National covid cohort collaborative

# tufts medical center – data acquisition to OMOP import dataset generation

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To: Team

Graphical user interface

Description automatically generated

***Figure 1.0 Tufts Medical Center: Philips capsule to OMOP ETL Dataset Process***

Figure 1 is an overview of the data capture and translation to an OMOP-based CSV import dataset process being developed at Tufts Medical Center. The Aim is to capture data representing 16 different devices presently connected to Tufts Medical Center’s (TMC) Philips capsule medical device data integration solution (Table 1). The above process captures all Philips Capsule generated HL7 format transactions continuously from two source servers: a) non-Philips monitor medical devices; and b) Philips specific monitors.

***Table 1: Tufts Medical Center Philips Capsule Device Support***

|  |  |  |
| --- | --- | --- |
| Device Group ID | Device Name(s) | Key Measurements |
| ArrowB | AutoCAT 2 WAVE | Blood pressure, balloon volume, mean pressure, etc |
| AveaA | Avea Plus | SpO2 Pulse rate, End Tidal CO2, PEEP, Inspired/Expire, etc |
| CASMedA | FORE-SIGHT Elite | Tissue perfusion, StO2 |
| DragerMedibus | Drager Medibus | SpO2, SpO2 pulse rate, EtCO2, Inspired CO2, Respiration rate, Tidal volume, etc |
| FreseniusF | Fresenius 2008T BlueStar | Heart rate, NIBP systolic, NIBP diastolic, NIBP mean, O2 saturation, Central venous pressure, Mean arterial pressure, Hematocrit, etc |
| InvivoB | Expression IP5 | Heart rate, NIBP systolic, NIBP diastolic, NIBP mean, INVP1 Systolic, INVP1 Diastolic, INVP1 Mean, etc |
| MaquetB | Cardiosave | Systolic pressure, diastolic pressure, arterial pressure waveform, settings, and alarms |
| MaquetF | Cardiohelp | Hematocrit, Hemogrlobin, Venous O2 saturation, Venous line pressure, Arterial temperature, Venous temperature, etc |
| NellcorPuritanBennettG PB980-840 | PB980-840 | EtCO2, Respiration rate, Inspired O2, PEEP, I:E Ratio, Minute volume, etc |
| NeuropticsA | NPI 200 | Neurological pupil index (NPI), Initial resting pupil size, constricted pupil size, etc. |
| NewportA HT70 | HT70 | Heart rate, SpO2, Inspired O2, PEEP, I:E ratio, Peak airway pressure, Mean airway pressure, etc |
| NxStageA | System One | Central venous pressure, Fluid removal cumulated volume, settings, and alarms |
| PhilipsDataExport | IntelliVue MP90 | NIBP systolic, NIPB diastolic, NIBP mean, SpO2, Respiratory rate, Heart rate, ST level, temperature, O2 saturation, etc. |
| PhilipsIIC - All monitors | IntelliVue Information Center iX | NIBP systolic, NIPB diastolic, NIBP mean, SpO2, Respiratory rate, Heart rate, ST level, temperature, O2 saturation, etc. |
| RespironicsEsprit V60 | V60 | Tidal volume, Minute volume, Peal inspiratory pressure, Total respiration rate, etc |
| SorinA S5 | S5 | NIBP systolic, NIPB diastolic, NIBP mean, SpO2, Respiratory rate, Heart rate, ST level, temperature, O2 saturation, etc. |

The medical device data acquisition to OMOP CSV import dataset process is designed as a document-centric, multi-staged process to facilitate a stepwise and recoverable approach to medical device data capture and translation. Document-centric refers to processing each HL7 transaction as an individual file object managed using the server native operating system’s file management – organized folders. A multi-stage process consists of well-defined and atomic tasks that collect and transform the Philips Capsule HL7 files through aggregation and organization that is patient centric. That is all transactions are inspected and organized (StageHL7ByLocation.java software) under a patient medical record number folder (root folder). The HL7 transactions are further organized by the patient location (ICU, ward, etc), medical device, and time frame (year-month). HL7 transactions are thus “stagged” in this hierarchy of folders to easily identify the patient (link to COVID-19 diagnosis and/or study cohort), department of interest (ICU only), and prioritization of device whose measurements are to be translated/mapped (HL72CSV.java software) to standard OMOP vocabularies and concepts for submission to N3C.

