

Appendix A: Summary of all classes and relations used to express permissions identified in the source data.

Table A1. Terms Present in the Informed Consent Ontology – including PURLs, Labels, Definitions, and Proposed Revisions and Comments – Used to Express Permissions Identified in the Source Data. Note: *** in the Ontology Label column denotes that the given term was identified through the review of US Federal Regulations via the literature. All other terms were first identified from permission-sentences from clinical consent forms.

Ontology PURL	Ontology Label	Ontology Definition	Recommendations and Comments
Source Ontologies: Classes			
BFO:0000040	material entity	An independent continuant that is spatially extended whose identity is independent of that of other entities and can be maintained through time.	--
DUO:0000001	data use limitation	A data item that is used to indicate consent permissions for datasets and/or materials, and relates to the purposes for which datasets and/or material might be removed, stored or used.	--
DUO:0000038	genetic research	Biomedical research concerning genetics (i.e., the study of genes, genetic variations and heredity).	--
DUO:0000039	drug development research***	Biomedical research concerning drug development.	--
IAO:0000027	data item***	a data item is an information content entity that is intended to be a truthful statement about something (modulo, e.g., measurement precision or other systematic errors) and is constructed/acquired by a method which reliably tends to produce (approximately) truthful statements.	--
IAO:0000030	information content entity	A generically dependent continuant that is about some thing.	--
IAO:0000185	photograph	A photograph is created by projecting an image onto a photosensitive surface such as a chemically treated plate or film, CCD receptor, etc.	--
IAO:0000572	documenting	A planned process in which a document is created or added to by including the specified input in it.	--
IAO:0021006	obligee role***	A role that is either the specified output of an obligation generating social act or the concretization of a transferable obligation and that is realized by its bearer being the providing part of a process that fulfills the previously agreed upon requirements.	--
IAO:0021300	obligor role***	A role that is either the specified output of an obligation generating social act or the concretization of a transferable obligation and that is realized by its bearer being the receiving part of a process that fulfills the previously agreed upon requirements.	--
ICO:0000001	informed consent form	A document that explains all relevant information to assist a human being in understanding the expectations and requirements of participation in a process, and is an instrument in obtaining consent and, after having obtained consent, is a record that such a consent has occurred.	--

ICO:0000019	signature section	A document part that is specified as a place to receive a signature.	--
ICO:0000060	act of storing a specimen	A planned process that involves placing a specimen in some location in order to maintain possession of it.	--
ICO:0000074	authorization for release of confidential health information	An act of authorizing that is signed by a patient, or his legal representative, or clinical study participant for the use or disclosure of oral, written, or electronic form of confidential health information that identifies the individual and relates to the medical history, diagnosis, treatment, or prognosis of his condition.	--
ICO:0000079	institutional review board***	A specially constituted organization comprised of medical, scientific and non-scientific members established and designated by an entity to ensure the protection of the rights, safety and well-being of human subjects recruited to participate in biomedical or behavioral research according to the requirements outlined in Title 38, part 16 (same as Title 45, part 46 and Title 21, part 56) of the U.S. Code of Federal Regulations. IRB responsibility include but not limited to the reviewing, approving, and providing continuing review of trial protocol and amendments and of the methods and material to be used in obtaining and documenting informed consent of the trial. Other equivalent committees with the same or similar functions are also considered to be IRBs.	--
ICO:0000081	legal guardian role***	A role that inheres in an individual who is authorized under applicable State or local law to consent on behalf of a child or incapable person to general medical care including participation in clinical research.	--
ICO:0000083	individually identifiable health information entity***	A protected health information entity which identifies an individual; or with respect to which there is a reasonable basis to believe the information can be used to identify an individual.	--
ICO:0000086	consenter role	A role that inheres in a patient or the legal guardian when he/she participates the consenting process.	--
ICO:0000101	health information entity***	An information content entity which is created or received by a health care provider, health plan, public health authority, employer, life insurer, school or university, or health care clearinghouse; and relates to the past, present, or future physical or mental health or condition of any individual, the provision of health care to an individual, or the past, present, or future payment for the provision of health care to an individual.	--
ICO:0000103	protected health information entity	A health information entity which is created, received, stored, or transmitted by covered entities and their business associates in relation to the provision of healthcare, healthcare operations and payment for healthcare services.	--

