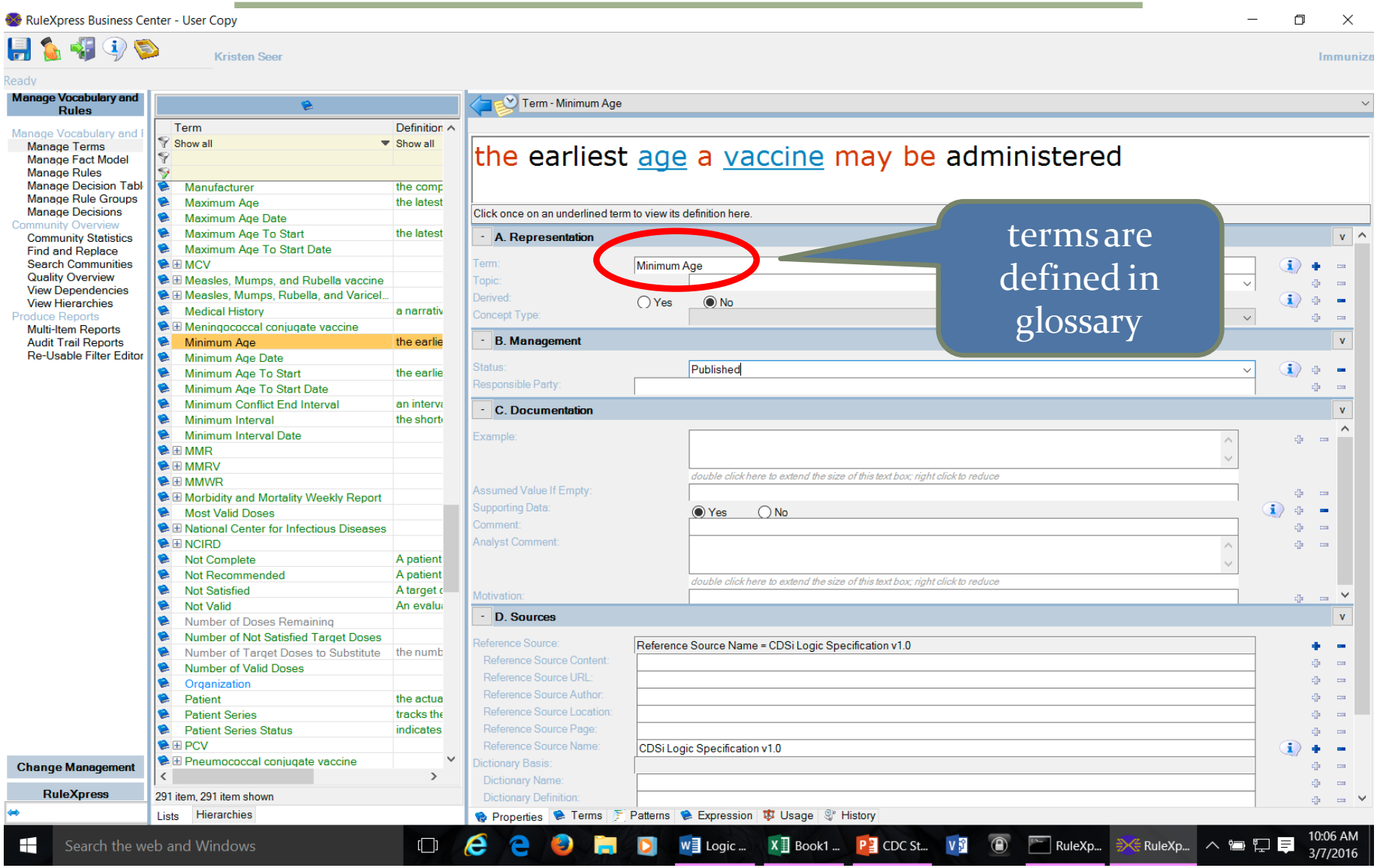
IIS Vendors

Electronic Health Record Vendors

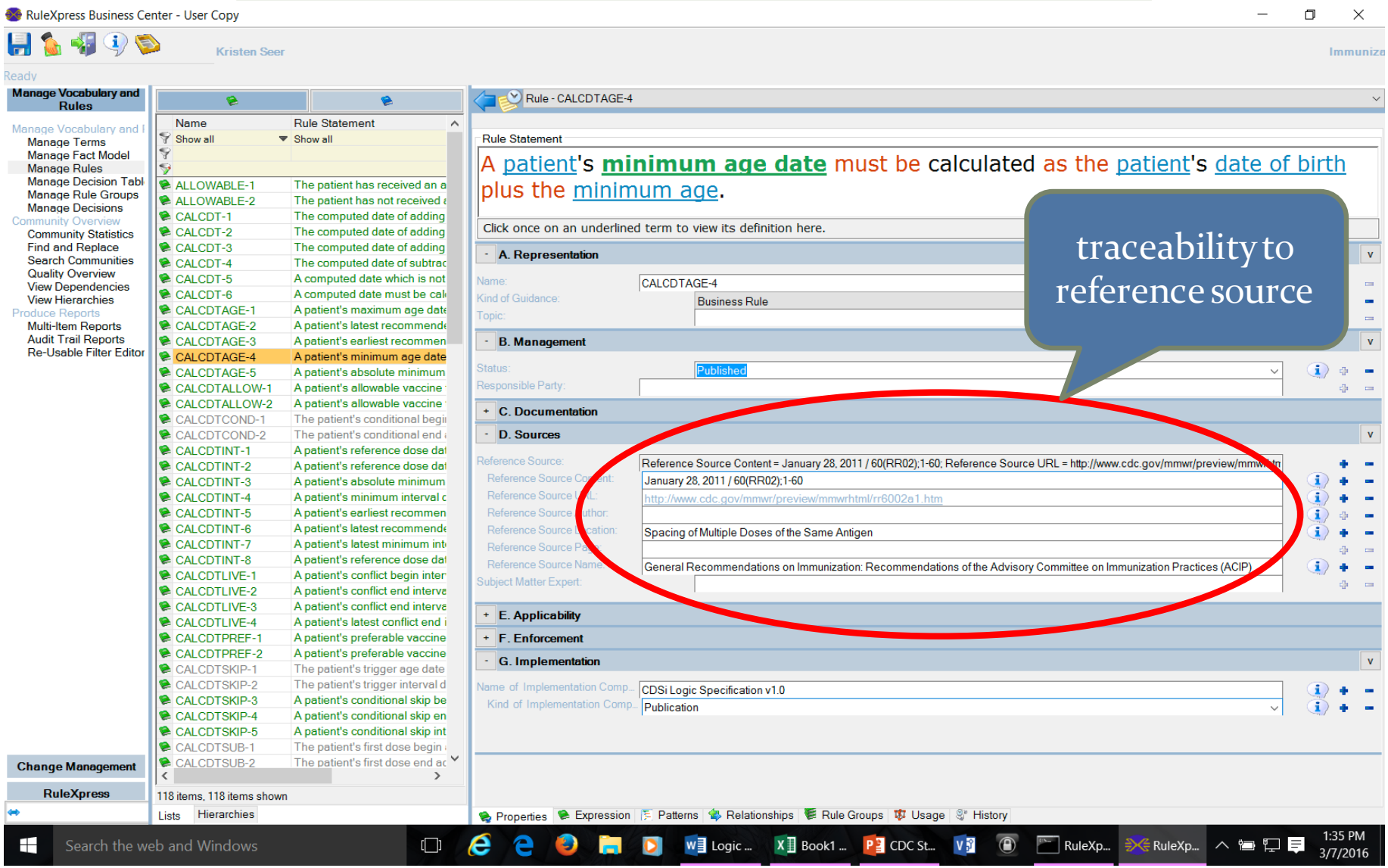
IIS Consultants

vision

business terms

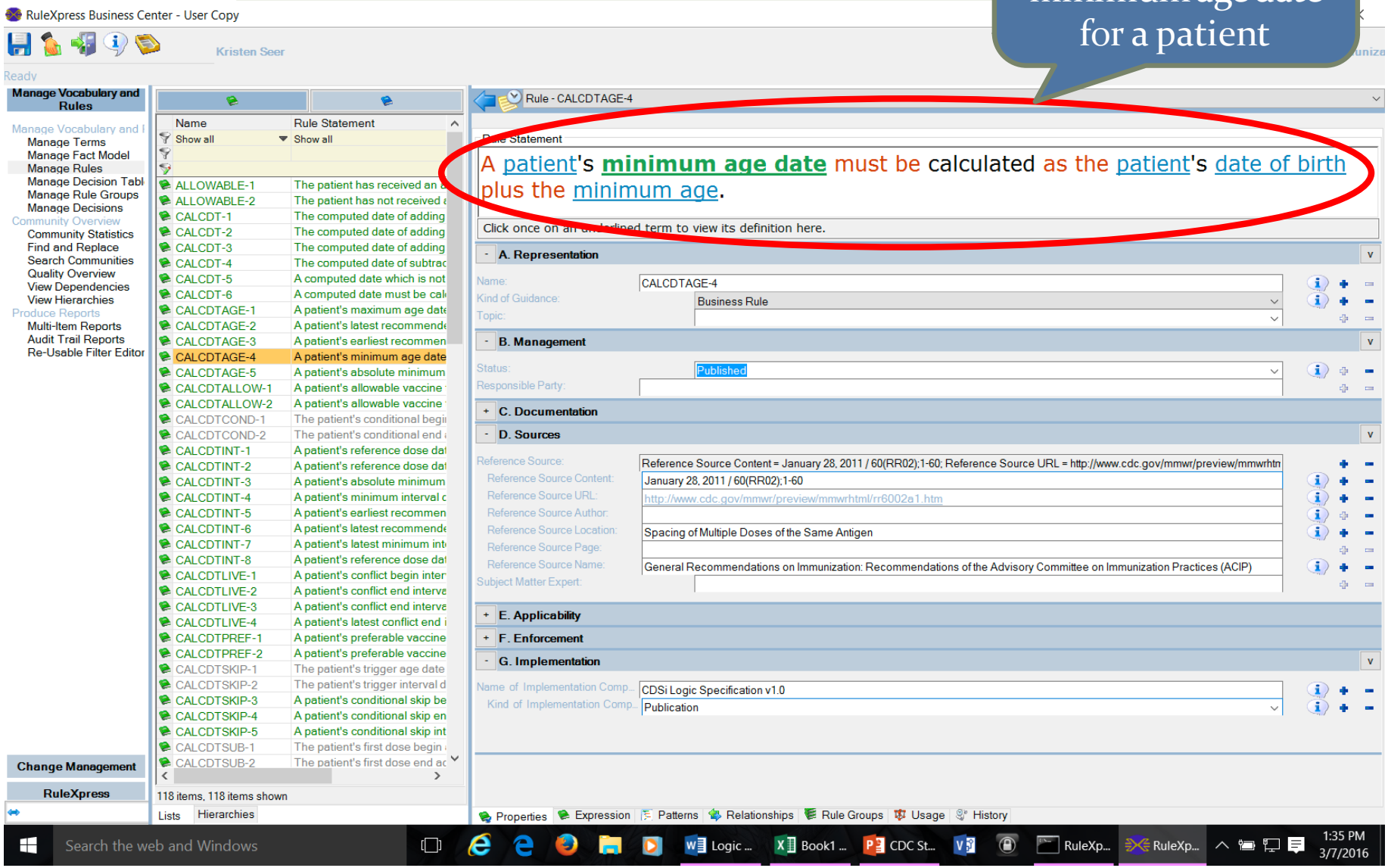


business rules

