

Laboratory-Clinical Communications LCC Profile

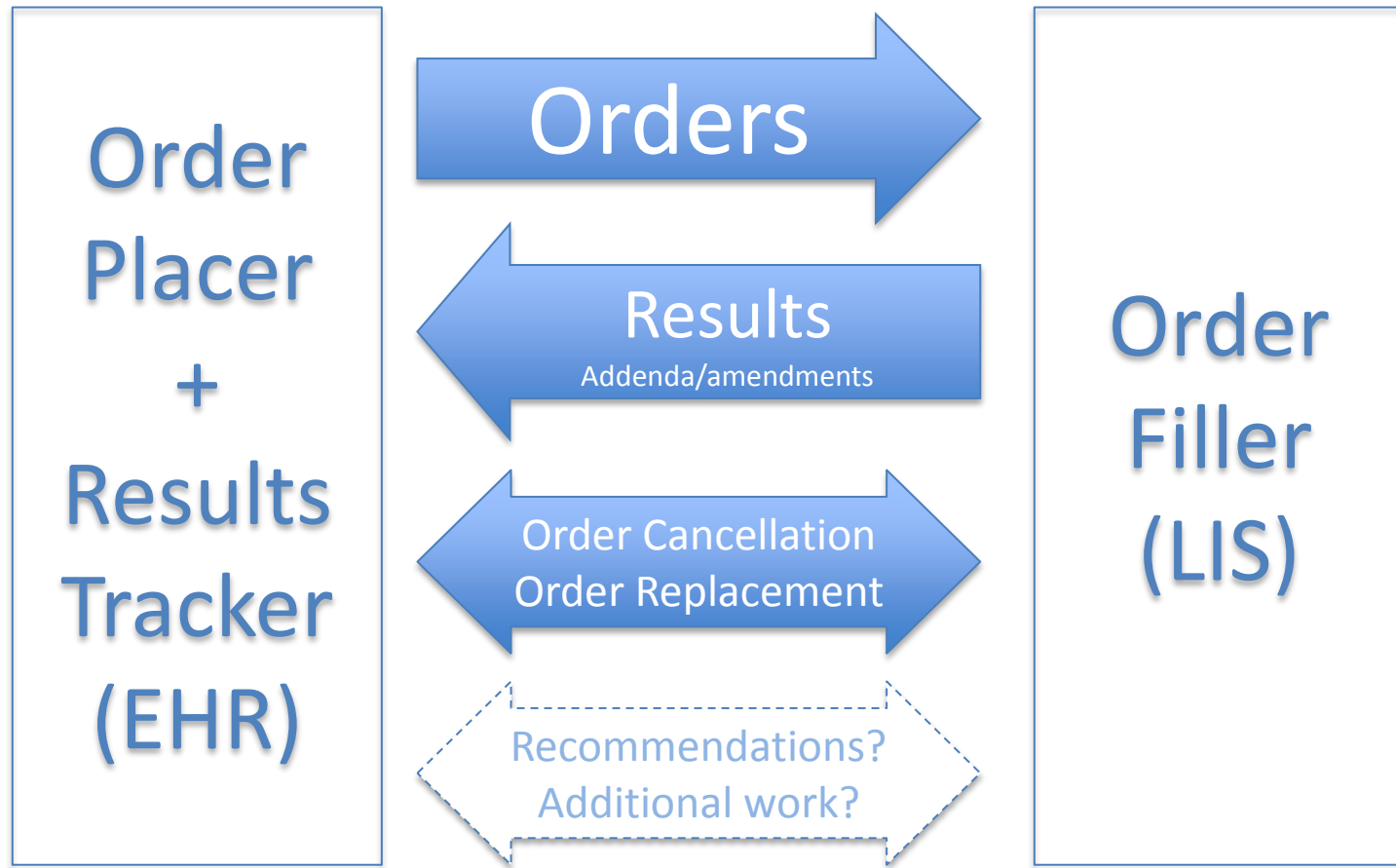
IHE Laboratory Domain

College of American Pathologists

(DIHIT Committee)

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HL7/LTW Order Communications



The Problem

- The traditional order-result paradigm does not include clinically-important workflow related to ordering and resulting
 - Recommending and accepting order replacement
 - 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