ICO:0000113	anonymized information content entity	An information content entity that has been processed to prevent the identification of the person with whom the data are associated, thereby enduring in a stasis of anonymization.	--
ICO:0000116	act of using participant data	A planned process that involves using data which was an output of a human being's participation in a study and which is about that human being.	Incorrect level of abstraction. Created new parent (ICO:0000421); see Table 5.
ICO:0000181	secondary use***	A planned process that involves a human biological specimen originally collected for the purpose of treatment or a different investigation.	
ICO:0000186	permission temporal region	A temporal region during which some act is permitted.	
ICO:0000196	act of informed consenting	An act of permitting that is a process part of some informed consent process.	'Act of Authorizing' is now a social act. Ongoing deliberation if also a deontic declaration.
ICO:0000199	permission role	A deontic role that inheres in an agent and which permits certain actions.	--
ICO:0000218	act of removing identifiable information	An act of anonymization that alters an information content entity by removing information content which identifies that individual.	--
ICO:0000222	signature	An information content entity that is a handwritten depiction of a name.	--
ICO:0000228	act of data sharing	a planned process in which data possessed by one person or organization is shared with one or more other persons or organizations.	--
ICO:0000233	regulatory document	A document that either prescribes actions or prescribes the permissions, obligations, restrictions, or protections relating to public or legal policy.	--
ICO:0000244	permission directive	A directive information entity that prescribes a deontic role that permits some action.	--
ICO:0000245	conditional permission directive	A conditional specification that prescribes a permission, should some trigger condition obtain.	Marked as obsolete and replaced with 'permission condition directive' (ICO:0000327).
ICO:0000248	obligation directive***	A directive information entity that prescribes an obligation that is realized a deontic role that is the output of a document act.	--
ICO:0000268	confidentiality directive***	A directive information entity that prescribes the nondisclosure of information.	--
ICO:0000290	waiver document***	A document designed for the purpose of assisting in an act of waiving, and which contains both some description of waiver and some waiver directive.	--
ICO:0000307	waiver directive***	A directive information entity that prescribes an act of waiving.	--
ICO:0000311	act of genetic testing	A planned process that involves the investigation of some sequence of DNA.	--
ICO:0000312	genetic testing directive	A directive information entity that prescribes some act of genetic testing.	--

ICO:0000313	excess material role	A role inhering in some material entity that is realized in an act of artifact modification.	Revised text definition: "...of artifact modification where the material entity is separated from another portion of material."
LABO:0000107	laboratory test	A measurement assay that has as input a specimen derived from an organism and that aims as having as output a data item that is about an entity related to the specimen.	--
NCBITaxon:9606	homo sapiens	The bipedal primate mammal, Homo sapiens; belonging to man or mankind; pertaining to man or to the race of man; use of man as experimental subject or unit of analysis in research	--
OBI:0000011	planned process	A processual entity that realizes a plan which is the concretization of a plan specification.	--
OBI:0000066	investigation	a planned process that consists of parts: planning, study design execution, documentation and which produce conclusion(s).	--
OBI:0000093	patient role	A role which inheres in a person and is realized by the process of being under the care of a physician or health care provider	--
OBI:0000112	specimen role	A role borne by a material entity that is gained during a specimen collection process and that can be realized by use of the specimen in an investigation.	--
OBI:0000202	investigation agent role***	A role borne by an entity and that is realized in a process that is part of an investigation in which an objective is achieved. These processes include, among others: planning, overseeing, funding, reviewing.	--
OBI:0000245	organization	An entity that can bear roles, has members, and has a set of organization rules. Members of organizations are either organizations themselves or individual people. Members can bear specific organization member roles that are determined in the organization rules. The organization rules also determine how decisions are made on behalf of the organization by the organization members.	--
OBI:0000659	specimen collection process	A planned process with the objective of collecting a specimen.	--
OBI:0001769	specimen collector role	An Investigation agent role borne by a person or organization which is realized in a specimen collection process.	--
OBI:0100051	specimen	A material entity that has the specimen role.	--
OGMS:0000018	laboratory finding	A representation of a quality of a specimen that is the output of a laboratory test and that can support an inference to an assertion about some quality of the patient.	--
OGMS:0000090	treatment	A planned process whose completion is hypothesized by a health care provider to eliminate, prevent, or alleviate the signs and symptoms of a disorder or pathological process	Recommendation to OGMS: 'Treatment' as a child of 'Health Care Process' instead of sibling.

Source Ontologies: Relations			
BFO:0000051	has part	<i>A core relation that holds between a whole and its part</i>	--
BFO:0000054	realized in	<i>To say that b realizes c at t is to assert that there is some material entity d & b is a process which has participant d at t & c is a disposition or role of which d is bearer_of at t& the type instantiated by b is correlated with the type instantiated by c.</i>	--
CommonCore Ontologies/ prescribes	prescribes	<i>For all types T1 and T2, if T1 prescribes T2, then there is some instance of T1, t1, that serves as a rule or guide to some instance of T2, t2 (if T2 is a type of bfo:Occurrent) or that serves as a model for some instance of T2, t2 (if T2 is a type of bfo:Continuant)</i>	--
DUO:0000010	is restricted to	<i>A is restricted to B iff A is a consent code and B is an investigation and A may only participate in instances of a class C, of which B is an instance.</i>	--
IAO:0000136	is about	<i>is:about is a (currently) primitive relation that relates an information artifact to an entity.</i>	--
OBI:0000293	has:specified:input	<i>A relation between a planned process and a continuant participating in that process that is not created during the process. The presence of the continuant during the process is explicitly specified in the plan specification which the process realizes the concretization of.</i>	--
OBI:0000295	is:specified:input:of	<i>A relation between a planned process and a continuant participating in that process that is not created during the process. The presence of the continuant during the process is explicitly specified in the plan specification which the process realizes the concretization of.</i>	--
OBI:0000299	has:specified:output	<i>A relation between a planned process and a continuant participating in that process. The presence of the continuant at the end of the process is explicitly specified in the objective specification which the process realizes the concretization of.</i>	--
OBI:0000312	is:specified:output:of	<i>A relation between a planned process and a continuant participating in that process. The presence of the continuant at the end of the process is explicitly specified in the objective specification which the process realizes the concretization of.</i>	--
RO:0000053	bearer of	<i>A relation between an independent continuant (the bearer) and a specifically dependent continuant (the dependent), in which the dependent specifically depends on the bearer for its existence</i>	--
RO:0000056	participates in	<i>A relation between a continuant and a process, in which the continuant is somehow involved in the process</i>	--
RO:0002350	member of	<i>Is member of is a mereological relation between a [sic] item and a collection.</i>	--