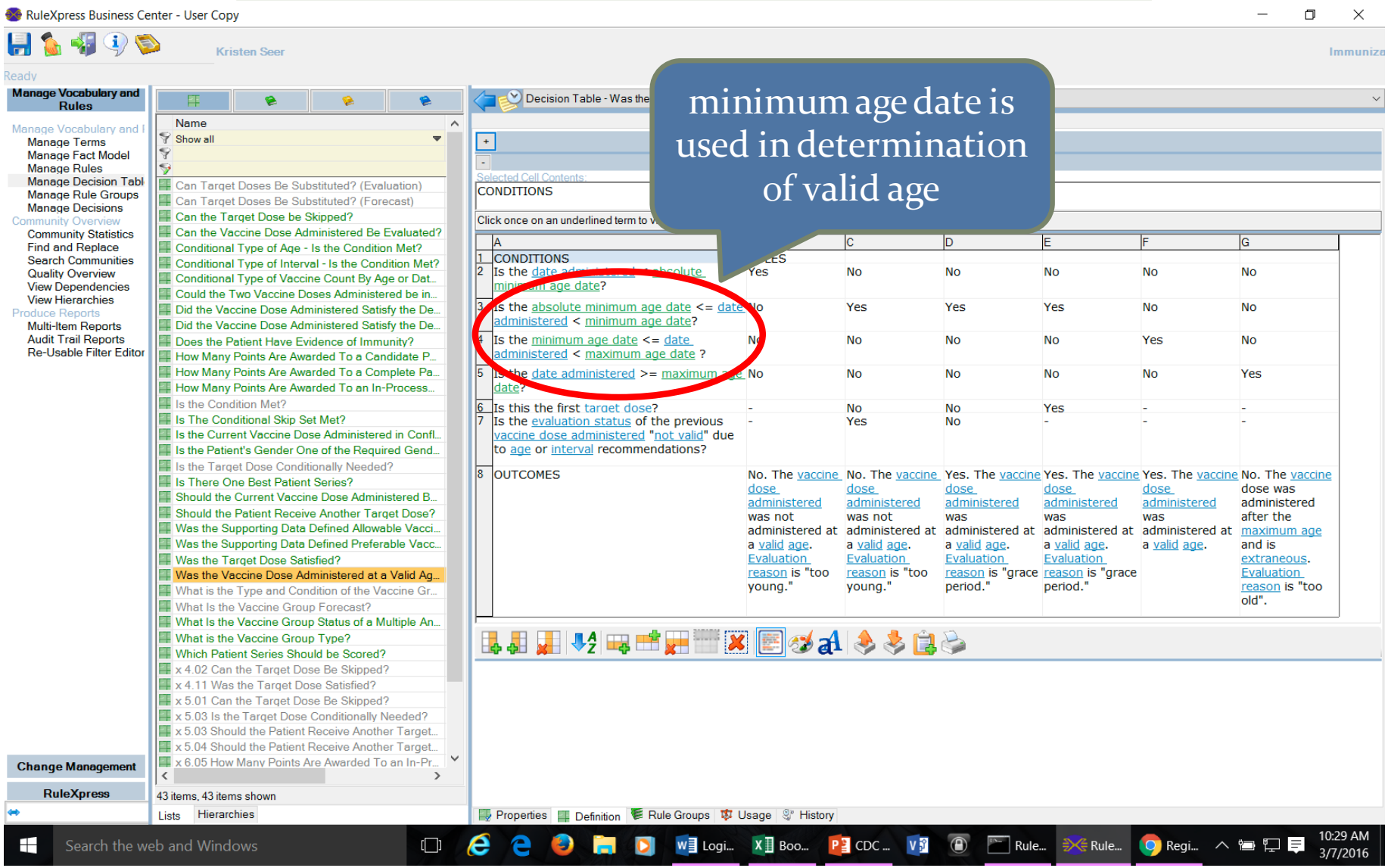


business rules

minimum age is used to calculate minimum age date for a patient

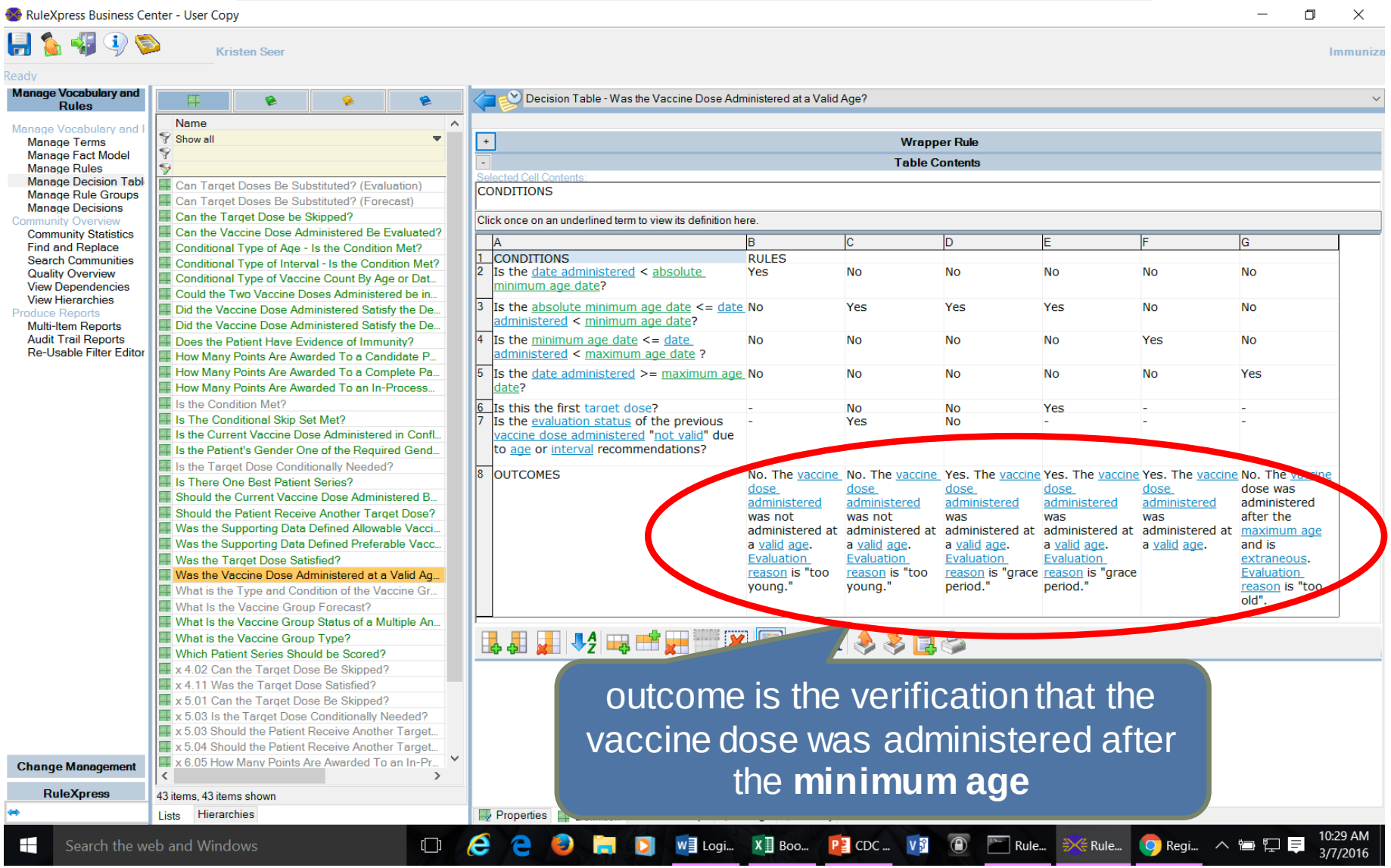


decision tables



	A	C	D	E	F	G
1	CONDITIONS	ES				
2	Is the date adm absolute minimum age date?	Yes	No	No	No	No
3	Is the absolute minimum age date <= date administered < minimum age date?	No	Yes	Yes	No	No
4	Is the minimum age date <= date administered < maximum age date ?	No	No	No	Yes	No
5	Is the date administered >= maximum age date?	No	No	No	No	Yes
6	Is this the first target dose?	-	No	No	Yes	-
7	Is the evaluation status of the previous vaccine dose administered "not valid" due to age or interval recommendations?	-	Yes	No	-	-
8	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".

