Chapter 7
Observation Reporting

7.1 INTRODUCTION AND OVERVIEW

This chapter describes the transaction set required for sending structured patient oriented clinical data from one computer system to another. A common use of these transaction sets will be to transmit observations and results of diagnostic studies from the producing system (e.g., clinical laboratory system, EKG system) (the filler), to the ordering system (e.g., HIS order entry, physician's office system) (the placer). However, the transaction set is not limited to such transactions. Observations can be sent from producing systems to archival medical record systems (not necessarily the order placer) and from such medical record systems to other systems that were not part of the ordering loop, e.g., an office practice system of the referring physician for inpatient test results ordered by an inpatient surgeon.

These transaction sets permit the transmission of any kind of clinical observations including (but not limited to) clinical laboratory results, the results of imaging studies (excluding the image), EKG pulmonary function studies, measures of patient status and condition, vital signs, Intake and output, severity and/or frequency of symptoms, drug allergies, problem lists, diagnostic lists, physician and nursing history, physicals, progress notes, operative notes and so on. These transaction sets carry information that is reported as text, numeric or categorical values. These messages do not carry the images or tracings themselves. (See ACR NEMA Publication 300-1988 *Digital Imaging and Communications Standard*, for image standards, and ASTM E1467.91 *Standard specification for transferring digital neurophysiological data between independent computer systems*, for transmitting EEG and EMG tracings.)

An observation can be one of many data types. The main ones are text, numbers and codes. This provides the flexibility needed to transmit observations that are recorded as continuous values (e.g., glucose, diastolic blood pressure), as categorical values, e.g., patient position (sitting, reclining or standing), VDRL (reactive, weakly reactive or nonreactive), or as text. An entire History and Physical could be transmitted as an observation whose value is one large chunk of formatted text.

This chapter provides mechanisms for transmitting *structured*, record-oriented reports. This means that individual observations are transmitted as separate logical entities (objects), and within this entity, separate fields are defined for identifying the observation, its values, its units, normal ranges, etc, such that the receiving system can "understand," reorganize and/or react to the contents of these messages. Structured reports are to be distinguished from text oriented reports which can also be transmitted via HL7 using the UDM message described in Chapter 2. The latter are ASCII images of nonstandard printed reports intended for display to humans. For practical purposes their contents are not "understandable" to the computer.

Observations may be transmitted in a solicited (in response to a query) or unsolicited mode. In the solicited mode, a user requests a set of observations according to criteria transmitted by the user. The sending system responds with

existing data to satisfy the query (subject to access controls). Queries do not elicit new observations by the target system, they simply retrieve "old" observations. (See Chapter 2 for full discussion of the query transmission.)

The unsolicited mode is used primarily to transmit the values of new observations. It is the mode used by producing services to return the values of observations requested by an ordering system. A laboratory system, for example, would usually send the results of an AM electrolytes to the ordering HIS via the unsolicited mode. An intensive care system would send the blood pressures to the same HIS by the same mode. Calling such transactions unsolicited may sound like a misnomer, but is not. The placing service solicits the producing service to make the observation. It could also (through a query) solicit the value of that observation after it has been made. However, such an approach would demand continuous polling of the producing system until the result was produced. Using the unsolicited mode, the producing service returns the value of an observation as soon as it is available. The unsolicited mode can also be used to transmit new results to a system (e.g. an archival medical record system) that did not order the observation. The transactions that define these modes are more fully described in Section 7.2.

Observations are usually ordered and reported as sets (batteries) of many separate observations. Physicians order electrolytes (consisting of sodium, potassium, chloride, bicarbonate) or vitals (consisting of diastolic blood pressure, systolic blood pressure, pulse, and temperature). Moreover, tests that we may think of as single entity, e.g., cardiac echo, usually yield multiple separate measurements, e.g. left ventricular diameter, left atrial diameter, etc. Moreover, observations that are usually reported as text (e.g. the review of systems from the history and physical) can also be considered a set of separately analyzable units (e.g. cardiac history, pulmonary history, genito-urinary history, etc). We strongly suggest that all "text" clinical reports be broken down into such separate analyzable entities and that these individual entities be transmitted as separate OBX segments. Because many attributes of a set of observations taken at one time will be identical, one OBR segment serves as a header for the report and carries the information that applies to all of the individual observations in the set. In the case of ordered observations, the OBR segment is a "turn-around document" like the manual request forms it replaces. It carries information about the order to the producing service; a copy of the OBR with additional fields completed is returned with the observations to the requesting service.
Not all observations are preceded by an order. However, all observations whether explicitly ordered or initiated without an order are reported with an OBR segment as the report header.

The major segments (OBR, OBX) defined in this chapter, their fields, and the code tables have been defined in collaboration with ASTM E31.11 with the goal of keeping HL7 observation transmission the same as ASTM E1238 in pursuit of the goals of ANSI HISPP and the Message Standards Developers Subcommittee. (Many sections of this chapter have been taken with permission directly from the E1238-91 document and vice versa in pursuit of those goals).

The OBR segment provides information that applies to all of the observations that follow. It includes a field that identifies a particular battery (or panel or set) of observations (e.g., electrolytes, vital signs or Admission H&P). For simplicity we will refer to the observation set as the battery. The battery usually corresponds to the entity that is ordered or performed as a unit. (In the case of a query, observation sets may be a more arbitrary collection of observations.) The OBX segment provides information about a single observation, and it includes a field that identifies that single observation (e.g., potassium, diastolic blood pressure or admission diagnosis). Both of these fields assume master tables that define coding systems (the universe of valid identifying codes) for batteries and observations, respectively. These tables will usually be part of the producing and sending services application and (usually) include many other useful pieces of information about the observation or battery. HL7 and ASTM are currently developing a segment for transmitting such master file information between systems that produce and systems that use clinical information.

This standard does not require the use of a particular coding system to identify either batteries or single observations. These are often defined locally, within a single institution or consortium of institutions. However, they may be based on an externally defined coding standard. Chapter 2's discussion of CE data types indicates how

to identify the battery and observation coding system. We encourage the use of universal coding systems when they are available (see Figure 2-2 of Chapter 2) to facilitate the exchange of clinical information between organizations (e.g., from physician's office, to hospital or nursing home and back). Moreover, we provide suggestions about constructing codes for observations (such as the components of the history and physical, EKG, cardiac cath, etc.) that are often not included in either "universal" or local procedure coding systems. These are given in Appendix A of Chapter 7. Most of these codes are presented as extensions to the CPT4 code system. But the same construction rules could be used to extend any procedure code system.

Many parts of this document (the discussion and tables defining units, the discussion of the rules of mapping observations to OBX segments, many of the examples at the end of the chapter, and Appendix 7.A), have been copied (with permission) from ASTM E1238-91.

As is true throughout this standard, the emphasis should be on the abstract messages, defined without regard to the encoding rules. The example messages, however, are based upon the HL7 encoding rules.

7.2.1 Glossary

7.2.2.1**placer:** Person or service that requests (places order for) an observation battery, e.g., the physician, the practice, clinic, or ward service, that orders a lab test, xray, vital signs, etc. The meaning is synonymous with, and used interchangably with, requestor. See *ORC-3-placer number*, Section 4.5.2.3.

7.2.2.2**filler:** Person, or service, who produces the observations (fills the order) requested by the requestor. The word is synonymous with "producer" and includes diagnostic services and clinical services and care providers who report observations about their patients. The clinical laboratory is a producer of lab test results (filler of a lab order), the nursing service is the producer of vital signs observations (the filler of orders to measure vital signs), and so on. See *ORC-4-filler number*, Section 4.5.2.4.

7.2.2.3**battery:** A set of one or more observations identified as by a single name and code number, and treated as a shorthand unit for ordering or retrieving results of the constituent observations. Vital signs, electrolytes, routine admission tests, and obstetrical ultrasound are all examples. Vital signs (conventionally) consist of diastolic and systolic blood pressure, pulse, and respiratory rate. Electrolytes usually consist of Na+, K+, Cl-, and HCO3-. Routine admission tests might contain CBC, Electrolytes, SMA12, and Urinalysis. (Note that the elements of a battery for our purposes may also be batteries). Obstetrical ultrasound is a battery made up of traditional component measurements and the impression, all of which would be returned as separate "results" when returned to the requestor. In keeping with the mathematical conventions about set, a battery can be a single observation.

The word battery is used in this specification synonymously with the word profile or panel. The individual observation elements within a battery may be characteristic of a physiologic system (e.g., liver function tests), or many different physiologic systems.

7.2.2.4**observation:** A measurement of a single variable or a single value derived logically and/or algebraically from other measured or derived values. A test result, a diastolic blood pressure, and a single chest xray impression are examples of observations.

7.2.2.5**segment (record):** A typed aggregate of data elements (fields) describing one complete aspect of a message. For example, the information about one order is sent as type of segment (OBR), the information related to an observation is sent as another segment (OBX).

The segment in a message is analogous to a record in a database, and in previous versions of the standard we used record in place of the word segment. We have changed the nomenclature to be consistent with HL7 and other standards organizations in this version.

7.2.2.6 **field:** One specific attribute of a segment, for example, patient diagnosis, which may contain aggregates of data elements further refining the basic attribute.

7.2.2.7 **repeated value:** some fields may contain many repeat data elements. For example, the diagnoses field may contain many different diagnoses.

7.2.2.8 **field components:** a field entry may also have discernable parts or components. For example, the patient's name is recorded as last name, first name, and middle initial, each of which is a distinct entity separated by a component delimiter (sub-subfield in ASTM E1238-94 -- see footnote 15).

7.2.3 Narrative reports as batteries with many OBX results

Narrative reports from services such as Radiology usually consist of a number of subcomponents (e.g., a chest xray report may consist of a description, an impression, and a recommendation). Other studies, such as echocardiograms, contain analogous components, as well as numeric observations (e.g., left ventricular and diastolic diameter). Surgical pathology reports may contain information about multiple specimens and reports: the anatomic source, the gross description, the microscopic description, and a diagnostic impression for each specimen.

The current standard treats each component of a narrative report as a separate "test" or observation. Just as a CHEM12 is transmitted as an order segment (OBR) plus 12 OBX segments, a chest xray would be transmitted as an order (OBR) segment plus three OBX segments, one for the description, one for the impression, and one for the recommendations. Similarly, an EKG report would be transmitted as an order segment (OBR), two OBX segments for the impression and recommendation, and additional OBX segments for each EKG measurement, e.g. the PR interval, QR interval, QRS axis, and so on.

We have defined code suffixes for constructing observation IDs for the common components of narrative reports (see Table 7.1). The observation identifier for each such component is obtained by concatenating the observation battery ID (the ID in *OBR-4-universal service ID* of the preceding OBR from any coding system) with the appropriate suffix. The observation ID for a chest xray impression, for example, would be the chest xray observation ID (if CPT4, it would be 71020), a subcomponent delimiter, and the suffix, "IMP", i.e., 71020&IMP.

This same combining rule applies to other coding systems including local and universal procedural codes (see Chapter 4). For example, if a local code for EKG was E793, and the locally agreed upon designation for that local code was EKG, the impression would be identified as E793&IMP^^99EKG.

> **Note:** The "99EKG" in the 3rd component is included to indicate a local code. The EKG's description, in this case, would be E793&GDT^^99EKG.

Optionally, when agreed upon by the sender and receiver, the "observation ID" component of a result segment could be omitted when they are the same as the observation ID of the preceding OBR. In this case, only the ampersand and the suffix would have to be sent, e.g., &IMP or &REC, in *OBX-3-observation identifier* of

a result segment. The full code would be assumed as the test identifier (recorded in the order segment) plus the category identifier recorded in the observation segment.

Figure 7-1 Observation ID suffices

Coded Results	Suffix	Type
Diagnostic impression	IMP	CE
Recommendation	REC	CE
Confirming Procedures	CNP	CE
Procedure medication	MED	CE
Anatomic site	ANT	CE
Device/instrument	DEV	CE
Serial # device/instrument	SER	ST
Bulk Text Reports		
Gross or general description of the study	GDT	TX or FT
Microscopic or secondary description	MDT	TX or FT
Technician's comment	TCM	TX or FT
Addendum note	ADT	TX or FT
Other		
Diagnosis onset date/time	ITM	TS
Diagnosis resolution date/time	RTM	TS
Comparison study	CMS	CE
Comparison date/time	CMT	TS
Comparison results	CMR	CE
Comparison change	CMC	CE
Predicted value	PRD	ST
Percent predicted	PPR	ST
After drug observed	AFD	ST
Predicted value after drug	ADP	ST
Percent predicted after drug	APP	ST

7.2.5 Suffixes for defining observation IDs for common components of narrative reports

The following subsections define each of the suffixes.

7.2.6.1 Diagnostic impressions (IMP)

When the suffix is IMP (*OBX-3-observation identifier*), the result is a diagnosis or finding, stored as a CE data type. When multiple distinct diagnostic impressions are being reported, for example, mitral valve prolapse and aortic stenosis, each distinct impression should be sent in a separate OBX segment. More than one code may be included within one coded result segment, but only when such codes are modifiers of the principal impression, e.g. to report additional detail about the finding, not to report an entirely different finding.

The coded data type for impressions does not mean that a reporting service must actually code all such impressions. The diagnostic impression can be sent as dictated text, but the text should be sent in the second component of the CE data type to distinguish it from code, i.e. it should be preceded by a component delimiter, e.g. ^congestive heart failure.

When multiple text impressions are being reported, they should be reported in separate OBX segments to indicate that they are distinct impressions.

7.2.6.2 Recommendations (REC)

When the suffix is REC (*OBX-3-observation identifier*), the value is a CE result, representing the reading physician's recommendations about repeat testing, follow up or therapy. For example, when an ambiguous lesion result is seen on a mammogram, the reading physician might recommend a repeat mammogram in six months, or a needle biopsy immediately. The recommended procedures are recorded as codes and/or text descriptions in the coded identifier structure.

If more than one follow up study is recommended, each such recommendation is sent in a separate REC.

7.2.6.3 Confirming procedure (CNP)

The confirming procedure OBX suffix identifies additional studies used to confirm the diagnosis reported in the IMP OBX. If, for example, electron microscopy was done to confirm a surgical pathology diagnosis, the identifier for electron microscopy *OBX-3-observation identifier* would be stored as the value field of an observation ID with a confirming procedure suffix. Confirming procedures are most important in surgical pathology reports. But they might also be used by services such as endoscopy, to record the fact that a biopsy, culture, etc., was taken during the procedure.

7.2.6.4 Procedure medication (MED)

A coded result segment with a suffix of MED (*OBX-3-observation identifier*) indicates that the segment contained information about medication given as part of the procedure -- contrast medication, medication intended to invoke a physiologic response (e.g., to be used in stress testing) or premedication. When patients receive more than one procedure medication, each medication should be reported in a separate OBX medication segment. If the transmitting system has codes available for medications, they would be recorded as the first component of *OBX-3-observation identifier*. The name and/or the dosages could be included in the second component of *OBX-5-observation value*.

7.2.6.5 Anatomic site (ANT)

Some diagnostic studies include observations about more than one anatomic site within one report. If, for example, a patient had an appendectomy incidental to gallbladder surgery, the pathologist's assessment of both specimens would usually be included under a single specimen number in one report. Each distinct anatomic site would be reported as a separate OBX segment with a suffix of ANT (*OBX-3-observation identifier*).

7.2.6.6 Devices (DEV)

When required, the instrument or device which generated an observation can be transmitted as an additional "result" of the study. In this case, the suffix of *OBX-3-observation identifier* is DEV. Examples include: an automated instrument in the laboratory; an imaging device and model number in radiology; or an automatic

blood pressure machine on the ward. The device is specified as a coded entry in anticipation that these identifiers could be specified as codes. Initially, we expect that most of the information about devices will be transmitted as text in the second component of the CE identifier.

7.2.6.7 Gross or general description (GDT)

The general description suffix identifies the description component of a diagnostic studies. In the case of anatomic pathology, it applies to the macroscopic (gross) description of the specimen. If the description consists of multiple paragraphs, the paragraphs should be separated by repeat delimiters so that the receiving computer can display them as paragraphs. It will not be necessary to include a description segment for a report when the impression segment says it all, e.g., for normal studies or studies such as EKG, whose reports are traditionally terse.

7.2.6.8 Secondary or microscopic description (MDT)

For most studies, a secondary description will not be needed. In the case of surgical pathology, however, the microscopic description is a separate part of the report. It describes the histology as seen through the microscope. The microscopic description will be sent in a segment with the suffix MDT in *OBX-3-observation identifier*.

7.2.6.9 Technician comment (TCM)

This is free text stored in a result segment whose *OBX-3-observation identifier* has a suffix of TCM for technician comment. It is used to record information about technical performance of the procedure, usually recorded by the technician.

7.2.6.10 Addendum note (ADT)

Use to report information that is added as an addendum after the original dictation and sent as a separate labeled section of the report.

7.2.6.11 Diagnosis (problem) onset date-time (ITM).

Use to record the date-time that a problem was first perceived to exist.

7.2.6.12 Diagnosis (problem) resolution date-time (RTM).

Use to record the date-time that a problem became inactive, i.e., the problem was cured or remitted.

7.2.6.13 Comparison study (CMS)

When the reader of a diagnostic report compares the results for the current study with those of a previous study, this suffix allows them to report the nature of the comparison study as a separate result, i.e., an OBX segment with a segment whose observation ID has a suffix of CMS. Ordinarily, this would not be required because the observation ID in the other comparison OBX's would identify the test, if any of the other comparison values were transmitted.

7.2.6.14 Comparison date-time (CMT)

When the reader of a diagnostic procedure compares the current results with a previous study, this suffix allows them to report the date-time of the previous study (time optional) as a separate result within the current report.

7.2.6.15 Comparison results (CMR)

When the reader of a diagnostic procedure compares the current results with those of a previous study on the same patient, this suffix allows them to report the results (impression) of the previous study as a discrete result within the current report.

7.2.6.16 Comparison change (CMC)

When a diagnostic service reports a comparison between the current and a previous study, this suffix is used to report the degree of change (e.g., much worse, worse, minimal worsening, no change, slightly better, better, much better, returned to normal) as a separate result within the report.

In current dictation, information about comparison is usually contained in the descriptions of the study. The provision of the comparison suffixes listed above do not imply a *requirement* to send this information as separate components. The comparison variables are only meant to be enabling. When a system would like to transmit them as discrete report components, these suffixes give them the option.

7.2.6.17 Predicted (PRD)

When an observation has a predicted value as is the case for many spirometry tests, this suffix identifies the predicted observation as distinguished from the actual observation. The AS4 code for forced vital capacity is 94010.1 (see appendix 7A). The predicted forced vital capacity would be 94010.1&PRD.

7.2.6.18 Percent of predicted (PPR)

This is a computed observation = (actual observation)/(predicted observation). For forced vital capacity the percent predicted would be identified as 94010.1&PPR.

7.2.6.19 After drug observed (AFD)

An observation might be taken before and after a drug is given. This occurs especially in Spirometry. The predose observation is identified by the base ID. The post drug measure is identified by the AFD suffix. Using the AS4 base code for the forced vital capacity the post drug result would be identified by 94010.1&AFD.

7.2.6.20 Predicted value after drug (ADP)

The post drug predicted value is identified by the suffix, ADP. Following the pattern of the above example, it would be 94010.1&ADP.

7.2.6.21 Percent predicted after drug (APP)

The percent predicted after drug is identified by applying the suffix, APP to the base code -- 94010.1&APP if using the AS4 code for forced vital capacity.

7.2.6.22 Expanded AS4 codes

To accommodate the additional observations included in the expanded scope of this revision, we have expanded the AS4 codes in Appendix 7.A for identifying clinical observations. [1]

7.2.7 Identifying reporting units

7.2.8.1 Background

When an observation's value is measured on a continuous scale, one must report the measurement units within the units field of the OBX segment. In HL7 version 2.2 of the specification, all fields that report units are of data type CE. The default coding system for the units codes consists of the ISO abbreviation for a single case unit (ISO 2955-83) plus extensions that do not collide with ISO abbreviations. We designate this coding system as ISO+ (see Figure 7-5). Both the ISO unit's abbreviations and the extensions are defined in section 7.1.4.2. The ISO+ abbreviations *are* the codes for the default coding system. Consequently, when ISO+ units are being used, only ISO+ abbreviations need be sent, and the contents of the units field will be backward compatible to HL7 version 2.1 and ASTM 1238-88.

We strongly encourage observation producers to use ISO+ abbreviated units exclusively, but permit the use of other code systems, including US customary units (ANSI X3.50) and locally defined codes where necessary. Local units are designated "L" or 99zz where z is an alpha numeric character. ANSI X3.50 -1986 provides an excellent description of these standards, as well as a table of single case abbreviations for US customary units such as foot or gallon.

We had originally intended to include the ANSI X3.50 - 1986 US customary units in the default ISO+ coding system. However, there are overlaps between ISO's abbreviations and the abbreviations for US customary units. For example, "ft" is the abbreviation for foot in US customary units and for femtotesla in ISO; "pt" is the abbreviation for pint in US customary and for picotesla in ISO. (Be aware that the ANSI document also differs from the ISO document regarding the abbreviation of a few ISO units, as well.) In order to avoid potential ambiguity, we have defined another coding system, designated ANS+. It includes the US customary units (e.g., feet, pounds) and "ISO" abbreviations defined in ANSI X3.50-1986, as well as other non-metric units listed in Table 24 and the ISO combinations of these units. Be aware that a few of the ANSI "ISO" unit abbreviations differ from their abbreviations in ISO (see note at bottom of table 24). Because the ANS+ specification includes both "ISO" and US customary units, as well as miscellaneous non-metric units, some of the abbreviations are ambiguous. Although there should be little confusion, in the context of a particular observation, this ambiguity is a good reason for avoiding ANS+ unit codes when possible.

When ANS+ units codes (abbreviations) are being transmitted, "ANS+" must be included in the 3rd (6th) component of the field. If the units of distance were transmitted as meters (ISO+) it would be transmitted as "m" because ISO+ is the default coding system for units. However, if transmitted in the US customary units of feet, the units would be transmitted as "ft^^ANS+". When required, the full text of the units can be sent as the second component in keeping with the CE data type conventions.

[1] These AS4 codes are taken directly from ASTM 1238-91, and are printed/adopted with their permission.

Both ISO and ANSI also provide a set of mixed case abbreviations, but these abbreviations cannot be translated to single case without loss of meaning, and should not be used in this specification whose content is required to be case insensitive.

7.2.8.2 ISO and ANSI customary units abbreviations

ISO builds its units from seven base dimensions measured as meters, kilograms, seconds, amperes, kelvins, moles and candelas (see Figure 7-2). Other units can be derived from these by adding a prefix to change the scale and/or by creating an algebraic combination of two or more base or derived units. However, some derived units have acquired their own abbreviations (see Figure 7-2). Abbreviations for U.S. customary units are given in Figure 7-3.

The ISO rules, well explained in ANSI X3.50, provide a way to create units of different scales by adding "multiplier" prefixes. These prefixes can be expressed as "words" or abbreviations. In this standard we are only concerned with the abbreviations.

