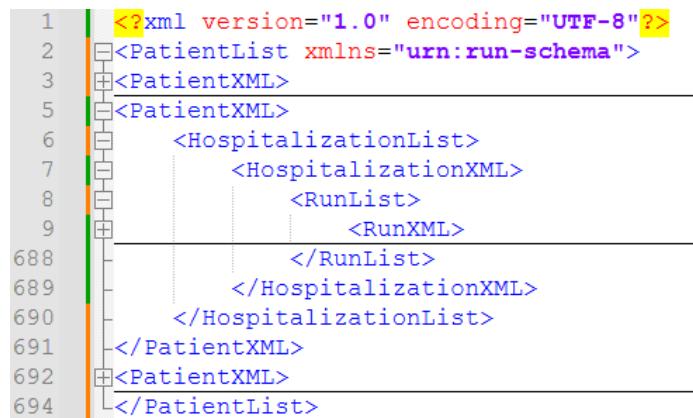


## ELSO Instructions for XML data import to the ELSO Registry

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The XML import file is composed of four unique parts: PatientList, HospitalizationList, RunList, PatientXML, HospitalizationXML and RunXML. The `<PatientList>` element contains multiple elements that represent patients and those patient elements are displayed as `<PatientXML>`. `<PatientXML>` contains `<HospitalizationList>`, which contains multiple elements that represent hospitalizations (contains hospitalization information) and their run. Inside each hospitalization there is `<RunList>` which contains informations about runs. Hospitalization element is named `<HospitalizationXML>` while run element is named as `<RunXML>`.

The basic structure of the XML file looks like this:



```
<?xml version="1.0" encoding="UTF-8"?>
<PatientList xmlns="urn:run-schema">
<PatientXML>
<PatientXML>
<HospitalizationList>
<HospitalizationXML>
<RunList>
<RunXML>
</RunList>
</HospitalizationXML>
</HospitalizationList>
</PatientXML>
<PatientXML>
</PatientList>
```

Image no: 1.1

In image 1.1, we have a patient list that contains three patients or three `<PatientXML>` elements, where the second patient counting from top contains the element `<HospitalizationList>` which itself contains `<RunList>` with two runs or two `<RunXML>` elements. A patient can have multiple hospitalizations and each hospitalization can have multiple runs.

`<HospitalizationXML>` is the element where we store data about each hospitalization and its runs. While `<RunXML>` is the element where we store data about each Run. All sections are present from editing the Run in the Registry Application, including sections like Run Info, Pre ECLS Assessment, Infections, Diagnoses, etc.

Before a user starts adding data about a Run and the sections of a run, the user needs to include information for Patient and Hospitalization, which are the parent elements of the `<RunList>` element. This image illustrates the structure.

## ELSO Instructions for XML data import to the ELSO Registry

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```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <PatientList xmlns="urn:run-schema">
3  <PatientXML>
4      <UniqueId>TestPatient123s</UniqueId>
5      <LocalUniqueId>1234abcd</LocalUniqueId>
6      <Birthdate>06/10/1962</Birthdate>
7      <Sex>1</Sex>
8      <HospitalizationList>
9          <HospitalizationXML>
10         <AdmitDate>03/11/2002 05:05</AdmitDate>
11         <AdmissionHeight>80</AdmissionHeight>
12         <AdmissionWeight>97.8</AdmissionWeight>
13         <DischargedAlive>1</DischargedAlive>
14         <DischargeDate>10/25/2002 10:50</DischargeDate>
15         <DischargeLocation>3</DischargeLocation>
16         <RunList>
17             <RunXML>
18             </RunXML>
19         </RunList>
20     </HospitalizationXML>
21     </HospitalizationList>
22 </PatientXML>
23 </PatientList>
```

Image no: 1.2

Image 1.2 shows <PatientXML> with patient fields including: UniqueId, Birthdate, Sex, etc. There is also a list with hospitalizations which is represented by the <HospitalizationList> element. The patient in this example has only one hospitalization and hospitalization contains only one run. This example shows only a few of the patient elements. The most important field for a patient is the <UniqueId> element which is used for tracking this patient.

To create a new patient, hospitalizations and runs using the XML import process, all required fields must be included. Some required fields include: Patient(Uniqued, Birthdate, Sex), Hospitalization(AdmitDate), Run(TimeOn, SupportType, Mode, and RunNo). Required fields can be seen in XML Import schema file, available for download on the ELSO website. In some cases, some fields are required for a specific section.

