

# Laboratory-Clinical Communications LCC Profile

IHE Laboratory Domain

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# The Problem

- The traditional order-result paradigm does not include clinically-important workflow related to ordering and resulting
  - Recommending and accepting order modification
  - Requests and responses for result verification, clarification, interpretation, annotation (fulfillment)
- Occur on an ad hoc basis outside of systems, limiting documentation, decision support, process standardization, quality improvement
- Clinical lab context, but general applicability

# Use Cases

- Order modification initiated by the lab
  - Laboratory-based decision support, utilization policies, clinical guidelines, missing/erroneous data
  - Specimen problems
  - Time-out of “future orders”
  - New use cases: incorrect orders, inconclusive results, complex reflexive/algorithmic testing
- Order fulfillment (post-result actions) initiated by clinician
  - Results inconsistent with clinical picture (e.g., verification request)
  - Test interpretation
  - Incorrect testing
  - Annotation of results

# New Order Mod Use Cases

- High incidence of incorrect lab orders, particularly for genetic testing
  - Incompatible demographics, clinical history, results
- Inconclusive results (e.g. FNA)
  - Recommend repeat and report all results together
- Tentative: testing algorithms with downstream orders based on upstream results
  - ER/PR/HER2, recommend downstream test orders based in intermediate results, report all in context

# Two New Transactions for LTW

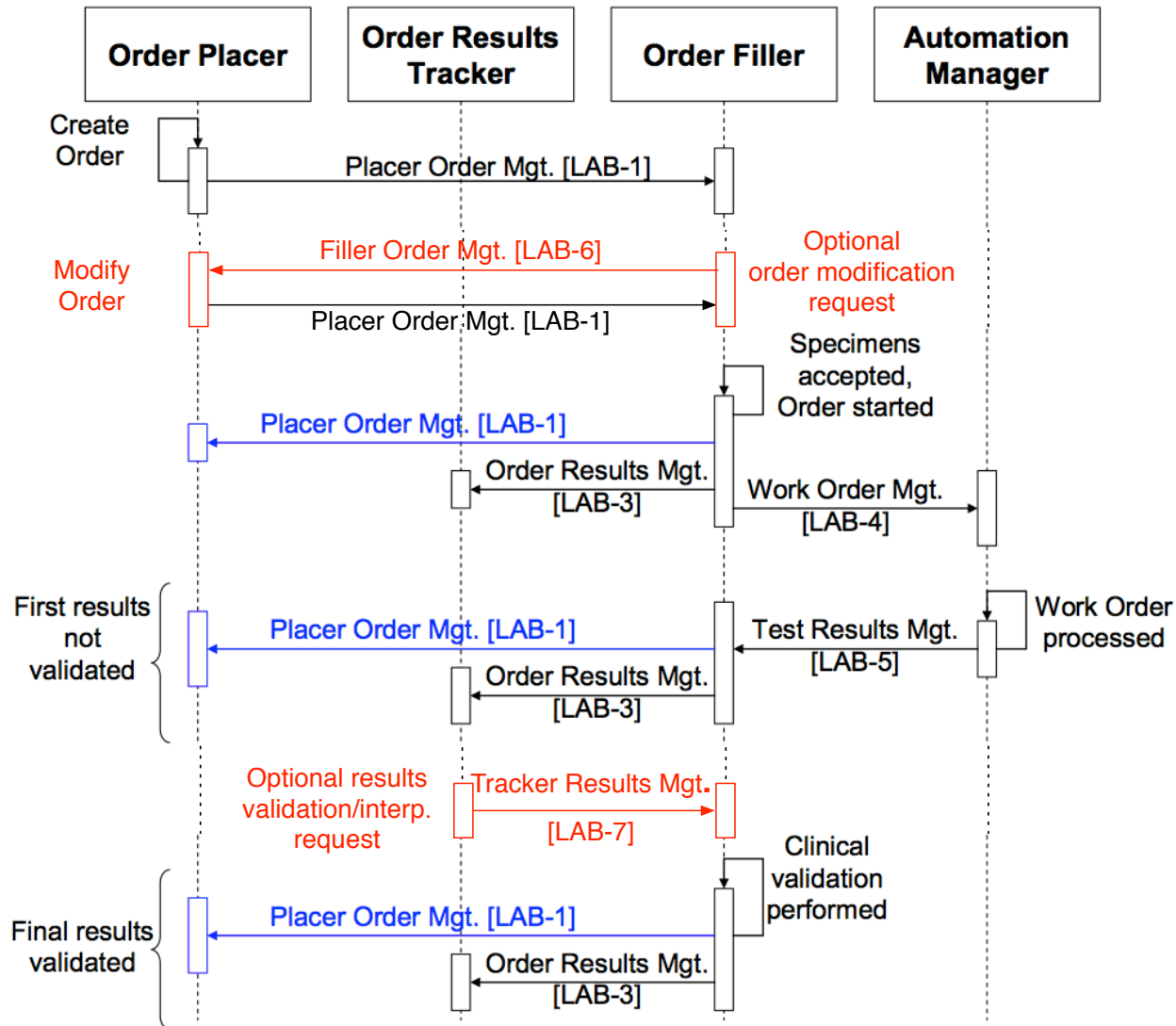
- Order modification
  - Information about the patient or specimen is available at the Order Filler that indicates orders should be changed for optimal care
  - Filler recommends changes to Placer
  - Placer returns order change request
- Result verification/interpretation/annotation
  - Result does not fully satisfy the clinical need, or conflicting information is available to the Placer
  - Placer requests follow-up or annotation from Filler
  - Filler responds with addendum or amendment to previous report