Figure 7-2 ISO single case units abbreviations

Units	Abbreviation	Units	Abbreviation	Units	Abbreviation
Base units code/abbreviations					
ampere	a	kelvin	k	meter	m
candela	cd	kilogram	kg	mole	mol
				second	s
Derived units with specified name and abbreviation					
coulomb	c	hour	hr	pascal	pal
day	d	joule	j	volt	v
degree Celsius	cel	minute (time)	min	watt	w
farad	f	newton	n	weber	wb
hertz	hz	ohm	ohm	year	ann
Other units					
atomic mass unit	u	grey	gy	minute of arc	mnt
bel	b	henry	h	radian	rad
decibel	db	liter	l	siemens	sie
degree	deg	lumen	lm	steradian	sr
gram	g	lux	lx	tesla	t
See ISA 2955-1983 for full set					

The ISO abbreviations for multiplier prefixes are given in Figure 7-4. Prefixes ranging from 10^{-18} (1/billion billionth) to 10^{18} (a billion billion) are available. The single case abbreviation for kilo (x1000) is "k". A unit consisting of 1000 seconds would be abbreviated as "ks", 1000 grams as "kg", 1000 meters as "km", and so on. Some prefixes share the abbreviation of a base unit. Farad and femto, for example, (10^{-18}) both have the abbreviation of "f". To avoid confusion, ISO forbids the use of solitary prefixes. Thus, "f" always means farad, "ff" would mean 1 million billionth of a farad. Compound prefixes are not allowed.

A unit can be raised to an exponential power. Positive exponents are represented by a number immediately following a unit's abbreviation, i.e., a square meter would be denoted by m2. Negative exponents are signified by a negative number following the base unit, e.g., "$1/m^2$" would be represented by as "m-2". The multiplication of units is signified by a period (.) between the units, e.g., meters X seconds would be denoted "m.s". Notice that spaces are not permitted. Division is signified by a slash (/) between two units, e.g. meters per second would be denoted as "m/s". Algebraic combinations of ISO unit abbreviations

constructed by dividing, multiplying, or exponentiating base ISO units, are also valid ISO abbreviations units.

Figure 7-3 ANSI+ unit codes for some U.S. customary units

Units	Abbreviation	Units	Abbreviation	Units	Abbreviation
LENGTH		VOLUME		TIME	
inch	in	cubic foot	cft	year	yr
foot	ft	cubic inch	cin	month	mo
mile (statute)	mi	cubic yard	cyd	week	wk
mautical mile	nmi	tablespoon	tbs	day	d
rod	rod	teaspoon	tsp	hour	hr
yard	yd	pint	pt	minute	min
		quart	qt	second	sec
		gallon	gal		
		ounce (fluid)	foz		
AREA		MASS			
square foot	sqf	dram	dr		
square inch	sin	grain	gr (avoir)		
square yard	syd	ounce (weight)	oz		
		pound	lb		
Other ANSI units, derived units, and miscellanous					
**British thermal unit	btu	**degrees fahrenheit	degf	**millirad	mrad
cubic feet/minute	cft/min	**feet/minute	ft/min	**RAD	rad

Note the abbreviations for conventional U.S. units of time are the same as ISO, except for year. ISO = ANN, AMSI = yr. The metric units in X3.50 are the same as ISO, except for: pascal ("pa" in ANSI, "pal" in ISO); ANSI uses "min" for both time and arc while ISO uses "mnt" for minutes of arc; and in ISA seconds are abbreviated "s", in ANSI, "sec".

This list is not exhaustive. Refer to ANSI X3.50-1986, Table 1, for other metric and standard U.S. units.

**Non-metric units not explicitly listed in ANSI

Figure 7-4 Single case ISO abbreviations for multiplier prefixes

Prefix		Code	Prefix		Code
exa	10^{18}	ex	atto	10^{-18}	a
peta	10^{15}	pe	femto	10^{-15}	f
tera	10^{12}	t	pico	10^{-12}	p
giga	10^{9}	g	nano	10^{-9}	n
mega	10^{6}	ma	micro	10^{-6}	u
kilo	10^{3}	k	milli	10^{-3}	m
hecto	10^{2}	h	centi	10^{-2}	c
deca	10^{1}	da	deci	10^{-1}	d

Figure 7-5 lists the abbreviations for common ISO derived units. It also includes standard unit abbreviations for common units, e.g., Milliequivalents, and international units, mm(Hg), and for counting per which we denote by a division sign, a denominator, but no numerator, e.g., /c, that are not part of the above referenced ISO standards.

Figure 7-5 Common ISO derived units and *ISO extensions

Name	Code/Abbr.	Name	Code/Abbr.
1/L	/l	Picosecond	ps
*10^3/Liter	10*3/l	Microgram	ug
*10^6/Liter	10*6/l	Microgram/Deciliter	g/dl
*10^9/Liter	10*9/l	Microgram/Gram	ug/g
*10^{12}/Liter	10*12/l	Microgram/Liter	ug/l
*1/milliliter	1/ml	Microgram/Minute	ug/min
*10^3/milliliter	10*3/ml	Microgram/Day	ug/d
*10^6/milliliter	10*6/ml	*Micro katel	ukat
*10^9/milliliter	10*9/ml	Micro meter = Micron	um
*1000 red blood cells	10*3(rbc)	Micro mole	mol
Beats Per Min	/min	Micro second	us
*Bodansky U	(bdsk_u)	*Milliequivalents	meq
*Body surface area	(bsa)	*Microequivalents	ueq
*Calories	(cal)	Milliequivalents/Liter	eq/l
*Catalytic Fraction	1	Milligram/Day	g/d
Cells/Liter	/l	Milligram/Deciliter	g/dl
*CM of Water	cm (h20)	Milligram/Liter	g/l
*Colony Forming Units	(cfu)	Milligram/Min	g/min
Day	d	Milligram	mg
Decibels	db	Milligram/Deciliter	g/dl
*Decibels a Scale	dba	Milligrams/Cubic Meter	g/m3
Degrees Celsius	cel	Milliliter	ml
Degrees of Angle	deg	Milliliter/Minute	l/min
Femtogram	fg	Milliliter/Second	ml/s
Femtoliter	fl	Millimeter	mm
Femtomole	fmol	*Millimeter (HG)	m(hg)
*Fibers/ml	/ml	Millimeter/HR	m/hr
*grams creatinine	g(creat)	Millimole/Liter	mol/l
*grams hemoglobin	g(hgb)	Millimoles/Day	mol/d
*grams total nitrogen	g(tot_nit)	*Milliosmols/Liter	osm/l
*grams total protein	g(tot_prot)	*Milliunits/Milliliter	iu/ml
*Grams wet weight tissue	g(wet_tis)	Moles/Kilogram	ol/kg
Gram/Deciliter	g/dl	Moles/Liter	ol/l
Gram/Liter	g/l	Moles/Second	ol/s
Grams	g	Nanogram	ng
*International Units	iu	*Nanokatel	nkat
*International Unit/Day	iu/d	Nanometer	nm
*International Unit/Milliliter	iu/ml	Nanosecond	ns
*International Unit/Liter	iu/l	Nanogram/Liter	ng/l
*kg body weight	kg(body_wt)	Nanogram/Milliliter	g/ml
*Katal	at	Nanomoles/Second	mol/s
*Katal/Kilogram	kat/kg	*O.D. (optical density)	(od)
*Katal/Liter	kat/l	*P.U.	(pu)
Kilocalories	(kcal)	*Pa	(pa)
Kilogram/liter	kg/l	*pH	(ph)
Kilograms	kg	*Particles/Total Count	(tot)
*Kunkel U	(knk_u)	*Particles/Cubic Meter	/m3
Lumen	lm	*Particles/Liter	/l
Lumen Per Squre Meter	lm/m2	*Parts Per Billion	ppb)
*MacLagan U	(mclg_u)	*Parts Per Million	ppm)
Meters	m	Pascal	pal
Meters/Second	m/s	*Per High Power Field	(hpf)
Meters/Second^2	m/s2	*Percent	%
*Micro international unit	uiu	Picogram	pg
Picogram/Milliliter	pg/ml	Picogram/Liter	pg/l
*Picokatel	pkat	*Todd U	td_u)
Picometer	pm	Volume Fraction	1

*Picomole	pmol		
* Starred items are not genuine ISO, but do not conflict.			

7.2.8.3 Local unit codes

Local codes can be used for the units by indicating the code source of "L" in the third component. In the case of local codes, the text name of the codes or the description of the units should also be transmitted (in the second component), so that the receiving system can compare the results with results for the same measurement sent by another service. An "L" should be stored in the third component to indicate that the code is locally defined. More specialized local code designations, as specified in the CE data type definition, can also be employed.

7.3 MESSAGE DEFINITIONS

The triggering events that follow are all served by the ORU (Observational report - Unsolicited) or the ORF (Observational Report Response) messages in combination with ACK and QRY. Each triggering event is listed below, along with the messages exchanged, and the segments that comprise the messages. The notation used to describe the sequence, optionality, and repeating of segments is described in Chapter 2, "Format for Defining Abstract Messages."

7.4.1 ORU - unsolicited transmission of an observation

With the type (OBX) defined in this chapter, and the OBR defined in Chapter 4, one can construct almost any clinical report as a three-level hierarchy, with the PID segment defined in Chapter 3 at the upper level, an order record (OBR) at the next level and one or more observation records (OBX) at the "bottom."

One result segment (OBX) is transmitted for each component of a diagnostic report, such as an EKG or obstetrical ultrasound or electrolyte battery.

```
ORU          Observational Results (Unsolicited)   Chapter

MSH          Message Header                 2
{
  [
   PID       Patient Identification         3
   [{NTE}]   Notes and comments             2
   [PV1]     Patient Visit                  3
  ]
   {
   [ORC]     Order common                   4
    OBR      Observations Report ID         7
    {[NTE]}  Notes and comments             2
     {
      [OBX]  Observation/Result             7
       {[NTE]} Notes and comments           2
     }
   }
```

}
[DSC] Continuation Pointer

ACK	Acknowledgement	Chapter
MSH	Message header	2
MSA	Message acknowledgement	2

Note: The ORC is permitted but not required in this message. Any information that could be included in either the ORC or the OBR must be included in the OBR on reporting. Notice also that the ORU (and the QRY) messages accommodate reports about many patients.

Many report headers (OBR) may be sent beneath each patient segment, with many separate observation segments (OBX) beneath each OBR. Note segments (NTE) may be inserted after any of the above segments. The note segment applies to the entity that immediately precedes it, i.e., the patient if it follows the PID segment, the observation if it follows the OBR segment, and the individual result if it follows the OBX segment.

7.4.3 Query for results of observation

QRY	Query	Chapter
MSH	Message Header	2
QRD	Query Definition	2
QRF	Query Filter	2

ORF	Observational Report	Chapter
MSH	Message Header	2
MSA	Message Acknowledgement	2
{		
QRD	Query Definition	2
[QRF]	Query Filter	2
[PID]	Patient ID	3
[{NTE}]		
}		
{		
[ORC]	Order common	
OBR	Observation request	7
{[NTE]}	Notes and comments	2
{		
[OBX]	Observation/Result	7
{[NTE]}	Notes and comments	2
}		
}		
[DSC]	Continuation Pointer	2

7.4.4.1 Query usage notes

Display-oriented results reporting is described in Chapter 2, Section 2.7. The QRD and QRF segments are defined in Chapter 2, Section 2.8.

The subject filters contained in the QRD and QRF segments are defined by local agreement between the inquiring system and the ancillary system.

The Set ID fields in the various segments (including PID) are used to count the number of segments of one kind transmitted at one level of the hierarchy.

The Query Result Level field of the QRD determines the amount of data requested. See Chapter 2, Section 2.10.

7.5 SEGMENTS

The full definitions of many segments required for reporting clinical observations are included in other chapters. The patient identifying segment (PID) is provided in Chapter 3. The NTE segment is in Chapter 2. We include a section on OBR in this chapter, but it includes only a brief description and a table listing the

fields. This is included for the convenience of the reader. The full definition of the OBR segment is given in Chapter 4, Section 4.8.

7.6.1 OBR - Observation request

In the reporting of clinical data, the OBR serves as the report header. It identifies the observation set represented by the following atomic observations. It includes the relevant ordering information when that applies. It contains many of the attributes that usually apply to all of the included observations.

When a set of observations is ordered, the order message contains an OBR segment. However, observations can be collected and reported without an antecedent order. When observations are reported, the report message also includes one or more OBR segments. So, the OBR segment is like a turn-around document. Some fields in the OBR segment apply only to the ordering message and some to the reporting message. To those familiar with health care procedures, these should be obvious from their names (e.g., transcriptionist or principal result interpreter could only apply to the reporting phase). However, we have also flagged them in Table 7.6 to indicate whether placer, filler, or both may send data in a given field.

Figure 7-6 OBR attributes

SEQ	LEN	DT	R/O	RP/#	TBL#	Item#	Element Name
1	4	SI				00237	Set ID - Observation Request
2	75	CM				00216	Placer Order Number
3	75	CM				00217	Filler Order Number +
4	200	CE	R			00238	Universal Service ID
5	2	ID				00239	Priority
6	26	TS				00240	Requested Date/time
7	26	TS	C			00241	Observation Date/Time #
8	26	TS	C			00242	Observation End Date/Time #
9	20	CQ	C			00243	Collection Volume *
10	60	CN		Y		00244	Collector Identifier *
11	1	ID			0065	00245	Specimen Action Code *
12	60	CM				00246	Danger Code
13	300	ST				00247	Relevant Clinical Info.
14	26	TS	C			00248	Specimen Received Date/Time ‡
15	300	CM			0070	00249	Specimen Source *
16	60	CN		Y		00226	Ordering Provider
17	40	TN		Y/2		00250	Order Callback Phone Number
18	60	ST				00251	Placer field 1
19	60	ST				00252	Placer field 2
20	60	ST				00253	Filler Field 1 +
21	60	ST				00254	Filler Field 2 +
22	26	TS	C			00255	Results Rpt/Status Chng - Date/Time +
23	40	CM				00256	Charge to Practice +
24	10	ID			0074	00257	Diagnostic Serv Sect ID
25	1	ID	C		0123	00258	Result Status +
26	200	CM				00259	Parent Result +
27	200	TQ		Y		00221	Quantity/Timing
28	150	CN		Y/5		00260	Result Copies To
29	150	CM				00261	Parent Number +
30	20	ID			0124	00262	Transportation Mode
31	300	CE		Y		00263	Reason for Study
32	60	CM				00264	Principal Result Interpreter +
33	60	CM		Y		00265	Assistant Result Interpreter +
34	60	CM		Y		00266	Technician +
35	60	CM		Y		00267	Transcriptionist +
36	26	TS				00268	Scheduled Date/Time +

The complete description of these fields is given in Chapter 4.

* Placer sends
† Filler sends
‡ Either may send - depends on whether specimen is required and who collects, filler or placer.

7.6.3 OBX - Observation/Result segment

The OBX segment is used to transmit a single observation or observation fragment. It represents the smallest indivisible unit of a report. Its structure is summarized in Figure 7-7.

Its principal mission is to carry information about observations in report messages. But the OBX can also be part of an observation order (see Section 4.2). In this case, the OBX carries clinical information needed by the filler to interpret the observation the filler makes. For example, an OBX is needed to report the inspired oxygen on an order for a blood oxygen to a blood gas lab, or to report the menstrual phase information which should be included on an order for a pap smear to a cytology lab. Appendix 7.A includes codes for identifying many of pieces of information needed by observation producing services to properly interpret a test result.

Figure 7-7 OBX attributes

SEQ	LEN	DT	R/O	RP/#	TBL#	ITEM#	ELEMENT NAME
1	4	SI	O			00569	Set ID - Observational Simple
2	2	ID	R		0125	00570	Value Type
3	80	CE	R			00571	Observation Identifier
4	20	ST	C			00572	Observation Sub-ID
5	65536[2]	*	C			00573	Observation Value
6	60	CE				00574	Units
7	60	ST				00575	References Range
8	10	ID		Y/5	0078	00576	Abnormal Flags
9	5	NM				00577	Probability
10	5	ID			0080	00578	Nature of Abnormal Test
11	2	ID	R		0085	00579	Observ Result Status
12	26	TS				00580	Date Last Obs Normal Values
13	20	ST				00581	User Defined Access Checks
14	26	TS				00582	Date/Time of the Observation
15	60	CE				00583	Producer's ID
16	60	CN				00584	Responsible Observer

7.3.2.0 OBX field definitions

7.6.4.1 Set ID - observation simple (SI) 00569

Definition: sequence number. For compatibility with ASTM.

7.6.4.2 Value type (ID) 00570

Definition: format of the observation value in OBX. If the value is CE then the result must be a coded entry. When the value type is TX or FT then the results are bulk text. The valid values for the value type of an observation are listed in *Table 0125 - value type*.

The observation value must be represented according to the format for the data type defined in Chapter 2, Control Section. For example, a PN consists of 6 components, separated by component delimiters.

[2]The length of the observation value field is variable, depending upon value type. See *OBX-2-value type*.

Although NM is a valid type, observations which are usually reported as numbers will often have the string (ST) data type because non-numeric characters are often reported as part of the result, e.g., >300 to indicate the result was off-scale for the instrument. In the example, ">300", ">" is a symbol and the digits are considered a numeric value.

All HL7 data types are valid except CM, because it is not a specific data type, CQ, because units for *OBX-5-observation value* are always specified explicitly in an OBX segment with *OBX-6-units* and SI sequence ID, because it only applies to HL7 message segments.

The RP value (reference pointer) must be used if the actual observation value is not sent in OBX but exists somewhere else. For example, if the observation consists of an image (document or medical), the image itself cannot be sent in OBX. The sending system may in that case opt to send a reference pointer. The receiving system can use this reference pointer whenever it needs access to the actual image through other interface standards, e.g., ACR-NEMA, or through appropriate data base servers.

Table 0125 Value type

Value	Description
ST	String data.
TX	Text data (display)
FT	Formatted text (display)
DT	Date
TM	Time
TS	Time stamp (date & time)
PN	Person name
TN	Telephone number
AD	Address
CK	Composite ID with check digit
CN	Composite ID and name
CE	Coded entry
RP	Reference pointer
NM	Numeric
TQ	Timing/quantity
ID	Coded value
SI	Sequence ID
CM	Composite
CQ	Composite quantity with units
CF	Coded element with formatted values
MO	Money

7.6.4.3 Observation Identifier (CE) 00571

Components: <identifier> ^ <text> ^ <name of coding system>^
<alternate identifier> ^ <alternate text> ^ <name of alternate coding system>

Definition: unique identifier for the observation. The format is that of the Coded Element (CE). Example: 93000.3^P-R interval.

In most systems the identifier will "point" to a master observation table that will provide other attributes of the observation that may be used by the receiving system to process the observations it receives. A proposed

set of message segments for transmitting such master observation tables is part of the master file proposal now under ballot. The relation of an observation ID to a master observation table is analogous to the relationship between a charge code (in a billing record) and the charge master.

When local codes are used as the first identifier in this field we strongly encourage sending a universal identifier as well to permit receivers to equivalence results from different providers of the same service (e.g., a hospital lab and commercial lab that provides serum potassium to a nursing home). One possible "universal" identifier is a combination of CPT4 codes and the AS4 extensions developed by ASTM (see Appendix 7A) which cover all of the common test results and physiologic variables (e.g., BP, Pulse).

7.6.4.4 Observation Sub-ID (ST) 00572

Definition: used to distinguish between multiple OBX segments with the same observation ID organized under one OBR. For example, a chest xray report might include three separate diagnostic impressions. The standard requires three OBX segments, one for each impression. By putting a 1 in the Sub-ID of the first of these OBX segments, 2 in the second, and 3 in the third, we can uniquely identify each OBX segment for editing or replacement.

The sub-identifier is also used to group related components in reports such as surgical pathology. It is traditional for surgical pathology reports to include all the tissues taken from one surgical procedure in one report. Consider, for example, a single surgical pathology report that describes the examination of gallbladder and appendix tissue. This report would be transmitted roughly as shown in Figure 7-8.

Figure 7-8 Example of sub-identifier usage

```
OBR|1|||88304&SURG PATH REPORT...
OBX|1|CE|88304&ANT|1|T57000^GALLBLADDER^SNM
OBX|2|TX|88304&GDT|1|THIS IS A NORMAL GALLBLADDER
OBX|3|TX|88304&MDT|1|MICROSCOPIC EXAM SHOWS HISTOLOGICALLY NORMAL GALLBLADDER TISSUE
OBX|4|CE|88364&IMP|1|M-00100^NML^SNM
OBX|5|CE|88304&ANT|2|T66000^APPENDIX^SNM
OBX|6|TX|88304&GDT|2|THIS IS A RED, INFLAMED, SWOLLEN, BOGGY APPENDIX
OBX|7|TX|88304&MDT|2|INFILTRATION WITH MANY PMN's - INDICATING INFLAMATORY CHANGE
OBX|8|CE|88304&IMP|2|M-40000^INFLAMMATION NOS^SNM
```

The example in Figure 5 has two segments for each component of the report, one for each of the two tissues. Thus, there are two 88304&ANT segments; there are two 88304&GDT segments, and there are two 88304&MDT segments. Segments that apply to the gallbladder all have the sub-identifier 1. Segments that apply to the appendix all have sub-identifier 2.

The observation sub ID has other grouping uses. It can be used to organize the reporting of some kinds of fluid intakes and outputs. For example, when intake occurs through multiple intravenous lines; a number of separate observations (OBX segments), the intake volume, the type of intake (Blood, D5W, Plasma, etc), the site of the IV line, etc. may be needed for each intravenous line, each requiring a separate OBX segment. If more than one IV line is running, we can logically link all of the OBX segments that pertain to the first IV line by assigning them an observation sub ID of 1. We can do the same with the second IV line by assigning them a sub ID 2 and so on. The same would apply to the outputs of surgical drains when there are multiple such drains.

Use a null or 1 when there is no need for multiples.

7.6.4.5 Observation value (*) 00573

Definition: value observed by the observation producer. *OBX-2-value type* contains the data type for this field according to which observation value is formatted. It is a required field in the OBX segment.

Representation

This field contains the value of *OBX-3-observation identifier* of the same segment. Depending upon the observation, the data type may be a number (e.g., a respiratory rate), a coded answer (e.g., a pathology impression recorded as SNOMED), or a date-time (the date-time that a unit of blood is sent to the ward). An observation value is always represented as the data type specified in *OBX-2-value type* of the same segment. Whether numeric or short text, the answer shall be recorded in ASCII text.

Reporting Logically Independent Observations

The main sections of dictated reports, such as radiologic studies or history and physicals, are reported as separate OBX segments. In addition, each logically independent observation should be reported in a separate OBX segment, i.e. one OBX segment should not contain the "result" of more than one logically independent observation. This requirement is included to assure that the contents of *OBX-6-units*, *OBX-8-abnormal flags*, and *OBX-9-probability* can be interpreted unambiguously. The electrolytes and vital signs batteries, for example, would be reported as four separate OBX segments. Two diagnostic impressions, e.g., congestive heart failure and pneumonia, would also be reported as two separate OBX segments whether reported as part of a discharge summary or chest xray report. Similarly, two bacterial organisms isolated in a single bacterial culture would be reported as two separate OBX segments.

Though two independent diagnostic "statements" cannot be reported in one OBX segment, multiple categorical responses are allowed (usually as CE data types separated by repeat delimiters), so long as they are fragments (modifiers) that together construct one diagnostic statement. Right upper lobe (recorded as one code) and pneumonia (recorded as another code), for example, could be both reported in one OBX segment. Such multiple "values" would be separated by repeat delimiters.

Multiple OBX Segments With The Same Observation ID and Sub ID

In some systems, a single observation may include "fragments" of more than one data type. The most common example is a numeric result followed by coded comments (CE). In this case, the logical observation can be sent in more than one OBX segment. For example, one segment of numeric or string data type for the numeric result and another segment of CE data type for coded comments. If the producer was reporting multiple coded comments they would all be sent in one OBX segment separated by repeat delimiters because they all modified a single logical observation. Multiple OBX segments with the same observation ID and sub ID should always be sent in sequence with the most significant OBX segment (the one that has the normal flag/units and or reference range and status flag) first. The value of *OBX-6 through 12* should be null in any following OBX segments with the same *OBX-3-observation identifier* and *OBX-4-observation sub-ID*. For the purpose of replacement or deletion, multiple OBX segments with the same observation ID and sub ID are treated as a unit. If any are replaced or deleted, they all are replaced.