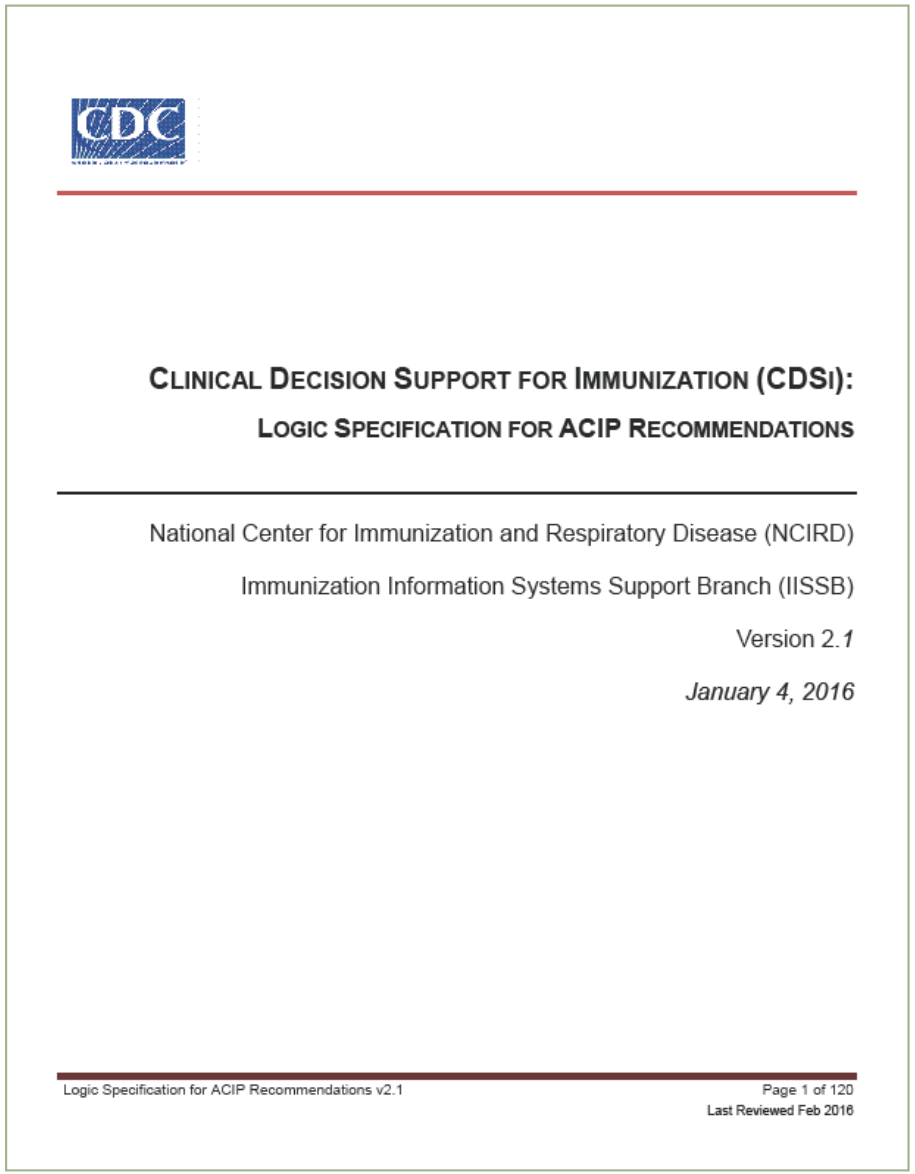
decision tables



	A	B	C	D	E	F	G
1	CONDITIONS	RULES					
2	Is the date administered < absolute minimum age date?	Yes	No	No	No	No	No
3	Is the absolute minimum age date <= date administered < minimum age date?	No	Yes	Yes	Yes	No	No
4	Is the minimum age date <= date administered < maximum age date ?	No	No	No	No	Yes	No
5	Is the date administered >= maximum age date?	No	No	No	No	No	Yes
6	Is this the first target dose?	-	No	No	Yes	-	-
7	Is the evaluation status of the previous vaccine dose administered "not valid" due to age or interval recommendations?	-	Yes	No	-	-	-
8	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".

outcome is the verification that the vaccine dose was administered after the **minimum age**

publication



CLINICAL DECISION SUPPORT FOR IMMUNIZATION (CDSI):

LOGIC SPECIFICATION FOR ACIP RECOMMENDATIONS

National Center for Immunization and Respiratory Disease (NCIRD)