# Chicago Meeting Discussions

- Tuesday: order modification message general strategy, control codes, timing fields
- Wednesday:
  - Specimen management (SPM segments in O21, O33 & O35 events)
  - Relationship to ONC LOI
    - LOI IG differs from LTW (new/append/cancel order use cases) and is important for US implementation

# Tentative LCC Implementation

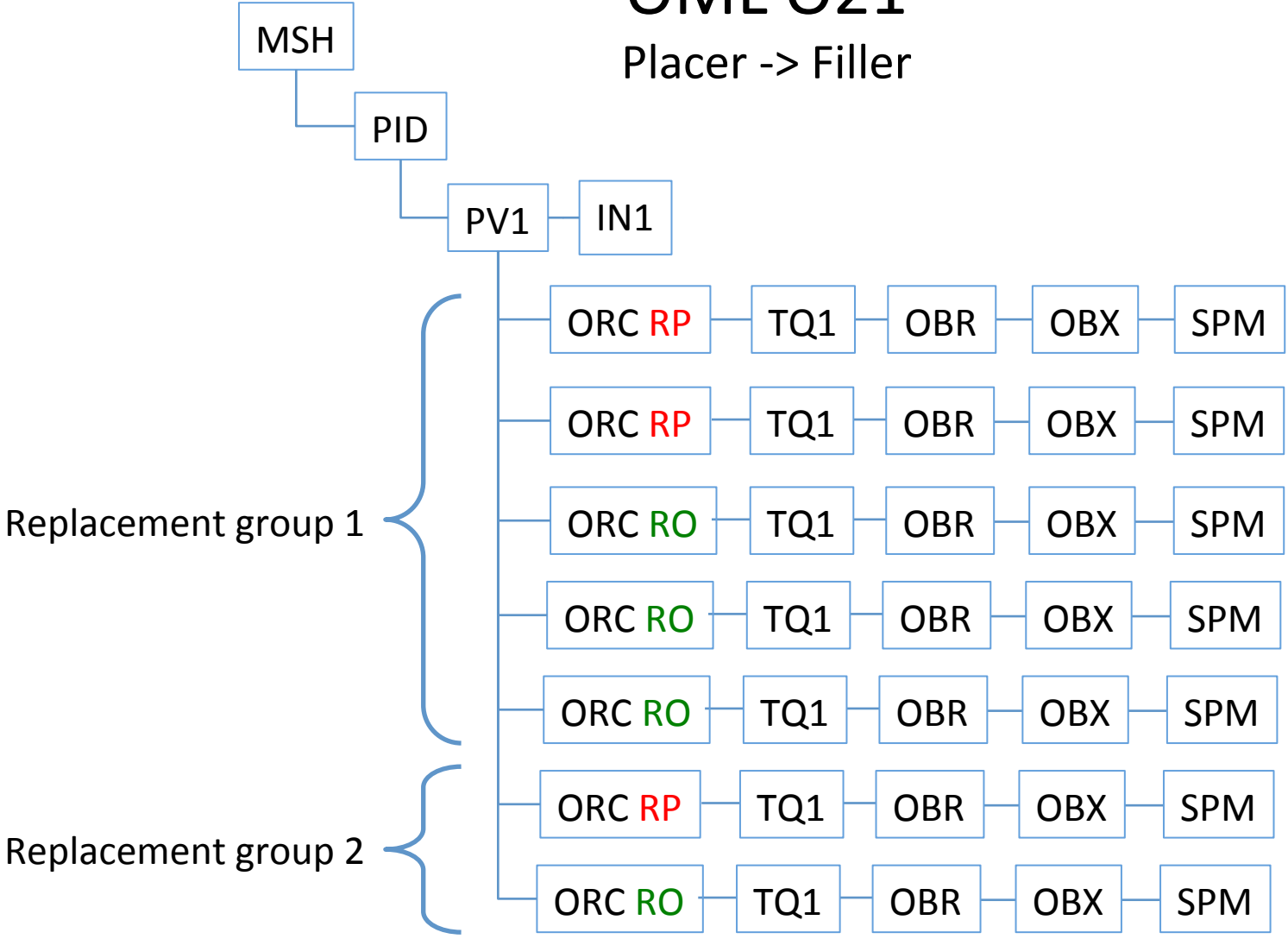
(additions to LTW shown in red)