Presently Philips Capsule to OMOP translation is focused on two device sources: a) PhilipsIIC - All monitors (Appendix A); and b) DragerMedibus (Appendix B). These two devices were the most commonly used in a survey of the HL7 transactions captured from the TMC Capsule system. The device to OMOP mapping are also available in a Java java.util.Properties and Simple Standard for Sharing Ontological Mappings (SSSOM) format. The CSV ETL formatted files produced by this process are illustrated in Appendix C.

As we validate and further tune the Philips Capsule to OMOP processes, additional device maps will be developed and added to the process. Those HL7 transactions to CSV are archived in a holding folder for recovery and mapping correction reprocessing needs. Un-mapped or un-processed devices will remain in the stagging folder.

**Appendix A: PhilipsIIC OMOP Map**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Device Name** | **Code** | **OMOP Class** | **Vocabulary** | **Concept ID** | **Qualifier/Modifier Vocabulary** | **Qualifier/Modifier Concept ID** | **Concept Name** |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1 | Measurement | SNOMED | 4239408 | - | - | Heart rate |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1234 | Measurement | LOINC | 3006620 | - | - | Oxygen [Partial pressure] in Blood Preductal |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1236 | Measurement | LOINC | 3024206 | - | - | Oxygen [Partial pressure] in Blood Postductal |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1244 | Observation | LOINC | 1031351 | - | - | Lead III |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1259 | Observation | LOINC | 1031330 | - | - | Lead AVL |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1260 | Observation | LOINC | 1031329 | - | - | Lead AVF |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1261 | Observation | LOINC | 1031335 | - | - | Lead AVR |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 1262 | Observation | LOINC | 1031358 | - | - | Lead V2 |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 14 | Observation | LOINC | 3013502 | - | - | Oxygen saturation in Blood |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 16 | Measurement | SNOMED | 4301868 | - | - | Pulse rate |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2 | Measurement | SNOMED | 37394652 | - | - | Non-invasive central systolic blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 20 | Measurement | SNOMED | 4353938 | - | - | End tidal carbon dioxide concentration |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2259 | Measurement | SNOMED | 4217013 | - | - | Systolic arterial pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2260 | Measurement | SNOMED | 35610320 | - | - | Diastolic arterial pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2261 | Measurement | SNOMED | 4298391 | - | - | Arterial blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2341 | Measurement | LOINC | 21490586 | - | - | Blood temperature |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2386 | Observation | LOINC | 1031344 | - | - | Lead I |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2601 | Measurement | LOINC | 21490839 | - | - | Premature ventricular contractions [#] |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 2602:Physical Object | SNOMED | 4107148 | - | - | Chest lead | |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 3 | Measurement | SNOMED | 