Two New Transactions

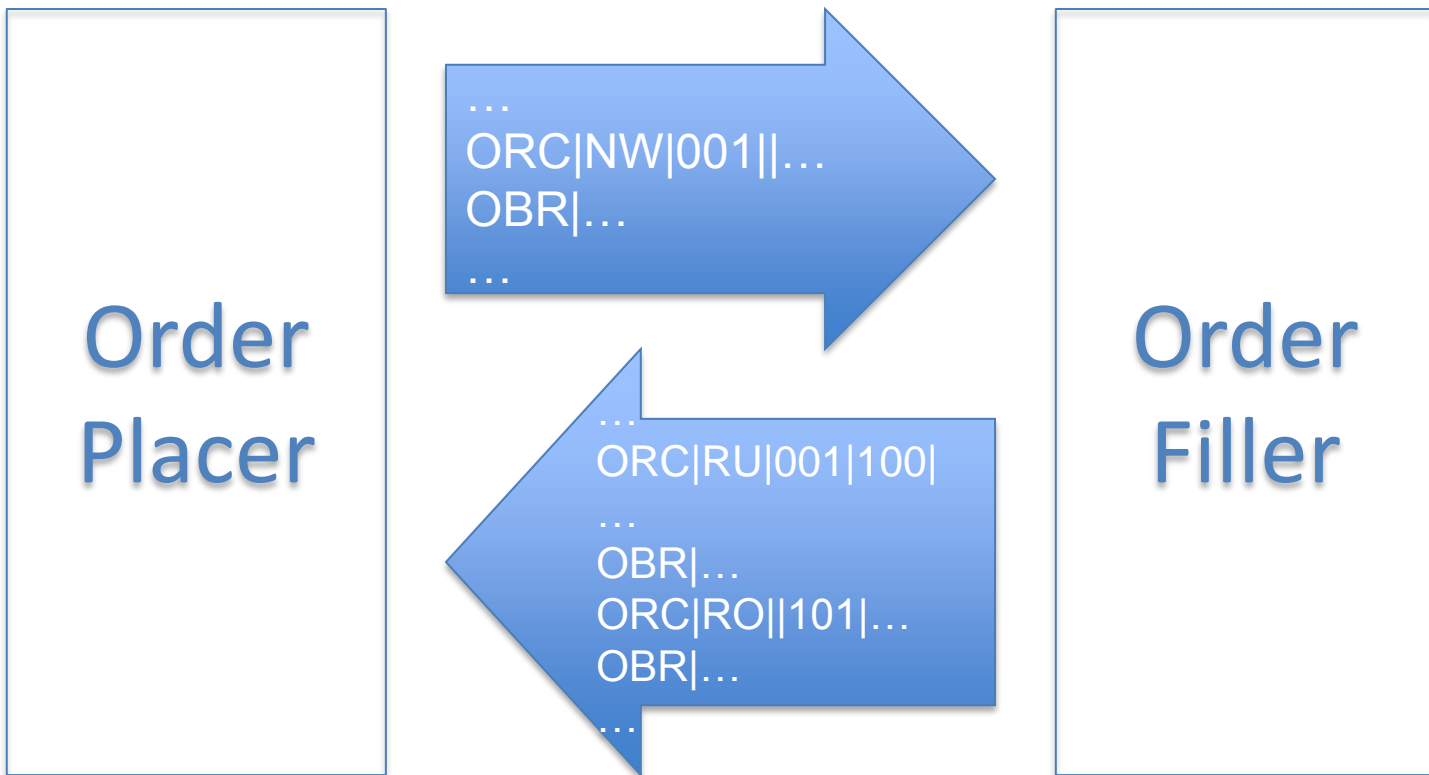
- Order replacement (LAB-6)
 - Information about the patient or specimen is available at the Order Filler that indicates orders should be changed for optimal care
 - Order Filler recommends changes to Order Placer
 - Placer returns order change request
- Result verification/interpretation/annotation (LAB-7)
 - 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 result that may include an addendum or amendment to previous report

Detailed Description

- IHE Wiki (Laboratory Technical Committee)
 - LCC Long Proposal working document
 - [http://wiki.ihe.net/index.php?title=LCC Long Proposal - wiki](http://wiki.ihe.net/index.php?title=LCC_Long_Proposal_-_wiki)
- Order replacement: 9 use cases
- Order fulfillment: 6 use cases
- Transaction descriptions
- Message structure proposals