```
<RunXML>
<RunInfo>
    <RunNo>1</RunNo>
    <SupportType>1</SupportType>
    <WeightUnknown>0</WeightUnknown>
    <AdmissionWeight>97.8</AdmissionWeight>
    <HeightUnknown>0</HeightUnknown>
    <AdmissionHeight>80</AdmissionHeight>
    <Intubation>2</Intubation>
    <IntubationDate>10/17/2002 10:50</IntubationDate>
    <InvasiveVentilation>1</InvasiveVentilation>
    <InvasiveVentilationDT>10/15/2002 12:23</InvasiveVentilationDT>
</RunInfo>
<Modes>
    <ConcurrentMode>
        <Mode>
            <StartTime>03/11/2019 10:00</StartTime>
            <EndTime>03/11/2019 16:00</EndTime>
            <ECLSMode>1</ECLSMode>
        </Mode>
        <Mode>
            <StartTime>03/11/2019 20:00</StartTime>
            <EndTime>12/13/2019 22:00</EndTime>
            <ECLSMode>2</ECLSMode>
        </Mode>
    </ConcurrentMode>
</Modes>
```

Image no: 1.3

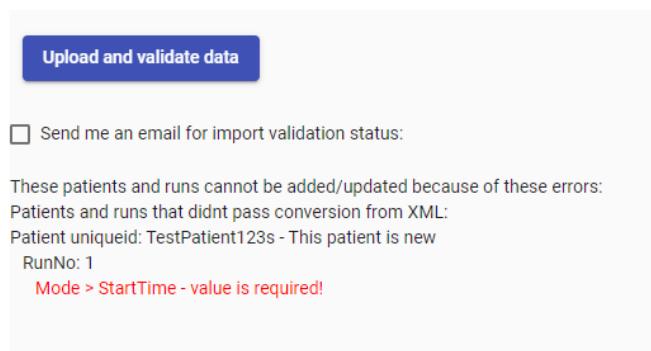
*ELSO Instructions for XML data import to the ELSO Registry*

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The <RunXML> element contains run sections such as RunInfo and Modes from the Registry Application and those sections contain the appropriate fields (image 1.3). <RunNo> and <SupportType> can be found in the <RunInfo> section (marked with red rectangle). In order to add the <SupportType> and <RunNo> elements, the <RunInfo> element must be created. The other fields in RunInfo are not required for the Patient, Hospitalization and Run creation through XML but should be included if you have them.

TimeOn and Mode are two other fields that are required for Run creation. Those fields are present in the <Modes> element section (marked with red rectangle). The StartTime of the Initial Mode is TimeOn for the run, while the Mode is marked as <ECLSMode>. The value for <ECLSMode> is the number that will represent that Mode. The element <EndTime> is not a required field for Run creation so we can easily create <Mode> element without that element, but bear in mind that <EndTime> of last or only Mode is TimeOff for the run, which is required for run to be submitted.

With only those fields completed, a Patient and Run can be created if the validation for BirthDate, AdmitDate, TimeOn and UniqueId are acceptable. Other elements that were not included in the XML file will have NULL or default value. This is the minimum data required to create a patient and hospitalization with run but all of the other data should be entered as well just as if the Registry Application was being used to enter the data. Missing required fields will be shown as red errors, while missing fields that are only required for the run to be marked as submitted will be displayed as blue errors (image 1.4 and image 1.5).



The screenshot shows a user interface for importing XML data. At the top is a blue button labeled "Upload and validate data". Below it is a checkbox labeled "Send me an email for import validation status:". Underneath is a list of validation errors:

- These patients and runs cannot be added/updated because of these errors:
- Patients and runs that didn't pass conversion from XML:
- Patient uniqueid: TestPatient123s - This patient is new
- RunNo: 1
- Mode > StartTime - value is required!

*Image no: 1.4*

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If you'd like to update data via XML only in the registry, please contact us at [RegistrySupport@elso.org](mailto:RegistrySupport@elso.org) and we can set up your center for XML Import.

**Upload and validate data**

Send me an email for import validation status:

These patients and runs cannot be added/updated because of these errors:

Patient uniqueid: TestPatient123s - This patient was previously imported and will be updated  
HospitalizationNo: 1  
RunNo: 1  
Hospitalization > Height - You can leave the data in the system as is, but these are fields outside the usual data range for Height (150 and 190). Current value for Height is 80.  
Run Info > AdmitDate - Hospital Admit Date is required.  
Run Info > Height - You can leave the data in the system as is, but these are fields outside the usual data range for Height (150 and 190). Current value for Height is 80.  