37394653 | - | - | Non-invasive central diastolic blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 3446 | Observation | LOINC | 3020891 | - | - | Temperature |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 3571 | Measurement | LOINC | 3022060 | - | - | Rectal temperature |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 3573 | Measurement | LOINC | 21490588 | - | - | Esophageal temperature |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 3574 | Observation | SNOMED | 4174894 | - | - | Core body temperature |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4 | Measurement | SNOMED | 36716965 | - | - | Non-invasive blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4084 | Measurement | SNOMED | 4301868 | - | - | Pulse rate |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4093 | Measurement | LOINC | 3000333 | - | - | Central venous pressure (CVP) Mean |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4507 | Observation | SNOMED | 40483579 | SNOMED | 4300877;Arterial oxygen saturation | |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4508 | Observation | SNOMED | 40483579 | SNOMED | 4080761;Arterial oxygen saturation | |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4539 | Measurement | LOINC | 3005606 | - | - | Pulmonary artery Systolic blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4540 | Measurement | LOINC | 3017188 | - | - | Pulmonary artery Diastolic blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4541 | Measurement | LOINC | 3028074 | - | - | Pulmonary artery Mean blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4545 | Measurement | LOINC | 21490593 | - | - | Intracranial pressure (ICP) Mean |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4557 | Measurement | SNOMED | 4174755 | - | - | Left ventricular systolic pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 4558 | Measurement | SNOMED | 4081034 | - | - | Left ventricular end-diastolic pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 501 | Measurement | SNOMED | 4217013 | - | - | Systolic arterial pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 502 | Measurement | SNOMED | 35610320 | - | - | Diastolic arterial pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 503 | Measurement | SNOMED | 4298391 | - | - | Arterial blood pressure |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 591 | Observation | LOINC | 1031348 | - | - | Lead III |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 6357 | Observation | LOINC | 1031770 | LOINC | 1020509;Respiration rate | |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 6394 | Measurement | SNOMED | 4301868 | LOINC | 21495294;Pulse rate | |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 6453 | Observation | LOINC | 3013502 | - | - | Oxygen saturation in Blood |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 696 | Measurement | LOINC | 3025809 | - | - | Q-T interval |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 7372 | Observation | LOINC | 1031770 | LOINC | 1019938;Respiration rate | |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 9315 | Measurement | LOINC | 3026258 | - | - | Q-T interval corrected |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 9592 | Observation | LOINC | 3013502 | SNOMED | 4106889;Oxygen saturation in Blood | |
| PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS | 9663 | Measurement | LOINC | 3009713 | - | - | Pulmonary vascular Resistance index |