Coded Values

When an OBX segment contains values of CE data types, the observations are stored as a combination of codes and/or text. In Section 7.4.4, examples of results that are represented as CE data types are shown in the first and second OBX segments of OBR 1 and the first and second OBX segments of OBR 2. The observation may be an observation battery ID (for recommended studies), a diagnostic code or finding (for

a diagnostic impression), or an anatomic site for a pathology report, or any of the other kinds of coded results.

It is not necessary to always encode the information stored within a coded observation. For example, a chest xray impression could be transmitted as pure text even though it has a CE data type. In this case, the test must be recorded as the second component of the "result code", e.g.,

```
OBX|1|CE|71020&IMP|1|^CONGESTIVE HEART FAILURE.
```

However, separate impressions, recommendations, etc., even if recorded as pure text, should be recorded in separate result segments. That is, congestive heart failure and pneumonia should not be sent as:

```
OBX|1|CE|71020&IMP|1|^CONGESTIVE HEART FAILURE AND PNEUMONIA|
```

but as:

```
OBX|1|CE|71020&IMP|1|^CONGESTIVE HEART FAILURE|
OBX|2|CE|71020&IMP|2|^PNEUMONIA|.
```

Even better would be fully-coded results that include computer understandable codes (component 1) instead of, or in addition to, the text description (component 2).

7.6.4.6 Units (CE) 00574

Components: <identifier> ^ <text> ^ <name of coding system>^
<alternate identifier> ^ <alternate text> ^ <name of alternate coding system>

Definition: units have a data type of CE. The default coding system for the units codes consists of the ISO+ abbreviation for a single case unit (ISO 2955-83) plus extensions, that do not collide with ISO abbreviations (see introductory section to this chapter). We designate this coding system as ISO+. Both the ISO unit's abbreviations and the extensions are defined in section 7.1.4 and listed in Figure 7-5. The ISO+ abbreviations *are* the codes for the default coding system. Consequently, when ISO+ units are being used, only ISO+ abbreviations need be sent, and the contents of the units field will be backward compatible to HL7 vs. 2.1.

7.6.4.7 References range (ST) 00575

Components: numeric values: <lower limit - upper limit>, e.g., for potassium, 3.5 - 4.5.
alphabetical values: the normal value may be reported in this location

Definition: if the observation quantifies the amount of a toxic substance, then the upper limit of the range identifies the toxic limit. If the observation quantifies a drug, the lower limits identify the lower therapeutic bounds and the upper limits represent the upper therapeutic bounds above which toxic side effects are common.

7.6.4.8 Abnormal flags (ID) 00576

Definition: a table lookup indicating the normalcy status of the result. We strongly recommend sending this value when applicable. If the observation is an antibiotic susceptibility, the interpretation codes are: S=sensitive;

R=resistant; I=intermediate; MS=moderately sensitive; VS=very sensitive. (See ASTM 1238 - review for more details). Refer to *Table 0078 - abnormal flags* for valid entries.

When the laboratory can discern the normal status of a textual report, such as chest xray reports or microbiologic culture, these should be reported as N when normal and A when abnormal. Multiple codes, e.g., abnormal and worse, would be separated by a repeat delimiter, e.g., A~W.

Table 0078 Abnormal flags

Value	Description
L	Below low normal
H	Above high normal
LL	Below lower panic limits
HH	Above upper panic limits
<	Below absolute low-off instrument scale
>	Above absolute high-off instrument scale
N	Normal (applies to non-numeric results)
A	Abnormal (applies to non-numeric results)
AA	Very abnormal (applies to non-numeric units, analagous to panic limits for numeric units)
null	No range defined, or normal ranges don't apply
U	Significant change up
D	Significant change down
B	Better--use when direction not relevant
W	Worse--use when direction not relevant
For microbiology sensitivities only:	
S	Sensitive
R	Resistant
I	Intermediate
MS	Moderately sensitive
VS	Very sensitive

7.6.4.9 Probability (NM)00577

Definition: probability of a result being true for results with categorical values. It mainly applies to discrete coded results. It is a decimal number represented as an ASCII string that must be between 0 and 1, inclusive.

7.6.4.10 Nature of abnormal test (ID) 00578

Definition: refer to *table 0080 - nature of abnormal testing* for valid codes.

Table 0080 Nature of abnormal testing

Value	Description
A	An age-based population
N	None - generic normal range
R	A race-based population
S	A sex-based population

7.6.4.11 Observ result status (ID) 00579

Definition: refer to *table 0085 - Observation result status* for valid codes. This field reflects the current completion status of the results for one Observation Identifier.

Table 0085 Observation result status codes interpretation

Value	Description
C	Record coming over is a correction and thus replaces a result
D	Deletes the OBX record
F	Final results; Can only be changed with a corrected result.
I	Specimen in lab; results pending
P	Preliminary results
R	Results entered -- not verified
S	Partial results
X	Results cannot be obtained for this observation
U	Results status change to Final. Results did not change (don't transmit test). E.g., radiology changes status from preliminary to final

7.6.4.12 Effective date last obs normal value (TS) 00580

Definition: changes in the observation methods that would make values obtained from the old method not comparable with those obtained from the new method.

Null if there are no normals or units. If present, a change in this date compared to date-time recorded, the receiving system's test dictionary should trigger a manual review of the results to determine whether the new observation ID should be assigned a new ID in the local system to distinguish the new results from the old.

7.6.4.13 User defined access checks (ST) 00581

Definition: permits the producer to record results-dependent codes for classifying the observation at the receiving system. This field should be needed only rarely, because most classifications are fixed attributes of the observation ID and can be defined in the associated observation master file (see description in section 7.1).

However, there are a few cases when such controls vary with the value of the observation in a complex way that the receiving system would not want to re-calculate. An example is an antimicrobial sensitivity result. Some systems prefer to display only the sensitivity results of inexpensive antibiotics depending upon the organism, the source of the specimen and the patients allergy status. The sending service wants to send all of the sensitivities so that certain privileged users (e.g., Infectious Disease specialists) can review all of the results but nonprivileged users would see only the "preferred" antibiotics to which the organism was sensitive. We expect that other cases also occur.

7.6.4.14 Date-time of the observation (TS) 00582

Definition: required in two circumstances. The first is when the observations reported beneath one report header (OBR) have different dates. This could occur in the case of queries, timed test sequences, or clearance studies where one measurement within a battery may have a different time than another measurement.

It is also needed in the case of OBX segments that are being sent by the placer to the filler, in which case the date of the observation being transmitted is likely to have no relation to the date of the requested observation. In France, requesting services routinely send a set of the last observations along with the request for a new set of observations. The date of these observations is important to the filler laboratories.

In all cases, the observation date-time is the physiologically relevant date-time or the closest approximation to that date-time. In the case of tests performed on specimens, the relevant date-time is the specimen's collection date-time. In the case of observations taken directly on the patient (e.g., xray images, history and physical), the observation date-time is the date-time that the observation was performed.

7.6.4.15 Producer's ID (CE) 00583

Components: <identifier> ^ <text> ^ <name of coding system>^
<alternate identifier> ^ <alternate text> ^ <name of alternate coding system>

Definition: unique identifier of the responsible producing service. It should be reported explicitly when the test results are produced at outside laboratories, for example. When this field is null, the receiving system assumes that the observations were produced by the sending organization. This information is needed to satisfy CLIA regulations in the US. The code for producer ID is recorded as a CE data type. In the US, the Medicare number of the producing service is suggested as the identifier.

7.6.4.16 Responsible Observer (CN) 00584

Components: <physician ID> ^ <family name> ^ <given name> ^ <middle initial or name> ^ <suffix (e.g., JR or III)> ^ <prefix (e.g., DR)> ^ <degree (e.g., MD)> ^ <source table ID>

Definition: when required, the identifier of the individual directly responsible for the observation (i.e., the person who either performed or verified it). In a nursing service, the observer is usually the professional who performed the observation (e.g., took the blood pressure). In a laboratory, the observer is the technician who performed or verified the analysis. The code for the observer is recorded as a CE data type. If the code is sent as a local code, it should be unique and unambiguous when combined with *OBX-15-producer ID*.

7.7 EXAMPLE TRANSACTIONS

7.8.1 Query/response

The following is a query of the EKG system for the data for a particular patient number 0123456-1 for reports that have been modified or created since 1/1/88. The response ends with a continuation pointer. A continuation query follows, in reply to which a continutation response is sent.

Query (QRY)

MSH|^~\&|CBD||EKG||||QRY^R02|CDB22222|P<CR>
QRD|198904180943|R|I|Q4412|||10|RD|0123456-1|RES<CR>
QRF|EKG||198801010000<CR>

Response

MSH|^~\&|EKG||CDB||||ORF^R04|X981672|P<CR>
MSA|AA|CDB22222|P<CR>
QRD|198904180943|R|I|Q4412|||10|RD|0123456-1|RES<CR>
QRF|EKG||198804010000<CR>
PID|1|0123456-1||ROBERTSON^JOHN^H|||||||9821111<CR>
OBR|1|43215^OE|98765^EKG|93000^EKG REPORT|R|198801111000|198801111330|||RMT||||
... 1988011 11330|?|P030||||||198801120930||||||88-126666|A111|
... VIRANYI ^ANDREW<CR>
OBX|1|ST|93000.1^VENTRICULAR RATE(EKG)||91|/MIN|60-100<CR>
OBX|2|ST|93000.2^ATRIAL RATE(EKG)||/MIN|60-100<CR>
OBX|3|ST|93000.3^PR INTERVAL||0|/MSEC|1.06-.10<CR>
OBX|4|ST|93000.4^QRS INTERVAL||368|/MSEC|.18-.22<CR>
...
...
...
OBX|8|CE|93000&IMP^EKG DIAGNOSES|1|^ATRIAL FIBRILATION<CR>
OBX|9|CE|93000&IMP^EKG DIAGNOSIS|2|^ST DEPRESSION<CR>
OBX|109|FT||93000&ADT^EKG COMMENT||\.in+4\\.ti-4\ 1. When compared with EKG of
... 31-oct-88 ventricular rate has increased by 30 bpm.\.sp\\.ti-4\
... 2. Criteria for Lateral infarct are no longer present.<cr>
OBR|2|43217^OE|98767^EKG|93000^EKG
REPORT||198810311004|198810311004||||?|||198810311004|?|P030||||||198810311744||||||
... 88-126689|A122|BREAL|WILLIAM<CR>
...
...
...
DSC|1896X22;0123456-1<CR>

Continuation Query

MSH|^~\&|CDB||EKG||||QRY^R02|CDB22289|P<CR>
QRD|198904180943|R|I|Q4412|||10|RD|0123456-1|RES<CR>
QRF|EKG||1988040100000<CR>
DSC|1896X22;0123456-1<CR>

Continuation Response

MSH|^~\&|EKG||CDB||||ORF^R04|X981672|P<CR>
MSA|AA|CDB22289|P<CR>
QRD|198904180943|R|I|Q4412|||10|RD|0123456-1RES<CR>
QRF|EKG||198804010000<CR>
PID||0123456-1||ROBERTSON^JOHN^H|||||||9821111<CR>

OBR| ...
...
...

7.8.3 Unsolicited

The following is an unsolicited transmission of radiology data.

MSH|^~\&|XRAY||CDB||||ORU^R01|K172|P<CR>
PID|1|0123456-1||ROBERTSON^JOHN^H||||||9821111<CR>
OBR|1|X89-1501^OE|78912^RD|71020^CHEST XRAY AP & LATERAL|R|198703291530|19873290800|||JBM|N <CR>
OBX|1|CE|71020&IMP^RADIOLOGIST'S IMPRESSION|4||^MASS LEFT LOWER LOBE|1||A<CR>
OBX|2|CE|71020&IMP|2|^INFILTRATE RIGHT LOWER LOBE|||A<CR>
OBX|3|CE|71020&IMP|3|^HEART SIZE NORMAL|||N<CR>
OBX|4|FT|71020&GDT|1|circular density (2 x 2 cm) is seen in the posterior segment of
... the LLL. A second, less well-defined infiltrated circulation density is
... seen in the R mid lung field and appears to cross the minor fissure#<CR>
OBX|5|CE|71020&REC||71020^Follow up CXR 1 month||30-45|<CR>

7.8.5 Example message (from ASTM 1238-91)

Laboratory message: electrolytes, CBC, sed rate, blood cultures and sensitivities ... <CR>

MSH...

PID|...

Eletrolytes:

OBR|1|870930010^OE|CM3562^LAB|80004^ELECTROLYTES|R|198703281530|198703290800|||
... 401-0^INTERN^JOE^^^^MD^L|N||||SER|^SMITH^RICHARD^W.^^^DR.|(319)377-4400|
... This is requestor field #1. Requestor field #2|Diag.serv.field #1.|
... Diag.serv.field #2.|198703311400|||F<CR>
OBX|1|ST|84295^NA||150|mmol/l|136-148|H||A|F|19850301<CR>
OBX|2|ST|84132^K+||4.5|mmol/l|3.5-5|N||N|F|19850301<CR>
OBX|3|ST|82435^CL||102|mmol/l|94-105|N||N|F|19850301<CR>
OBX|4|ST|82374^CO2||27|mmol/l|24-31|N||N|F|19850301<CR>

CBC:

OBR|2|870930011^OE|HEM3268^LAB|85022^CBC|R|198703281530|198703290800|||401-0 ^
... INTERN^JOE^^^^MD^L|N||||BLD|^SMITH^RICHARD^W.^^^DR.|(319)377-4400|This is
... requestor field #1.|This is Requestor field #2.|This is lab field #1.|Lab
... field #2.|198703311400|||F<CR>
OBX|1|ST|85018^HGB||13.4|GM/DL|14-18|N||S|F|19860522<CR>
OBX|2|ST|85014^HCT||40.3|%|42-52|L||S|F|19860522<CR>
OBX|3|ST|85041^RBC||4.56|10*6/ml|4.7-6.1|L||S|F|19860522<CR>
OBX|4|ST|85021.11^MCV||88|fl|80-94|N||S|F|19860522<CR>
OBX|5|ST|85021.21^MCH||29.5|pg|27-31|N||N|F|19860522<CR>
OBX|6|ST|85041.25^MCHC||33|%|33-37|N||N|F|19860522<CR>

OBX|7|ST|85048^WBC||10.7|10*3/ml|4.8-10.8|N||N|F|19860522<CR>
OBX|8|ST|85048.18^BAND NEUT.%||2|%||||F<CR>
OBX|9|ST|85048.16^SEG.NEUT.%||67|%||||F<CR>
OBX|10|ST|85048.42^LYMPH.%||29|%||||F<CR>
OBX|11|ST|84048.52^MONOCYTE.%||1|%||||F<CR>
OBX|12|ST|85012.1^EOSIN.%||2|%||||F<CR>

Sed rate:

OBR|3|870930011^OE|HEM3269^LAB|85650^ESR|R|198703281530|198703290800|||
... 401-0^INTERN^JOE^^^^MD^L|N||||BLD|^SMITH^RICHARD^W.^^^DR.|(319)377-4400|
... This is requestor field #1.|This is Requestor field #2.|This is lab field
... #1.|Lab field #2.|198703311400|||F<CR>
OBX|1|ST|85650^ESR||7|MM/HR|0-10|N||S|F|19860522|E|1|1792|27<CR>

Parent micro result, identifies organism

OBR|4|2740X^OE|BC376^MIC|87040^Blood culture|R|198703280600|198703290800|||
... 99-2^JONES&COLLECTOR|N|Hepatitis risk||198703290830|Bld|
... 4010^INTERN^JOE^^^^MD^L|X3472|Requestor field 1|Requestor field 2|
... Producer's field 1|Producer's field 2|198703301000|35.00|MB|F|<CR>
OBX|1|CE|87040^Blood culture|1|^E Coli|||A||F<CR>
OBX|2|CE|87040^Blood culture|2|^S Aureus|||A||F<CR>

Child micro result, gives antibiotic sensitivities for organism identified in first OBX of parent

OBR|5|2740X^OE|BC402^MIC|87186^Antibiotic MIC|R|198703281230|198703290800||||G|
... Hepatitis risk||198703290830|Bld|401.0^INTERN^JOE^^^^MD^L|X3472|||||
... 198703310900|40.00|MB|F|87040^1|||2740X&OE^BC376&MIC<CR>
OBX|1|ST|87186.2^Ampicillin MIC||<2|ug/ml||S|<CR>
OBX|2|ST|87186.5^Carbenicillin MIC||<16|ug/ml||S|<CR>
OBX|3|ST|87186.21^Gentamicin MIC||<2|ug/ml||S|<CR>
OBX|4|ST|87186.33^Tetracycline MIC1||<1|ug/ml||S|<CR>
OBX|5|ST|87186.29^Piperacillin MIC||<8|ug/ml||S|<CR>
OBX|6|ST|87186.15^Cefuroxime MIC||<2|ug/ml||S|<CR>
OBX|7|ST|87186.16^Cephalothin MIC||<8|ug/ml||S|<CR>
OBX|8|ST|87186.3^Amoxicillin-Clavulanate||<4|ug/ml||S|<CR>
OBX|9|ST|87186.56^Thienamycin MIC||<1|ug/ml||S|<CR>
OBX|10|ST|87186.17^Chloramphen MIC||<4|ug/ml||S|<CR>
OBX|11|ST|87186.37^Tobramycin MIC||<2|ug/ml||S|<CR>
OBX|12|ST|87186.7^Amakacin MIC||<4|ug/ml||S|<CR>
OBX|13|ST|87186.36^Trimeth-Sulf MIC||<2/38|ug/ml||S|<CR>
OBX|14|ST|87186.8^Cefazolin MIC||<2|ug/ml||S|<CR>
OBX|15|ST|87186.39^Cefoxitin MIC||<2|ug/ml||S|<CR>
OBX|16|ST|87186.14^Ceftriazone MIC||<4|ug/ml||S|<CR>
OBX|17|ST|87186.44^Ceftazidime MIC||<2|ug/ml||S|<CR>
OBX|18|ST|87186.34^Timentin MIC||<8|ug/ml||S|<CR>
OBX|19|ST|87186.41^Ciprofloxacn-MIC||<1|ug/ml||S|<CR>

Second micro child result, gives sensitivities or organism identified by Second OBX of parent

OBR|6|2740X^OE|BC403^MIC|87186^Antibiotic MIC|R|198703281230|198703290800||||G|
... Hepatitis risk||198703290830|Bld|401.0^INTERN^JOE^^^^MD^L|X3472|||||
... 198703310900|40.00|MB|F|87040^2|||2740X&OE^BC376&MIC<CR>

OBX|1|ST|87186.2^Ampicillin MIC||<8|ug/ml||R|<CR>
OBX|2|ST|87186.18^Clindamycin MIC||<.25|ug/ml||S|<CR>
OBX|3|ST|87186.21^Gentamicin MIC||<1|ug/ml||S|<CR>
OBX|4|ST|87186.19^Erythromycin MIC||<.5|ug/ml||S|<CR>
OBX|5|ST|87186.27^Oxacillin MIC||<.5|ug/ml||S|<CR>
OBX|6|ST|87186.38^Vancomycin MIC||<2|ug/ml||S|<CR>
OBX|7|ST|87186.28^Penicillin MIC||<8|ug/ml||R|<CR>
OBX|8|ST|87186.16^Cephalothin MIC2||<2|ug/ml||S|<CR>
OBX|9|ST|87186.17^Chloramphen MIC||<4|ug/ml||S|<CR>
OBX|10|ST|87186.1^Amikacin MIC||<16|ug/ml||S|<CR>
OBX|11|ST|87186.41^Ciprofloxacn-MIC||<1|ug/ml||S|<CR>
OBX|12|ST|87186.31^Rifampin MIC||<1|ug/ml||S|<CR>

7.8.7 Example of narrative report messages (from ASTM 1238-91)

This example of the body of reports shows the following observation from what are usually free text reports. The text within these examples that begins with **-- and ends with --** are explanatory comments, not a formal part of the message. The following outline shows the segments that are included in this example message.

a)patient identifying record (PID)

b)EKG order record (OBR)

c)EKG coded result record (OBX)

d)EKG result records (OBX):

1) ventricular rate

2) atrial rate

3) QRS width

4) PR interval

e)order record for chest x-ray (OBR)

f) two diagnostic impressions for CXR (OBX)

g)description record for CXR (OBX)

h)a recommendation record for CXR (OBX)

i) an order record for surgical pathology (OBR)

j)a gross description record for pathology showing use of anatomy fields (OBX)

k)a microscopic description record for pathology (OBX)

l) vital signs request (OBR)

m) six vital signs (OBX)

n) part of the physical history (OBR & OBX)

o)end record

```
... MSH ...
... PID ...

**--Order record for EKG--**
OBR|1|P8753^OE|EK5230^EKG|93000^EKG|R|198703281530|198703290800|||401-0^INTERN^JOE^^^^MD^L|N <CR>

**--Two interpretation records for EKG--**
**--[In this case, the result observation ID assumes the observation code in the order record.]--**
OBX|1|CE|&IMP|1|^Sinus bradycardia|||A <CR>
OBX|2|CE|&IMP|2|^Occasional PVCs|||A <CR>

**--Four numeric results for EKG--**
**--[The AS4 code is an extension of the CPT4 code (93000) for EKG plus extension .1, .2, etc., as detailed in Appendix 7.A.]--**
OBX|3|ST|93000.2^Ventricular rate||80|/min|60-100 <CR>
OBX|4|ST|93000.3^Atrial rate||80|/min|60-100 <CR>
OBX|5|ST|93000.5^QRS width||.08|msec|.06-.10 <CR>
OBX|6|ST|93000.4^PR interval||.22|msec|.18-.22 <CR>

**--Order record for CXR--**
OBR|2|P8754^OE|XR1501^XR|71020^Chest Xray AP & Lateral|R|198703281530|198703290800|||
  401-0^INTERN^JOE^^^^MD^L|N <CR>

**--Two CXR diagnostic impressions--**
OBX|1|CE|71020&IMP^Radiologist's Impression|1|.61^RUL^ACR~.212^Bronchopneumonia^ACR|||A<CR>
OBX|2|CE|71020&IMP|2|51.71^Congestive heart failure^ACR|||A<CR>

**--CXR Description with continuation records--**
OBX|3|TX|71020&GDT||Infiltrate probably representing bronchopneumonia in the right lower lobe.  Also pulmonary venous
congestion cardiomegaly and cephalization, indicating early congestive heart failure.<CR>

**--Recommendations about CXR report to follow up one month with a repeat CXR--**
OBX|4|CE|71020&REC||71020^Followup CXR 1 month^AS4<CR>

**--Order record for pathology report--**
OBR|3|P8755^OE|SP89-739^SP|88304^Surgical Path Report|R|198703281530|198703290800|||401-
0^INTERN^JOE^^^^MD^L|N<CR>
```

OBX|1|CE|&ANT|1|Y0480-912001^orbital region^SNM<CR>

--Gross description record (with overflow) for pathology--
OBX|2|TX|&GDT^GrossSpecimenDescription|1|The specimen is received in four containers. The first is labeled with the patient's name and consists of three fragments of reddish-brown tissue each of which measures 2 mm in greatest dimension. They are wrapped in tissue paper and submitted in toto in a single cassette| <CR>

--Microscopic description record for pathology--
OBX|3|TX|&MDT^MicroscopicDescription|1|A|Sections of the first specimen received for frozen section diagnosis reveal thick walled, ramifying vessels lined by a single layer of flattened endothelial cells. The thick smooth muscle walls exhibit no malignant cytologic features nor do the endothelial lining cells. Within the same specimen are also found fragments of fibrous connective tissue, bone, and nerve which are histologically unremarkable<CR>

--Vital signs--
OBR|4|P8756^OE|N2345^NR|3000.02^VITAL SIGNS|R|198703281530|198703290800|||401-0^INTERN^JOE^^^^MD^L|N<CR>

OBX|1|ST|1002.3^BP DIAS||90|mm(hg)|60-90|<CR>
OBX|2|ST|1002.2^BP SYS||120|mm(hg)|100-160|<CR>
OBX|3|ST|1002.4^BP MEAN||100|mm(hg)|80-120|N<CR>
OBX|4|ST|1006.2^HEART RATE||74|/min|60-100|N<CR>
OBX|5|ST|1002.1^BP METHOD||MANUAL BY CUFF|<CR>
OBX|6|ST|1006.1^PULSE METHOD||MANUAL BY PALP|<CR>

--Part of the patient's history--
OBR|5|P8568^OE|HX2230^CLN||2000^HISTORY|R|198703281530|198703290800|401-0^INTERN^JOE^^^^MD^L|N<CR>

OBX|1|CE|2000.40^CHIEF COMPLAINT|| ... <CR>
OBX|2|ST|2000.01^SOURCE||PATIENT<CR>
OBX|3|TX|2000.02^PRESENT ILLNESS||SUDDEN ONSET OF CHEST PAIN. 2 DAYS, PTA ASSOCIATED WITH NAUSEA, VOMITING & SOB. NO RELIEF WITH ANTACIDS OR NTG. NO OTHER SX. NOT PREVIOUSLY ILL.<CR>

.
.
and so on.