Table A2. Terms from OBO Foundry Ontologies (and not in ICO) – including PURLs, Labels, Definitions, and Proposed Revisions and Comments – Used to Express Permissions Identified in the Source Data. Note: *** in the Ontology Label column denotes that the given term was identified through the review of US Federal Regulations via the literature. All other terms were first identified from permission-sentences from clinical consent forms.

Ontology PURL	Ontology Label	Ontology Definition	Parent Term (Label and PURL)	Recommendations and Comments
Source Ontologies: Classes				
CHMO:0002832	material disposal	A planned process in which materials for an experiment are removed permanently from the laboratory.	waste management (CHMO:0002845)	Imported (including parent classes). Recommendation adopted by CHMO: delete 'for an experiment' and add 'or repository'.
ERO:0000333	video	Data containing moving pictures stored in digital and analog formats.	data format specification (IAO:0000098)	Imported.
GEO:000000400	government organization***	An organization that governs the people living in a particular geographical region or aggregate of geographical regions. The geographical region it governs can change over time (such as the westward expansion of the United States and the addition of Hawaii). Note: this definition was taken over from "geopolitical organization".	organization (OBI:0000245)	Imported.
NCIT:C13235	fetus	An unborn or unhatched vertebrate in the later stages of development showing the main recognizable features of the mature being.	--	All NCIT terms submitted to ICO issue tracker for import and new parent hierarchies. Additionally, recommend importing all age group and at-risk population classes.
NCIT:C15380	telemedicine	The use of telecommunications technology to provide, enhance, or expedite health care services, as by accessing off-site databases, linking clinics or physicians' offices to central hospitals, or transmitting x-rays or other diagnostic images for examination at another site.	--	
NCIT:C142640	postmarketing surveillance***	Programs to identify adverse events that did not appear during the drug approval process.	--	
NCIT:C163409	safety monitoring	Review of safety data to ensure safety of the individuals who are participating in the study, or to identify potential safety concerns for the duration of the study lifecycle.	--	
NCIT:C16423	child	An age group comprised of individuals who are not yet an adult. The specific cut-off age will vary by purpose.	--	
NCIT:C43960	health care organization	An organization that provides healthcare services or that is involved in the provision of health	--	

		care activities. Groupings or subdivisions of an organization, such as departments, may also be considered as organizations where there is a need to identify them.		
NCIT:C54131	company	Any formal business entity for profit, which may be a corporation, a partnership, association or individual proprietorship.	--	
NCIT:C64262	biologic sample preservation procedure	Procedures utilized to save organic substances from decay. Some preservation procedures are meant to maintain cells, tissues, or organisms in a viable state.	--	
OBI:0001305	genotype information***	a genetic characteristics information that is about the genetic material of an organism and minimally includes information about the genetic background and can in addition contain information about specific alleles, genetic modifications, etc.	genetic characteristics information (OBI:0001404)	Imported (including parent classes).
OBI:0000145	pathologist role	a worker role of being responsible for making the histopathology diagnoses associated with data from a study; this activity occurs outside the study timeline	--	NOT imported (consensus).
OBI:0000207	health care provider role	A worker role of providing medical care either within or outside the study timeline	--	NOT imported (consensus). Action by OBI: Class obsoleted in favor of adopting OMRSE_00000012.
OBI:0600003	performing a clinical assessment	A protocol application during which a series of tests are made of a patient leading to determination of disease state, or condition.	--	NOT imported (consensus).
OBIB:0000039	blood specimen on blood spot card***	A blood specimen that is located on a blood spot card.	processed specimen (OBI:0000953)	Imported.
OGMS:0000096	health care process	A planned process with the objective to improve the health status of a patient that directly involves the treatment, diagnosis, or prevention of disease or injury of a patient	planned process (OBI:0000011)	Imported.
OGMS:0000104	diagnostic process	A health care process that involves the interpretation of a clinical picture from a given patient (input) and the assertion to the effect that the patient has a disease, disorder, or syndrome of a certain type, or none of these (output).	health care process (OGMS:0000096)	Imported.