Immunization Information Systems Support Branch (IISSB)

Version 2.1

January 4, 2016

Logic Specification

- clinical decision aid
- interprets ACIP recommendations for IIS community
- implementation-independent
- published on CDC website

sample Logic Specification pages

3. TARGET DOSE

Target dose is a term used often in the Logic Specification document. A target dose is a patient-specific dose required to satisfy the recommendations of ACIP. Until a target dose is satisfied, the patient is not allowed to move to the next target dose in the patient series. The patient remains on the "unsatisfied" target dose until the patient has a "valid" vaccine dose administered that satisfies the target dose. A target dose is also allowed to be skipped however this situation isn't the common path and not immediately discussed here. Details on skipping target doses can be found in chapters 4 and 5.

This concept can be seen graphically below in figure 3-1. For simplicity in this hypothetical patient series, the target doses are defined only by the minimum age. The target doses have minimum ages of 0 days, 2 months, and 6 months. These are the minimum ages allowed by this patient series. The patient must have vaccine doses administered on or after these minimum ages to be considered valid. A valid vaccine dose administered will satisfy a target dose and allow movement to the next target dose. A vaccine dose administered which is anything but valid does not satisfy a target dose and does not allow movement to the next target dose.

This can be seen in figure 3-1 by looking at *target dose 2* and vaccine doses administered *dose 2* and *dose 3*. Dose 2 was administered too early and resulted in the evaluation status "not valid." A not valid vaccine dose administered means the target dose was not satisfied and must be repeated. Dose 3 was given at an appropriate age which resulted in the evaluation status "valid" and satisfied the goals of target dose 2. This allows movement to target dose 3 which is subsequently satisfied by vaccine dose administered *dose 4*.

While not shown on this graphic, there is also a status which tracks the patient's progress towards completion of a patient series. In this example, the patient series status is "not complete" for the first three vaccine doses administered. The patient series status is changed to "complete" once the fourth vaccine dose administered satisfies the third target dose which completes the patient series.

The following process model, attribute table and decision table are used to evaluate age at administration.

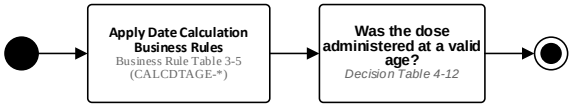


FIGURE 4 - 1 EVALUATE AGE PROCESS MODEL

TABLE 4 - 1 AGE ATTRIBUTES

Attribute Type	Attribute Name	Assumed Value if empty
Vaccine dose administered	Date Administered	-
Calculated date (CALCDTAGE-1)	Maximum Age Date	12/31/2999
Calculated date (CALCDTAGE-4)	Minimum Age Date	01/01/1900
Calculated date (CALCDTAGE-5)	Absolute Minimum Age Date	01/01/1900

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

CONDITIONS	RULES					
Is the Date administered < absolute minimum age date?	Yes	No	No	No	No	No
Is the Absolute minimum age date ≤ date administered < minimum age date?	No	Yes	Yes	Yes	No	No
Is the Minimum age date ≤ date administered < maximum age date?	No	No	No	No	Yes	No
Is the Date administered ≥ maximum age date?	No	No	No	No	No	Yes
Is this the first target dose?	-	No	No	Yes	-	-
Is the evaluation status of the previous vaccine dose administered "not valid" due to age or interval recommendations?	-	Yes	No	-	-	-
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."

Spacing of Multiple Doses of the Same Antigen

Vaccination providers should adhere as closely as possible to recommended vaccination schedules (Table 1). Administration at recommended ages and in accordance with recommended intervals between doses of multidose antigens provide optimal protection. Administration of doses of a multidose vaccine using intervals that are [illegible] certain circumstances, such as impending international travel or when a pers[illegible]id protection. In these situations, an accelerated schedule can be implem[illegible]er than intervals recommended for routine vaccination. The accelerated or mi[illegible]ccinations are available at http://www.cdc.gov/vaccines. Vaccine doses should n[illegible]um intervals or at an age that is younger than the minimum age.*

verify that all previous doses were administered after the minimum age

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 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 ≥4 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 on or 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 28 days has elapsed from the invalid dose is recommended. For example, if the first dose of varicella vaccine were inadvertently administered at age 10 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 recipients when administered more frequently than recommended (6,7). Careful record keeping, maintenance of patient histories, use of immunization information systems (IISs), and adherence to recommended schedules can decrease the incidence of such reactions without adversely affecting immunity.

ACIP

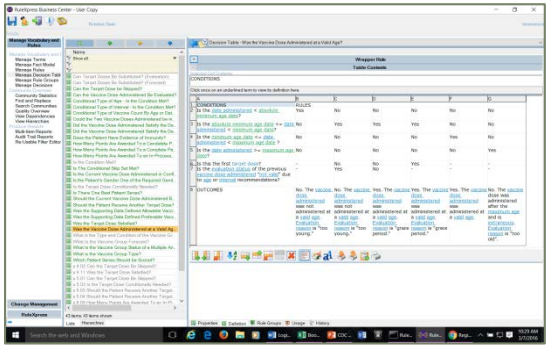
Vaccine Recommendations

RULEXPRESS™

Rule Repository

CDSi Logic Specification

working together



The following process model, attribute table and decision table are used to evaluate age at administration.