Run Info > BMI - We do not allow the height and weight combination you've entered. Please double check and update the height and weight of this patient.  
Run Info > IntubationDate - You can leave date/time of intubation date as is, but it is unusual for this date to be more than a month before the time of Eclwo date 3/11/21  
Pre ECLS Assessment > FIO2 - You can leave the data in the system as is, but these are fields outside the usual data range for FIO2 (21 and 100). Current value for FIO2 is 8.15  
Pre ECLS Assessment > PIP - You can leave the data in the system as is, but these are fields outside the usual data range for PIP (10 and 45). Current value for PIP is 8.15  
Pre ECLS Assessment > DeltaP - You can leave the data in the system as is, but these are fields outside the usual data range for DeltaP (30 and 90). Current value for DeltaP is 8.15  
Pre ECLS Assessment > MeanAirwayPressure - You can leave the data in the system as is, but these are fields outside the usual data range for MeanAirwayPressure (10 a  
Pre ECLS Assessment > SBP - You can leave the data in the system as is, but these are fields outside the usual data range for SBP (50 and 180). Current value for SBP is 4  
Pre ECLS Assessment > DBP - You can leave the data in the system as is, but these are fields outside the usual data range for DBP (30 and 180). Current value for DBP is 4  
Pre ECLS Assessment > SvO2 - You can leave the data in the system as is, but these are fields outside the usual data range for SvO2 (20 and 80). Current value for SvO2 is 4  
Pre ECLS Assessment > MAP - You can leave the data in the system as is, but these are fields outside the usual data range for Mean BP (30 and 180). Current value for Mean BP is 4  
Pre ECLS Assessment > BradycardiaTime - Please use date/time ONLY 00:00:00 and must be no less than 10 hours AFTER time of Eclwo 03/11/2021 10:00

*Image no: 1.5*

To update the data for an existing patient, place the same data that was previously used for patient creation, with new changes to values if needed, import the file. That will update the Patient/Run if there are no red errors.

If an element needs to be reset to NULL value, set that element to empty value like this:  
<BirthWeight></BirthWeight>.

If a list needs to be reset to an empty list (Diagnoses, Complications, Races etc.), the XML file should contain an empty list, like this: <PatientsRaces></PatientsRaces>. If <PatientsRaces> contain any races after the patient is updated, all races that were previously included for this patient will be DELETED first, and the new races will be the only ones included. This process is the same for all elements that can contain multiple repeated elements such as: Diagnoses, Procedures, Infections, etc. If one <Diagnosis> is added in <Diagnoses> element, and the run already included three diagnoses in database, those three diagnoses will be deleted and only the new diagnosis will be saved, leaving the run with only one diagnosis.

To submit a run, all fields that are required for run/patient submission in the registry application must be included. Without those fields, a patient or run can be successfully imported, but it will not be submitted. Imported data cannot be edited by in the Registry application, except ASCEND data. Patients, hospitalizations and runs imported can be viewed in the Registry application.

Red errors are also shown when a field contains a wrong value. If the wrong value is entered in the Race field for example, where a letter is inserted instead of a number, a warning will be shown displaying that patient with the UniqueId that shows the wrong value for Race (Image 1.6).

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Upload and validate data

Send me an email for import validation status:

These patients and runs cannot be added/updated because of these errors:  
Patients and runs that didn't pass conversion from XML:  
Patient uniqueid: TestPatient123s - This patient is new  
RunNo: 1  
Race > Race - wwTestxx value is not valid!

Image no: 1.6