# Order Update

## OML O21

Placer -> Filler



# Order Modification Transaction Goals

- Communicate a rec. to add to, replace, or cancel existing clinical lab orders prior to resulting
  - Queue up recommended replacement orders
  - Do not constrain replacement order modification
- Accommodate modification within a defined time frame
  - On receipt of the order (immediate)
  - Between ordering and specimen receipt
  - After specimen receipt but before testing
  - After shipment to reference lab, but before testing
- Consistency with and fully optional in current IHE LTW (and possibly ILW) profile: HL7 2.5.1, no changes in existing communication flow

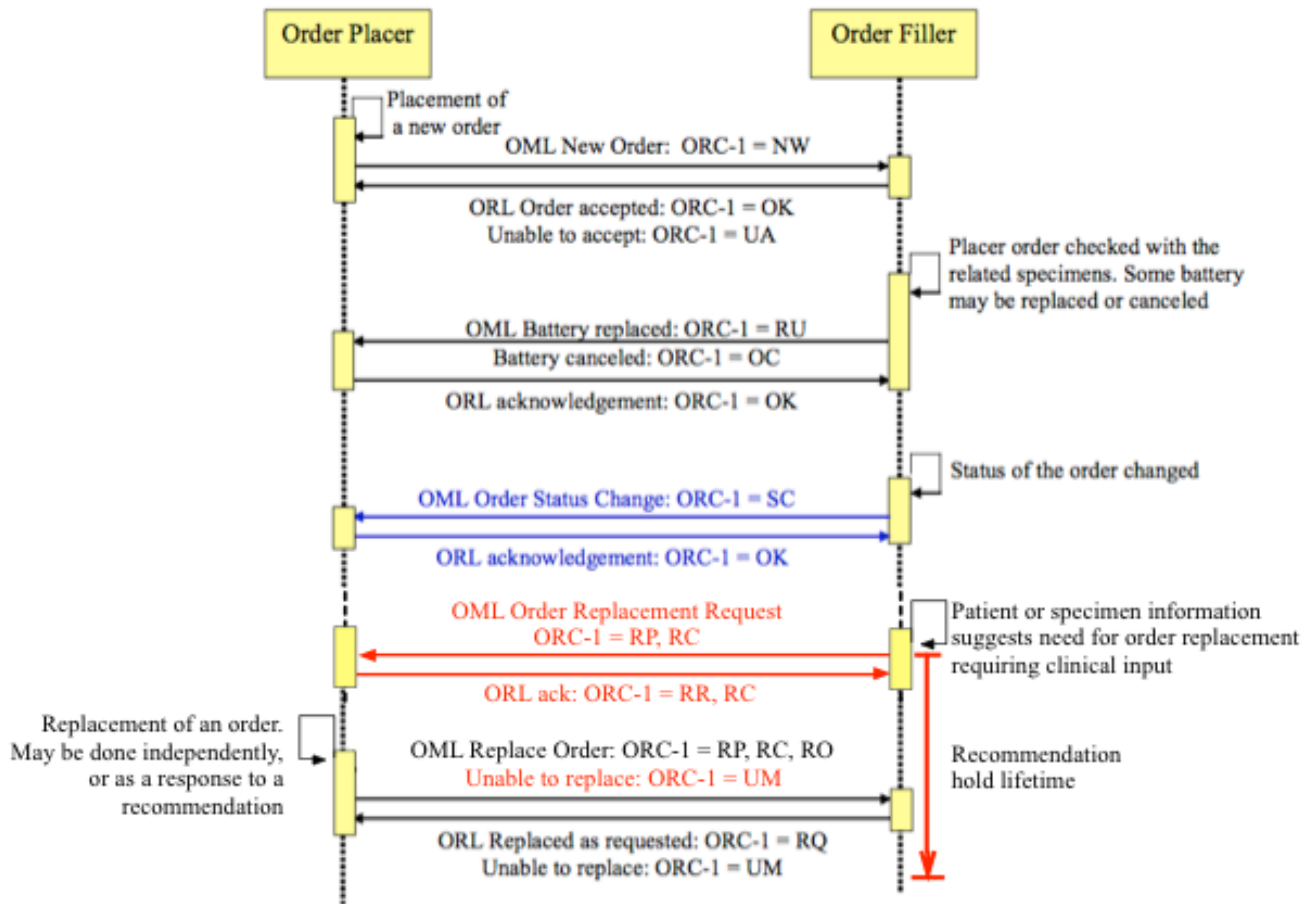
# Order Modification Transaction Strategy

- Based on unsolicited order update message; OML O21, O33, O35; but sent in the reverse direction (Filler to Placer)
- Filler sends “recommended order update” message to Placer
  - Original orders to be modified have control code RP and status *OH*
  - Recommended change orders follow with control code *RC*
    - Order update uses control code RO for replacement orders
  - Recommendation time window, with default processing of original orders if rec. isn’t received
- Placer returns the order update message
  - Similar to unsolicited order update except for control code RC in new orders that were recommended
  - Return orders that should not be replaced with UM control code
- If UM response, or time window is exceeded without response, processing continues as now (loose coupling of recommendation and response)

# Order Modification Transaction Details

- Filler sends “recommended order change” message to Placer, structure similar to order update message
  - Original orders to be changed
    - ORC-1 Control Code RP if replacement, CA if no replacement
    - Placer and filler order numbers (ORC-2 and -3)
    - Status OH (ORC-5, code in HL7 but may need to be added to LTW)
    - Reason for change (ORC-16, new codes) and NTE following ORC/OBR
    - Timestamp for recommendation time window (*location TBD*)
    - Must include OBR segments
  - Replacement orders
    - Control Code RC for recommended change
    - Replacements do not carry order numbers
- Placer response is via return of the rec. change message
  - Accepted recommended changed orders retain RC control code
  - Changes other than those recommended carry RO control codes
  - Control code UM in orders that are not modified

# Placer Order Process with Change Recommendation



**Placer order (LAB-1) sequence diagram.**

Blue transactions are required only if order placer and order results tracker are separate.

LAB-6 additions are shown in red.