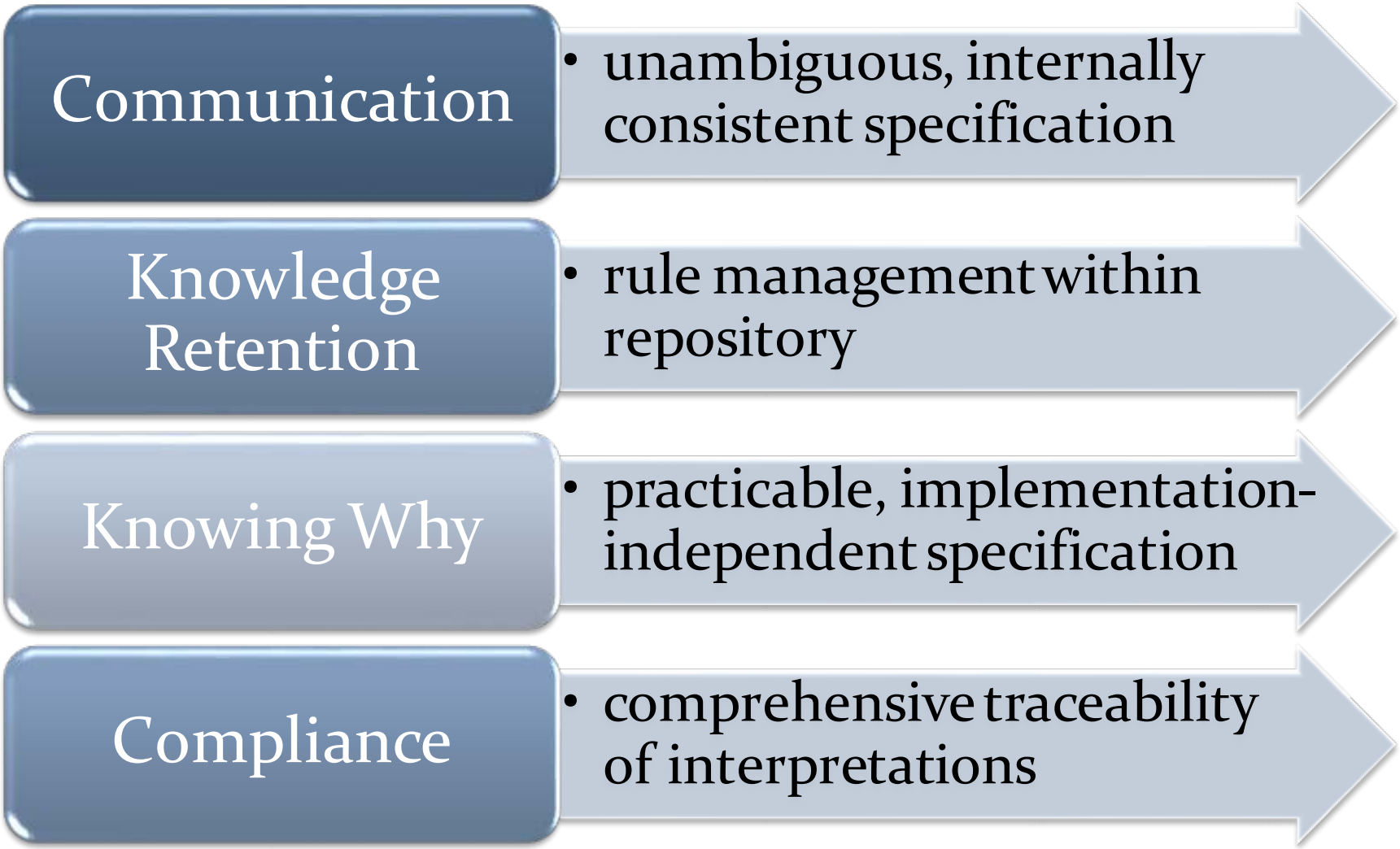
FIGURE 4 - 1 EVALUATE AGE PROCESS MODEL

TABLE 4 - 1 AGE ATTRIBUTES

Attribute Type	Attribute Name	Assumed Value if empty
Vaccine dose administered	Date Administered	-
Calculated date (CALCDTAGE-1)	Maximum Age Date	12/31/2999
Calculated date (CALCDTAGE-4)	Minimum Age Date	01/01/1900
Calculated date (CALCDTAGE-5)	Absolute Minimum Age Date	01/01/1900