OMIABIS:0000010	biobank organization***	An organization bearing legal personality that owns or administrates a biobank.	organization (OBI:0000245)	Imported.
OMRSE:00000012	health care provider role	A human health care role inhering in an organization or human being that is realized by a process of providing health care services to an organism.	human health care role (OMRSE:00000010)	To be considered for import in a future release of ICO.
OMRSE:00000087	employer role***	a role in human social processes that is realized when the bearer provides a wage or salary in exchange for some labor or services as specified by some declaration	role in human social processes (OMRSE:00000024)	Imported.
OMRSE:00000093	insurance company***	An organization that secures a group of people against pecuniary loss by payment of a sum of money if a specified event occurs.	organization (OBI:0000245)	Imported.
OMRSE:00000198	information content entity-request process***	a communication in which some participant requests of some other participant an information content entity about some portion of reality	communication (OMRSE:00000192)	Imported (including parent classes).
OMRSE:00000054	hospital role	A healthcare provider role that inheres in an organization and is realized by providing inpatient and outpatient care.	health care provider organization role (OMRSE:00000015)	Imported (including parent classes).
OMRSE:00000056	hospital organization	An organization that is the bearer of a hospital role.	organization (OBI:0000245)	Imported (including parent classes).
OMRSE:00002029	education process	A planned process with an active participant who acquires mental representations of information content entities (ICEs), which had no previous mental representation in the cognitive system, and through repeated use or application of these ICEs becomes the bearer of a new instance of some type of capability, and the participant was not previously the bearer of that instance of that type of capability.	planned process (OBI:0000011)	Imported.
XCO:0000527	genetic manipulation	A condition in which the genotype or the gene expression of an organism or a cell has been modified.	--	Submitted to ICO issue tracker for import and new parent hierarchy.

Table A3. Proposed/New Terms Necessary to Express Permissions Identified in the Source Data. Note: *** in the Ontology Label column denotes that the given term was identified through the review of US Federal Regulations via the literature. All other terms were first identified from permission-sentences from clinical consent forms.

Proposed Label	Proposed Definition	Parent Term (Label and PURL)	Comments and Citations
Classes			
owner role	A role in a human social process that is that is based on a social act and whose bearer exercises exclusive control over a property, where this control is permitted by one or more deontic roles, which are parts of the ownership role.	deontic role (IAO:0021008)	Created in the Document Acts Ontology (IAO:0020027)
temporal restriction directive	A 'permission restriction directive' that designates the temporal boundaries of the 'designated action'.	deontic role (IAO:0021008)	Created (ICO:0000363)
act of data use	A planned process in which data is put to some use by an entity.	planned process (OBI:0000011)	Created (ICO:0000421)
act of selling***	A planned process in which goods or services are exchanged for money ("Sell," 2020).	planned process (OBI:0000011)	Created (ICO:0000423)
covered entity role***	A role based on the Health Insurance Portability and Accountability Act that inheres in individuals, organizations, and agencies that are also health care providers, health plans, or health care clearinghouse (HIPAA Administrative Simplification Regulation Text, 2013).	role (BFO:0000023)	Created (ICO:0000424)
data recipient role***	A role which is realized in processes of data disclosure (Article 4 EU GDPR "Definitions," 2020).	role (BFO:0000023)	Created (ICO:0000425)
limited data set***	Protected health information that excludes HIPAA-specified identifiers of the individual or of relatives, employers, or household members of the individual (HIPAA Administrative Simplification Regulation Text, 2013).	protected health information entity (ICO:0000103)	Created (ICO:0000426)
owner role directive	A directive information entity that prescribes the owner role.	directive information entity (IAO:0000033)	Created (ICO:0000427)
ownership stasis	A stasis in which an entity bears an ownership role.	Stasis (CommonCore Ontologies/ Stasis)	Created (ICO:0000428)
residual clinical biospecimen	A material entity, collected during some health care process, that bears both a specimen role and an excess material role following some act of artifact modification.	material entity (BFO:0000040)	Created (ICO:0000429)
graphic illustration	Proposed: "Works consisting of photographs, prints, drawings, portraits, plates, diagrams, facsimiles, maps, tables, or other representations or systematic arrangements of data designed to elucidate or decorate the contents of a publication" (definition from MeSH Code: D019489) (Bodenreider, 2004; "Book Illustrations (Product)," 2020).	--	Submitted to ICO issue tracker for deliberation regarding definitions, parent hierarchies, and source ontologies.
prospective data collection***	Proposed: "A study design in which the documentation of the presence or absence of an exposure of interest is documented at a time period preceding the onset of the condition being studied" ("Prospective Study," 2010).	--	

Appendix A References

- Article 4 EU GDPR “Definitions.” (2020, May 28). PrivazyPlan; SecureDataService. <https://www.privacy-regulation.eu/en/article-4-definitions-GDPR.htm>
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Appendix B: Terms Used to Express Permission-Sentences in Clinical Consent Forms

Table B1. Terms and Sentence References to Express the Permission-Sentence: “By signing this form, I am requesting and giving my consent for MHSM and the doctors and/or nurses to give me blood and/o blood products during this admission or series of treatments.”