IHE  
Lab  
TF-2  
HL7  
2.5.1  
ch. 4

Table 3.5-1: ORC Segment

SEQ	LEN	DT	Usage	Card.	TBL #	ITEM#	Element name
1	2	ID	R	[1..1]	0119	00215	Order Control
2	22	EI	C	[0..1]		00216	Placer Order Number
3	22	EI	C	[0..1]		00217	Filler Order Number
4	22	EI	RE	[0..1]		00218	Placer Group Number
5	2	ID	C	[0..1]	0038	00219	Order Status
6	1	ID	O	[0..1]	0121	00220	Response Flag
7	200	TQ	X	[0..0]		00221	Quantity/Timing
8	200	EIP	C	[0..1]		00222	Parent
9	26	TS	R	[1..1]		00223	Date/Time of Transaction
10	250	XCN	RE	[0..*]		00224	Entered By
11	250	XCN	RE	[0..*]		00225	Verified By
12	250	XCN	O	[0..1]		00226	Ordering Provider
13	80	PL	O	[0..1]		00227	Enterer's Location
14	250	XTN	O	[0..2]		00228	Call Back Phone Number
15	26	TS	O	[0..1]		00229	Order Effective Date/Time
16	250	CE	O	[0..1]		00230	Order Control Code Reason
17	250	CE	C	[0..1]		00231	Entering Organization
18	250	CE	O	[0..1]		00232	Entering Device
19	250	XCN	O	[0..*]		00233	Action By
20	250	CE	X	[0..0]	0339	01310	Advanced Beneficiary Notice Code
21	250	XON	O	[0..1]		01311	Ordering Facility Name
22	250	XAD	O	[0..1]		01312	Ordering Facility Address
23	250	XTN	O	[0..1]		01313	Ordering Facility Telephone Number
24	250	XAD	O	[0..1]		01314	Ordering Provider Address
25	250	CWE	X	[0..0]		01473	Order Status Modifier
26	60	CWE	X	[0..0]	0552	01641	Advanced Beneficiary Notice Override Reason
27	26	TS	C	[0..1]		01642	Filler's Expected Availability Date/Time
28	250	CWE	O	[0..1]		00615	Confidentiality Code
29	250	CWE	RE	[0..1]		01643	Order Type
30	250	CNE	O	[0..1]		01644	Enterer Authorization Mode
31	250	CWE	X	[0..1]		02286	Parent Universal Service Identifier

\* RP CA RC RO UM  
\*  
\*  
\* OH  
- Timeout ?  
-  
\* Reason codes

# Order Control Codes

## Recommended Order Update

### ORC-1, Order control code

RP	Order to be replaced	Recommendation and update messages for orders to replace
CA	Order to be canceled	Recommendation and update messages for orders to cancel
RR	Request received	Ack messages for orders to replace or cancel
RC*	Recommended change	Recommendation, ack, and update messages for orders that are recommended changes
RO	Replacement order	Update messages, for replacement orders other than those listed in a recommendation message
UM	Unable to modify	Update messages for orders that should not be modified

### ORC-5, Order status

OH	On hold	Recommendation and ack message for orders to be replaced or canceled, indicating “on hold” status
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# Reason for Recommendation Codes