If an XML element is not closed properly, a red error will also appear, or if a section element is missing, for example VentSetting (image 1.7 and image 1.8).



Upload and validate data

Send me an email for import validation status:

Please check your xml file structure. The 'VentSettingTime' start tag on line 60 position 40 does not match the end tag of 'VentSetting'. Line 69, position 7.

Image no: 1.7



Upload and validate data

Send me an email for import validation status:

Please check your xml file structure. There are some errors  
Validation Error: The element 'PreECLSAessment' has incomplete content. List of possible elements expected: 'VentSetting' ... Line number: 74. Line position: 6

Image no: 1.8

The screen that displays warnings will also display warnings about min/max, hard/soft limits, and date validations. This is also true when a run contains an inactive code such as a complication or infection that cannot be used anymore. A red error will show that value is not valid.

The values for each element vary (some can be whole numbers and some can be decimal numbers). If a decimal number is included for a field that can only accept whole numbers, an error message will be generated stating that the value has the wrong input and it needs to be fixed before importing again. For date/time elements, acceptable formats include: YYYY-MM-DD HH:MM AM/PM or YYYY-MM-DD HH:MM, in other words 12h or 24h format. For example, both of

## ELSO Instructions for XML data import to the ELSO Registry

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these are acceptable: 2002-09-24 13:40 or 2002-09-24 1:40 PM. It is possible to import date fields in other formats also, but the most common one is used in the example.

Some fields can accept values in two different units, for example <PO2> from the <ECLSAessment> section can be measured in both mmHg or kPa. Before importing data please check the settings for “Unit System” which are located in the upper right corner of the Registry Application screen, simply by clicking on the “username” icon. The settings where “Unit System” dropdown can be adjusted there (Image 1.9).

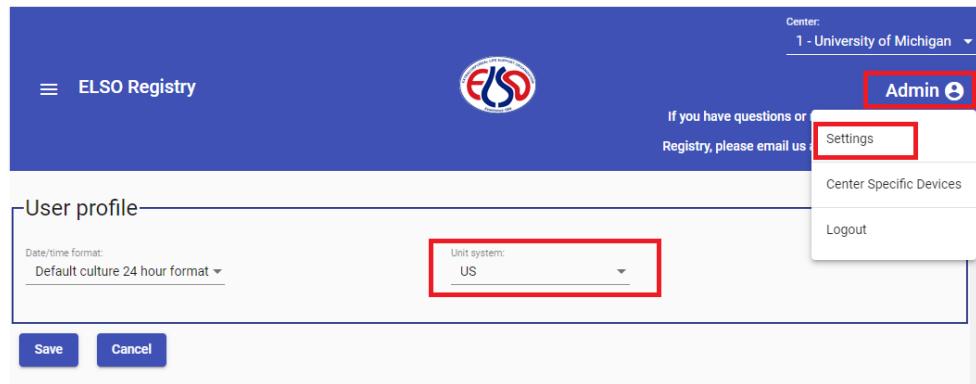


Image no: 1.9

If International Units (SI) system is selected <PO2> is measured in kPa. That means it will have different hard/soft min/max limits from United States Units (US) system, when its validated. If, for example, the user has International Units (SI) system selected and <PO2> is imported in mmHg, the user will receive soft/hard error if value is not in range for kPa which is a measure unit from International Units (SI) system.

When a user is importing a patient for the first time and that patient doesn't already exist in the Registry database, that patient will be labeled as “-This patient is new” to denote that new data is being added instead of updating existing data (image 1.10).



image 1.10

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When updating an existing patient, the Patient will be labeled as: “-This patient was previously imported and will be updated”. This will denote that a patient is being updated in the database (image 1.11). Remember to provide all data for patient that will be updated, because previously inserted data for patient will be overwritten.

UniqueId: test1231231231 --This patient was previously imported and will be updated.  
RunNo: 1 -- This run was previously imported and will be updated for this patient.  
RunDemographics > You can leave Date/Time of Intubation Date as is, but it is unusual for this date to be more than a month before the time on ECMO date December 18, 2003 10:50.  
RunECLSAssessment > You can leave the data in the system as is, but these are fields outside the usual data range for FiO2 (21 and 100). Current value for FiO2 is 12.  
RunPreECLSAssessment > You can leave the data in the system as is, but these are fields outside the usual data range for FiO2 (21 and 100). Current value for FiO2 is 11.

Send me an email for import result status:

The patients and runs above will be added/updated when you press the Confirm button:

Image 1.11