By signing this form, I am requesting and giving my consent for MHSM and the doctors and/or nurses to give me blood and/o blood products during this admission or series of treatments.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	'this form'
ICO:0000019	signature section	'By signing this form'
ICO:0000086	consenter role	'I am requesting'
ICO:0000186	permission temporal region	'during this admission or series of treatments'
ICO:0000196	act of informed consenting	'I am requesting'
ICO:0000199	permission role	'consent for MHSM and the doctors and/or nurses'
ICO:0000222	signature	'By signing this form'
ICO:0000244	permission directive	<i>entire sentence</i>
ICO:0000363	temporal restriction directive	'during this admission or series of treatments'
NCBITaxon:9606	homo sapiens	'I', 'me', 'doctors and/or nurses'
OBI:0000093	patient role	'to give me blood'
OBI:0000207	health care provider role	'doctors and/or nurses'
OBI:0000245	organization	'MHSM'
OGMS:0000090	treatment	'give me blood and/or blood products'
OGMS:0000096	health care process	'give me blood and/or blood products'
OMRSE:0000054	hospital role	'MHSM'
OMRSE:0000056	hospital organization	'MHSM'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
DUO:0000010	is restricted to	
OBI:0000293	has:specified:input	
RO:0000053	bearer of	
RO:0000056	participates in	
RO:0002350	member of	

Table B2. Terms and Sentence References to Express the Permission-Sentence: “Your signature below indicates that you understand to your satisfaction the information about the genetic testing ordered by your health care provider and that you consent to having this testing performed.”

Your signature below indicates that you understand to your satisfaction the information about the genetic testing ordered by your health care provider and that you consent to having this testing performed.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	'signature below'
ICO:0000019	signature section	'signature below'
ICO:0000086	consenter role	'your signature below indicates... consent'
ICO:0000196	act of informed consenting	'your signature below indicates... consent'
ICO:0000199	permission role	'that you consent to having this testing performed'
ICO:0000222	signature	'signature below'
ICO:0000244	permission directive	<i>entire sentence</i>
ICO:0000311	act of genetic testing	'genetic testing'
ICO:0000312	genetic testing directive	'consent to having this testing performed'
NCBITaxon:9606	homo sapiens	'your', 'health care provider'
OBI:0000093	patient role	'ordered by your health care provider' and 'to having this testing performed'
OBI:0000207	health care provider role	'health care provider'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B3. Terms and Sentence References to Express the Permission-Sentence: “I consent to the Facility videotaping, photographing, video monitoring, or taking other recordings of me or parts of my body for diagnosis, treatment, research, or patient safety purposes.”

I consent to the Facility videotaping, photographing, video monitoring, or taking other recordings of me or parts of my body for diagnosis, treatment, research, or patient safety purposes.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
BFO:0000040	material entity	'videotaping, photographing, video monitoring, or taking other recordings'
DUO:0000001	data use limitation	'for diagnosis, treatment, research, or patient safety purposes'
ERO:0000333	video	'videotaping', 'video monitoring'
IAO:0000030	information content entity	'videotaping, photographing, video monitoring, or taking other recordings'
IAO:0000185	photograph	photographing'
IAO:0000572	documenting	'videotaping, photographing, video monitoring, or taking other recordings'
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000086	consenter role	'I consent to'
ICO:0000196	act of informed consenting	'I consent to'
ICO:0000199	permission role	'I consent to'
ICO:0000244	permission directive	<i>entire sentence</i>
NCBITaxon:9606	homo sapiens	'I'
NCIT:C163409	safety monitoring	'patient safety purposes'
NCIT:C43960	health care organization	'the facility'
OBI:0000066	investigation	'research'
OBI:0000093	patient role	'for diagnosis, treatment, ...'
OBI:0000245	organization	'the facility'
OGMS:0000090	treatment	'treatment'
OGMS:0000096	health care process	'I consent to'
OGMS:0000104	diagnostic process	'diagnosis'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
OBI:0000295	is:specified:input:of	
OBI:0000299	has:specified:output	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B4. Terms and Sentence References to Express the Permission-Sentence: “I hereby consent to the use and disclosure of my protected health information as described in the Notice of Privacy Practices.”

I hereby consent to the use and disclosure of my protected health information as described in the Notice of Privacy Practices.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000074	authorization for release of confidential health information	'I hereby consent to the use and disclosure of my protected health information'
ICO:0000086	consenter role	'I hereby consent to'
ICO:0000103	protected health information entity	'protected health information'
ICO:0000116	act of using participant data	'use'
ICO:0000196	act of informed consenting	'I hereby consent to'
ICO:0000199	permission role	'consent to the use and disclosure of'
ICO:0000228	act of data sharing	'disclosure'
ICO:0000233	regulatory document	'Notice of Privacy Practices'
ICO:0000244	permission directive	<i>entire sentence</i>
NCBITaxon:9606	homo sapiens	'I', 'my'
OBI:0000093	patient role	'I', 'my protected health information'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
IAO:0000136	is about	
OBI:0000295	is:specified:input:of	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B5. Terms and Sentence References to Express the Permission-Sentence: “I hereby authorize XXX to retain, preserve and use for scientific or teaching purposes, or to dispose at its discretion or convenience, any specimen or tissues taken from my body during my visit.”