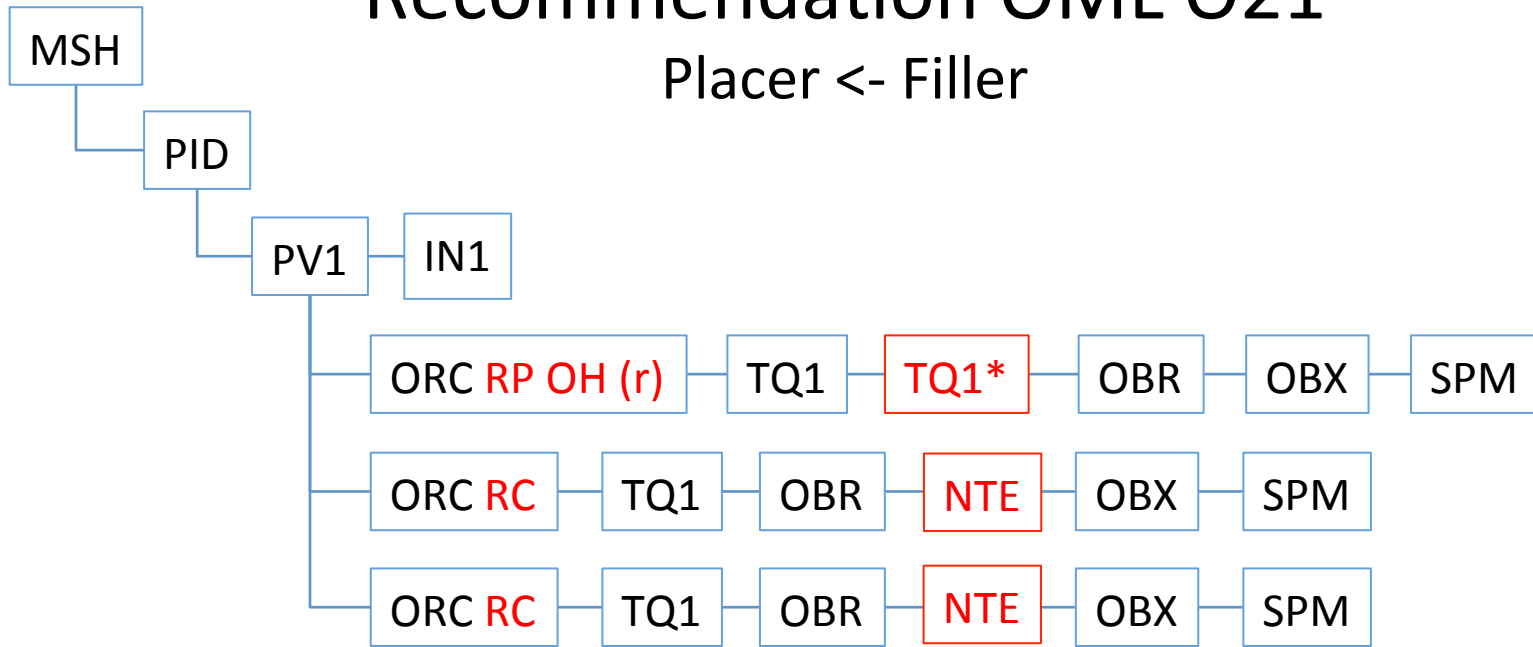
## Recommended Order Update

### Reason for recommendation (ORC-16, new codes)

SD	Specimen Damaged	Available specimen inadequate for tests ordered
SV	Specimen Volume	Specimen volume inadequate for requested testing
ST	Specimen Type	Incorrect specimen type for requested testing
UN	Unavailable	Requested test unavailable, alternative testing proposed
SR	Screening Required	Screening test required prior to confirmatory test
IT	Indicated testing	Indicated follow up testing based on initial results
CE	Cost Efficacy	Lower cost testing strategy proposed
FO	Future Order	Future order timed out without specimen
CI	Contraindicated	Requested testing contraindicated in this patient, alternative strategy proposed
PY	Poor Yield	Requested strategy has poor diagnostic yield for this patient, alternative strategy proposed
IY	Improved Yield	Recommended testing improves diagnostic yield