**Appendix B DragerMedibus to OMOP Map**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Device Name** | **Code** | **OMOP Class** | **Vocabulary** | **Concept ID** | **Qualifier/Modifier Vocabulary** | **Qualifier/Modifier Concept ID** | **Concept Name** |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 1189 | Observation | SNOMED | 4353713 | - | - | Positive end expiratory pressure |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 1306 | Observation | SNOMED | 4029625 | - | - | Tidal volume |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 1307 | Observation | SNOMED | 4353621 | - | - | Minute volume |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 1393 | Measurement | LOINC | 37067076 | - | - | Maximum airway pressure limit setting |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 1415 | Measurement | LOINC | 42527086 | - | - | Mean airway pressure |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 169 | Observation | LOINC | 3007191 | - | - | Age - Reported |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 20 | Measurement | SNOMED | 4353938 | - | - | End tidal carbon dioxide concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 21 | Observation | SNOMED | 4354269 | - | - | Inspired carbon dioxide concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2104 | Observation | SNOMED | 4216746 | - | - | Positive end expiratory pressure setting |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 23 | Measurement | LOINC | 21490847 | - | - | Respiratory rate by Carbon dioxide measurement |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2324 | Measurement | LOINC | 36303816 | - | - | Tidal volume.inspired |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2355 | Measurement | SNOMED | 435393 | - | - | End tidal carbon dioxide concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2564 | Observation | SNOMED | 4108457 | SNOMED | 4114683 | Airway pressure |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2565 | Observation | SNOMED | 4108457 | LOINC | 1004398 | Airway pressure |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2885 | Observation | SNOMED | 4354273 | - | - | Inspired nitrous oxide concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2886 | Observation | SNOMED | 4108443 | - | - | Expired nitrous oxide concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2904 | Observation | SNOMED | 4354269 | - | - | Inspired carbon dioxide concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 2987 | Observation | SNOMED | 4215838 | - | - | Inspiratory pressure setting |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 3540 | Observation | LOINC | 37025943 | - | - | Halothane gas delivered.total |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 3541 | Observation | LOINC | 37040552 | - | - | Desflurane gas delivered.total |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 3542 | Observation | LOINC | 37029818 | - | - | Isoflurane gas delivered.total |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 3543 | Observation | LOINC | 37022786 | - | - | Sevoflurane gas delivered.total |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 3544 | Observation | LOINC | 37050105 | - | - | Enflurane gas delivered.total |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 3804 | Measurement | LOINC | 21490846 | - | - | Respiratory rate by Airway flow measurement |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 3806 | Measurement | LOINC | 3006396 | - | - | Respiratory rate by Spirometry at maximum voluntary ventilation |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4003 | Measurement | SNOMED | 4313591 | - | - | Respiratory rate |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4017 | Measurement | LOINC | 21490545 | - | - | Halothane gas delivered during case [Volume] from Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4018 | Measurement | LOINC | 21490541 | - | - | Enflurane gas delivered during case [Volume] from Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4019 | Measurement | LOINC | 21490549 | - | - | Isoflurane gas delivered during case [Volume] from Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4020 | Measurement | LOINC | 21490537 | - | - | Desflurane gas delivered during case [Volume] from Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4021 | Measurement | LOINC | 21490553 | - | - | Sevoflurane gas delivered during case [Volume] from Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4024 | Measurement | LOINC | 21490718 | - | - | Fresh gas.oxygen flow Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4113 | Measurement | LOINC | 21490716 | - | - | Fresh gas.air flow Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4115 | Measurement | LOINC | 21490717 | - | - | Fresh gas.nitrous oxide flow Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4302 | Measurement | LOINC | 21490536 | - | - | Desflurane [VFr/PPres] Gas delivery system.inspiratory limb during inspiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4303 | Measurement | LOINC | 21490535 | - | - | Desflurane [VFr/PPres] Gas delivery system.expiratory limb during expiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4304 | Measurement | LOINC | 21490619 | - | - | Sevoflurane [VFr/PPres] Gas delivery system.inspiratory limb during inspiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 4305 | Measurement | LOINC | 2149082 | - | - | Sevoflurane [VFr/PPres] Gas delivery system.expiratory limb during expiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 584 | Measurement | LOINC | 3004921 | - | - | Ventilation mode Ventilator |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 593 | Observation | LOINC | 1023878 | - | - | Desflurane during inspiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 594 | Observation | LOINC | 1023877 | - | - | Desflurane during expiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 595 | Observation | LOINC | 1023897 | - | - | Sevoflurane during inspiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 596 | Observation | LOINC | 1023896 | - | - | Sevoflurane during expiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 60 | Measurement | SNOMED | 4029625 | - | - | Tidal volume |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 601 | Observation | LOINC | 1023884 | - | - | Halothane during inspiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 602 | Observation | LOINC | 1023883 | - | - | Halothane during expiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 603 | Observation | LOINC | 1023881 | - | - | Enflurane during inspiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 604 | Observation | LOINC | 1023880 | - | - | Enflurane during expiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 605 | Observation | LOINC | 1023889 | - | - | Isoflurane during inspiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 606 | Observation | LOINC | 1023888 | - | - | Isoflurane during expiration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 61 | Measurement | SNOMED | 4090654 | - | - | Dynamic compliance |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 625 | Measurement | LOINC | 21490578 | - | - | Apnea duration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 634 | Observation | SNOMED | 4353937 | - | - | Expired oxygen concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 635 | Observation | SNOMED | 4353936 | - | - | Inspired oxygen concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 6551 | Observation | SNOMED | 4353940 | - | - | End tidal carbon dioxide partial pressure |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7076 | Observation | LOINC | 37042784 | - | - | Ventilation mode |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7077 | Measurement | LOINC | 3004921 | - | - | Ventilation mode Ventilator |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 780 | Measurement | LOINC | 3024882 | - | - | Oxygen/Inspired gas setting [Volume Fraction] Ventilator |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7857 | Observation | SNOMED | 4090647 | - | - | Oxygen uptake |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7915 | Observation | SNOMED | 4144152 | - | - | Inspired halothane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7916 | Observation | SNOMED | 4143986 | - | - | End tidal halothane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7917 | Observation | SNOMED | 4143990 | - | - | Inspired enflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7918 | Observation | SNOMED | 4137689 | - | - | End tidal enflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7919 | Observation | SNOMED | 4140152 | - | - | Inspired isoflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7920 | Observation | SNOMED | 4146300 | - | - | End tidal isoflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7921 | Observation | SNOMED | 4141359 | - | - | Inspired desflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7922 | Observation | SNOMED | 4140454 | - | - | End tidal desflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7923 | Observation | SNOMED | 4137519 | - | - | Inspired sevoflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 7924 | Observation | SNOMED | 4140731 | - | - | Expired sevoflurane concentration |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 8560 | Measurement | LOINC | 3032445 | - | - | Ideal body weight |
| DRAGERMEDIBUS\_5.3.21.3\_APOLLO\_[MEDIBUS.X]\_DR\_\_\_GER | 9310 | Measurement | LOINC | 3030916 | - | - | Compliance of last 20% of breath/Compliance of entire breath |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 1189 | Observation | SNOMED | 4353713 | - | - | Positive end expiratory pressure |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 1306 | Observation | SNOMED | 4029625 | - | - | Tidal volume |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 1307 | Observation | SNOMED | 4353621 | - | - | Minute volume |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 1393 | Measurement | LOINC | 37067076 | - | - | Maximum airway pressure limit setting |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 1415 | Measurement | LOINC | 4.25E+14 | - | - | Mean airway pressure |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 2104 | Observation | SNOMED | 4216746 | - | - | Positive end expiratory pressure setting |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 2564 | Observation | SNOMED | 4108457 | SNOMED | 4114683 | Airway pressure |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 2565 | Observation | SNOMED | 4108457 | LOINC | 1004398 | Airway pressure |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 2987 | Observation | SNOMED | 4215838 | - | - | Inspiratory pressure setting |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 4003 | Measurement | SNOMED | 4313591 | - | - | Respiratory rate |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 4024 | Measurement | LOINC | 21490718 | - | - | Fresh gas.oxygen flow Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 4113 | Measurement | LOINC | 21490716 | - | - | Fresh gas.air flow Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 4115 | Measurement | LOINC | 21490717 | - | - | Fresh gas.nitrous oxide flow Gas delivery system |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 584 | Measurement | LOINC | 3004921 | - | - | Ventilation mode Ventilator |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 60 | Measurement | SNOMED | 4029625 | - | - | Tidal volume |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 635 | Observation | SNOMED | 4353936 | - | - | Inspired oxygen concentration |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 7076 | Observation | LOINC | 37042784 | - | - | Generic Ventilation Mode unitless |
| DRAGERMEDIBUS\_5.3.21.3\_FABIUS\_TIRO\_[MEDIBUS.X]\_DR\_\_\_GER | 7077 | Measurement | LOINC | 3004921 | - | - | Ventilation Mode Primary unitless |