I hereby authorize XXX to retain, preserve and use for scientific or teaching purposes, or to dispose at its discretion or convenience, any specimen or tissues taken from my body during my visit.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
CHMO:0002832	material disposal	'to dispose'
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000060	act of storing a specimen	'to retain'
ICO:0000086	consenter role	'I hereby authorize'
ICO:0000186	permission temporal region	'during my visit'
ICO:0000196	act of informed consenting	'I hereby authorize'
ICO:0000199	permission role	'hereby authorize XXX'
ICO:0000244	permission directive	<i>entire sentence</i>
ICO:0000363	temporal restriction directive	'during my visit'
NCBITaxon:9606	homo sapiens	'I, 'my', <i>implicit</i>
NCIT:C64262	biologic sample preservation procedure	
OBI:0000066	investigation	'use for scientific... purposes'
OBI:0000093	patient role	'I, 'my body during my visit'
OBI:0000112	specimen role	'sample'
OBI:0000207	health care provider role	'taken from my body', <i>implicit</i>
OBI:0000245	organization	'XXX'
OBI:0000659	specimen collection process	'taken from my body'
OBI:0100051	specimen	'any specimen or tissues'
OMRSE:00000054	hospital role	'XXX'
OMRSE:00002029	education process	'use for... teaching purposes'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
OBI:0000295	is:specified:input:of	
OBI:0000299	has:specified:output	
RO:0000053	bearer of	
RO:0000056	participates in	
RO:0002350	member of	
Note: XXX denotes the name of a health care facility which voluntarily contributed consent form(s) for this study.		

Table B6. Terms and Sentence References to Express the Permission-Sentence: “I am a New York state resident and I give permission for GeneDx to retain any remaining sample longer than 60 days after completion of testing and use my de-identified data for scientific and medical research purposes.”

I am a New York state resident and I give permission for GeneDx to retain any remaining sample longer than 60 days after completion of testing and use my de-identified data for scientific and medical research purposes.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000060	act of storing a specimen	'to retain any remaining sample'
ICO:0000086	consenter role	'I give permission'
ICO:0000113	anonymized information content entity	'de-identified data'
ICO:0000186	permission temporal region	'longer than 60 days'
ICO:0000196	act of informed consenting	'I give permission'
ICO:0000199	permission role	'I give permission to GeneDx'
ICO:0000218	act of removing identifiable information	'de-identified data'
ICO:0000244	permission directive	<i>Entire Sentence</i>
ICO:0000313	excess material role	'remaining sample'
ICO:0000363	temporal restriction directive	'give permission to... retain... longer than 60 days'
ICO:0000429	residual clinical biospecimen	'remaining sample'
LABO:0000107	laboratory test	<i>Implicit</i>
NCBITaxon:9606	homo sapiens	'I, 'my', <i>implicit</i>
NCIT:C54131	company	'GeneDx'
OBI:0000093	patient role	'any remaining sample', 'my deidentified data'
OBI:0000112	specimen role	'sample'
OBI:0000207	health care provider role	<i>Implicit</i>
OBI:0000659	specimen collection process	<i>Implicit</i>
OBI:0001769	specimen collector role	<i>Implicit</i>
OBI:0100051	specimen	'sample'
OGMS:0000018	laboratory finding	<i>Implicit</i>
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
DUO:0000010	is restricted to	
OBI:0000293	has:specified:input	
RO:0000053	bearer of	
RO:0000056	participates in	
RO:0002350	member of	

Table B7. Terms and Sentence References to Express the Permission-Sentence: “I also consent to diagnostic studies, tests, anesthesia, x-ray examinations and any other treatment or courses of treatment relating to the diagnosis or procedure described herein.”

I also consent to diagnostic studies, tests, anesthesia, x-ray examinations and any other treatment or courses of treatment relating to the diagnosis or procedure described herein.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000086	consenter role	'I also consent to'
ICO:0000196	act of informed consenting	'I also consent to'
ICO:0000245	conditional permission directive	'consent to... relating to the diagnosis or procedure described herein'
NCBITaxon:9606	homo sapiens	'I'
OBI:0000093	patient role	'I', 'diagnostic studies, tests, anesthesia, x-ray examinations and any other treatment or courses of treatment'
OGMS:0000096	health care process	'diagnostic studies, tests, anesthesia, x-ray examinations and any other treatment or courses of treatment'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B8. Terms and Sentence References to Express the Permission-Sentence: “I DONATE and authorize XXX to own, use, retain, preserve, manipulate, analyze, or dispose of any excess tissues, specimens, or parts of organs that are removed from my body during the procedures described above and are not necessary for my diagnosis or treatment.”