When the XML import file is validating, there are two options with checkboxes that can send those validations or XML import results via email. Check one or both boxes and an email will be sent accordingly (image 1.12).

Send me an email for import validation status:

Patient uniqueid: TestPatient123 - This patient was previously imported and will be updated  
RunNo: 1  
Run Info > Height - You can leave the data in the system as is, but these are fields outside the usual data range for Height (150 and 190). Current value for Height is 80.  
Run Info > IntubationDate - You can leave Date/Time of Intubation Date as is, but it is unusual for this date to be more than a month before the time on ECMO date 3/11/2019 10:00.  
ECLS Assessment > BloodgasTime - Blood gas date time 3/11/2019 22:17 must be less than 18 hours AFTER time on ECMO 3/11/2019 10:00.  
ECLS Assessment > MAP - You can leave the data in the system as is, but these are fields outside the usual data range for Mean BP (30 and 180). Current value for Mean BP is 3.  
Complications > ComplicationCode - If the membrane lung replacement was due to an oxygenator failure, please make sure to include mechanical: oxygenator failure as a complicati  
Outcome > ICUDischargeDate - ICU Discharge Date 8/13/2019 10:50:00 AM should be after time off Date 6/10/1962 12:00:00 AM.  
SARS-CoV-2 Addendum > CRPDayOfIntubation - You can leave the data in the system as is, but these are fields outside the usual data range for CRPDayOfIntubation (0.8 and 3.1). Cu  
ECPR Addendum > DBPflowStart - You can leave the data in the system as is, but these are fields outside the usual data range for DBPflowStart (5 and 110). Current value for DBPflow  
ECPR Addendum > CPR - You can leave the data in the system as is, but these are fields outside the usual data range for CPR (40 and 160). Current value for CPR is 25.  
ECPR Addendum > PO2 - You can leave the data in the system as is, but these are fields outside the usual data range for PO2 (20 and 300). Current value for PO2 is 1.  
ECPR Addendum > HCO3 - You can leave the data in the system as is, but these are fields outside the usual data range for HCO3 (10 and 40). Current value for HCO3 is 1.  
TRAUMA Addendum > DateSurgicalProcedureAdmitDate - Surgical procedure date 4/13/2004 18:20 should be after hospital admit date 3/11/2019 16:17.  
> Run - >>>ReceiveCenter: After update, Pre-EDS Assessment section will be disabled for edit.  
 Send me an email for import result status:

The patients and runs above will be added/updated when you press the Confirm button:

Image 1.12

When adding equipment for runs, all equipment information is stored in the `<Equipment></Equipment>` element. To add Hemofilters and Temperature Regulations devices, `<HemofilterId>` and `<TemperatureRegulationId>` elements are used, while adding MembraneLungs, Pumps and Consoles, `<MembraneLungId>`, `<PumpId>`, `<ConsoleId>` elements are used when there is single device of that type, to add more devices of MembraneLung, Pump or Console type, `<MembraneLungs>`, `<Pumps>` and `<Consoles>` elements are used. (image 1.13)

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```
<Equipment>
  <HemofilterId>132</HemofilterId>
  <TemperatureRegulationId>107</TemperatureRegulationId>
  <Pumps>
    <Device>
      <DeviceId>150</DeviceId>
      <AddedReplaced>1</AddedReplaced>
      <ReplaceReasonId>1</ReplaceReasonId>
      <StartTime>04/11/2019 21:22</StartTime>
      <EndTime>04/11/2019 21:29</EndTime>
    </Device>
    <Device>
      <DeviceId>211</DeviceId>
      <AddedReplaced>2</AddedReplaced>
      <ReplaceReasonId></ReplaceReasonId>
      <StartTime>04/12/2019 20:29</StartTime>
      <EndTime></EndTime>
    </Device>
  </Pumps>
  <MembraneLungs>
    <Device>
      <DeviceId>215</DeviceId>
      <AddedReplaced>1</AddedReplaced>
      <ReplaceReasonId>1</ReplaceReasonId>
      <StartTime>04/11/2019 21:22</StartTime>
      <EndTime>04/11/2019 21:29</EndTime>
    </Device>
    <Device>
      <DeviceId>211</DeviceId>
      <AddedReplaced>2</AddedReplaced>
      <ReplaceReasonId></ReplaceReasonId>
      <StartTime>04/12/2019 20:29</StartTime>
      <EndTime></EndTime>
    </Device>
  </MembraneLungs>
</Equipment>
```