Appendix C Philips Capsule to OMOP ETL CSV Format

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| person\_id | mrn | last name | first name | domain\_id | datetime | concept\_id | value | unit concept\_id | unit | range | source |  |
| null | 11223344 | DOE | JOHN | Measurement | 20230130193519.006-0500 | 4239408 | 100 | 4118124 | 1 | 40-130 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1|[IDENTIFIER]=1;[SET\_ID]=1;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1;[VALUE]=100;[UNITS]=1;[REFERENCE\_RANGE]=40-130;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 3013502 | 100 | 8554 | 19 | 88-100 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.14|[IDENTIFIER]=14;[SET\_ID]=2;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.14;[VALUE]=100;[UNITS]=19;[REFERENCE\_RANGE]=88-100;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 1031348 | 0 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.591|[IDENTIFIER]=591;[SET\_ID]=5;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.591;[VALUE]=0;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 1031351 | -0.2 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1244|[IDENTIFIER]=1244;[SET\_ID]=7;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1244;[VALUE]=-0.2;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 1031330 | 0.2 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1259|[IDENTIFIER]=1259;[SET\_ID]=8;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1259;[VALUE]=0.2;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 1031329 | 0 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1260|[IDENTIFIER]=1260;[SET\_ID]=9;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1260;[VALUE]=0;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 1031335 | -0.1 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1261|[IDENTIFIER]=1261;[SET\_ID]=10;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1261;[VALUE]=-0.1;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 1031344 | 0.2 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.2386|[IDENTIFIER]=2386;[SET\_ID]=14;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.2386;[VALUE]=0.2;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Measurement | 20230130193519.006-0500 | 21490839 | 0 | 4119681 | 1 | <10 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.2601|[IDENTIFIER]=2601;[SET\_ID]=15;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.2601;[VALUE]=0;[UNITS]=1;[REFERENCE\_RANGE]=<10;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Physical Object | 20230130193519.006-0500 | 4107148 | 0.1 | 0 | 23 | -4 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.2602|[IDENTIFIER]=2602;[SET\_ID]=16;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.2602;[VALUE]=0.1;[UNITS]=23;[REFERENCE\_RANGE]=-2-2;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Measurement | 20230130193519.006-0500 | 4301868 | 100 | 4118124 | 1 | 40-130 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.6394|[IDENTIFIER]=6394;[SET\_ID]=21;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.6394;[VALUE]=100;[UNITS]=1;[REFERENCE\_RANGE]=40-130;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230130193519.006-0500 | 1031770 | 20 | 0 | 149 |  | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.7372|[IDENTIFIER]=7372;[SET\_ID]=24;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.7372;[VALUE]=20;[UNITS]=149;[REFERENCE\_RANGE]=8-30;[RESULT\_STATUS]=F;[DATE]=Mon Jan 30 19:35:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Measurement | 20230131152519.001-0500 | 4239408 | 97 | 4118124 | 1 | 40-130 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1|[IDENTIFIER]=1;[SET\_ID]=1;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1;[VALUE]=97;[UNITS]=1;[REFERENCE\_RANGE]=40-130;[RESULT\_STATUS]=F;[DATE]=Tue Jan 31 15:25:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230131152519.001-0500 | 3013502 | 93 | 8554 | 19 | 88-100 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.14|[IDENTIFIER]=14;[SET\_ID]=2;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.14;[VALUE]=93;[UNITS]=19;[REFERENCE\_RANGE]=88-100;[RESULT\_STATUS]=F;[DATE]=Tue Jan 31 15:25:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230131152519.001-0500 | 1031348 | 0 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.591|[IDENTIFIER]=591;[SET\_ID]=6;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.591;[VALUE]=0;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Tue Jan 31 15:25:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230131152519.001-0500 | 1031351 | -0.4 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1244|[IDENTIFIER]=1244;[SET\_ID]=8;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1244;[VALUE]=-0.4;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Tue Jan 31 15:25:19 EST 2023 | |
| null | 11223344 | DOE | JOHN | Observation | 20230131152519.001-0500 | 1031330 | 0.4 | 0 | 23 | -2 | PHILIPSIIC\_5.1.13.10\_INTELLIVUE INFORMATION CENTER IX\_PHILIPS MEDICAL SYSTEMS.1259|[IDENTIFIER]=1259;[SET\_ID]=9;[VALUE\_TYPE]=NM;[SUB\_ID]=1.0.0.1259;[VALUE]=0.4;[UNITS]=23;[REFERENCE\_RANGE]=-1-1;[RESULT\_STATUS]=F;[DATE]=Tue Jan 31 15:25:19 EST 2023 | |