I DONATE and authorize XXX to own, use, retain, preserve, manipulate, analyze, or dispose of any excess tissues, specimens, or parts of organs that are removed from my body during the procedures described above and are not necessary for my diagnosis or treatment.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
CHMO:0002832	material disposal	'dispose of'
IAO:0020027	owner role	'to own'
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000060	act of storing a specimen	'retain'
ICO:0000086	consenter role	'I DONATE and authorize'
ICO:0000196	act of informed consenting	'I DONATE and authorize'
ICO:0000199	permission role	'I... authorize XXX'
ICO:0000245	conditional permission directive	'I... authorize... and are not necessary for my diagnosis or treatment.'
ICO:0000313	excess material role	'excess tissues, specimens, ...organs'
ICO:0000421	act of data use	'use'
ICO:0000427	owner role directive	'I DONATE and authorize XXX to own'
ICO:0000428	ownership stasis	'to own'
ICO:0000429	residual clinical biospecimen	'excess tissues, specimens, ...organs'
LABO:0000107	laboratory test	<i>Implicit</i>
NCBITaxon:9606	homo sapiens	'I, 'my'
NCIT:C64262	biologic sample preservation procedure	'preserve'
OBI:0000066	investigation	'analyze'
OBI:0000093	patient role	'I, 'my diagnosis or treatment'
OBI:0000112	specimen role	'sample'
OBI:0000659	Implicit	'removed from my body'
OBI:0100051	specimen	'excess tissues, specimens, or parts of organs'
OGMS:0000018	laboratory finding	<i>Implicit</i>
OMRSE:0000056	hospital organization	'XXX'
XCO:0000527	genetic manipulation	'manipulate'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
OBI:0000293	has:specified:input	
OBI:0000295	is:specified:input:of	
RO:0000053	bearer of	
RO:0000056	participates in	
<i>Note: XXX denotes the name of a health care facility which voluntarily contributed consent form(s) for this study.</i>		

Table B9. Terms and Sentence References to Express the Permission-Sentence: “I agree that any excess tissue, fluids or specimens removed from my body during my outpatient visit or hospital stay (my specimens) that would otherwise be disposed of by the Hospital may be used for such educational purposes and research, including research on the genetic materials (DNA).”

I agree that any excess tissue, fluids or specimens removed from my body during my outpatient visit or hospital stay (my specimens) that would otherwise be disposed of by the Hospital may be used for such educational purposes and research, including research on the genetic materials (DNA).		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
DUO:0000038	genetic research	'research, including research on the genetic materials (DNA).'
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000086	consenter role	'I agree that'
ICO:0000196	act of informed consenting	'I agree that'
ICO:0000199	permission role	'I agree... by the hospital'
ICO:0000244	permission directive	<i>Entire sentence</i>
ICO:0000313	excess material role	'excess tissue, fluids or specimens'
ICO:0000429	residual clinical biospecimen	'excess tissue, fluids or specimens'
LABO:0000107	laboratory test	<i>Implicit</i>
NCBITaxon:9606	homo sapiens	'I, 'my'
OBI:0000066	investigation	'research'
OBI:0000093	patient role	'during my outpatient visit or hospital stay'
OBI:0000112	specimen role	'sample'
OBI:0000659	specimen collection process	'removed from my body'
OBI:0100051	specimen	'tissue, fluids or specimens'
OGMS:0000018	laboratory finding	<i>Implicit</i>
OMRSE:0000056	hospital organization	'the hospital'
OMRSE:0000209	education process	'educational purposes'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
OBI:0000295	is:specified:input:of	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B10. Terms and Sentence References to Express the Permission-Sentence: “I authorize the pathologist, at his or her discretion, to retain, preserve, use, or dispose of any tissues, organs, bones, bodily fluid or medical devices that may be removed during the operation(s) or procedure(s).”

I authorize the pathologist, at his or her discretion, to retain, preserve, use, or dispose of any tissues, organs, bones, bodily fluid or medical devices that may be removed during the operation(s) or procedure(s).		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
CHMO:0002832	material disposal	'dispose'
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000060	act of storing a specimen	'to retain'
ICO:0000086	consenter role	'I authorize'
ICO:0000196	act of informed consenting	'I authorize'
ICO:0000199	permission role	'I authorize the pathologist'
ICO:0000244	permission directive	<i>Entire sentence</i>
ICO:0000313	excess material role	<i>Implicit</i>
ICO:0000421	act of data use	'use'
ICO:0000429	residual clinical biospecimen	<i>Implicit</i>
LABO:0000107	laboratory test	<i>Implicit</i>
NCBITaxon:9606	homo sapiens	'I, 'the pathologist'
NCIT:C64262	biologic sample preservation procedure	'preserve'
OBI:0000093	patient role	'removed during the operation(s) or procedure(s)'
OBI:0000112	specimen role	'sample'
OBI:0000145	pathologist role	'the pathologist'
OBI:0000659	specimen collection process	'removed during the operation(s) or procedure(s)'
OBI:0100051	specimen	'tissues, organs, bones, bodily fluid or medical devices'
OGMS:0000018	laboratory finding	<i>Implicit</i>
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/	prescribes	
DUO:0000010	is restricted to	
OBI:0000293	has:specified:input	
OBI:0000295	is:specified:input:of	
OBI:0000299	has:specified:output	
OBI:0000312	is:specified:output:of	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B11. Terms and Sentence References to Express the Permission-Sentence: “I, , request and consent to the start or induction of my labor by my provider: and other assistants as may be selected by him/her.”

I, , request and consent to the start or induction of my labor by my provider: and other assistants as may be selected by him/her.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000086	consenter role	'I, , request and consent'
ICO:0000196	act of informed consenting	'I, , request and consent'
ICO:0000199	permission role	'I, , request and consent... by my provider'
ICO:0000244	permission directive	<i>Entire Sentence</i>
NCBITaxon:9606	homo sapiens	'I, 'my provider', 'assistants'
OBI:0000093	patient role	'I, 'induction of my labor'
OBI:0000207	health care provider role	'by my provider: and other assistants...'
OGMS:0000096	health care process	'start or induction of my labor'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B121. Terms and Sentence References to Express the Permission-Sentence: “I voluntarily consent to receive medical and health care services that may include diagnostic procedures, examination, and treatment.”