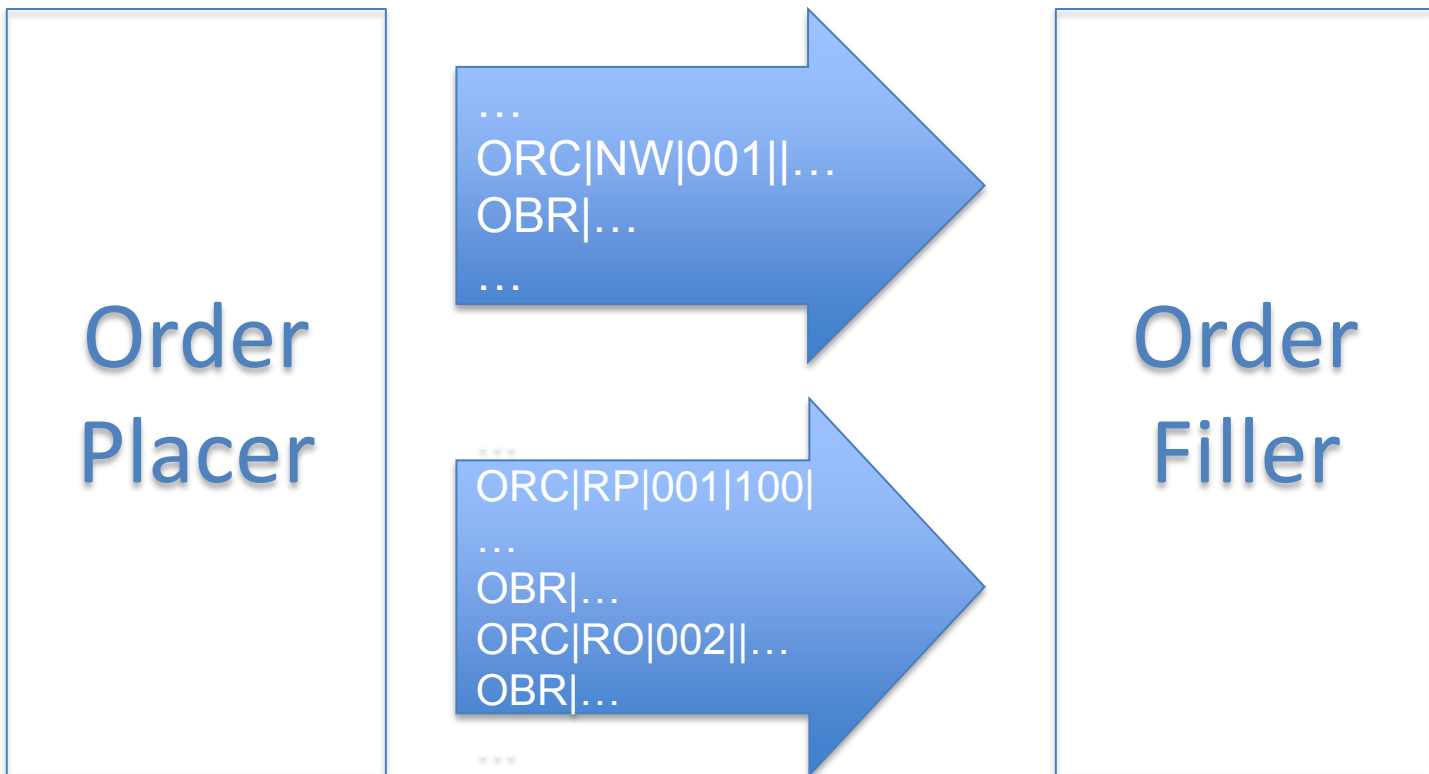
Current Order Replacement

Unsolicited