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

CONDITIONS	RULES					
Is the Date administered < absolute minimum age date?	Yes	No	No	No	No	No
Is the Absolute minimum age date ≤ date administered < minimum age date?	No	Yes	Yes	Yes	No	No
Is the Minimum age date ≤ date administered < maximum age date?	No	No	No	No	Yes	No
Is the Date administered ≥ maximum age date?	No	No	No	No	No	Yes
Is this the first target dose?	-	No	No	Yes	-	-
Is the evaluation status of the previous vaccine dose administered "not valid" due to age or interval recommendations?	-	Yes	No	-	-	-
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."



goal for know-how in a knowledge economy

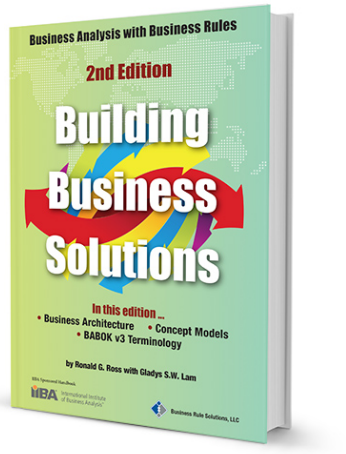
governance & research

operations

IT technology

- business rules
- decision structures
- decision tables
- subject vocabulary

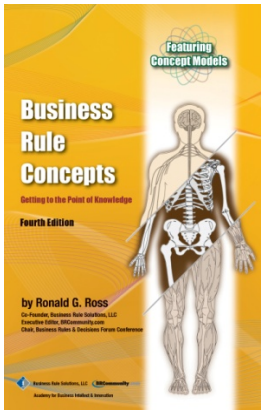
the same complete, intelligible, unambiguous, deployable meaning for each audience



Building Business Solutions

Business Analysis with Business Rules

2nd edition, 2015



Business Rule Concepts

Getting to the Point of Knowledge

4th edition, 2013

Primer Trio

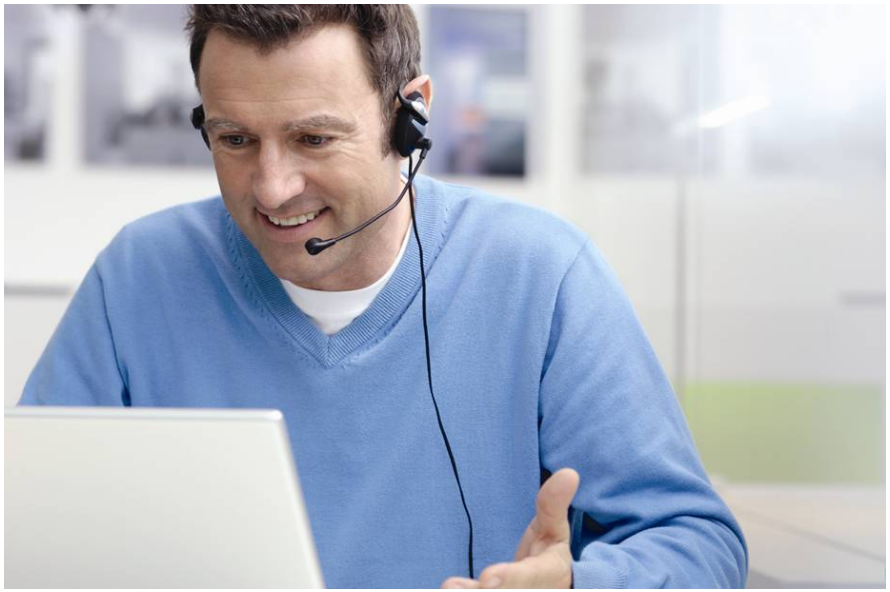
Decision Analysis
Decision Tables
RuleSpeak® 3.0

brsolutions.com
(free)

http://www.brsolutions.com/publications

BRS instructor-led online training series …

- June 7-9, 2016 … Working with Business Rules: Capture, Specification, Analysis & Management
- Oct 4-6, 2016 … Business Analysis with Business Rules: From Strategy to Requirements



http://www.brsolutions.com/training

references

- 2007 - OMG Semantics of Business Vocabulary and Business Rules (SBVR) standard
- 2000 - BRG Business Motivation Model (BMM)
  www.businessrulesgroup.org/second_paper/BRG-BMM.pdf
- 2002 - Business Rules Manifesto (16+ languages)
  www.businessrulesgroup.org/brmanifesto.htm
- 1997 – 2016 - Business Rules & Decisions Forum conference, Oct. 31 – Nov 4, Las Vegas
- 2000 – 2016 - www.BRCommunity.com

BRCommunity.com
THE WORLD'S MOST TRUSTED RESOURCE FOR BUSINESS RULE AND ENTERPRISE DECISIONING PROFESSIONALS

request
30 minutes
with us!

~~

thank you!

Ronald G. Ross
Business Rule Solutions, LLC
Rross@BRSolutions.com
@Ronald_G_Ross

Gladys S. W. Lam
Business Rule Solutions, LLC
Glam@BRSolutions.com
@GladysLam

www.BRSolutions.com