7.8.9 Reporting cultures and sensitivities

7.8.10.1 Culture battery/report representation

Organisms and other observations/tests are reported using multiple OBX segments. The granularity expected for HL7 culture reports is one observation per organism.

All OBX segments which have the same observation ID and sub-ID are part of a single observation.

Each organism in a culture battery is assigned a unique *OBX-4-observation sub-ID* (and is therefore a separate observation). The organism name is given in *OBX-5-observation value* (results). It is recommended, but not required that the organism name may change over time, but the corresponding observation sub-ID never changes. (The observation ID will be identical for all organisms reported.)

Recommended:

```
OBX||CE|organism^413^L|1|^E. Coli|
OBX||CE|organism^413^L|2|^S. Aureus|
```

Not Recommended:

```
OBX||CE|organism1^413^L|1|^E. Coli|
OBX||CE|organism2^413^L|1|^S. Aureus|
```

7.8.10.2 Sensitivity battery/report representation

Each antibiotic should be reported as a separate (OBX) observation where the Observation ID is a code for the antibiotic. (OBXs for non-antibiotic observations and related information may be present in the same battery.)

MIC and Kirby Bauer sensitivity results cannot be combined in the same OBX segment. An OBX can contain an MIC value (in *OBX-5-observation value* (results)) and *OBX-8-abnormal flag* that indicates whether the organism is sensitive, resistant, or intermediate (see Table 0078 under abnormal flag fields).

Or, an OBX can contain a Kirby Bauer result string (e.g., "sensitive") in the Observation Results field and the Kirby Bauer interpretation in *OBX-8-abnormal flags* (e.g., "S").

A sensitivity battery may only contain results corresponding to a single organism that has been previously reported in a culture battery.

7.8.10.3 Identification of the organism for a sensitivity battery

The following is the preferred, but not required method of organizing data about antibiotic sensitivities.

A sensitivity battery may only contain results corresponding to a single organism that has been previously reported in a culture battery.

A sensitivity battery is always a child "order" to a culture battery. *OBR-29-parent number* (parent's filler order number) in the sensitivity OBR is equal to *OBR-3-filler order number* in the parent culture OBR and is used to link the two batteries logically.

The sensitivity battery also contains a linkage back to a particular organism in the culture battery. *OBR-26-parent result* of the sensitivity OBR contains two components--*OBX-3-observation identifier* (code only) and *OBX-4-observation sub-ID* of the OBX in the culture battery which contains the organism name.

The identity of an organism/isolate is expected to be refined over time. When an organism identification changes, the parent culture battery can be resent without resending the child sensitivity battery.

The case may occur where a sensitivity battery is reported on an organism which has not yet been identified. In this case, it is required that a placeholder OBX for the organism name be reported in the corresponding culture battery so that *OBR-26-parent result* in the sensitivity OBR will point to a valid organism OBX in the culture battery. Transmission of an organism OBX (in the culture battery) with the Sub-ID field valued must precede the sensitivity battery which uses the identical Sub-ID in *OBR-26-parent result*.

Discussion and examples:

Order Micro Results (Blood Culture)

```
MSH|^~\&|LAB1||DESTINATION||19910127105114||ORU^R03|LAB1003929
PID|||900329493||PETRSN~DAVID|||927
PV1||I|
ORC|NW|
OBR||A485388^OE|H29847^LAB1|BLOOD CULTURE|||
```

Result for Culture

```
ORC|RE
OBR||A485388^OE|H29847^LAB1|BLOOD CULTURE||
OBX||FT|SDES^SOURCE||BLOOD-RAPID||
OBX||FT|EXAM^MICROSCOPIC||GRAM POSITIVE COCCI IN GROUPS||
OBX||FT|ORGANISM^IDENTIFIER|1|ISOLATE 1||
```

Result for Sensitivity

```
ORC|RE
OBR||A485388^OE|H29848^LAB1|BT1^SUSCEPTIBILITY BATTERY|||||MC|to field
    ... 26|ORGANISM^1|||A485388&OE^H29847&LAB1|
OBX||CE|ACAPEN^PENICILLIN||0.5|R||
OBX||CE|ACHNAF^NAICILLIN||1|R||
OBX||CE|ACHCCLI^CLINDAMYCIN||<=0.1|S||
```

Result for Culture ID

```
ORC|RE
OBR||A485388^OE|H29847^LAB1|BLOOD CULTURE||
OBX||FT|ORGANISM^IDENTIFIER|1|STAPH EPI||
```

New Result for Culture ID

```
ORC|RE
OBR||A485388^OE|H29847^LAB1|BLOOD CULTURE||
OBX||FT|ORGANISM^IDENTIFIER|1|STAPH EPI SERO TYPE 3||
```

Assumptions

1.All OBXs in the parent order must employ the same coding scheme.

2.The Sub-ID of the parent OBXs (result) cannot change.

7.8.11 Results reporting

Suppose an order has been placed to the EKG system for three EKGs to be performed on successive days. These results can be reported in various ways.

1. The EKG application needs to communicate to anyone the results of the 1st EKG:

ORU message:

```
MSH|...
PID|...
OBR|||89-551^EKG|93000^EKG REPORT|...        // 1ST child OBR.
OBX||ST|93000.1^VENTRICULAR RATE (EKG)|...
OBX||ST|93000.2^...
...
...
OBX||FT|93000.14^EKG COMMENT|...
OBR|...                                      // other observation segments to follow
```

-Notice that this report is without reference to the original order.

-No ORC is required because the identifying Filler's Order Number (and other ORC fields) are carried in the OBR segment.

2.The EKG application needs to communicate to anyone the original order information, the details of the child orders, the fact of the child spin off, and the results of all three EKGs:

ORU message:

```
MSH|...
PID|.
ORC|PA|A226677^OE|89-450^EKG|...          // original order's ORC.
OBR||||93000^EKG REPORT|...        // original order segment
ORC|CH|A226677^OE|89-451^EKG<CR>          // 1st child ORC.
OBR||||93000^EKG REPORT|...        // 1st EKG child OBR.
OBX||ST...                         // 1st EKG report
OBX||ST...
      ...
OBX||FT...
ORC|CH|A226677^OE|89-452^EKG<CR>          // 2nd child ORC.
OBR||||93000^EKG REPORT|...        // 2nd EKG child OBR.
OBX||ST...                         // 2nd EKG report
OBX||ST...
      ...
OBX||FT...
ORC|CH|A226677^OE|89-453^EKG<CR>          // 3rd child ORC.
OBR||||93000^EKG REPORT|...        // 3rd EKG child OBR.
OBX||ST...                         // 3rd EKG report
OBX||ST...
      ...
OBX||FT...
  ...                              // Other parts of message might follow.
```

-In this case, we are transmitting the information about the fact of child spin off, the original order and the results all at the same time. Thus, this form of the ORU message reports not only the results of an order, but all of its associated ordering information including the original OBR for three EKGs that was replaced by three separate OBR EKG segments.

7.8.13 Patient-specific clinical data with an order

Reporting body weight and height with a creatinine clearance.

```
MSH|...
PID|...
ORC|NW|...                    // New order.
OBR||P42^PC||98142.1^Creatinine Clearance|...
OBX||ST1010.1^Body Weight|62|kg<CR>
OBX||ST1010.3^Height|190|cm<CR>
ORC|NW|...                    // Next order.
...
```

7.9 OUTSTANDING ISSUES

1.We have not devised universal code extensions for all diagnostic studies.

APPENDIX 1.1 (Informative) Universal (AS4) Identifiers for Common Test Battery

1.1.1 Components That Do Not Have Uniquely Defined CPT-4 Codes[1]

Appendix 7.AS4 provides codes for common clinical and nursing variables and codes for extending battery procedure codes to identify important components.

This standard is highly dependent on the availability of a set of codes for uniquely identifying the observations carried in an OBX segment. Here we suggest a set of codes for the most common clinical observations such as diastolic blood pressure, urine output per shift, pulse, and Glascow coma score. We include these codes both to make concrete how the standard can be used to transmit most kinds of clinical information, as well as to encourage standardization of clinical variable codes. Note that some clinical variables have categorical (multiple choice) rather than numerical answers. We have included a minimal list of suggested answer sets for these variables.

We have also included a set of codes from The Health Outcomes Institute[4], representing the most common outcome variables such as the Rand Short Form-36, and the Interstudy TyPE Specifications.)

Most procedure systems do not provide individual codes for the component observations of tests such as the urinalysis, blood cell differential count and antibiotic sensitivities as the separate observation recorded as part of an EKG tracing, cardiac echoes, etc., because the constituents of these batteries cannot be ordered separately. This appendix also provides extensions for uniquely identifying the constituents of such test "batteries", such as differential whole blood, all cultured urinology, EKG, cardiac echo, etc.

CPT4 is the base procedure coding system used to illustrate how to extend such procedural coding systems in this appendix. Because CPT4 is universally available in the US to code procedures, it is a candidate coding system. However, CPT4 has many weaknesses. It does not precisely identify many tests, it does not provide sufficient discrimination about the method used, and, in the case of imaging procedures, it often aggregates many separate activities under one code. ICCS is another candidate. It is a more elegant and comprehensive procedure classification than CPT4. It has a hierarchical structure, is more complete (regarding the individual tests included). But at the present, it is proprietary and is not complete regarding less common tests, nor does it discriminate by method. SNOMED III will include a procedure coding system. SNOMED III's codes for diseases, topology, and pathology, are very good. The procedure codes may be equally good. ASTM E31.12 has an on going effort to define vocabulary (and abbreviations) for chemistry tests. Euclides[5] has an active effort to define codes for all clinical laboratory tests. Within the scope of both the Euclides and E31.12 effort, the AS4 extensions for test batteries would not be needed.

We have chosen the new codes for the clinical variables to avoid any overlap with CPT4. However, such overlap cannot be guaranteed with all procedural coding systems. Consequently, when the clinical variables for physical exam, etc., listed in this appendix are used with code systems other than CPT4, it is up to the user to either include a

[3]The content Appendix 7.A is taken directly from ASTM 1238 and is printed/adapted with their permission.

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[5] Contact Georges DeMoor, M.D., State University Hospital Gent, De Pintelaan 185-5K3, 9000 Gent, Belgium.

local code system designator as the third component CE data types with these clinical codes, or to verify that there is no overlap with the procedural coding system of choice.

Patient specific drug/toxicology information has many dimensions and contexts. From the perspective of a laboratory, drug levels can be measured. However, different variables need to be defined according to the specimen type, (blood, serum, blood cells, urine, hair), and the kind of method (quantitative, semi-quantitative or qualitative), drug dose and timing (peak or trough). Most of these distinctions apply to toxic substances as well.

Contextual variables are also important to drug testing. Examples are the dose of the drug given (where the time and the units would be carried in an OBX segment), who gave the drug, and how many hours pre-blood draw the last dose was given. The lab usually requires that these contextual "observations" be transmitted with the order and are usually reported back as part of the battery that represents the drug measurement.

Drug (treatment) dosing can also be considered from the context of the prescription for the treatment, and a number of separate drug order related variables could be defined for each drug, so that users could transmit this information as an OBX to a patient's computer-based flowsheet (in a critical care unit, for example) or as part of a study of drug levels. For example, the amount of drug given at a particular dosing time (as reported above), the average daily dose prescribed, the total amount given to the patient, the percent of compliance (as estimated by the patient), and so on.

In the following, we provide construction rules for building codes for such drug variables from drug codes. Our examples are based on the World Health Organization's drug record number (up to 6 digits) and code for salt (2 digits), for a total of 8 digits, and we identify these extended coding system as WA. The World Health drug codes have many advantages, including international coverage, linkage to a hierarchical code (ATC), to preferred name, brand names and manufacturers, to multiple component drugs, and to the American Chemical Societies(ACS) chemical codes. Moreover, it is modestly priced. But other drug code systems (e.g., the ACS chemical codes for the drugs, SNOMED III's drug codes, etc.) could also be used to construct these drug related variables.

Observation Name	Identifier
Urinalysis:	
Root Code:	
Urinalysis	81000
Extensions:	
Dip stick pH	.1
Specific gravity	.2
Dip stick protein	.3
Dip stick glucose	.9
Reducing substance	.4
Dip stick Hgb	.5
Dip stick bilirubin	.6
Dip stick ketones	.7
Urine Appearance	.8
Dipstick WBC esterase	.10
Dipstick Nitrate	.11
Dipstick Ascorbic acid	.12
Dipstick Urobilinogen	.13
Root Code:	
Urine Miscroscopic:	81015
Extensions:	
Urine WBC's	.1
Urine RBC's	.2
Urine WBC casts	.3
Urine RBC casts	.4
Urine hyaline casts	.5
Urine granular casts	.6
Urine waxy casts	.27
Urine fatty casts	.7
Urine bacteria	.8
Trichomonas	.9
Uric acid crystals	.11
Pyrophosphate crystals	.12
Cystine crystals	.13
Bilirubin crystals	.14
Triple phosphate crystals	.15
Ca carbonate crystals	.16
Ca PO4 crystals	.17
Urine fat globules	.18
Urine epithelial cells	.19
Urine yeast-like fungi	.21

Urine filamentous fungi	.22
Urine unidentified crystals	.23

Complete Blood Count Components:

Root Code:	
Red blood cell (RBC) only	85041
White Blood Cell (WBC)	85048
Extensions:	
Total neutrophil count	.11
Total neutrophil, %	.12
Hypersegmented neutrophil count	.13
Hypersegmented neutrophil, %	.14
Segmented neutrophil count	.15
Segmented neutrophil, %	.16
Band neutrophil count	.17
Band neutrophil, %	.18
Metamyelocyte count	.19
Metamyelocyte, %	.21
Lymphocyte count	.41
Lymphocyte, %	.42
Atypical lymphocyte count	.44
Atypical lymphocyte, %	.45
Monocyte count	.51
Monocyte, %	.52
Eosinophil, count	.63
Eosinophil, %	.64
Basophil count	.59
Basophil, %	.60
Promyelocyte count	.53
Promyelocyte, %	.54
Myelocyte count	.55
Myelocyte, %	.56
Blast count	.57
Blast, %	.58
Nucleated RBC count	.59
Nucleated RBC, %	.60
Other leukocyte count	.61
Other leukocyte, %	.62

Root Code:	
Hemogram, Automated (RBC, WBC, Hgb, Hct and indices only):	85021
Extensions:	
Mean corpuscular volume--MCV	.11
Mean corpuscular diameter--MCD	.15
Red cell size distribution--RDW	.18
Mean corpuscular hemoglobin--MCH	.21
Hemoglobin distribution width--HDW	.26
Mean corpuscular hemoglobin	.27
Hypochromia	.32
Basophilic stippling	.33
Toxic Granules	.34
Microcytes	.35
Macrocytes	.36
Atypical lymphocytes	.37
Ovalocytes	.38
Spherocytes	.39
Schistocytes	.41
Hypersegmented Neutrophils	.42
Sickle cells	.43
Poikilocytosis	.44
Anisocytosis .45	
Anisochromic	.46
Platelet count Auto	.47

Root Code:	85580
Platelet Count (Rees-Ecker):	
Extensions:	
Mean platelet volume	.11
Mean platelet diameter	.15

Antibiotics (Sensitivities/Levels)

Approach - Use the appropriate CPT-4 code to identify the nature of the testing. Append the appropriate antibiotic identifier from the list below for a complete specification.

Root Code	
I.E. Agar diffusion	87181
Disk antibiotic sensitivity	87184
Minimum inhibitory concentration	87186
Minimum bacteriocidal concentration	87187
Macrotube dilution method	87188
Serum bacteriocidal titre	87197
Antibiotic level RIA	80040
Antibiotic bio assay	80042

Extensions: Add the antibiotic number to one of the above codes to obtain a complete code, e.g., 87184.1 is the code for amikacin disk antibiotic sensitivity, 87186.1 is the code for amikacin MIC, 80040.1 is the code for amikacin level done by RIA.

Amdinocillin	.54
Amikacin	.1
Aminosalicylic acid (e.g., PAS)	.58

Amoxicillin	.59	Ethionamide	.83
Amoxicillin/clavulanic acid	.3	Flucytosine	.84
Ampicillin	.2	Gentamicin	.21
Ampicillin/sulbactam	.53	Imipenem/cilastatin	.34
Anasmycin	.60	Isoniazid	.85
Azithromycin	.61	Kanamycin	.86
Azlocillin	.4	Lincomycin	.87
Aztreonam	.43	Lomefloxacin	.88
Bacampicillin	.62	Methenamine hippurate	.89
Capreomycin	.63	Methenamine Mandelate	.90
Carbenicillin	.5	Methicillin	.22
Cefadroxil	.65	Metronidazole	.92
Cefamandole	.6	Mezlocillin	.23
Cefamezin	.7	Miconazole	.93
(do not use = cefazolin)		Minocycline	.94
Cefazolin	.8	Minocycline	.24
Cefixime	.66	Moxalactam	.25
Ceflacor	.64	Moxalactam	.95
Cefmetazol	.67	Nafcillin	.96
Cefonicid	.9	Nalidixic acid	.97
Cefoperazone	.11	Natamycin	.98
Cefotaxime	.12	Neomycin	.99
Cefoxitin	.39	Netilmicin	.42
Cefotetan	.55	Nitrofurantoin	.26
Cefprozil .68		Norfloxacin	.48
Cefsulodin	.56	Ofloxacin	.49
Ceftazidime	.44	Oxacillin	.27
Ceftizoxime	.13	Oxytetracycline	.100
Ceftriaxone	.14	Pefloxacin	.50
Cefuroxime	.15	Penicillin	.28
Cefuroxime axetil	.69	Pentamidine isethionate	.101
Cephalothin	.16	Piperacillin	.29
Cephradine	.70	Polymyxin B	.102
Chloramphenicol	.17	Proampacin	.103
Cinoxacin	.71	Protionamide .104	
Ciprofloxacin	.41	Pyrazinamide	.105
Clarithromycin	.72	Pyrimethamine	.106
Clindamycin	.18	Pyrimethamine sulfadoxine	.107
Clofazimine	.73	Ributin	.108
Cloxacillin	.74	Rifampin	.31
Colistimethate	.75	Rifampin-isoniazid	.109
Cyclacillin	.45	Spectinomycin	.110
Cycloserine	.76	Streptomycin	.111
Dapsone	.77	Sulfa	.32
Demeclocycline	.78	Sulfisoxazole	.112
Dicloxacillin	.79	Teicoplanin	.51
Doxycycline	.80	Temafloxacin	.113
Enoxacin	.46	Tetracycline	.33
Erythromycin	.19	Tetracycline HCl	.114
Erythromycin-sulfisoxazole	.81	Thiabendazole	.115
Ethambutol	.82	Ticarcillin	.52

Ticarcillin/clavulanic acid	.35
Tobramycin	.37
Trimeth-Sulf	.36
Trimethoprim	.116
Trisuflapyrimidines	.117
Troleandomycin	.118
Vancomycin	.38

ISO enzymes:

Root Code:

Creatinine phosphokinase isoenzymes	82550

Extensions:

CK MB Fraction	.1
CK MM Fraction	.2
CK BB Fraction	.3
CK MM Isoforms	.4

Root Code:

LDH isoenzymes, electrophoretic separation	83625
LDH isoenzymes, chemical separation	83626

Extensions:

LDH Isoenzyme I	.1
LDH Isoenzyme II	.2
LDH Isoenzyme III	.3
LDH Isoenzyme IV	.4
LDH Isoenzyme V	.5

Root Code:

Alkaline Phosphatase Isoenzyme	84080

Extensions:

Liver ALK PHOS ISO	.1
Bone ALK PHOS ISO	.2
Intestinal ALK PHOS ISO	.3
Placental ALK PHOS ISO	.4
Reagin ALK PHOS ISO	.5
Other ALK PHOS ISO	.6

Clotting Tests:

Root Code:

Prothrombin Time	85618

Extensions:

Patient Prothrombin	.1
Control Prothrombin	.2

Skin Tests: 86455

Codes (CPT4):

Coccidiomycosis (mm)	86490
Histoplasmosis (mm)	86510
Mumps Interacts (mm)	86540
Trichophyton (mm)	4000
Candida (mm)	4001
Days post application read (#days)	4002

Root Code:

Tuberculosis intradermal	86580

Extensions:

1st strength	.1
PPD	.2
2nd strength	.3

Cardiac Echo:

Root Codes

Cardiac echo M mode	93300
Cardiac echo CSE	93307
Cardiac echo doppler	93320

Extensions (add the extension number of the appropriate root code given above)

LV diameter systolic (cm)	.1
LV diameter diastolic (cm)	.2
LV diastolic area (cm2)	.3
LV systolic area (cm2)	.4
Fractional area change	.5
RV diameter (cm)	.6
RV diameter systolic (cm)	.7
RV diameter diastolic (cm)	.8
RV diastolic area (cm2)	.9
RV systolic area (cm2)	.10
Left atrial diameter (cm)	.11
LA diameter systolic (cm)	.12
LA diameter diastolic (cm)	.13
Right atrial diameter (cm)	.14
Aortic valve area (sq cm)	.15
Interventricular septum thickness (cm)	.16
LV posterior wall thickness (cm)	.17
Mitral valve area (cm2)	.18
Ejection fraction (%)	.19
Aortic gradient (mmHg)	.20

Pulmonic gradient (mmHg)		.21
Cardiac Echo Impression		&IMP
Cardiac Echo Recommendation		&REC
Cardiac Echo Device	&DEV	
RV diameter (cm)		