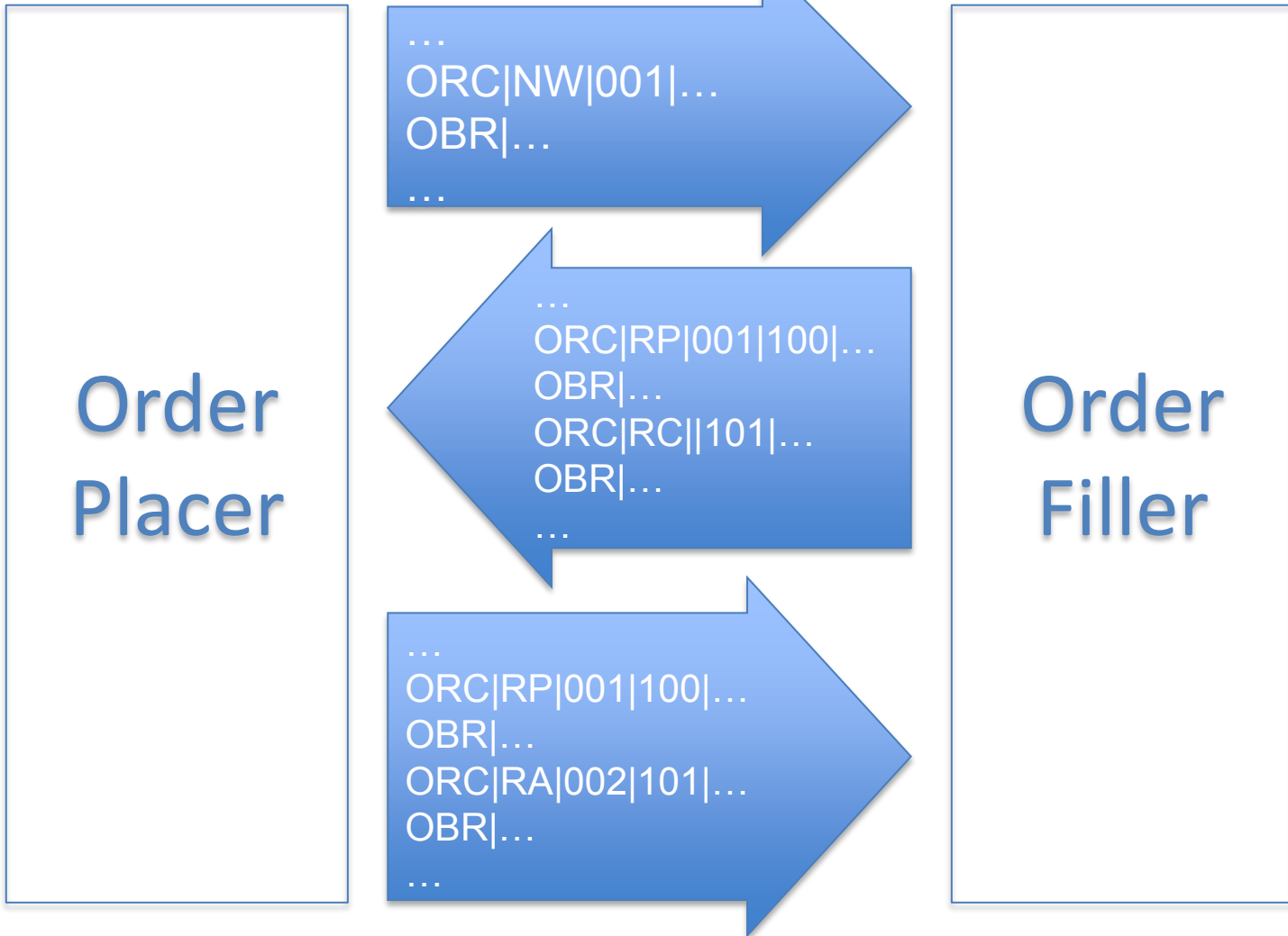
Current Order Replacement

Solicited



Order Replacement

Recommended (LCC)