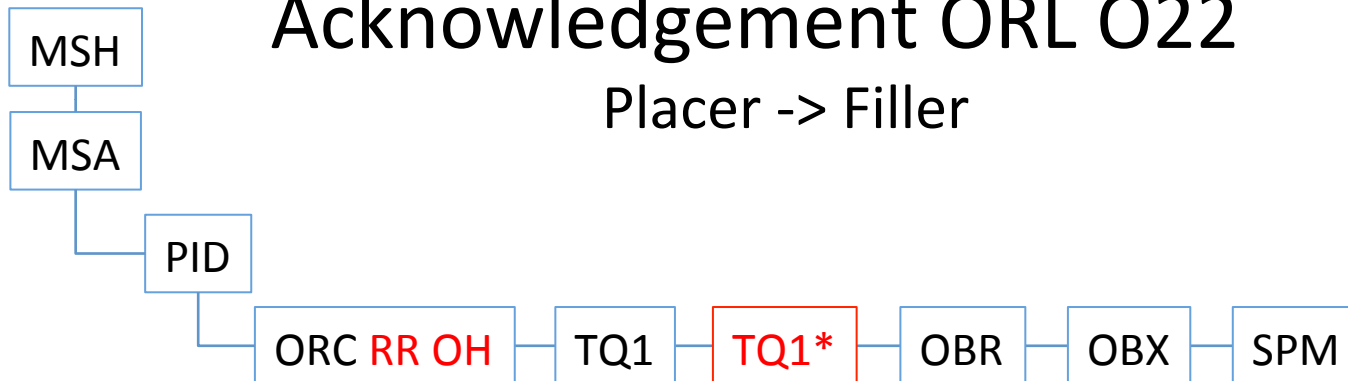
# Recommendation OML O21

Placer <- Filler



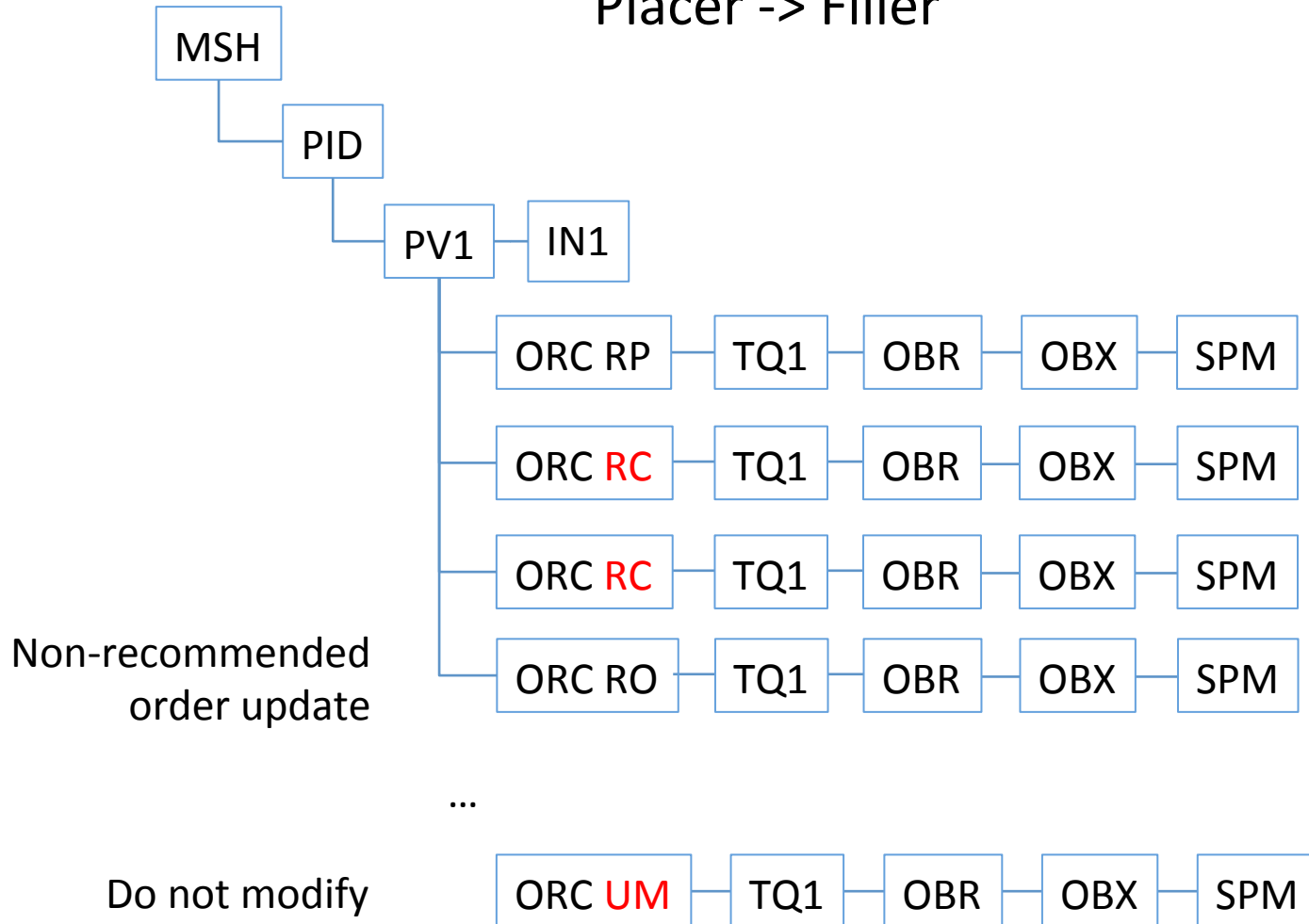
# Acknowledgement ORL O22

Placer -> Filler



# Recommendation Response OML O21 Update Orders

Placer -> Filler



# Recommendation Hold Lifetime

- Available ORC Timestamps
  - OCR-7 Quantity/timing?
    - Deprecated in favor of TQ segments
    - Resurrection? But would need content definition
  - ORC-9 Date/time of transaction?
  - ORC-15 Order effective date/time?
  - ORC-27 Filler's expected availability date/time?
  - TQ1 segment?

# Timing/Quantity (TQ) Segments

HL7 Attribute Table – TQ1 – Timing/Quantity

SEQ	LEN	DT	OPT	RP/#	TBL#	ITEM#	ELEMENT NAME
1	4	SI	O			01627	Set ID - TQ1
2	20	CQ	O			01628	Quantity
3	540	RPT	O	Y	0335	01629	Repeat Pattern
4	20	TM	O	Y		01630	Explicit Time
5	20	CQ	O	Y		01631	Relative Time and Units
6	20	CQ	O			01632	Service Duration
7	26	TS	O			01633	Start date/time *
8	26	TS	O			01634	End date/time *
9	250	CWE	O	Y	0485	01635	Priority
10	250	TX	O			01636	Condition text
11	250	TX	O			01637	Text instruction *
12	10	ID	C		0427	01638	Conjunction
13	20	CQ	O			01639	Occurrence duration

- No “type,” purpose, or role definition for the timing
- Implicitly refers to the timing of performance of the service
- Order timing should be modifiable through the LCC
- LTW allows only a single TQ1 segment (TQ2 not supported)
- Would need to add a timestamp type or role to TQ1 in HL7, allow multiple TQ1 segments in LTW

# Possible Change Proposals

HL7 v. 2.8 with pre-adoption, IHE LTW

- ORC-1 control code RC, recommended change
- Reason for recommendation code set (for ORC-16, control code reason)
- New TQ1 field, “Purpose” with codes:
  - ST, service timing (default)
  - HR, hold for revision
- Multiple TQ1 in LTW, with different purposes

# Specimen Management

- Order change recommendations after specimen receipt
  - If specimen is present and appropriate, use it
  - Obtain new specimen if necessary
  - Placer may modify recommendations