Spirometry

Root Code:		94010
Extensions:		
Forced Vital Capacity (FVC) (l)		.1
Vital Capacity (l)		.2
FVC .5 sec (l)		.3
FVC 1 sec (l)		.4
FVC 3 sec (l)		.5
FEV1/FVC		.6
Peak expiratory flow (l/min)		.7
Peak inspiratory flow (l/min)		.8
Flow 50% (l/min)		.9
Flow 75% (l/min)		.10
F25-75 % (l/min)		.11
Maximum ventilation value		.12
Slow Vital Capacity		.13
Inspiratory Capacity		.14
Expiratory reserve volume		.15
Bronchodilator use		.16
Answers		
Not used		
Pre-bronchodilators		
Post-bronchodilators		
Bronchodilators ID		.17
(text name of drug used)		
Bronchodilator dose		.18
Total lung capacity, helium (sgl. breath)		.19
Total lung capacity, nitrogen (mult. breath)		.20
Total lung capacity, plethysmography		.21
Total resid. vol/total lung capacity		.22
Drug given		.23
Dose of drug		.24
Spirometry Impression		&IMP
Spirometry Recommendation		&REC
Spirometry Device		&DEV

EMG [Neurology]

(for full list, review E31.16 draft specifications, available as listed on footnote 12, Section 2.4)

EEG [Neurology] 95816

(for full list, review E31.16 draft specifications, available as listed on footnote 12, Section 2.4)

OBGYN Ultrasound (OBGYN)

Root Code:		
Echography, pregnant uterus, B-scan and/or real time with image documentation; complete		76805
Extensions/:		
Fetal Biparietal diameter (cm)		.1
Fetal Head circumference (cm)		.2
Fetal Abdominal circumference (cm)		.3
Fetal Femur length (cm)	.4	
Longitudinal Ovary Axis Right (cm)		.5
Longitudinal Ovary Axis Left (cm)		.6
Transverse Ovary Axis Right (cm)		.7
Transverse Ovary Axis Left(cm)		.8
A - P Ovary Axis Right (cm)		.9
A - P Ovary Axis Left(cm)		.10
Longitudinal Uterus Axis (cm)		.11
Transverse Uterus Axis(cm)		.12
A - P Uterus Axis(cm)		.13
Gestational age-size (weeks)		.14
Gestational age-menstrual period (months)		.15
Ob-Gyn US Impression		&IMP
Ob-Gyn US Recommendation		&REC
Ob-Gyn US Device		&DEV

CXR

Root Code:		
Radiologic examination, chest single view, frontal		71020
Extensions:		
Cardiac width		.1
Cardiac/thoracic ratio		.2
Largest mass size (rough diameter) (cm)		.3
Largest mass size height (cm)		.4
# masses		.5
CXR Impression		&IMP
CXR Recommendation		&REC
CXR Device		&DEV

Endoscopy

Root Code		
Esophageal endoscopy		43200
UGI endoscopy		43234

ERCP	43260
Small bowel endoscopy	44360
Sigmoidoscopy fixed	45300
Sigmoidoscopy flexible	45330
Colonoscopy	45358

Extensions

Polyp size (mm)	.1
Polyp number (#)	.2
Maximum polyp size (mm)	.3
Max depth instrument reached (cm)	.4
Ulcer(s) (#)	.5
Maximum ulcer size (cm)	.6
Duration of procedure (min)	.7
Endoscopy impression	&IMP
Endoscopy device	&DEV
Endoscopy recommendation	&REC

Cardiac Catheterization Measure

Cardiac Cath Measurements

Root Code: 1030

Extension:

Central Venous Pressure [mm(hg)]	.1
Wedge Pressure [mm(hg)]	.2
Cardiac Index (l/min/mm2)	.3
Cardiac Output (l/min)	.4
Left Ventricular Ejection Fraction (%)	.5
LAM	.6
CCW	.7
Pulmonary Artery Systolic Pressure [mm(hg)]	.8
Pulmonary Artery Diastolic Pressure [mm(hg)]	.9
Intracoronary Pressure [mm(hg)]	.10
Aortic Root Diastolic Pressure [mm(hg)]	.11
Aortic Root Mean [mm(hg)]	.12
LV Systolic [mm(hg)]	.13
LV Diastolic [mm(hg)]	.14
LV Mean [mm(hg)]	.15
RA Mean [mm(hg)]	.16
RV Systolic [mm(hg)]	.17
RV Diastolic [mm(hg)]	.18
RV Mean [mm(hg)]	.19
Cardiac Catheterization Impression	&IMP

Angiogram Coronary Artery Lesions

Answer given as percent obstruction

Root Code: 1101

Extension:

RCA Proximal Obstruction (%)	.2
RCA Med Obstruction (%)	.3
RCA Distal Obstruction (%)	.4
RFDA Obstruction (%)	.5
RPLS Obstruction (%)	.6
1st RPL Obstruction (%)	.7
2nd RPL Obstruction (%)	.8
3rd RPL Obstruction (%)	.9
Acute Marginal Obstruction (%)	.10
RV BRANF Obstruction (%)	.11
Left Anterior Descend Obstruction (%)	1102.2
LCD Proximal Obstruction (%)	.3
LCD Med Obstruction (%)	.4
LCD Distal Obstruction (%)	.5
1st DIG Obstruction (%)	.6
2nd DIG Obstruction (%)	.7
1st Septal Obstruction (%)	.8
Prox CX Obstruction (%)	.9
Distal CX Obstruction (%)	.10
Interradiate Obstruction (%)	.11
1st cm Obstruction (%)	.12
2nd cm Obstruction (%)	.13
LAV Obstruction (%)	.14
1st LPL Obstruction (%)	.15
2nd LPL Obstruction (%)	.16
3rd LPL Obstruction (%)	.17
LPDA Obstruction (%)	.18

Electrocardiographic Measures

Note: all measures will not apply to all instruments

Root Code

Holter (use for all durations)	93266
Rhythm Strip	93040
EKG 12-Lead	93000
Signal Averaged/High Resolution ECG	5000

Extension

Ventricular rate EKG/min	.2
Atrial rate EKG/min	.3
P interval (ms)	.25
P-R interval (ms)	.4
QRS - interval (ms)	.5
QT - interval (ms)	.6
Q wave width (ms)	.7

Q wave depth (mv)	.8
# PVCs (min)	.9
# PACs (min)	.10
ST-elevation (mv)	.11
P-wave axis (deg)	.12
QRS-axis (deg)	.13
T-wave axis (deg)	.14
EKG axis (deg)	.26
EKG.Rhythm	.15

Answers
Atrial fibrillation
Atrial Flutter
Atrial premature contractions (/min)
Atrial tachycardia
Artificial Pacemaker
Bigeminy
Junctional complex
Junctional tachycardia
Normal
Paired VPC
Sinus arrhythmia
Sinus bradycardia
Sinus tachycardia
Trigeminy
Ventricular Premature contractions (/min)
Ventricular Tachycardia

Pacemaker Model_	.16
Pacemaker type	.28
Pacemaker	.29
EKG Conduction	.17
ST-T waves	.27

Answers
Normal
1st deg block
AV Wenckebach
AV Mobitz II
AV dissociation
Right bundle branch block
Left bundle branch block
Incomplete RBBB
Incomplete LBBB
Bilateral BBB
Accelerated Conduction
Delta Wave

Cardiac Pacemaker.EKG	.18

Answers
Sinus
Atrial
Ventricular
HV Bundle

Morphology Atrial.EKG	.19

Answers
Normal
Right Atrial Hypertrophy RAH
Left Atrial Hypertrophy LAH

Morphology Ventricle.EKG	.20

Answers
Normal
Right Ventricular Hypertrophy RVH
Left Ventricular Hypertrophy LVH

Myocardial.Infarct.EKG(Age)	.21

Answers
Acute
Old
Age indeterminate

Myocardial.Infarct.EKG(Location)	.22

Answers
Septal MI(V1-3)
Lateral MI(I,L,V5-6)
Interior MI(II,3,F)
High Lateral MI(I,L)
Anterior MI(V3-4)
Extensive Anterior MI(I,L,V1-0)
Anterior Septal MI(V1-4)
Anterior Lateral MI(V3-6)

EKG miscellaneous	.30
EKG lead placement	.31
Other Morphology.EKG	.23

Answers
high peaked T wave
large U wave

Monitor duration (min)	.24

Holter/Ambulatory Extensions

Holter recording duration(HH:MM)	.32
Holter number of heart beats recorded	.33
Holter mean heart rate (BPM)	.34
Holter Maximum heart rate (BPM)	.35
Holter Minimum heart rate (BPM)	.36
Holter Maximum heart rate time stamp	.37

Holter Minimum heart rate time stamp	.38
Holter Maximum VT rate (BPM)	.39
Holter SVT rate (BPM)	.40
S-T depression (mm)	.41
Number of ventricular ectopics	.42
Number of VT runs	.43
Longest VT run (number of beats)	.44
Number of supraventricular ectopics)	.45
Number of SVT runs	.46
Longest SVT run (number of beats)	.47
Number of pauses	.48
Final impressions (uncoded text)	.49

Signal Averaged/High Resolution ECG

Signal number of beats averaged	.50
Signal number of beats detected	.51
Signal QRS duration, unfiltered (ms)	.52
Signal QRS duration, filtered (ms)	.53
Signal RMS voltage in terminal 40 ms	.54
Signal HFLA (High Frequency Low Amplitude)	.55
Duration (ms)	.56

Note: the filter setting may be used as a Sub ID for identification. At the present time, the following filters are most commonly used - 25hz, 40hz to 250hz, 60hz to 250hz, and 80hz to 250hz. These filter settings refer to the filtered values in the signal averaged ECG.

EKG Impression	&IMP
EKG Device	&DEV

Physiologic Observations (No specific CPT-4 codes. Have used ASTM 4-digit codes to identify)

Miscellaneous

Root Code:

Miscellaneous clinical findings: 1000

Extensions:

Stool output (ml/60min)	.13
Pupil size R (mm)	.14
Pupil size L (mm)	.15
Glasgow Score	.16
Apache score	.17
CVP pressure [mm(hg)]	.18
Cardiac output (l/min)	.19
#Bowel movements/8hrs	.20
Calorie count/shift (kcal)	.21
Apgar score 1 min	.22
Apgar score 5 min	.23

Medical History

Root Code: 2000

Extensions:

Chief complaint	.40
Source of history	.01
Present illness	.02
Family Hx	.03
Social Hx	.04
Functional status Hx	.05
Travel Hx	.06
Occupational Hx	.07
Childhood Disease Hx	.08
Surgical Procedures Hx	.09
Allergy Hx	.10
Medication Hx	.11
Review of Systems (header):	.12
Smoking Hx total (pack/yr)	.30
Smoking Hx current (pack/day)	.31
Dermatologic Hx	.13
Head Hx	.14
Eyes (vision) Hx	.15
Ears (hearing) Hx	.16
Nose (smell) Hx	.17
Mouth/throat/teeth Hx	.18
Respiratory Hx	.19
Neurologic Hx	.20
Musculoskeletal Hx	.21
Cardiovascular Hx	.22
Urinary Hx	.23
Sexual/reproductive Hx	.24
Date last menstrual period (OBM)	.32
Menstrual status	.33

Answers

Amenorrheic
Premenarche
Follicular phase
Periovulatory
Luteal phase
Amenorrheic
Menstruating
Pregnant
Postmenopausal

Birth control method	.34
Answers	
Not needed	
Not used	
Birth control pills	
Condom	
Cervical cap	
Spermicide	
Tubal Ligation	
IUD	
Rhythm	
Diaphragm	
Vasectomy	
Depo-provera hormone	
Endocrine Hx	.35
Hematologic Hx	.36
Psychiatric Hx	.37
Industrial exposure Hx	.38

Physical Exam

Root Code:	3000
Extensions:	
General status Px	.01
Vital signs Px	.02
Skin Px	.03
Head Px	.04
Eyes Px	.05
Ears Px	.06
Nose Px	.07
Mouth/throat/teeth Px	.08
Thorax/lungs Px	.09
Breasts Px	.10
Heart Px	.11
Abdomen Px	.12
Back Px	.13
Pelvic exam (female) Px	.14
Genitourinary exam (male) Px	.15
Rectal Px	.16
Limbs/extremities Px	.17
Vessels Px	.18
Neurologic Px (may be used instead of the following more discrete categories)	.19
Mental status Px	.20
Deep tendon reflex Px	.21
Sensation Px	.22
Balance, coordination Px	.23
Strength Px	.24

Hospital Discharge

Root Codes:	4000
Extension:	
Patient Name	.1
Admission Discharge	.2
Discharge Date	.3
Admission DX	.4
Discharge DX	.5
History	.6
Findings	.7
Procedures	.8
Hospital Course	.9
Consultations	.10
Discharge Disposition	.11
Discharge Meds	.12
Discharge Instructions	.13
Staff	.14
Dictated by	.15

Surgical Report

Root Code:	5000
Extension:	
Patient	.1
Date	.2
Preoperative DX	.3
Postoperative DX	.4
Staff Surgeon	.5
Resident Surgeon	.6
Operation	.7
Anesthesia	.8
Indications	.9
Findings	.10
Description of Oper	.11
Specimens	.12
Fluids	.13
Estimated Blood Loss	.14
Complications	.15
Dictated by	.16

Body Temperature (TEMP)

NOTE: The default and preferred units are given in parentheses. The result segment has space for a specified unit. When the

measurement units differ from the default they must be stored in the units field of the result segment. E.g., if the temperature was transmitted as F° instead of Celsius, the units should be transmitted using standard ANSI unit abbreviations (see section 10.7.1).

Root Code 1000

Extension:

Temp Method .1

Answer

Glass thermometer
Digital probe
Color strip
Infrared sensor

Temp.Oral (cel) .2
Temp.Rectal (cel) .3
Temp.Axillary (cel) .4
Temp.Other (cel) .5
Temp Body Source Other .6

Answers

Oral Urinary Bladder
Auxiliary Central Line
Rectal Trachea
Forehead Urinary Catheter

Temp Device .&DEV

Blood Pressure (BP)

Measure

Code

Blood Pressure = BP
Systolic Blood Pressure = SYS BP
Diastolic Blood Pressure = DIAS BP
Mean Blood Pressure = MED BP

Root Code: 1002

Extension:

BP Method .1

Answers

Manual by Palpation
Manual by Cuff & Stethoscope
Automatic Oscillatory
Automatic Auscultation
Automatic Arterial Lines

Measures (The default --standard-- unit of measure is mmHg)

BP.SYS [mm(hg)] .2
BP.DIAS [mm(hg)] .3
BP.MEAN [mm(hg)] .4

BP Measure SITE (may apply to cuff or arterial line) .6

Answers

Right Arm	Left Arm
Right Forearm	Left Forearm
Right Thigh	Left Thigh
Right Brachial	Left Brachial
Right Radial	Left Radial
Right Ulnar	Left Ulnar
Right Femoral	Left Femoral
Right Popliteal	Left Popliteal
Right Post Fibular	Left PostFibular
Right Dorsal Pedal	Left Dorsal Pedal
Right Carotid	Left Carotid

Umbilical

BP CUFF POSITIONS (applies only to cuff-based methods) .7

Answers

Right Arm	Left Arm
Right Forearm	Left Forearm
Right Thigh	Left Thigh
Right Calf	Left Calf

Heart Rate (HR = Pulse)

Pulse can be ascertained by many methods - from EKG tracings, blood pressure tracings, palpation auscultation

Root Code: 1006

Extension:

HR Method .1

Answers

Palpation
Stethoscope
Automatic BP Oscillatory
Automatic BP Auscultation
Arterial Line
EKG monitor
Impedance

HR (/min) .2

HR SITE .3

Answers

Right Arm Left Arm
Right Forearm Left Forearm
Right Thigh Left Thigh
Right Brachial Left Brachial
Right Radial Left Radial
Right Ulnar Left Ulnar
Right Femoral Left Femoral
Right Popliteal Left Popliteal
Right Post Fibular Left Post Fibular
Right Dorsal Pedal Left Dorsal Pedal
Umbilical

PULSE.STRENGTH (1-4) .4

PULSE QUALITY .5

PULSE RHYTHM .6

Answers

Regular
Irregular
Premature Beats

PREMATURE BEATS (/min) .7

Respiratory Rate (RR)

Root Code: 1007

Extension:

RR Method .1

Answers

visual
ventilator
stethoscope
chest stretch sense
pressure sense

RR (/min) .2

RR.QUAL .4

Answers

Stridor Wheezing
Labored Cyclical

General Patient State (may apply to any of the above)

Root Code: 1008

Extension:

General Measure
(Body Position) .2

Answers

Standing Lying
Sitting

Measure Exercise .3

Answers

Rest Maximum Exercise
Post Exercise

Time Post Exercise (min) .4

Maximum Exercise (EKG/min) .5

Body Weight

Root Code: 1010

Extension:

Body Weight (kg) .1

Type of Scale .2

Answer

Standing Scale Bed Scale

Height

Root Code:

Extension:

Height (cm) .3

Intake and Output

Urine Output

Root Code: 1013

Extension:

Urine.Output.Method .1

Measure as quantity urine output

Answers

Manual
Automatic

Urine.Output.Spot (ml) .2

Urine.Output.Shift.Total (ml) .3

Urine.Output.24H Total (ml) .4

Urine.Output Device &DEV

Urine.Output.Color .6

Answers

Bloody	Yellow
Brown	Clear

NG Output

Root Code: 1014

Extension:

Ng Output Method	.1
Ng Output.Spot (ml)	.2
Ng Output.Shift Total (ml)	.3
Ng Output.24H Total (ml)	.4
Ng Output.Device	&DEV
Ng Output.Qual	.6

Answers

Bloody	Green
Coffeegrounds	Food
Yellow	Pill particles

Chest Tube Output

Root Code: 1015

Extension:

Chest Tube Output Methods	.1
Chest Tube Output Spot (ml)	.2
Chest Tube Output.Shift total (ml)	.3
Chest Tube Output 24H total (ml)	.4
Chest Tube Output Device	&DEV
Chest Tube Output.Qual	.6

Stool Output

Root Code: 1016

Extension:

Stool Output Method	.1
Stool Output Spot (ml)	.2
Stool Output.Shift Total (ml)	.3
Stool Output.24H Total (ml)	.4
Stool Output Device (ml)	&DEV
Stool Output.Qual (ml)	.6

Answers

Watery	Bloody
Loose	Blood-streaked
Soft	

Surgical Drain Output

Root Code: 1017

Extension:

Surgical Drain Output Method	.1
Surgical Drain Output Spot (ml)	.2
Surgical Drain Output.Shift Total (ml)	.3
Surgical Drain Output.24H Total (ml)	.4
Surgical Drain Output Where (ml)	.5
Surgical Drain Output.Qual (ml)	.6

IV Intake

Root Code: 1020

Extension:

IV Intake Volume (ml)	.1
IV Intake Type	.2
IV Intake Na (mmol)	.3
IV Intake Cal (kcal)	.4
IV Intake K+ (mmol)	.5
IV Intake Where	.6
IV Intake Device	&DEV

PO Intake

Root Code: 1030

Extension:

PO Intake Spot Volume (ml)	.1
PO Intake Type	.2
PO Intake Shift Total (ml)	.3
PO Intake 24H Total (ml)	.4

GT Intake (gastric tube)

Root Code: 1031

Extension:

GT Intake Spot Volume (ml)	.1
GT Intake Type	.2
GT Intake Shift Total (ml)	.3
GT Intake 24H Total (ml)	.4

NG Tube Intake

Root Code: 1032

Extension:

NG Tube Intake Spot Volume (ml)	.1
NG Tube Intake Type	.2
Ng Tube Intake Shift Total (ml)	.3
Ng Tube Intake 24H Total (ml)	.4

Peritoneal Intake

Root Code: 1033

Extension:

Peritoneal Intake	.1

Peritoneal Shift Total (ml) .2
Peritoneal 24H Total (ml) .3

Drug related clinical variables (excluding antibiotic sensitivities)

Root codes (examples are WHO drug record numbers and salt extensions). The Who codes provide unique identifiers for each single component drug at the generic drug-salt level and every combination drug -- a total of over 6,500 chemical substances and 8,700 multiple ingredient drugs.

Chloroquine phosphate	000010 02
Chloroquine sulfate	000010 03
Chloroquine diorotate	000010 05
Chloroquine hydrochloride	000010 06
Atromid-S	000013 01
Amantadine hydrochloride	000559 02
Amantadine sulfate	000559 01

To construct a code for identifying the variable type for drug X, append the string that identifies the drug variable type to the WHO record number code for drug X. Measurements labeled QN are measures of amount. Measurements labeled QL are qualitative, given as CE codes, indicating presence or absence.

Codes related to drug measurement:

Drug X peak serum level QN .1
Drug X trough serum level QN .2
Drug X time post dose level drawn .3
Drug X dose given (see below)
Drug X random serum level QN .4
Drug X random serum level QL .5
Drug X urine level spot QN .6
Drug X urine level spot QL .7
Drug X urine level 24 hr QN .8
Drug X saliva measure QL .9
Drug X saliva measure QN .10
Drug X hair measure QL .11
Drug X hair measure QN .12
Drug X RBC measure QN .13
Drug X frequency of dosing (ST) e.g., BID, TID

Codes related to dosing and prescription:

Drug X dose amount given .21
(the date-time of dose would be recorded in OBX-15 and units in OBX-6 used to report the dose given before a peak or a trough)

Drug X dose route given .22
(CE data type use, HL7 route codes)

Drug X who prescribed (CE)

Drug X dose prescribe a point in time .22
E.g., if dose was 5 mg three times per day (TID) value would be "5", and units "mg"

Drug dose prescribed average per day (NM) .23
E.g., if dose was 5 mg TID the value would be 15 and units mg. If dose was 5 mg alternating with 10 mg on alternate days, the value would be 7.5 and units would be mg

Drug dose percent compliance patient estimate (NM) .24
This is recorded as patients estimate of percent of doses taken. Could be more than 100%. E.g., if he/she missed half of the afternoon dose of twice a day insulin and none of the morning doses the percent compliance would be 75%)

Drug dose percent compliance dispensing estimate (NM) .26
This is compliance estimated by pharmacy dispensing. (Could be more than 100%)

Drug dose percent compliance automatic count .27
This records the actual drug doses removed from an automatic pill dispenser compared to the number that was supposed to be take over a unit time.

Number of doses per day. .28

Recorded as the number of doses taken per day. For if prescribed three times a day its value would be 3. If four times a day or every 6 hours, it would be 4. If every other day it would be .5

Drug dose frequency instructions (TX) .29

Drug prescribing instructions full (TX) .30

The full instructions as written by the physician

Cumulative dose (total dose of drug

given relative to a time) .31

Date time of cumulative dose started .32

Health Outcome Variables (from Health Outcomes Institute)

The following lists a large number of health outcomes variables and their codes. (The code system designation is HI) available from the Health Outcomes Institute (17). The Health Outcomes Institute is collecting outcomes variables such as those defined in the RAND 36 questions health status questionnaire, and the InterStudy TyPE specifications. These are being used by a consortium of 36 large group practices. The full questionnaires are available from the Health Outcomes Institute (2001 Killebrew Dr, Suite 122, Bloomington, MN 55425).

We list the variables here to give concrete examples of outcome variables that are being used in real outcomes data bases, and to provide yet another illustration of how OBX segments can communicate data related to different master code files.

The codes listed are the complete codes for Health Outcomes Institute, not extensions intended for constructing codes.