Order Replacement Transaction Strategy

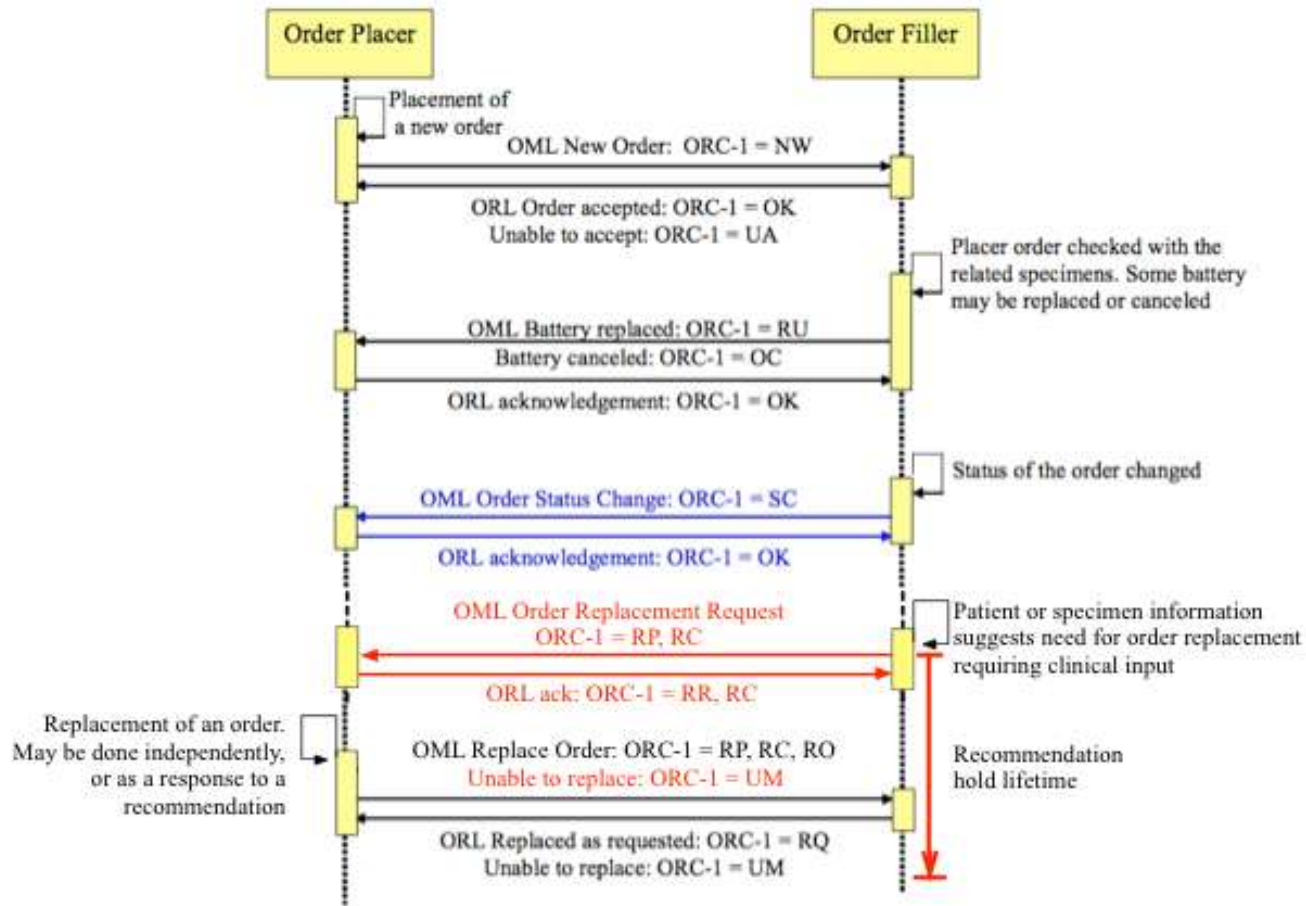
(LAB-6)

- Based on unsolicited order replacement message OML^O21 (Filler to Placer)
- Filler sends “recommended order replacement” message to Placer
 - Original orders to be replaced have control code RP and status HR, new control code reasons (ORC-16)
 - Recommended change orders follow with control code RC, status HR
 - Recommendation time window, with default processing of original orders if response isn’t received within that time span
- Placer responds with an order replacement message similar to order replacement (OML^O21 Placer to Filler)
 - Control code RP for orders to be replaced, same status and reason
 - Control codes RA and RD for accepted and declined recommendations
 - If replacement is declined 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 replacement” message to Placer, structure similar to existing Filler -> Placer unsolicited order replacement
 - Original orders to be changed
 - ORC-1 Control Code RP
 - Placer and filler order numbers (ORC-2 and -3)
 - Status HR (ORC-5)
 - Reason for change (ORC-16, new codes) and NTE following ORC/OBR
 - Deadline for recommendation response in TQ1 (new TQ1 role field 15) or REL
 - Must include OBR segments
 - Recommended replacement orders
 - Control Code RC for recommended change
 - Replacements do not carry order numbers
- Placer response is similar to solicited order replacement
 - Orders to replace retain RP control code
 - Orders that should not be replaced carry control code UM
 - Accepted recommended orders carry RA control code
 - Declined recommended orders carry RD control code
 - Added orders carry RO control codes

Order Replacement Overview



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.