Image no: 1.13

<DeviceId> element stands for <PumpId> and <MembraneLungId>. <ReplaceReasonId> is a required element when the <AddedReplaced> element has the value of '1'. This means that this device was replaced and the system will require a replacement reason for why that device was replaced. Other validation, such as date validations for <StartTime> and <EndTime>, are the same as they are described in the Database Definitions document and within the registry application.

There are certain elements that cannot be present when other elements are present. In the ECPR addendum section, there are some XML elements that cannot be present in the XML import file when certain elements from this group are present. These include the Location of Arrest in the ECPR addendum. Location of Arrest can be 'In hospital' or 'Out of Hospital'. Depending on which location is used, different sub XML elements can or cannot be inserted. In the next image (image 1.18) there are two red blocks that contain two different types of arrest. Only one of them can be present in the XML import file. Element <LAICUDesc> can only be used if the value for the <LAInHospital> element is present and only if the value is '5'. The same is true for <OOHCAList>, which can only be used if there is a value in the <LAOutOfHospital> element.

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```
<LAInHospital></LAInHospital>
<LAICUDesc></LAICUDesc>
<LAOutOfHospital>1</LAOutOfHospital>
<OOHCAList>
  <OOHCA>
    <OOHCAId>1</OOHCAId>
  </OOHCA>
</OOHCAList>
```

Image no: 1.14

The same rule applies for Location of Cannulation arrest. The run can have Out of Hospital Arrest or In Hospital Arrest. The `<CDICUDesc>` element can only be used if the `<CDInHospital>` element has a value and that value is '5' (image 1.15).

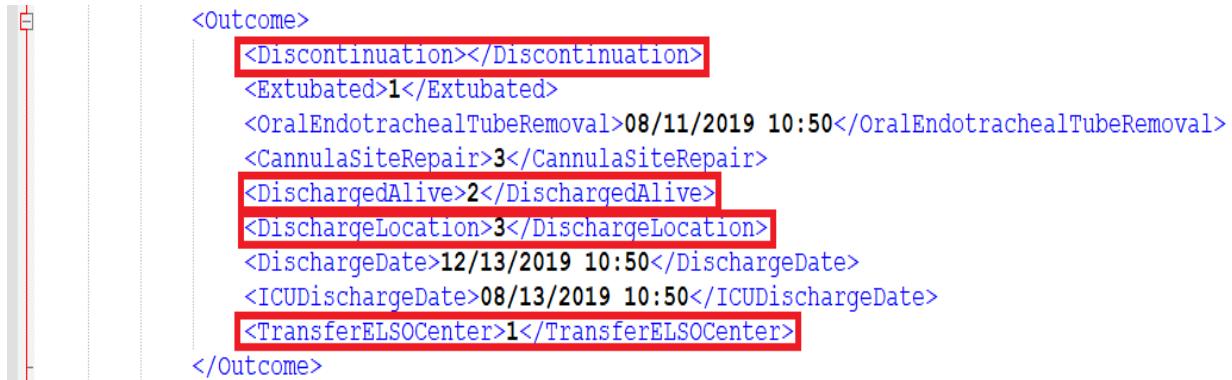
```
<CDOutOfHospital>5</CDOutOfHospital>
<CDInHospital>5</CDInHospital>
<CDICUDesc>1</CDICUDesc>
```

*Image no: 1.15*

When transferring a run to another center, `<TransferELSOCenter>`, `<TransferNonELSOCenter>` elements are used. `<TransferELSOCenter>` element must hold a valid center number existing in Registry database, while `<TransferNonELSOCenter>` can hold any name or number, it doesn't matter if center is not present in the registry database. Both of those elements cannot exist together, only one of them can be used. In order to transfer a run, `<Discontinuation>` must be set to `NULL`, `<DischargedAlive>` must be set to 'On ECMO' and `<DischargeLocation>` must be 'Transferred to another hospital'. On the next image (image 1.16) we are transferring a run to an existing registry center number 1.