GENERAL HEALTH STATUS

In general, would you say your health is:	1.1

Change in Health in General Over One Year

Change in health over last year	2.1

Physical Function

Vigorous activities limited by health	3.1
Moderate activities now limited by health	3.2
Lifting or carrying groceries limited by health	3.3
Climbing several flights of stairs limited by health	3.4
Climbing one flight of stairs limited by health	3.5
Bending, kneeling or stooping limited by health	3.6
Walking more than a mile is limited by health	3.7
Walking several blocks is limited by health	3.8
Walking one block is limited by health	3.9
Bathing or dressing self is limited by health	3.10

Role Physical Items

Limit amount of time spent on work	4.1
Accomplish less than you would like	4.2
Limited in kind of work performed	4.3
Difficulty performing work	4.4

Role Mental Items

Cut down amount of time spent on work or other activities - past 4 we	5.1
Accomplish less than you would like over the last 4 weeks	5.2
Didn't do work or other activities as carefully as usual over the past	5.3

Social Function Items I

Extent physical/emotional problems interfered with social activities	6.1

Pain Items I

Pain experienced over last four weeks	7.1

Pain Items II

Extent pain interferes with normal work, last four weeks	8.1

General Health Perceptions

I seem to get sick a little easier than other people	11.1
I am as healthy as anybody I know	11.2
I expect my health to get worse	11.3
My health is excellent	11.4

Present Height and Weight (Feet, Inches, Pounds)

Patient height	110.1

Three Item Depression Screener

Two weeks or more of past year was depressed	121.1
Two years in life feeling depressed or sad most days	121.2
Felt depressed or sad much of the time in past year	121.3

Energy, Fatigue, Emotional Status (InterStudy)

Did you feel full of pep?	122.1
Have you been a nervous person?	122.2
Have you felt so down nothing could cheer you?	122.3
Have you felt calm and peaceful?	122.4
Did you have a lot of energy?	122.5
Have you felt downhearted and blue?	122.6
Did you feel worn out?	122.7
Have you been a happy person?	122.8
Did you feel tired?	122.9

- Limited in kind of activities 379.3
- Difficulty performing activities 379.4

Does Your Asthma Cause You To Feel Anxious, Etc.

- Anxiousness, depression, irritability due to asthma 380.1

Your Asthma Interfered With Your Normal Activities

- Your asthma interfered with your normal social activities with family 381.1

Have You Missed From Work Because of Asthma?

- Have you missed from work, school, or your usual activities because o 382.1

Is Your Activity Limited by Other Condition?

- Is your physical activity limited by any condition other than asthma? 383.1

During the Past 4 Weeks Having Feelings of Anxious

- Cut down on time spent on work or other activities 384.1
- Accomplished less than would have liked 384.2
- Didn't do work or activities as carefully as possible 384.3

What Medication Do you Take to Control Your Asthma

- Taken Prednisone, Medrol, or another steroid pill/cortisone in last 6 385.1
- Taken Prednisone, Medrol, or other steroid/cortisone for short period 385.2
- Number of treatments last 6 months 385.3
- How regularly is medications used to control asthma 385.4
- Number of times needed to suddenly increase dosage to control asthma 385.5
- Steroid/cortisone injection last 6 months 385.6

Hip - Post Discharge Antithrombotic Methods

- Coumadin - Post discharge 386.1
- Heparin - Post discharge 386.2
- Other Drug - Post discharge 386.3
- Other mechanical - Post discharge 386.4
- None - Post discharge 386.5

Do You Take Any Other Pills or Liquids For Asthma?

- Other pills or liquids taken for asthma 394.1

Choose the Following Pills or Liquids You Take

- Slo-phyllin, Theo-24, Quibron, Slo-bid, Theodur, Uniphyl, or other 395.1
- Brethine, Bricanyl, Proventil, Ventolin, Alupent, Metaprel, Terbutali 395.2
- Other medications taken regularly 395.3

Do You Use Inhalers For Asthma?

- Use of any inhalers 396.1
- Use of Alupent, Proventil, Ventolin, Tornalate, Brethair, Maxair, Bro 396.2
- Use of Primatine, Bronkaid 396.3
- Use of Atrovent 396.4
- Use of Intal, Cromolyn 396.5
- Use of Azmacort, Vanceril, Beclovent, Aerobid, or other inhaled stero 396.6
- Use of other inhalers 396.7
- Use of Extender or spacer 396.8
- Use of nebulizer with air compressor 396.9
- Use of Alupent, Proventil, Ventolin, Brethine, Bronkosol in nebulizer 396.10
- Use of Atropine, Robinal in nebulizer 396.11
- Use of Intal, Cromolyn in nebulizer 396.12
- Use of other medications in nebulizer 396.13

How Often Forget Med

- How often patient forgets to take medications 400.1

Complications From Medication

- Difficulty sleeping 401.1
- Shakiness 401.2
- Heart palpitations 401.3
- Headaches 401.4
- Nervousness, moodiness, irritability 401.5
- Hoarseness 401.6
- Thrush or yeast infections 401.7

Problems Due to Expense of Medication

- Problems due to expense of asthma medications 402.1

Do You Take Your Med for Asthma

- Medications not taken due to cost 403.1

Do You Have a Pet?

- Pets in home? 404.1

Do You Have a Peak Flow Meter?

- Do you have a peak flow meter? 405.1

When is peak flow meter used 405.2
Is the peak flow meter helpful? 405.3
Adjust medications or call physician based on peak flow readings 405.4
Do you know your personal best/normal pfm reading 405.5

Do You Smoke?
Do you smoke? 406.1

Are You Exposed to Significant Tobacco?
Exposed to significant tobacco smoke? 407.1

What Trigger Your Acute Asthma Attacks?
Pets in home 408.1
Cats, dogs, or other animals 408.2
Household dust 408.3
Pollens or certain seasons during the year 408.4
Aspirin 408.5
Foods 408.6
Exercise 408.7
Smoke, cold air, or other irritants 408.8

Exposure in Current Work Place Affects Your Asthma
Do you think exposure to something in your current work place affects 410.1

Exposure to Something at Home Effect Your Asthma?
Do you think exposure to something in your home effects your asthma? 411.1

Over the Past Year Has Your Asthma Gotten Better?
Improvement in asthma over past year 412.1

Does Asthma Affect the Quality of Your Life?
How much asthma effects quality of life 413.1

How Often Do You Have the Following Symptoms?
Cough 414.1
Sputum 414.2
Chest tightness 414.3
Wheezing or whistling sound in chest 414.4
Shortness of breadth 414.5
Heartburn 414.6

Have You Ever Had Allergic, etc...
Allergic rhinitis, hay fever, or nasal allergy 415.1
Hives 415.2
Eczema415.3
Family members with asthma, hay fever, or eczema 415.4
Recurrent sinusitis 415.5
Nasal polyps 415.6
Worsening of asthma before periods or during pregnancy 415.7

What Is Your Quality of Care For Asthma Treatment?
Quality of care received for asthma last 3 months 416.1

Have You Had an Evaluation?
Evaluation done by: 417.1

Who Filled Out This Form?
Who filled out this form? 418.1

First You Have Seen This Patient For Asthma?
First time seen this patient for asthma 419.1

Convincing Clinical History?
Convincing clinical history of hyperactive airways disease 420.1

Improvement of FEV1
Improvement of FEV1 > 15% with treatment 421.1

Response to Methacholine Challenge Test?
Response to methacholine challenge test 422.1

Fixed Obstructive Airway Disease
Patient with fixed obstructive airway disease 423.1

Indicating Patient's Asthma
Asthma severity 424.1
Level of control of asthma 424.2
Patient compliance with medication treatment 424.3
Patient compliance of suggested environmental changes 424.4
Patient understanding of asthma and treatment 424.5

Patient Has Used Systemic Steroid
Use of systemic steroid medications 429.1

Patient Hospitalized
Hospitalizations in past 6 months for asthma 430.1

Emergency Room Treatment for Asthma
Emergency room treatment for asthma last 6 months 431.1

Patient Asthma Medication History
Inhaled beta agonist 432.1
Oral beta agonist 432.2
Inhaled corticosteroid 432.3
Oral corticosteroid 432.4
Oral methylxanthine 432.5

Frequency left hip interfered with your sleep, last 4 weeks 463.1
Extent to which RH interfered with sleep over last four weeks 463.2

Do You Have Difficulty Putting On Your Shoes?
Difficulty putting on your shoes and socks 464.1
Level of difficulty to put on shoes and socks 464.2

Describes How You Go Up Stairs?
Stairclimbing method 465.1

Best Describes How Your Go Down Stairs?
Best describes how you go down stairs? 466.1

Do You Have Difficulty Moving From a Sitting To A Standing?
Ability to rise from sitting position 467.1

Ambulation - Type of Support Required
Support used when walking 468.1

Ambulation - Minutes Walked - Without Support
Duration able to walk without support 469.1

Ambulation - Minutes Walked - With Support
Walk with support 470.1

Ambulation - Degree of Limp - Without Support
Limp without support 471.1

Ambulation - Degree of Limp - With Support
Degree of limp with support 472.1

How Would You Describe Your Cigarette Smoking?
Cigarette smoking habits 473.1

Satisfaction With Results of Hip Replacement
Level of satisfaction with the results of hip replacement 474.1

Vision - Self Rating - Both Eyes
How would you rate your vision 476.1

Vision - Affect of Bright Light
How does bright light affect your vision 477.1

Vision - Self Rating, Right Eye
How would you rate the vision in your right eye 478.1

Vision Hinders Activity
Extent vision hinders from participating in daily activities 479.1
Ability to recognize people and things across the street 479.2
Extent ability to drive in daytime is hindered 479.3
Extent ability to drive at night is hindered 479.4
Extent ability to read street signs is hindered 479.5
Extent ability to see traffic lights is hindered 479.6
Extent ability to watch tv is hindered 479.7

Vision - Self Rating, Left Eye
How would you rate the vision in your left eye 480.1

Vision - Close-up Activities
Extent vision hinders from performing close-up activities (reading) 481.1
Extent vision hinders from crafts & hobbies 481.2
Extent vision hinders reading labels in stores 481.3
Extent depth perception is limited 481.4

Sex
Sex 483.1

Occupation
Occupation: 484.1

Vision - Hindered by Glare
Extent glare limits participation in daily activities 493.1
Extent limited fr reading shiny paper 493.2
Extent hindered by sun, headlight glare when driving 493.3
Extent limited fr walking outside on a sunny day 493.4
Extent limited fr reading glare-y signs in supermarket 493.5

Expectation of Vision After Surgery
After surgery I expect my vision to be: 494.1

Expected Post-Operative Performance of Usual Activ
Expected improvement in performance of usual daily activities 495.1

Past Medical History of Patient
No known medical conditions 496.1
Cardiac disease 496.2
Diabetes requiring medical treatment 496.3
Hypertension 496.4
Past stroke 496.5
Autoimmune/rheumatoid disease 496.6
COPD 496.7
Mental illness 496.8

Cancer, excluding skin	496.9
Other conditions	496.10

No Eye Disease besides Cataract

No known eye disease besides cataract	497.1
No known OS disease besides cataract	497.2

Systemic Medications Taken by Patient

Patient currently not regularly medication	498.1
Patient taking aspirin	498.2
Patient taking insulin	498.3
Patient taking Coumadin	498.4
Patient taking steroids	498.5
NSAID	498.6
Other	498.7

Stage of Glaucoma Treatment

Procedures to treat OD glaucoma	499.1
Procedures to treat OS glaucoma	499.2
Laser trabeouloplasty treatment - glaucoma	499.3
OD past filtering surgery - glaucoma	499.4
OS no current treatment	499.5
OS topical therapy	499.6
OS laser trabeouloplasty	499.7
OS past filtering surgery	499.8

Other Eye Disease

Amblyopia	500.1
Other OD nerve disease	500.2
Previous cataract extraction and implant	500.3
History of cataract extraction and implant	500.4
OD significant eye trauma	500.5
OD chronic uveltis500.6	
OD diabetic retinopathy	500.7
OD macular degeneration	500.8
OD other significant problems	500.9
OS amblyopia	500.10
OS other optic nerve disease	500.11
OS previous cataract extract/implant	500.12
OS history of cataract extraction & implant	500.13
Significant OS trauma	500.14
OS chronic uveltis	500.15
OS diabetic retinopathy	500.16
OS macular degeneration	500.17
Other significant OS problems	500.18

Pupils

OD pupil	501.1
OS pupils	501.2

Amsler Grid

OD Amsler Grid	502.1
OS Amsler Grid	502.2

Corneal Examination

OD normal cornea	503.1
Guttata w/o edema	503.2
OD confluent guttata w/o edema	503.3
OD corneal edema	503.4
OD central corneal opacity	503.5
OD corneal dystrophy or degeneration	503.6
OD corneal interstitial keratitis	503.7
OD herpetic disease	503.8
OD other corneal pathology	503.9
OD previous corneal transplant	503.10
OD cornea cannot be assessed	503.11
OS normal cornea	503.12
OS corneal guttata w/o edema	503.13
OS corneal confluent guttata w/o edema	503.14
OS edema	503.15
OS central corneal opacity	503.16
OS corneal dystrophy	503.17
OS interstitial keratitis	503.18
OS herpetic disease	503.19
OS other corneal pathology	503.20
OS previous corneal transplant	503.21
OS cornea cannot be assessed	503.22
OS shallow cornea	503.23
OS cornea cannot be assessed	503.24

Anterior Chamber Findings

OD AC normal	504.1
OD AC flare only	504.2
OD AC cells only	504.3
OD AC keratic precipitates	504.4
OD AC posterior synechiae	504.5
OD pupil mydriatis	504.6
OD pupil irregular	504.7
OD shallow AC	504.8
OD transillumination defects	504.9
OD cannot assess	504.10
OS AC normal	504.11
OS AC flare only 504.12	
OS AC cells only	504.13
OS keratic precipitates	504.14
OS posterior synechiae	504.15
OS pupil mydriasis	504.16
OS pupil irregular	504.17
OS shallow AC	504.18
OS transillumination defects	504.19

OS cannot assess anterior chamber	504.20
Predominant Lens Findings	
Normal OD lens	505.1
Normal OS lens	505.2
Type of Cataract	
Type of Cataract (nuclear, cortical, PSC, hypermature)	506.1
OS cataract type	506.2
OD cataract etiology	506.3
OS cataract etiology	506.4
Pseudophakia	
OD P/C IOL	507.1
OS P/C IOL	507.2
OD A/C IOL	507.3
OS A/C IOL	507.4
OD posterior capsule opacification	507.5
OS posterior capsule opacification	507.6
OD posterior capsulotomy	507.7
OS posterior capsulotomy	507.8
Other Lens Findings	
OD surgical aphakia	508.1
OS surgical aphakia	508.2
OD dislocated/subluxed crystalline lens	508.3
OS dislocated/subluxed crystalline lens	508.4
OD exfoliation syndrome	508.5
OS exfoliation syndrome	508.6
OD other lens findings	508.7
OS other lens findings	508.8
OD cannot assess lens	508.9
OS cannot assess	508.10
Optic Nerve (Note All Abnormalities)	
Optic Nerve findings - OD	509.1
OS Nerve findings	509.2
OD C/D ratio - horizontal	509.3
OS C/D ratio - horizontal	509.4
OD C/D ratio - vertical	509.5
OS C/D ratio - vertical	509.6
Retina	
OD normal retina	510.1
OS normal retina	510.2
OD macular edema	510.3
OS macular edema	510.4
Od macular hole	510.5
OS macular hole	510.6
OD epimacular membrane	510.7
OS epimacular membrane	510.8
Diabetic Retinopathy	
OD diabetic retinopathy	511.1
OS Diabetic Retinopathy	511.2
OD proliferative diabetic retinopathy	511.3
OS proliferative diabetic retinopathy	511.4
OD vitreous hemorrhage	511.5
OS vitreous hemorrhage	511.6
OD prior laser therapy	511.7
OS prior laser therapy	511.8
OD prior vitrectomy	511.9
OS prior vitrectomy	511.10
Macular Degeneration	
OD rare drusen	512.1
OS rare drusen	512.2
OD scattered drusen	512.3
OS scattered drusen	512.4
OD confluent drusen	512.5
OS confluent drusen	512.6
OD geographic atrophy	512.7
OS geographic atrophy	512.8
OD active subretinal NVM	512.9
OS active subretinal NVM	512.10
OD prior laser therapy	512.11
OS prior laser therapy	512.12
OD disciform scar	512.13
OS disciform scar	512.14
Retinal Detachment	
OD current retinal detachment	513.1
OS current retinal detachment	513.2
OD prior retinal detachment surgical therapy	513.3
OS prior retinal detachment surgical therapy	513.4
OD current retinal break	513.5
OS current retinal break	513.6
OD prior surgical therapy	513.7
OS prior surgical therapy	513.8
Retinal Vascular Occlusion	
OD BRVO	514.1
OS BRVO	514.2
OD CRVO	514.3
OD BRVO	514.4
OD BRAO	514.5
OS BRAO	514.6
OD CRAO	514.7
OS CRAO	514.8
Other Retinal Findings	
OD other retinal findings	515.1

OS other retinal findings	515.2
Cannot assess OD retina	515.3
Cannot assess OS retina	515.4

Ocular Exam: Recent Visual Acuity

SC	516.1
CC	516.2
PH	516.3
MR w/in 3 months	516.4
Glare	516.5
PAM	516.6

Recent Visual Acuity - OS

SC	517.1
CC	517.2
PH	517.3
MR w/in 3 months	517.4
Glare	517.5
PAM	517.6

OD Recent Refraction

OD recent refraction, sign value, spherical	518.1
OD recent refraction, spherical (hundredths)	518.2
OD recent refraction, sign for cylindrical value	518.3
OD recent refraction, cylindrical (hundredths)	518.4
OD recent refraction, axis	518.5

Operated Eye

Operated eye	519.1

Operation Type

Cataract operation type	520.1
Total time, (tenths of minutes)	520.2
Power (tenths)	520.3

Acetabular Graft Data

Acetabular graft type	521.1
Acetabular Graft source - Femoral head	521.2
Acetabular Graft source - Femur	521.3
Acetabular Graft source - Freeze dried	521.4
Acetabular Graft source - Local	521.5
Acetabular Graft source - Iliac Crest	521.6
Acetabular Graft source - Structural	521.7
Acetabular Graft source - Other	521.9
Acetabular Graft source - Morselized	521.10
Acetabular Graft location - Superior	521.11
Acetabular Graft location - Medial	521.12
Acetabular Graft location - Posterior	521.13
Acetabular Graft location - Anterior	521.14

Acetabular Bone Defects Found Intra-Operatively

Acetabular Bone defects - Contained Anterior	522.1
Acetabular Bone defects - Contained Superior	522.2
Acetabular Bone defects - Contained Posterior	522.3
Acetabular Bone defects - Contained Medial	522.4
Acetabular Bone defects - Segmental Anterior	522.5
Acetabular Bone defects - Segmental Superior	522.6
Acetabular Bone defects - Segmental Posterior	522.7
Acetabular Bone defects - Segmental Medial	522.8
Acetabular Bone defects - Central	522.9
Acetabular Bone defects - Pelvic Discontinuity	522.10

Intraop Blood Transfusions

Intraoperative Blood transfusions - Autologous Blood	523.1
Intraoperative Blood transfusions - Bank Blood	523.2

Surgical Time

Elapsed time of surgery	524.1

Anesthesia

Cataract surgery anesthesia	525.1

Duration of Procedure

Total duration of cataract procedure	526.1

Intraocular Lens Type

Intraocular lens type	527.1
IOL irrigation	527.2
Visco-elastic IOL	527.3

Antibiotic Coverage

Erythromycin	528.1
Velosef usage	528.2
Other antibiotics usage	528.3
Subconjunctival Gentamycin	528.4

Steroid Treatment

Use of Kenalog	529.1
Use of Hexadrol	529.2
Weeks of topical steroid use	529.3
Weeks of topical steroid use	529.4

Location of Incision

Millimeters from limbus	530.1
Quadrant of incision	530.2
Type of incision	530.3

Desired Spherical Equivalent Refraction

Desired spherical refraction (hundredths)	531.1
Desired spherical refraction to the hundredths	531.2

Intraoperative events

Intraoperative events	532.1
Retrobulbar hemorrhage	532.2
Vitreous loss	532.3
Choroid hemorrhage	532.4
Loss of nuclear fragment	532.5
Significant residual cortical material	532.6
Residual posterior capsule opacity	532.7
Broken capsule	532.8
Zonule dehiscence	532.9
Retinal break	532.10
Retinal detachment	532.11
IOL malposition	532.12
Other interoperative events	532.13
Other interoperative events	532.14

Dilated Pupil Size (mm) at Commencement of Surgery

Dilated pupil size at commencement of surgery in mm	533.1

Cord Incision Length

Cord incision length in mm	534.1

Size of Capsulectomy

Size of capsulectomy in mm	535.1
Continuous tear capsulorrhexis 535.2	
Can-opener capsulorrhexis	535.3
Other capsulorrhexis	535.4
Meri?? extension of capsul??	535.5

OS Recent Refraction

OS recent refraction, sign value	536.1
OS recent refraction, spherical (hundredths)	536.2
OS recent refraction, sign of cylindrical value	536.3
OS recent refraction, cylindrical (hundredths)	536.4
OS recent refraction, axis	536.5

Intraocular Pressure

OD intraocular pressure	537.1
OS intraocular pressure	537.2

OD K Readings

OD K1 readings, spherical (hundredths)	538.1
OD K2 readings, cylindrical, (hundredths)	538.2
OD K readings, axis	538.3

K Readings - OS

OS K1 readings, spherical, (hundredths)	539.1
OS K2 readings, cylindrical, (hundredths)	539.2
OS K readings, axis	539.3

Axial Length

OD axial length, (hundredths)	540.1
OS axial length (hundredths)	540.2

Corneal Edema

Corneal epithelial edema	542.1
Stromal K edema	542.2
Folds decemet	542.3

Wound Status

Normal	543.1
Broken suture	543.2
Leak present	543.3
Filtering blebs	543.4
Choroidal hemorrhage	543.5

Anterior Chamber

Cell, anterior chamber	544.1
Flare, anterior chamber	544.2
Vitreous present in AC	544.3
Hyphema	544.4
Endophthalmitis	544.5

Pupil Exam Items

Normal pupil characteristics	545.1
Mydriatic pupil > 4mm	545.2
Irregular pupil	545.3
Pupillary block	545.4
Other pupil characteristics	545.5

Intraocular Lens Dislocation

IOL dislocation	546.1
IOL dislocation length 546.2	
Optically significant	546.3
Optically significant	546.4

Posterior Capsule

Clear posterior capsule	547.1
Visually significant opacity	547.2
Retained cortex	547.3
S/P yag or surgical capsulotomy	547.4
Pitting of lens	547.5

Optic Nerve

Status of optic nerve	548.1
OD horizontal cup to disk ratio to the hundredths	548.2
OS horizontal C/D ratio, to the hundredths	548.3
OD vertical CD ratio (hundredths)	548.4
OS vertical C/D ratio	548.5

Post-op Fundus Findings

Same as pre-op	549.1
Uncovered pre-op disease	549.2
New post-op disease	549.3
CME	549.4
Filtering blebs	549.5
Choroidal detachment	549.6
Epimacular membranes	549.7
Retinal break since surgery	549.8
Retinal detachment since surgery	549.9

Suture Lysis Performed, Date

Suture lysis performed	550.1
Month of suture lysis	550.2
Day of suture lysis	550.3
Year of suture lysis	550.4
Day of suture lysis	550.5
Year of yag capsulotomy	550.6
Month of yag capsulotomy	550.7
Day of yag capsulotomy	550.8
Year of yag capsulotomy	550.9
Month of eyeglass Rx	550.10
Day of eyeglass Rx	550.11
Year of eyeglass Rx	550.12
Year of eyeglass Rx	550.13

Intraocular Pressure

Intraocular pressure	551.1
Status of glaucoma	551.2
IOP	551.3

Visual Acuity

SC	552.1
CC	552.2
PH	552.3
MR	552.4
PAM	552.5
Near vision with correction	552.6

Refraction

Sign for spherical value	553.1
Spherical value (hundredths)	553.2
Sign of cylindrical value	553.3
Cylindrical (hundredths)	553.4
Axis	553.5

Change in Vision

Significant change in vision	554.1
Macular degeneration	554.2
Glaucoma	554.3
Optic nerve disease	554.4
Diabetic retinopathy	554.5
Other	554.6

Perioperative IOP

Perioperative IOP - day 1	555.1
Final day, perioperative IOP	555.2
Perioperative IOP - day n	555.3

Patient Satisfaction With Results of Surgery

Patient satisfaction with results of surgery	556.1

Patient's Willingness to Repeat

Patient willing to undergo same procedure	557.1

Iris Color

OD iris color	558.1
OS iris color	558.2

Visual Field Loss

OD mild visual field loss	559.1
OD mod visual field loss	559.2
OD severe visual field loss	559.3
OS mild visual field loss	559.4
OS moderate visual field loss	559.5
OS severe visual field loss	559.6

Pupils - Additional

OD mydriatis > 4mm	560.1
OD irregular pupils	560.2
OS mydriatis > 4mm	560.3
OS irregular pupil	560.4

Intraocular Lens Decentralization

Intraocular lens decentralization - OD	561.1
Intraocular lens decentralization - OS	561.2

Alternative Version - Visual Field Loss

OD visual field loss	562.1
OS visual field loss	562.2

Etiology of Cataract

Etiology of Cataract (nuclear, cortical, PSC, hypermature)	601.1
OS cataract etiology	601.2

Cup to Disc Ratio

OD C/D ratio - horizontal (hundredths)	602.1
OS C/D ratio (hundredths)	602.2
OD C/D ratio - vertical (hundredths)	602.3

OS C/D ratio - vertical (hundredths)	602.4

Retinal Break

OD current retinal break	603.1
OS current retinal break	603.2
OD retinal break prior surgical therapy	603.3
OD retinal break prior surgical therapy	603.4

Intraocular Irrigation

IOL irrigation	604.1

Visco-elastic

Visco-elastic	605.1

Yag Capsulotomy Performed

Yag capsulotomy	606.1
Month of yag capsulotomy	606.2
Day of yag capsulotomy	606.3
Year of yag capsulotomy	606.4

Eyeglass RX

Eyeglass Rx written	607.1
Month of eyeglass Rx	607.2
Day of eyeglass Rx	607.3
Year of eyeglass Rx	607.4

Type of Suture

Type of suture	633.1

Employment Status - Attributed to Vision

Current employment status of patient	634.1

Time it Took to Reach Current Vision Status

Patient - Time it took to reach current vision status	635.1

Energy, Fatigue, Emotional Status Items

Did you feel full of pep?	694.1
Have you been a nervous person?	694.2
Have you felt so down nothing could cheer you?	694.3
Have you felt calm and peaceful?	694.4
Did you have a lot of energy?	694.5
Have you felt downhearted and blue?	694.6
Did you feel worn out?	694.7
Have you been a happy person?	694.8
Did you feel tired?	694.9

Social Function During Past Four Weeks

Physical health/emotional problems interfered with social	695.1

APPENDIX 1.2 (Normative) TEST/OBSERVATION MASTER SEGMENTs (OMx)

1.3.1 General Approach

These segments define the format for the general information about the observations that a clinical or diagnostic service produces and sends to its "clients." This format can be used to send the producer's entire test/observation definition or a few of the producer's observations, such as those with procedure, technique, or interpretation changes.