LAB-6 Alternative Implementations

1. Do not communicate time window, send status update when window closes (no structural changes needed)
2. Use a TQ1 segment for time window information (need to add a “role” field to TQ1)
3. Use an REL segment to carry time window information (need to accommodate REL in OML)

Single Order Replacement

...
ORC|NW|1234||... New order with Placer order number
OBR|...
...

Begin LCC -- Filler recommends a change in this order (Filler to Placer OML^O21):

...
ORC|RP|1234|5678||HR|||||||||PY|... RP control code, HR status, PY control code reason
OBR|...
ORC|RC||5679||HR|... RC recommended replacement, HR status
OBR|...
NTE|... Additional information
...

Placer immediately acknowledges the recommendation (Placer to Filler ORL^O22):

...
ORC|RR|1234|5678||HR|||||||||PY|... RR control code
TQ1|||||<start>|<stop>|||||HR|...
OBR|...
ORC|RC|1504|5679||HR|... Placer order number added
OBR|...
NTE|...

Single Order Replacement

Placer accepts recommendation within the time window (Placer to Filler OML^O21):

...

ORC|RP|1234|5678||HR|||||||||PY|... RP control code

OBR|...

ORC|RA|1504|5679|||... RA control code (replacement accepted)

OBR|...

...

Filler confirms replacement (Filler to Placer ORL^O22):

...

ORC|RQ|1234|5678||RP|||||||||PY|... RQ replaced as requested, RP status

OBR|...

ORC|RA|1504|5679|||...

OBR|...

...

OR, status change if Placer response is not sent within the time window

...

ORC|SC|1234|5678||IP|||||||||... Filler updates status to IP, processing proceeds

OBR|...

...

Multiple Order Replacement

Filler recommends replacing the three orders with two orders (Filler to Placer OML^O21):

...

ORC|RP|1234|5678||HR|||||||PY|... First order to replace

TQ1|||||<start>|<stop>|||||HR|...

OBR|...

ORC|RP|1235|5679||HR|||||||PY|... Second order to replace

TQ1|||||<start>|<stop>|||||HR|...

OBR|...

ORC|RP|1236|5680||HR|||||||PY|... Third order to replace

TQ1|||||<start>|<stop>|||||HR|...

OBR|...

ORC|RC||5690||HR|... First replacement order

OBR|...

NTE|...

ORC|RC||5691||HR|... Second replacement order

OBR|...

NTE|...

...

Placer returns immediate ORL^O22 acknowledgement with placer order numbers (not shown)...

Multiple Order Replacement

Placer accepts one recommendation, declines one, and adds an additional replacement order (Placer to Filler OML^O21):

...
ORC|RP|1234|5678||HR|||||||||PY|... First order to replace (RP control, order still HR, PY reason)
OBR|...
ORC|RP|1235|5679||HR|||||||||PY|... Second order to replace (RP)
OBR|...
ORC|RP|1236|5680||HR|||||||||PY|... Third order to replace (RP)
OBR|...
ORC|RA|2236|5690||HR|... Accepted recommendation (RA)
OBR|...
NTE|...
ORC|RD|2237|5691||HR|... Declined recommendation (RD)
OBR|...
NTE|...
ORC|RO|2238|||... New replacement order (RO) added by Placer
OBR|...
NTE|...
...

Filler confirms replacement (Filler to Placer ORL^O22):

...
ORC|RQ|1234|5678||RP|||||||||PY|... First is replaced (RQ, status replaced RP)
OBR|...
ORC|RQ|1235|5679||RP|||||||||PY|... Second is replaced (RQ)
OBR|...
ORC|RQ|1236|5680||RP|||||||||PY|... Third is replaced (RQ)
OBR|...
ORC|RA|2236|5690|||... Accepted recommendation (RA)
OBR|...
NTE|...
ORC|RD|2237|5691|||... Declined recommendation (RD) consider status code DR
OBR|...
NTE|...
ORC|RO|2238|6123|||... New replacement order (RO) now with filler order number

Order Replacement Using TQ1

...
ORC|NW|1234||... New order with Placer order number
OBR|...
...