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```
<Outcome>
  <Discontinuation></Discontinuation>
  <Extubated>1</Extubated>
  <OralEndotrachealTubeRemoval>08/11/2019 10:50</OralEndotrachealTubeRemoval>
  <CannulaSiteRepair>3</CannulaSiteRepair>
  <DischargedAlive>2</DischargedAlive>
  <DischargeLocation>3</DischargeLocation>
  <DischargeDate>12/13/2019 10:50</DischargeDate>
  <ICUDischargeDate>08/13/2019 10:50</ICUDischargeDate>
  <TransferELSOCenter>1</TransferELSOCenter>
</Outcome>
```

Image no: 1.16

To receive a run from another center, the elements `<ReceiveELSOCenter>` and `<ReceiveNonELSOCenter>` are used. In this example we will receive a run from center 1. So the `<ReceiveELSOCenter>` element should be used. `<ReceiveNonELSOCenter>` can hold any name or number while `<ReceiveELSOCenter>` must hold a valid Registry center number, and that must be the center number that sent the run to the receiving center. To receive a run from another center, the receiving run must have same patient birthdate as the run sent to this center, TimeOn must be same as TimeOff of transferred run, and `<PatientTransported>` value must be set to 1 which is equal to 'Transported on ECMO' (image 1.17).



```
<RunInfo>
  <RunNo>1</RunNo>
  <SupportType>1</SupportType>
  <WeightUnknown>0</WeightUnknown>
  <AdmissionWeight>97.8</AdmissionWeight>
  <COVID19>1</COVID19>
  <Misc>1</Misc>
  <HeightUnknown>0</HeightUnknown>
  <AdmissionHeight>80</AdmissionHeight>
  <Intubation>2</Intubation>
  <IntubationDate>10/17/2002 10:50</IntubationDate>
  <InvasiveVentilation>1</InvasiveVentilation>
  <InvasiveVentilationDT>10/15/2002 12:23</InvasiveVentilationDT>
  <AdmitDate>03/11/2019 16:17</AdmitDate>
  <PatientTransported>1</PatientTransported>
  <PreECLSArrest>1</PreECLSArrest>
  <Transplant>1</Transplant>
  <Trauma>1</Trauma>
  <ReceiveELSOCenter>1</ReceiveELSOCenter>
</RunInfo>
```

Image no: 1.17

After validating the XML import file, the system will check if there is a match of transferring/receiving run, and if there is one, user will receive green message in validation for imported run, stating: '> Run - >>>ReceiveCenter: After update, the Pre-ECLS Assessment section will be disabled for edit.'. After inserting this run, the Pre-ECLS Assessment section will be disabled for edit.

If you have questions on the XML import process, please email [registrysupport@elso.org](mailto:registrysupport@elso.org).