In anticipation of an object-oriented organization of segments in future releases of this standard, the attributes of observations/batteries have been grouped into six different segments:

OM1 contains attributes that apply to all observations
OM2 applies to numerically-valued observations
OM3 applies to text or code-valued observations
OM4 applies to observations or batteries that require specimens
OM5 contains attributes of batteries, or sets of observations or other batteries
OM6 contains quantities (observations in a most general sense) that are calculated from one or more other observations

Thus, the full definition of a numerically-valued laboratory observation would require the transmission of OM1, OM2, and OM4.

In the following discussion, we use OMx to refer to any of the six observation-defining segments. Each instance of an OMx segment contains information about one observation or observation battery. These OMx segments are designed to be "inclusive" and accommodate the attributes of many kinds of observations. Thus, the fact that a field is listed in a particular segment should not be construed as meaning that a producer must include information about that item in its definition transmission. Many fields will apply to some terms; others will not. One observation producer may choose to populate one set of fields; another may choose to populate a different set of fields, according to the requirements of that producer's "client."

Most of the fields of data type TX in those segments are intended to include information typically contained in a diagnostic service's user manual. Such fields should describe how the data is to be interpreted or used, and are not intended for computer interpretation.

One or more observation definition segments (OMx) may be included in any message, but they should immediately follow the MSH segment and precede any other kinds of segments except the error (E) segment in the message.

Remember that the magnitude of a treatment can also be regarded as an observation and, as such, can be represented as an observation within these segments. Many examples exist. When a blood gas is transmitted, the requesting service usually transmits the amount of inspired O2 (a treatment) on requisition. (In an electronic transmission, the service would send this as an OBX segment, along with the electronic order for the test.) When blood levels are drawn, the amount and time of the last dose are routinely included as observations on the request for service. A pharmacy system could routinely send to a medical record system the average daily dose of each outpatient medication it dispenses. In such cases, the treatment amounts would be observations to the receiving system and would be transmitted as OBX segments. When

received, they would be treated like any other observation. A medical record system could then create, for example, a flowchart of lab results, or lab results mixed with relevant treatments.

1.3.3 Message Structure

The message structure is as follows:

```
MSH
{ OM1
      [ other segments(s) ]
}
```

where *other segments* can be any of the following combinations:

```
      [
        [ OM2 ]
        [ OM3 ]
        [ OM4 ]
      ]

or

      [ OM3
       [ { OM4 } ]
      ]

or

      [ OM5
       [ { OM4 } ]


or

      [ OM6
       OM2 ]
```

Note: A result may have both an OM2 (numeric) and OM3 (categorical) segment included in case the value may be either numeric and/or categorical.

1.3.5 OM1 - General Segment (Fields That Apply to Most Observations)

The OM1 segment contains attributes that apply to the definition of most observations. This segment also contains the field attributes that specify what additional segments might also be defined for this observation.

Figure 7B-1 OM1 attributes

SEQ	LEN	DT	R/O	RP/#	TBL#	ITEM#	ELEMENT NAME
1	3	ST	R			00585	Segment Type ID
2	4	NM	R			00586	Sequence Number
3	200	CE	R			00587	Producer's Test/Observation ID
4	12	ID		Y	0125	00588	Permitted Data Types
5	1	ID	R			00589	Specimen Required
6	200	CE	R			00590	Producer ID
7	200	CE				00591	Observation Description
8	200	CE				00592	Other Test/Observation IDs for the Observation
9	200	ST	R	Y		00593	Other Names
10	30	ST				00594	Preferred Report Name for the Observation
11	8	ST				00595	Preferred Short Name or Mnemonic for Observation
12	200	ST				00596	Preferred Long Name for the Observation
13	1	ID				00597	Orderability
14	60	CE		Y		00598	Identity of Instrument Used to Perfrom this Study
15	200	CE		Y		00599	Coded Representation of Method
16	1	ID				00600	Portable
17	1	ID		Y		00601	Observation Producing Department/Section
18	40	TN				00602	Telephone Number of Section
19	1	ID	R		0174	00603	Nature of Test/Observation
20	200	CE				00604	Report Subheader
21	20	ST				00605	Report Display Order
22	26	TS	R			00606	Date/Time Stamp for any change in Def Attri for Obs
23	26	TS				00607	Effective Date/Time of Change
24	20	NM				00608	Typical Turn-around Time
25	20	NM				00609	Processing Time
26	40	ID		Y	0168	00610	Processing Priority
27	5	ID			0176	00611	Reporting Priority
28	200	CE		Y		00612	Outside Site(s) Where Observation may be Performed
29	1000	AD				00613	Address of Outside Site(s)
30	400	TN				00614	Phone Number of Outside Site
31	1	ID			0177	00615	Confidentiality Code
32	200	CE				00616	Observations Required to Interpret the Obs
33	64K	TX				00617	Interpretation of Observations
34	64K	CE				00618	Contraindications to Observations
35	200	CE		Y		00619	Reflex Tests/Observations
36	80	ST				00620	Rules that Trigger Reflex Testing
37	64K	CE				00621	Fixed Canned Message
38	200	TX				00622	Patient Preparation
39	200	CE				00623	Procedure Medication
40	200	TX				00624	Factors that may Effect the Observation
41	60	ST		Y		00625	Test/Observation Performance Schedule
42	64K	TX				00626	Description of Test Methods

7.B.3.1.0 OM1 field definitions

1.3.6.1 Segment Type ID (ST) 00585

Definition: the string OM1 - identifies a record as a general observation definition segment.

1.3.6.2 Sequence Number (NM) 00586

Definition: the first OM1 segment in a message is described as 1, the second as 2, and so on.

1.3.6.3 Producer's Test/Observation ID (CE) 00587

Components: <identifier> ^ <text> ^ <name of coding system>^
<alternate identifier> ^ <alternate text> ^ <name of alternate coding system>

Definition: the producer's usual or preferred identification of the test or observation. Only three components should be included: <ID code>^<service text name/description>^<source list of code>. All components should be non-null. The source list may be any of those included in ASTM Tables 3 and 5, or a local code.

1.3.6.4 Permitted Data Types (ID) 00588

Definition: the allowed data type(s) for this observation. The codes are the same as those listed OBX (a given observation may, under different circumstances, take on different data types). Indeed, under limited circumstances, an observation can consist of one or more fragments of different data types. When an observation may have more than one data type, e.g., coded (CE) and numeric (NM) the allowable data types should be separated by repeat delimiters. Refer to *table 0125 - value type* for valid values.

1.3.6.5 Specimen Required (ID) 00589

Definition: a flag indicating whether or not at least one specimen is required for the test/observation. Refer to *table 0136 - Y/N indicator* as defined in Chapter 2.

Y one or more specimens are required to obtain this observation
N a specimen is not required

When a specimen is required, segment OM4 will usually be included (one per specimen is required).

1.3.6.6 Producer ID (CE) 00590

Definition: uniquely identifies the service producing the observation described in this segment. Three components should be included: an identifying code, the name of the producer, and the identity of the coding system (e.g., 323-5678^Acme Special Lab^MC). The identity of the coding system will usually be MC (Medicare provider number or HIBCC site codes) in the United States. Each country may want to specify its preferred coding system and define a coding system ID to identify it.

Remember that the magnitude of a treatment or the setting on a machine, such as a ventilator, can be regarded as an observation. Thus, pharmacy, respiratory care, and nursing may be producers of such observations.

1.3.6.7 Observation Description (TX) 00591

Definition: a text description of this observation.

1.3.6.8 Other Test/Observation IDs for the Observation (CE) 00592

Definition: lists all alias codes/identifiers for this observation. If more than one alias code needs to be specified, multiple three-component, CE-format entries (<code 1>^<name 1>^<code system 1>) may be given, separated by repeat delimiters. An observation may have as many names/codes as are applicable (e.g., ICD9, ACR-NEMA, SNOMED, and READ). We encourage the inclusion of as many different codes as may apply to assist cross-system mapping of terminology. All components of each triplet should be non-null (that is, names and coding system IDs within the CE data type are required in addition to codes). The source list may be any of those included in ASTM Tables 3 and 5.

Because the size (dose) of a treatment can also be an observation, codes that identify treatments (e.g., NDC, ICCS) may also be included in this field.

Note: In this field, the names within the CE data type are required.

1.3.6.9 Other Names (Recognized by the Producer for the Observation) (ST) 00593

Definition: include any text aliases, or synonyms for the name in the context of the ordering service. These are alternative names, not associated with a particular coding system, by which the battery, test, or observation (e.g., measurement, test, diagnostic study, treatment) is known to users of the system. Multiple names in this list are separated by repeat delimiters.

1.3.6.10 Preferred Report Name for the Observation (ST) 00594

Definition: the preferred name for reporting the observation or battery. The name can contain up to 30 characters (including blanks). It is the preferred name for columnar reports that require a maximum name size.

1.3.6.11 Preferred Short Name or Mnemonic for the Observation (ST) 00595

Definition: a name that can be used in space-limited reports (e.g., specimen labels) to identify the observation for the convenience of human readers. The name can contain up to eight characters.

1.3.6.12 Preferred Long Name for the Observation (ST) 00596

Definition: the fully specified name for the observation or battery. It may include the full (unabbreviated) multiple-word names and contain up to 200 characters. It should be as scientifically precise as possible.

1.3.6.13 Orderability (ID) 00597

Definition: whether or not a test/observation is an orderable code. Refer to *table 0136 - Y/N indicator* as defined in Chapter 2.

Y the test/observation is an orderable code
N the test/observation is not orderable

For example, blood differential count is usually an orderable "test." MCV, contained within the differential count, is usually not independently orderable.

1.3.6.14 Identity of Instrument Used to Perform This Study (CE) 00598

Definition: when applicable, specifies the instrument or device that is used to generate this observation or battery. Examples are the automated instrument in the laboratory, the imaging device and model number in radiology, and the automatic blood pressure machine on the ward. The instrument is specified as a coded entry in anticipation that these identifiers could be specified as codes. Initially, we expect that most of the information about devices will be transmitted as text in the second component of the CE identifier. If more than one kind of instrument is used, all of them can be listed, separated by repeat delimiters.

1.3.6.15 Coded Representation of Method (CE) 00599

Definition: method(s) used to produce the observation should be recorded in a computer-understandable (coded) form here. This field should report the same method(s) reported in narrative in the following field. More than one method may be listed, but only if they produce results that are clinically indistinguishable. Multiple methods must be separated by repeat delimiters.

1.3.6.16 Portable (ID) 00600

Definition: whether or not a portable device may be used for the test/observation. Refer to *table 0136 - Y/N indicator* as defined in Chapter 2.

Y the observation can be obtained with a portable device brought to the patient
N the patient or specimen must be transported to the device.

1.3.6.17 Observation Producing Department/Section (ID) 00601

Definition: permits the sorting of observation orders and values by the providing service's department/section. It provides "source oriented" reporting when required. The codes for this field should be taken from ASTM Table 15 (Diagnostic Service Codes). Free text may be used instead of these codes, but in that case, they should be recorded as the second "component" of the field to distinguish them from the standard codes. Multiple codes in this field are separated by repeat delimiters.

1.3.6.18 Telephone Number of Section (TN) 00602

Definition: the telphone number for calling responsible parties in this section to ask results or advice about the use of this test.

1.3.6.19 Nature of Test/Observation (ID) 00603

Definition: whether the definition entry identifies a test battery, an entire functional procedure or study, a single test value (observation), multiple test batteries or functional procedures as an orderable unit (profile), or a single test value (observation) calculated from other independent observations. The possible options are the following:

User-defined Table 0174 - Nature of test/observation

Value	Description
P	Profile or battery consisting of many independent atomic observations (e.g., SMA12, electrolytes), usually done at one instrument on one specimen
F	Functional procedure that may consist of one or more interrelated measures (e.g., glucose tolerance test, creatine clearance), usually done at different times and/or on different specimens
A	Atomic test/observation (test code or treatment code)
S	Superset--a set of batteries or procedures ordered under a single code unit but processed as separate batteries (e.g., routines = CBC, UA, electrolytes) This set indicates that the code being described is used to order multiple test/observation batteries. For example, a client who routinely orders a CBC, a differential, and a thyroxine as an outpatient profile might use a single, special code to order all three test batteries, instead of having to submit three separate order codes.
C	Single observation calculated via a rule or formula from other independent observations (e.g., Alveolar--arterial ratio, cardiac output)

Codes P, F, and S identify sets (batteries) and should be associated with an OM5 segment that defines the list of elements. The definitions for the contained elements would have to be sent in other independent OMx segments, one for each contained element. In the ASTM context, most text reports--such as discharge summaries, admission H&Ps, and chest x-ray reports--are considered as sets, in which each section of the report (e.g., description, impression, and recommendation of an x-ray report) is considered a separate observation.

Code A identifies a single direct observation and would usually be associated with an OM2 and/or OM3 segments.

Code C identifies a derived quantity and would usually be associated with an OM6 segment.

All of these codes can be associated with one or more OM4 (specimen) segments.

1.3.6.20 Report Subheader (CE) 00604

Definition: an optional string that defines the preferred header under which this observation should be listed on a standard display. For example, if the test is hemoglobin, this string might be "Complete blood count." It is represented as a coded data type so that a battery can be a header. Only the description part of the string may be included in case the subheader does not have an associated code. When a series of observations is displayed according to the sort order given below, the subheader that groups those observations is presented whenever the subheader changes.

1.3.6.21 Report Display Order (ST) 00605

Definition: an optional string that defines the sort order in which this observation is presented in a standard report or display that contains many observations.

1.3.6.22 Date/Time Stamp for Any Change in Definition for the Observation (TS) 00606

Definition: the date and time that the last of any field change was made and in the host's record corresponding to the OM1 segment.

1.3.6.23 Effective Date/Time of Change in Test Procedure That Make Results Non-Comparable (TS) 00607

Definition: the date and time of the last change in the test procedure that would make previous results incompatible with new results, e.g., the last time that normal reference range or units changed for a numeric test/observation.

We strongly suggest that observation producers never use the same observation ID when the measurement procedures changes in such a way that results produced under the new procedure are clinically different from those produced with the old procedure. Rather the producer should try to adjust the new procedure so that its values are clinically indistinguishable from the old. Failing that, one should create a new observation ID for the observation produced under the new procedure.

In the rare circumstances when a procedure change occurs and neither of the above two options are viable, this field shall be used to transmit the effective date-time of the new procedure. The receiving system shall assume that any values that come across under this observation ID are under the new procedure after this date and take appropriate steps to distinguish the old from the new observations.

This number is included to provide a means of communicating with the observation producing service when they have questions about particular observations or results.

1.3.6.24 Typical Turn-around Time from Receipt of Specimen/Subject to Result Produced (NM) 00608

Definition: typical processing time for single test/observation. This field indicates the time from the delivery of a specimen or transport of a patient to a diagnostic service and the completion of the study. It includes the usual waiting time. The units are measured in minutes.

1.3.6.25 Processing Time (NM) 00609

Definition: usual length of time (in minutes) between the start of a test process and its completion.

1.3.6.26 Processing Priority (ID) 00610

Definition: specifies one or more available priorities for performing the observation or test. This is the priority that can be placed in *OBR-28-quantity/timing*. For tests that require a specimen, this field may contain two components in the format <specimen priority>^<processing priority>. The first component in this case indicates the priority with which the specimen will be collected and is the priority that is specified in an OBR segment when ordering the observation. The second component indicates the corresponding priority with which the producer service will process the specimen, produce the observation, and return results, when this differs from collection priority. Permitted priority values are the following:

Table 0168 - Processing Priority

Value	Description
S	Stat (do immediately)
A	As soon as possible (a priority lower than stat)
R	Routine
P	Preoperative (to be done prior to surgery)
T	Timing critical (do as near as possible to requested time)
C	Measure continuously (e.g., arterial line blood pressure)
B	Do at bedside or portable (may be used with other codes)

The priority for obtaining the specimen is included in OM4. Multiple priorities may be given, separated by repeat delimiters. For example, S~A~R~P~T indicates that the test may be ordered using codes S, A, R, P, or T.

1.3.6.27 Reporting Priority (ID) 00611

Definition: the available priorities reporting the test results when the user is asked to specify the reporting priority independent of the processing priority. The available codes are:

Table 0169 - Reporting Priority

Value	Description
C	Call back results
R	Rush reporting

1.3.6.28 Outside Site(s) Where Observation May Be Performed (CE) 00612

Definition: if an outside service or services produce the observation, this field contains the identification(s) of the outside service(s). The format of this CE field uses the producer ID (as defined in *OM1-6-producer ID*) and the name of the service separated by component delimiters. An example is 39221^ACME lab^MC. If multiple services are used, they should be separated by repeat delimiter(s).

1.3.6.29 Address of Outside Site(s) (AD) 00613

Definition: record in this field the address of the outside services listed in *OM1-28-outside site(s) where observation may be performed*. If multiple services are recorded in that field, their addresses should be separated by repeat delimiters, and the addresses should appear in the same order in which the services appear in the preceding field.

1.3.6.30 Phone number of outside site (TN) 00614

Definition: the telephone number of the outside site.

1.3.6.31 Confidentiality Code (ID) 00615

Definition: the degree to which special confidentiality protection should be applied to the observation. For example, a tighter control may be applied to an HIV titer than to a CBC. Refer to user-defined *table 0177 - confidentiality code* for suggested values.

User-defined Table 0177 Confidentiality Code

Value	Description
V	Very restricted
R	Restricted
U	Usual control
EMP	Employee
UWM	Unwed mother
VIP	Very important person or celebrity
PSY	Psychiatric patient
AID	AIDS patient
HIV	HIV(+) patient
ETH	Alcohol/drug treatment patient

1.3.6.32 Observations Required to Interpret This Observation (CE) 00616

Definition: list of variables that the diagnostic service needs to interpret the results of an ordered study. The observations specified here should be sent to the diagnostic service as OBX segments along with the order (OBR) segment.

Example for cervical pap smear:

2000.32^date last menstrual period^AS4~2000.33^menstrual state^AS4

Example for arterial blood gas:

94700^inspired 02^AS4

These examples use AS4 codes in code/text format to identify the variables. Separate multiple items by repeat delimiters.

1.3.6.33 Interpretation of Observations (TX) 00617

Definition: clinical information about interpreting test results. Examples are the conditions (drugs) that may cause false abnormals, and the information about the sensitivity and specificity of the test for diagnoses.

1.3.6.34 Contraindications to Observations (CE) 00618

Definition: list diagnosis or problem for which the test is a contraindication or of possible danger (e.g., pacemaker, pregnancy, diabetes). For example, if the test identified in OM1 was an intravenous pyelogram, this field would include warnings about the use of contrast media in diabetes. The contraindication diagnoses should be separated by repeat delimiters.

Most contraindication rules will be transmitted as free text. In such cases, the contents serves only as information for human reading. However, an alternative for machine readable contraindication rules also exists. The rule may be defined formally in the Arden syntax (ASTM 1460-1992) which has syntax for defining algebraic and transcendental equations, as well as temporal and logical selection criteria based on patient information stored in the computer record. Reflex rules that are written in Arden Syntax should begin and end with a double semi-colon (;;), the Arden slot delimiter.

1.3.6.35 Reflex Tests/Observations (CE) 00619

Definition: includes the test names as type CE (i.e., <code>^<text name>^<coding system>) that may be ordered automatically by the diagnostic service, depending on the results obtained from the ordered battery. A screening CBC might trigger a reticulocyte count if the Hgb is less than 12. Multiple reflex tests are separated by repeat delimiters.

1.3.6.36 Rules That Trigger Reflex Testing (TX) 00620

Definition: the rules that trigger the reflex tests listed above. If multiple reflex tests are listed in *OM1-35-reflex tests/observations* separated by repeat delimiters, a set of corresponding rules will be included in this section. The first rule will apply to the first test, the second to the second test, and so on.

Most reflex rules will usually be transmitted as free text. In such cases, the contents serves only as information for human reading. However, an alternative for machine readable rules also exists. The rule may be defined formally in the Arden syntax (ASTM 1460-1992) which has syntax for defining algebraic and transcendental equations, as well as temporal and logical selection criteria based on patient information stored in the computer record. Reflex rules that are written in Arden Syntax should begin and end with a double semi-colon (;;), the Arden slot delimiter.

1.3.6.37 Fixed Canned Message (CE) 00621

Definition: codes and a fixed text message that is always associated with an abbreviation. The field may include multiple messages separated by repeat delimiters.