Begin LCC -- Filler recommends a change in this order (Filler to Placer OML^O21):

...
ORC|RP|1234|5678||HR|||||||PY|... RP control code, HR status, PY control code reason
TQ1|||||<start>|<stop>||||HR|... Time window for response, HR new role
OBR|...
ORC|RC||5679||HR|... RC recommended replacement, HR status
OBR|...
NTE|... Additional information
...

Placer immediately acknowledges the recommendation (Placer to Filler ORL^O22):

...
ORC|RR|1234|5678||HR|||||||PY|... RR control code
TQ1|||||<start>|<stop>||||HR|...
OBR|...
ORC|RC|1504|5679||HR|... Placer order number added
OBR|...
NTE|...

TQ1 segments are not required in the remaining messages

Order Replacement Using REL

- REL Clinical Relationship defined in v. 2.6

HL7 Attribute Table - REL – Clinical Relationship Segment

SEQ	LEN	C.LEN	DT	OPT	RP/#	TBL#	ITEM #	ELEMENT NAME	
1	1..4		SI	C			02240	Set ID –REL	
2			CWE	R			02241	Relationship Type	*
3			EI	R			02242	This Relationship Instance Identifier	
4			EI	R			02243	Source Information Instance Identifier	*
5			EI	R			02244	Target Information Instance Identifier	*
6			EI	O			02245	Asserting Entity Instance ID	*
7			XCN	O			02246	Asserting Person	
8			XON	O			02247	Asserting Organization	
9			XAD	O			02248	Assertor Address	
10			XTN	O			02249	Assertor Contact	*
11			DR	O			02250	Assertion Date Range	*
12	1..1		ID	O		0136	02251	Negation Indicator	
13			CWE	O			02252	Certainty of Relationship	
14		5=	NM	O			02253	Priority No	
15		5=	NM	O			02254	Priority Sequence No (rel preference for consideration)	
16	1..1		ID	O		0136	02255	Separability Indicator	

Order Replacement Using REL

Initial message from Placer to Filler (Lab order OML^O21):

...

ORC|NW|1234||... New order with Placer order number

OBR|...

...

Begin LCC:

...

ORC|RP|1234|5678||HR|||||||||PY|... RP control code, HR status, PY cc reason

OBR|...

ORC|RC||5679||HR|... RC recommended replacement order

OBR|...

NTE|...

REL||RP|999|5679|1234 5678|<FillerID>||||<startTime>^<endTime>|...

...

REL segments are not required in the remaining messages

Implementation Notes

- No timing data, status update only
 - No structural changes needed
 - Placer can't report time window or escalate
- TQ1 segment
 - Provides timing data, may benefit TQ1 usage
 - Requires new TQ1 field and codes
- REL segment
 - Timing data, contact information, no new fields
 - Requires message structure change, usage not well established (no other use cases or examples), awkward many-to-many replacements

Order Control Codes

Recommended Order Replacement

ORC-1, Order control code (*new)

RP	Order to be replaced	Recommendation and replacement messages (orders to replace)
RC*	Recommended change	Recommendation, ack, and update messages for orders that are recommended changes
RA*	Recommendation accepted	Recommendation, ack, and replacement messages for accepted proposed orders
RD*	Recommendation declined	Recommendation, ack, and replacement messages for declined proposed orders
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
RR	Request received	Ack messages for orders to replace or cancel

ORC-5, Order status (*new)

HR*	Hold for revision	Recommendation and ack message for orders to be replaced or canceled, indicating “on hold” status
-----	-------------------	---

Reason for Recommendation Codes

Recommended Order Replacement

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

TQ1 Role Codes

TQ1-15, Role codes (defaults to service timing, *new)

ST* Service Timing TQ1 data refers to the timing of the order action (default)

HR* Hold for Revision TQ1 data refers to the timing of a hold on the order

Specimen Management

- Order replacement after specimen receipt
 - If specimen(s) are available, include SPM segments referencing the appropriate specimen after each recommended order
 - If no SPM segment for an order, new specimen is required
- Order modification is inherently order-centric; specimen-centric messages (O33 and O35) are not supported

Results Fulfillment

- 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

Fulfillment Workflow

- From results review at results tracker...
- Directly trigger a follow up request on a particular result, indicate type, add comment
- Request sent to Filler as order with link to original result
- Filler creates report indicating actions and outcome
- Filler may create addendum/amendment/annotation for original result extending the information it provides

Fulfillment Implementations

How to reference previous orders and results for follow up?