- Order modification seems inherently order-centric
  - Are O33 and O35 structures necessary or useful for change recommendation messages?
- Typical use of SPM in OML O21?

# Results Verification (LAB-7)

- Use cases
  - Unexpected or inconsistent results
  - Complex/unusual/unclear results
  - Systematic inconsistency or process problems
  - Testing errors (incorrect test or other clear error)
  - Other annotation
- Goal: Annotate results to fulfill clinical need, optimize individual care, improve overall quality

# LAB-7 Workflow

- From results review at results tracker...
- Directly trigger annotation request on a particular result, indicate type, add comment
- Request sent to Filler as order with link to original order and result
- Filler creates addendum/amendment/annotation for original result extending the information it provides
- Request resulted as “Result X annotated”

# LAB-7 Questions

- How to reference previous orders and results?
  - Annotation target may be a report, an order panel, or one result from an order panel
  - Child order?
    - Link to results?
    - Documentation of child order usage?
- LOINC code(s) for annotation order
- Codes for annotation types and results
- Result of annotation order
  - Primary result is annotation of another result

# Tentative LAB-7 Messaging Strategy

- Spawn child order requesting annotation of parent
  - Carries link to parent order
  - Link to one OBX or multiple OBXs of a parent
  - Indicates type of follow up and annotation needed (coded)
    - Result verification request (result accuracy single patient perspective)
    - Systematic result problem (result accuracy multiple patient perspective)
    - Result interpretation
    - Service process or workflow issue
    - Result annotation
  - Comments and direct annotations from clinician (NTE, OBX at order entry)
- Original result annotated (could be coded and/or textual annotation, addendum/amendment/correction)
- Result of child indicates annotation added