I voluntarily consent to receive medical and health care services that may include diagnostic procedures, examination, and treatment.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000086	consenter role	'consent to receive medical and health care services'
ICO:0000196	act of informed consenting	'I voluntarily consent'
ICO:0000244	permission directive	<i>Entire Sentence</i>
NCBITaxon:9606	homo sapiens	'I, <i>implicit</i>
OBI:0600003	performing a clinical assessment	'examination'
OGMS:0000090	treatment	'treatment'
OGMS:0000096	health care process	'health care services that may include diagnostic procedures, examination, and treatment'
OGMS:0000104	diagnostic process	'diagnostic procedures'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B13. Terms and Sentence References to Express the Permission-Sentence: “I consent to the use of closed-circuit television, taking of photographs (including videos), and the preparation of drawings and similar illustrative graphic material for scientific purposes providing my identity is not revealed.”

I consent to the use of closed-circuit television, taking of photographs (including videos), and the preparation of drawings and similar illustrative graphic material for scientific purposes providing my identity is not revealed.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
BFO:0000040	material entity	'photographs', 'videos', 'illustrative graphic material'
DUO:0000001	data use limitation	'for scientific purposes providing my identity is not revealed'
ERO:0000333	video	'videos'
FBbi:00000223	graphic illustration	'illustrative graphic material'
IAO:0000030	information content entity	'photographs', 'videos', 'illustrative graphic material'
IAO:0000185	photograph	'photographs'
IAO:0000572	documenting	'use of closed-circuit television, taking of photographs (including videos), and the preparation of drawings and similar illustrative graphic material'
ICO:0000001	informed consent form	<i>Implicit</i>
ICO:0000086	consenter role	'I consent to'
ICO:0000196	act of informed consenting	'I consent to'
ICO:0000199	permission role	'consent to the use of'
ICO:0000218	act of removing identifiable information	providing my identity is not revealed'
ICO:0000244	permission directive	<i>Entire Sentence</i>
NCBITaxon:9606	homo sapiens	I, <i>implicit</i>
OBI:0000066	investigation	'scientific purposes'
OBI:0000093	patient role	'I, <i>implicit</i>
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
OBI:0000295	is:specified:input:of	
OBI:0000299	has:specified:output	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B14. Terms and Sentence References to Express the Permission-Sentence: “I hereby consent to engaging in virtual health/telemedicine services, where available, as part of my treatment.”

I hereby consent to engaging in virtual health/telemedicine services, where available, as part of my treatment.		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000001	informed consent form	Implicit
ICO:0000086	consenter role	'hereby consent to engaging in virtual health/telemedicine services'
ICO:0000196	act of informed consenting	'I hereby consent to'
ICO:0000244	permission directive	<i>Entire Sentence</i>
NCBITaxon:9606	homo sapiens	'I', <i>implicit</i>
NCIT:C15380	telemedicine	'virtual health/telemedicine services'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
RO:0000053	bearer of	
RO:0000056	participates in	

Table B15. Terms and Sentence References to Express the Permission-Sentence: “I request and authorize URM Labs to perform only the above designated test(s) on the sample from me (or my child or fetus).”

I request and authorize URM Labs to perform only the above designated test(s) on the sample from me (or my child or fetus).		
Ontology PURL	Ontology Label	Sentence Reference
Classes		
ICO:0000199	permission role	'request and authorize URM Labs'
ICO:0000086	consenter role	'I request and authorize'
OBI:0000245	organization	'URM Labs'
NCBITaxon:9606	homo sapiens	'I', 'sample from me (or my child or fetus)'
ICO:0000244	permission directive	<i>Entire Sentence</i>
LABO:0000107	laboratory test	'perform only the above designated test(s)'
ICO:0000196	act of informed consenting	'I request and authorize'
ICO:0000001	informed consent form	<i>Implicit</i>
NCIT:C16423	child	'child'
NCIT:C13235	fetus	'fetus'
Relations		
BFO:0000051	has part	
BFO:0000054	realized in	
CommonCore Ontologies/prescribes	prescribes	
RO:0000053	bearer of	
RO:0000056	participates in	

Appendix C: Citations for correspondences regarding proposed and actual changes to ICO and other OBO Foundry ontologies.

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- Umberfield, E. E. (2020b, April 16). Recommended revision for “Health Care Provider Role” · Issue #1154 · obi-ontology/obi. GitHub. <https://github.com/obi-ontology/obi/issues/1154>
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- Umberfield, E. E. (2021b, August 11). Modify textual definition for ‘residual clinical biospecimen’ (ICO:0000429) · Issue #32 · ICO-ontology/ICO. GitHub. <https://github.com/ICO-ontology/ICO/issues/32>
- Umberfield, E. E., & Stansbury, C. (2020, August 27). ICO Updates [Personal communication].