Most rules about patient testing will be transmitted as free text. In such cases, the contents serves only as information for human reading. However, an alternative for machine readable rules also exists. The rule may be defined formally in the Arden syntax (ASTM 1460-1992) which has syntax for defining algebraic and transcendental equations, as well as temporal and logical selection criteria based on patient information stored in the computer record. Rules about patient preparation are written in Arden Syntax should begin and end with a double semi-colon (;;), the Arden slot delimiter.

1.3.6.38 Patient Preparation (TX) 00622

Definition: for tests or observations that require special patient preparation, diet, or medications, record them here. For GI contrast studies, this field would contain the pretest diet, e.g., low residue for two days, NPO before study, and the preferred purgatives. Each separate med, diet, or preparation should be delimited by a repeat delimiter. Separate each requirement by a repeat delimiter. Example for a sigmoidectomy: clear liquid diet full day before procedure~take 8 oz mag citrate 6pm day before procedure~take 2 ducat tabs (5m) at 4pm day before procedure~NPO past midnight.

1.3.6.39 Procedure Medication (CE) 00623

Definition: treatments that may be needed as part of the procedure. Examples are radioactive iodine for a thyroid screen, and methacholine for a methacholine spirometry challenge. This field should be identified as a CE data type.

1.3.6.40 Factors That May Effect the Observation (TX) 00624

Definition: text description of the foods, diagnoses, drugs, or other conditions that may influence the interpretation of the observation. Information about the direction of the effect, and any recommendation about altering the diet, conditions, or drug before initiating the test observation.

Most rules about factors that effect the test interpretation will be transmitted as free text. In such cases, the contents serves only as information for human reading. However, an alternative for machine readable rules also exists. The rule may be defined formally in the Arden syntax (ASTM 1460-1992) which has syntax for defining algebraic and transcendental equations, as well as temporal and logical selection criteria based on patient information stored in the computer record. Rules about patient preparation are written in Arden Syntax should begin and end with a double semi-colon (;;), the Arden slot delimiter.

1.3.6.41 Test/Observation Performance Schedule (ST) 00625

Definition: for diagnostic studies/tests that are performed only at certain times during the course of a work day or work week, this field indicates the maximum interval between successive test performances (the test may actually be performed more frequently). The format given in ASTM Table 17, Codes for Service Intervals, should be used. If necessary, multiple codes may be given, separated by repeat delimiters. The use of multiple codes indicates that the test is performed at multiple concurrent intervals. For example, Q6H indicates that the test is performed at least once every 6 hours around the clock. Q1J indicates that the test is performed at least every week on Mondays. QAM~QPM indicates that the test is performed at least once every morning and every evening. Q1J~Q3J~Q5J indicates that the test is performed at least every week on Mondays, Wednesdays, and Fridays. C indicates that the test is performed continuously, 7 days per week.

1.3.6.42 Description of Test Methods (May Include Bibliographic Citations) (TX) 00626

Definition: text description of the methods used to perform the text and generate the observations. Bibliographic citations may be included.

1.3.7 OM2 - Numeric Observation Segment

This segment contains attributes of observations with continuous values (including those with data types of numeric, date, or time stamp). It can be applied to observation batteries of type A and C (see *OM1-19-nature of test/observation*).

Figure 7B-2 OM2 attributes

SEQ	LEN	DT	R/O	RP/#	TBL#	ITEM#	ELEMENT NAME
1	3	ST	R			00585	Segment Type ID
2	4	NM				00586	Sequence Number
3	60	CE				00627	Units of Measure
4	10	NM		Y		00628	Range of Decimal Precision
5	20	CE				00629	Corresponding SI Units of Measure
6	60	TX				00630	SI Conversion Factor
7	200	CM				00631	Reference (Normal) Range - Ordinal & Continuous Obs
8	200	CM				00632	Critical Range for Ordinal & Continuous Obs
9	200	CM				00633	Absolute Range for Ordinal & Continuous Obs
10	200	CM		Y		00634	Delta Check Criteria
11	20	NM				00635	Minimum Meaningful Increments

7.B.4.1.0 OM2 field definitions

1.3.8.1 Segment Type ID (ST) 00585

Definition: the string OM2 - identifies a record as a numeric observation segment.

1.3.8.2 Sequence Number (NM) 00586

Definition: the same value as the sequence number of the associated OM1 segment.

1.3.8.3 Units of Measure (CE) 00627

Definition: for single tests/observations (those with a nature code of A or C, as described in *OM1-19-nature of test/observation*) that have numeric values, this field contains their customary units of measure.

1.3.8.4 Range and Decimal Precision (NM) 00628

Definition: used for numerically valued single observations (code A or C as described in OM1;15), specifies the total length in characters of the field needed to display the observation, and the number of digits displayed to the right of the decimal point. This is coded as a single number in the format <length>.<decimal-digits>. For example, a value of 6.2 implies 6 characters total (including the sign and decimal point) with 2 digits after the decimal point. For integer values, the period and <decimal-digits> portion may be omitted (that is, 5.0 and 5 are equivalent). More than one such mask may be transmitted (separated by repeat delimiters) when it is necessary to define multiple display formats that are possible.

1.3.8.5 Corresponding SI Units of Measure (CE) 00629

Definition: for single tests/observations - the corresponding SI units of measure in the format, when these differ from the customary units of measure given in the previous field.

1.3.8.6 SI Conversion Factor (TX) 00630

Definition: for continuous, numerically valued tests/observations, with a nature code of A or C (see *OM1-19-nature of test/observation*). This is a factor for converting the customary units to SI units.

In the case that the observation units are not SI units, this fields provide the formula needed to convert from the reported units to SI units, this shall include the equation needed to convert from the reporting to the SI units.

In the case that the relation is simply multiplicative, this field shall include only the conversion factor. E.g., if (results SI units) = c * (results reporting units). Then only c would be stored in this field. In the case of any other functional relationship, the entire equation would be stored as a test.

1.3.8.7 Reference (Normal) Range for Ordinal and Continuous Observations (CM) 00631

Definition: provides reference (normal) ranges for "numeric" observations/tests with a nature code of A or C (see *OM1-19-nature of test/observation*). It can identify different reference (normal) ranges for different categories of patients according to age, sex, race, and other conditions.

The general format is

<ref. (normal) range$_1$>^<sex$_1$>^<age range$_1$>^<age gestation$_1$>^<species$_1$>^<race/subspecies$_1$>^<text condition$_1$>~
<ref. (normal) range$_2$>^<sex$_2$>^<age range$_2$>^<age gestation$_2$>^<species$_2$>^<race/subspecies$_2$>^<text condition$_2$>~
.
.
.
<ref. (normal) range$_n$>^<sex$_n$>^<age range$_n$>^<age gestation$_n$>^<species$_n$>^<race/subspecies$_n$>^<text condition$_n$>

The components are defined in the following sections.

1.3.8.7.1 The Reference (Normal) Range

The format of this component is <low value & high value>, where the range is taken to be inclusive (i.e., the range includes the end points). In this specification, the units are assumed to be identical to the reporting units given in *OM2-3-units of measure*).

1.3.8.7.2 Sex

The sex of the patient.

1.3.8.7.3 Age Range

The age range (in years or fractions thereof) is specified as two values separated by a subcomponent delimiter (i.e., <low value & high value>) in order to allow a simple and consistent machine interpretation of this component. Ages of less than one year should be specified as a fraction (e.g., 1 month = 0.0830, 1 week = 0.01920, 1 day = 0.0027300). However, for most purposes involving infants, the gestational age (measured in weeks) is preferred. The lower end of the range is not indicated; the upper end is, assuring that series of ranges do not overlap.

1.3.8.7.4 Gestational Age Range

The gestational age is relevant only when the reference range is influenced by the stage of pregnancy. A range of values separated by a component delimiter is required, i.e., <low value & high value>. The gestational age is measured in weeks from conception. For example, <1&10> implies that the normals apply to gestational ages from 1 week to 4 weeks inclusive (1&4). The lower end of the range is not included; the upper end is, assuring that series of age ranges do not overlap.

1.3.8.7.5 Species

This field is assumed to be human unless otherwise stated. The species should be represented as text (e.g., rabbit, mouse, rat).

1.3.8.7.6 Race/Subspecies

In the case of humans (the default), the race is specified when race influences the reference range. When normal ranges for animals are being described, this component can be used to describe subspecies or special breeds of animals.

1.3.8.7.7 Conditions

The condition is simply free text. This component allows for definition of normal ranges based on any arbitrary condition, e.g., phase of menstrual cycle or dose of a particular drug. It is provided as a way to communicate the normal ranges for special conditions. It does not allow automatic checking of these text conditions.

1.3.8.7.8 Examples

A range that applies unconditionally, such as albumin, is transmitted as:

```
3.0 & 5.5
```

A normal range that depends on sex, such as Hgb, is transmitted as:

```
13.5 & 18^M~
12.0 & 16^F
```

A normal range that depends on age, sex, and race (a concocted example) is:

```
10 & 13   ^M^0  &  2 ^^^B
11 & 13.5 ^M^2  & 20 ^^^B~
12 & 14.5 ^M^20 & 70 ^^^B~
13 & 16.0 ^M^70 &    ^^^B
```

When no value is specified for a particular component, the range given applies to all categories of that component. For example, when nothing is specified for race/species, the range should be taken as the human range without regard to race. If no age range is specified, the normal range given is assumed to apply to all ages. If the upper or lower end of a range is left out, it is assumed to be +infinity or -infinity, respectively.

When two different methods result in two different reference ranges, two different observations and corresponding OMx segments should be defined.

1.3.8.8 Critical Range for Ordinal and Continuous Observations (CM) 00632

Definition: applies only to single tests/observations (i.e., a nature code of A or C, as described in *OM1-19-nature of test/observations*) with numeric results. When a critical range is defined for such observations, it should be recorded here in the same format as the normal range (see *OM2-7-reference (normal) range-ordinal and continuous obs*).

1.3.8.9 Absolute Range for Ordinal and Continuous Observations (CM) 00633

Components: <range> ^ <numeric change> ^ <%/a change> ^ <days>

Definition: applies only to single tests/observations with a nature code of A or C (see *OM1-19-nature of test/observation*). It defines the range of possible results. Results outside this range are not possible. The field should be recorded in the same format as the normal and critical ranges.

1.3.8.10 Delta Check Criteria (CM) 00634

Definition: applies to numeric tests/observations with a nature code of A or C (see *OM1-19-nature of test/observation*). The field describes the information that controls delta check warnings and includes four components.

1) The range to which the following applies: <low & high>

All the ranges are defined in terms of the customary reporting units given in *OM2-3-units of measure*. If no value range is given, the check applies to all values.

2) The numeric threshold of the change that is detected, e.g., 10

3) Whether the change is computed as a percent change or an absolute change. This component can have two possible values:

% Indicates a percent change
a Absolute change

4) The length of time that the service retains a value for computing delta checks. This is recorded in number of days.

More than one delta check rule can apply. 13&16^10^%^100~16.1&20^2^a^100 implies that the delta check will trigger on a 10% change when the value of the observation is between 13 and 16. The check will trigger on an absolute change of 2 when the value is between 16.1 and 20. In both cases, the system will keep the last result for 100 days. In this example, beyond 100 days, the computer will not compute a delta check because it will not have a comparison value.

1.3.8.11 Minimum Meaningful Increments (NM) 00635

Definition: used for numerically valued single observations (a nature code of A or C, as described in *OM1-19-nature of test/observation*) and specifies the smallest meaningful difference between reported values (the effective resolution of the measuring instrument or technique for continuous data, or the smallest discrete interval that can occur for discrete data).

1.3.9 OM3 - Categorical Test/Observation Segment

This segment applies to free text and other non-numeric data types.

Figure 7B-3 OM3 attributes

	SEQ	LEN	DT	R/O	RP/#	TBL#	ITEM#	ELEMENT NAME
	1	3	ST				00585	Segment Type ID
	2	4	NM				00586	Sequnce Number
	3	5	ID				00636	Preferred Coding System
	4	60	CE				00637	Valid Coded "Answers"
	5	200	CE		Y		00638	Normal Text/Codes for Categorical Observations
	6	200	CE				00639	Abnormal Text/Codes for Categorical Observations
	7	200	CE				00640	Critical Text Codes for Categorical Observations
	8	2	ID				00641	Data Type

7.B.5.1.0 OM3 field definitions

1.3.10.1 Segment Type ID (ST) 00585

Definition: the string OM3 - identifies a record as a categorical test/observation segment.

1.3.10.2 Sequence Number (NM) 00586

Definition: the same value as the sequence number of the associated OM1 segment.

1.3.10.3 Preferred Coding System (ID) 00636

Definition: for observations whose categorical responses are taken from a specified table of codes (e.g., CE data types), record the preferred coding system for this observation (e.g., ICD9, SNOMED III). Take the codes from ASTM Table 3 or 5, or specify a local code.

1.3.10.4 Valid Coded "Answers" (CE) 00637

Definition: in the case that the list of coded answers is easily enumerated, list the valid coded answers for this observation here using the preferred coding system given in *OM3-3-preferred coding system*. If for example, the given observation was VDRL, the valid answers might be non-reactive, 86^ intermediate, and 87^ reactive.

1.3.10.5 Normal Text/Codes for Categorical Observations (CE) 00638

Definition: certain observations/tests with a nature code of A or C (see *OM1-19-nature of test/observation*) have text (alpha) results (e.g., reactive, nonreactive). Alpha normals for those tests should be entered in this field (e.g., "nonreactive").

The format of this field is:

The first component is a code taken from a standard code source list. The second component is the text associated with the code. The third component is the identification of the code table source. When only a text description of a possible answer is available, it is recorded as ^<text>.

Care should be taken to transmit only those results that are considered normal for that test. A drug screen may have possible results of "negative" and "positive." However, only a result of "negative" is considered to be normal. When an observation has more than one "normal" result, multiple values in this field should be separated with a repeat delimiter.

1.3.10.6 Abnormal Text/Codes for Categorical Observations (CE) 00639

Definition: a list of the text answers that are abnormal for the test.

1.3.10.7 Critical Abnormal Text/Codes for Categorical Observations (CE) 00640

Definition: a list of coded results that are critically abnormal for this observation.

1.3.10.8 Data Type (ID) 00641

Definition: the allowed data type for a single categorical observation (code A or C in *OM1-19-nature of observation*).

1.3.11 OM4 - Observations That Require Specimens

Figure 7B-4 OM4 attributes

SEQ	LEN	DT	R/O	RP/#	TBL#	ITEM#	ELEMENT NAME
1	3	ST				00585	Segment Type ID
2	4	NM				00586	Sequence Number
3	60	ID			0170	00642	Derived Specimen
4	60	TX				00643	Container Description
5	20	NM				00644	Container Volume
6	60	CE				00645	Container Units
7	60	CE				00646	Specimen
8	60	CE				00647	Additive
9	10K	TX				00648	Preparation
10	10K	TX				00649	Special Handling Requirements
11	20	CQ				00650	Normal Collection Volume
12	20	CQ				00651	Minimum Collection Volume
13	10K	TX				00652	Specimen Requirements
14	60	ID		Y	0027	00653	Specimen Priorities
15	20	CQ				00654	Specimen Retention Time

7.B.6.1.0 OM4 field definitions

1.3.12.1 Segment Type ID (ST) 00585

Definition: this segment applies to observations/batteries that require a specimen for their performance. When an observation or battery requires multiple specimens for their performance (e.g., creatinine clearance requires

a 24-hour urine specimen and a serum specimen), multiple segments may be included, one for each specimen type.

1.3.12.2 Sequence Number (NM) 00586

Definition: the same value as the sequence number of the associated OM1 segment.

1.3.12.3 Derived Specimen (ID) 00642

Definition: for some diagnostic studies -- especially in microbiology -- the initial specimen (e.g., blood) is processed to produce results (e.g., the identity of the bacteria grown out of the culture). The process also produces new "specimens" (e.g., pure culture of staphylococcus, and E. Coli), and these are studied by a second order process (bacterial sensitivities). This field contains codes that identify the parents (e.g., blood culture) and children (e.g., penicillin MIC) in such cases. The codes are the following:

Table 0170 - Derived Specimen

Value	Description
P	Parent Observation
C	Child Observation
N	Not Applicable

1.3.12.4 Container Description (TX) 00643

Definition: the physical appearance, including color of tube tops, shape, and material composition (e.g., red-top glass tube). Note that the color is not necessarily a unique identifier of the additive and/or use of the tube. This is especially true for black and some blue tube tops, as can be seen above. Color is included here for user convenience.

1.3.12.5 Container Volume (NM) 00644

Definition: the capacity of the container.

1.3.12.6 Container Units (CE) 00645

Definition: reports the units of measure of the container volume. If the units are ISO+ units, they should be recorded as single case abbreviations. If the units are ANS+ or L (local), the units and the source code table must be recorded, except that in this case, component delimiters should be replaced by subcomponent delimiters. For example, 1 indicates liters, whereas pt&&ANS+ indicates pints (ANSI units). The default unit is milliliters (ml), which should be assumed if no units are reported.

1.3.12.7 Specimen (CE) 00646

Definition: the specimen should be reported as one of the specimen codes described in ASTM Table 14 of 1238-91. If multiple kinds of specimen are associated with this observation (as in the case for a creatinine clearance), separate them with repeat delimiters.

1.3.12.8 Additive (CE) 00647

Definition: codes should be those provided by NCCLS[6]. The following list is not exhaustive; it includes only examples.

NAME	NCCLS Code	Color	DESCRIPTION
(1)Lithium Heparin -- anticoagulant	LIH	Green	Dry powder. 10 to 30 USP units per mL of blood
(2)Sodium Heparin -- anticoagulant	NAH	Green	Dried solution. 10 to 30 U.S.P. units per mL of blood
(3)Ethylenediaminetetraacetic acid; dipotassium salt [EDTA(K_2)]	K2E	Lavender	Dry powder. 1.5 to 2.2 mg per mL of blood
(4)Ethylenediaminetetraacetic acid; tripotassium salt [EDTA (K_3)]	K3E	Lavender	Clear solution. 1.5 to 2.2 mg per mL of blood
(5)Ethylenediaminetetraacetic acid; disodium salt [EDTA (Na_2)]	N2E	Lavender	

1.3.12.9 Preparation (TX) 00648

Definition: the special processing that should be applied to the container, e.g., add acidifying tablets before sending.

1.3.12.10 Special Handling Requirements (TX) 00649

Definition: record special handling requirements here (e.g., ice specimen, deliver within 2 hours of obtaining).

1.3.12.11 Normal Collection Volume (CQ) 00650

Definition: record the normal specimen volume required by the lab. This is the amount used by the normal methods and provides enough specimens to repeat the procedure at least once if needed. The default unit is milliliters (ml).

1.3.12.12 Minimum Collection Volume (CQ) 00651

Definition: the amount of specimen needed by the most specimen sparing method (e.g., using micro techniques). The minimum amount allows for only one determination. The default unit is milliliters (ml).

1.3.12.13 Specimen Requirements (TX) 00652

Definition: other requirements for specimen delivery and special handling (e.g., delivery within one hour, iced).

[6]NCCLS Document H1-A3: Evacuated tubes for blood specimen collection -- Third Edition, Volume 11, Number 9, Approved standard. July 1991.

1.3.12.14 Specimen Priorities (ID) 00653

Definition: the allowed priorities for obtaining the specimen. Note that they may be different from the processing priorities given in *OM1-26-processing priority*. When a test is requested, the specimen priority given in *OBR-27-quantity/timing* should be one of the priorities listed here. Multiple priorities are separated by repeat delimiters. Permitted specimen values are the following:

Table 00027 - Priority

Value	Description
S	Stat (do immediately)
A	As soon as possible (a priority lower than stat)
R	Routine
P	Preoperative (to be done prior to surgery)
T	Timing critical (do as near as possible to requested time)

1.3.12.15 Specimen Retention Time (CQ) 00654

Definition: record the usual time that a specimen for this observation is retained after the observation is completed, for the purpose of additional testing. The first component is the duration, and the second component is an ISO time unit.

1.3.13 OM5 - Observation Batteries (Sets)

This segment contains information about batteries and supersets (a nature code of F, P or S, as described in *OM1-19-nature of test/observation*).

Figure 7B-5 - OM5 attributes

	SEQ	LEN	DT	R/O	RP/#	TBL#	ITEM#	ELEMENT NAME
	1	3	ST				00585	Segment Type ID
	2	4	NM				00586	Sequence Number
	3	200	CE		Y		00655	Test/Observations Included w/an Ordered Test Battery
	4	200	ST				00656	Observation ID Suffixes

7.B.7.1.0 OM5 field definitions

1.3.14.1 Segment Type ID (ST) 00585

Definition: the string OM5 - identifies a record as an observation battery (set).

1.3.14.2 Sequence Number (NM) 00586

Definition: the same value as the sequence number of the associated OM1 segment.

1.3.14.3 Tests/Observations Included Within an Ordered Test Battery (CE) 00655

Definition: lists the codes and names of all tests/observations included within a single battery (nature code P, as described in *OM1-19-nature of test/observation*), a single functional procedure (nature code F), or a given superset (nature code S). When a segment includes a list of component elements, the sending system should be sure that the segments defining all of the components are sent before the segment that reference them. An entry in this list can itself be a battery.

The individual test/observation IDs should be recorded as type CE, i.e., in the standard format for coded observation identifiers. Multiple observations should be separated by repeat delimiters.

If the definition segment defined serum electrolytes, this field might look like the following:

84132^potassium^AS4~
84295^sodium^AS4~
82435^chloride^AS4~
82374^HCO3^^AS4~

For S (superset) parameters, this field contains the batteries that are included within the "super" battery. For example, ROUTINES might be defined as:

402^Electrolytes~352^Urinalysis~432^CBC~520^SMA12

1.3.14.4 Observation ID Suffixes (ST) 00656

Definition: for tests or procedures that produce a type which uses observation ID suffixes following the test/observation ID code, this field lists the possible options. The applicable three-character mnemonics given in ASTM Table 20 (or others appropriate to the application) are listed, separated by repeat delimiters. For example, a chest x-ray may use the suffixes IMP, REC, DEV, or others. Each of the expected suffixes should be listed here.

1.3.15 OM6 - Observations That Are Calculated from Other Observations

This segment contains information about quantities that are derived from one or more other quantities or direct observations by mathematical or logical means.

Figure 7B-6 OM6 attributes

	SEQ	LEN	DT	R/O	RP/#	TBL#	ITEM#	ELEMENT NAME
	1	3	ST				00585	Segment Type ID
	2	4	NM				00586	Sequence Number
	3	10K	TX				00657	Derivation Rule

7.B.8.1.0 OM6 field definitions

1.3.16.1 Segment Type ID (ST) 00585

Definition: the string OM6 - identifies a record as an observation that is derived or calculated from one or more other observations.

1.3.16.2 Sequence Number (NM) 00586

Definition: the same value as the sequence number of the associated OM1 segment.

1.3.16.3 Derivation Rule (TX) 00657

Definition: in the case of patient variables that are derived from one or more other patient variables (e.g., creatinine clearance, ideal weight, maximum daily temperature, average glucose, framingham risk), this field contains the rules for deriving the value of this variable (i.e., nature code C, as given in *OM1-19-nature of test/observation*). These can be described in terms of humanly understandable formulas or descriptions.

When possible, however, they should be defined in terms of the Arden syntax for specifying selection and transcendative functions and algebraic operations, ASTM E1460-92. Derivation rules that are represented in Arden syntax should begin and end with an Arden slot delimiter (;;). Within this syntax, variables should be identified by *OM1-3-producer's test/observation ID*. We recommend the use of the Arden syntax because it permits the unambiguous specification of most such derived values and is a published standard for medical logic modules.