- Fulfillment target result may be a discrete result, a report, a panel of results, or one result from a panel

1. Child order linked to parent results
 - “Verify my parent’s results”
2. Observation Instance Identifier indicating fulfillment target
 - OBX-21, v. 2.6, Entity Identifier (EI)
 - OBR-46, Supplemental Service Information?
3. REL segment indicating fulfillment target

Result Fulfillment

Parent-Child Linkage

Clinician working from order review requests verification of a serum porcelain test (OML^O21):

```
...
ORC|PA|1234|2208|...           Parent ORC = target order
ORC|CH|1567|||||1234^2208|...   New child ORC (fulfillment order)
OBR||1567||50595-8^Interp^LN|...|88888-2&Serum porcelain&LN^45||1234^2208|... New child OBR (fulfillment order)
OBX...                          Additional detail and description
PID...                          Start of previous results
PV1...
OBR||1234|2208|...           Target OBR = parent order
OBX|3|NM|88888-2&Serum porcelain&LN|45|...   Target OBX = parent result
OBR...                          Additional orders/results for context
OBX...
...
```

ORC-8 Parent order
OBR-26 Parent result
OBR-29 Parent order

Interpretation order with parent => interpret parent

Result Fulfillment

Observation Instance Identifier Linkage

Clinician working from order review requests verification of a serum porcelain test (OML^O21):

```
...
ORC|NW|1567|...           New fulfillment order
OBR||1567||50595-8^Pathol Interp^LN|...|HL-9876|... Observation Instance Identifier in field 46
OBX...                   Additional detail and description from clinician
PID...                   Start of previous results
PV1...
OBR||1234|2208|...       Target OBR
OBX|3|NM|88888-2&Serum porcelain&LN||45|...|HL-9876|... Target OBX with Observation Instance Identifier in field 21
OBR...                   Additional orders/results for context
OBX...
...
```

OBX-21 Observation Instance Identifier (EI)
OBR-46 Placer supplemental service information

Result Fulfillment

REL Segment

Clinician working from order review requests verification of a serum porcelain test (OML^O21):

```
...
ORC|NW|1567|...           New fulfillment order
OBR||1567||99999-1^Pathol Interp^LN|...   LOINC code for result interpretation
OBX...                     Additional detail and description from clinician
REL|T|9999|1567|HL-9876|...   Target relationship between this order and the OBX below
OBR||1234|2208|...         Target OBR (previous orders/results)
OBX|3|NM|88888-2&Serum porcelain&LN||45|...|HL-9876|...   Target OBX with Observation Instance Identifier in field 21
OBR...                     Additional orders/results for context
OBX...
...
```

Implementation Issues

- Parent-Child
 - No HL7 changes needed
 - Not the usual use of parent-child, targets result indirectly (target order, then use result identifier and subidentifier)
- Observation Instance Identifier (OBX-21)
 - Targets result directly
 - OBX-21 OII entity identifier not well defined; not the typical use for OBR-46
- REL segment
 - Targets results directly
 - Requires OII and REL segment pre-adoption 2.5.1

Service Identifiers for Fulfillment

LOINC

- 59465-5 Pathologist review of results
- 50595-8 Pathologist interpretation of unspecified specimen tests
- 14869-2 Pathologist review of blood tests
- 21026-0 Pathologist interpretation of blood tests
- 32144-8 Pathologist review of serum or plasma results
- 21025-2 Pathologist interpretation of body fluid tests

Other

- | | |
|----------------------------|--|
| Verify observation values | Results inconsistent with clinical impression |
| Test error | Incorrect test carried out |
| Result error | Incorrect result |
| Process quality annotation | Other issues (sample handling, reporting, TAT) |