

I n t e r n a t i o n a l T e l e c o m m u n i c a t i o n U n i o n

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OF ITU

**X.1080.1**

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SERIES X: DATA NETWORKS, OPEN SYSTEM  
COMMUNICATIONS AND SECURITY

Information and network security – Telebiometrics

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**e-Health and world-wide telemedicines –  
Generic telecommunication protocol**

Recommendation ITU-T X.1080.1



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# Recommendation ITU-T X.1080.1

## e-Health and world-wide telemedicines – Generic telecommunication protocol

### Summary

Recommendation ITU-T X.1080.1 defines a generic telecommunication protocol that supports interactions between a medical station local to a patient and a remote medical centre providing greater expertise.

It specifies a set of protocols, including security features that enable these interactions to take place.

The protocol specification is generic, and can be supplemented by standards from other Standards Development Organizations.

### History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T X.1080.1	2011-10-14	17

### Keywords

e-Health, protocol, telebiometrics, telemedicines.

## FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

## NOTE

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## Introduction

This Recommendation makes medical expertise and diagnostic and remedial techniques that are currently primarily available in one country or in urban areas of a country, available on an equal and global basis in other countries or rural areas of a country by the use of telecommunications.

It includes things that are often called "traditional medicine/remedies" and things that are often called "alternative medicine/remedies".

There are two aspects of this work. This part defines a set of messages, with authentication and integrity and privacy (specified using ASN.1) that provide the telebiometric communications between an operator and a remote telemedicine device. The other is the adequate instances taken from the tables of quantities and units that need to be transmitted in support of the communication. These are related to both measurement (out modalities) and interaction with (in modalities) the human body. These parts of the ITU-T X.1080 series of Recommendations give names and symbols for quantities and units concerned with emissions from the human body that can be detected by a sensor and relayed to a remote clinic, and with effects on the human body that can be produced by the telebiometric medical devices and robots in its environment, or by human medical staff under advice from a remote clinic.

The ITU-T X.1080 series addresses physical, chemical, biological, culturological and psychological diagnosis, interventions and prescriptions.

This Recommendation is designed to provide wide-area communication in support of all health-related activities, where the communication can usefully be undertaken as structured messages. This includes the transmission of health or dental or DNA records, but does not seek to define the format of such records. This is left to other Standards Development Organizations.

It aims to remove the need for medical staff and patients to be co-located, and supports both multi-party (for audit and training purposes) as well as one-to-one interactions. It recognizes that in many cases interactions between medical staff and patients need to be supplemented by unstructured voice and/or video communication, which may need synchronization with the structured message flows.

There are already many standards groups, Health Level Seven (HL7) and ISO TC 215 (Health Informatics) among others, involved in health-care, that provide standardization of various aspects of medical and dental and DNA records. This Recommendation does not attempt to duplicate work already being done by these groups (which is well-advanced), but recognizes and identifies their defined data formats and interactions using international ASN.1 object identifiers (OIDs and OID-IRIs).

Security features are provided using the CMS (Cryptographic Message Syntax) which provides for both integrity and encryption, using any appropriate security algorithms.

The communications require the identification of a variety of objects ranging from medical practitioners and medical and dental record formats to drugs and surgical intervention procedures. The communication also requires identification of physiological quantities, units and values.

This Recommendation specifies ASN.1 information object classes for the identification of these objects. Future Recommendations, which will cover the fields of physics, chemistry, biology, culturology and psychology, will provide the associated information object definitions and assign OIDs and OID-IRIs for quantities, units and other objects associated with that field of study.

The identification of physiological quantities and units has been undertaken in close collaboration with ISO/TC 12 and IEC/TC 25.

# Recommendation ITU-T X.1080.1

## e-Health and world-wide telemedicines – Generic telecommunication protocol

### 1 Scope

- 1.1 This Recommendation describes an architecture for remote medical activity.
- 1.2 It specifies a generic ASN.1 protocol which uses ASN.1 information object classes to support a wide-range of medical-related formats and reports that can be carried in the protocol.
- 1.3 It specifies mechanisms to provide either integrity or encryption or both for the protocol interactions.
- 1.4 The protocol defined here is called the ITUEHP protocol (ITU-T E-Health Protocol).

### 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T X.509] Recommendation ITU-T X.509 (2008) | ISO/IEC 9594-8 (2008), *Information technology – Open systems interconnection – The Directory: Public-key and attribute certificate frameworks*.
- [ITU-T X.680] Recommendation ITU-T X.680 (2008) | ISO/IEC 8824-1 (2008), *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*.
- [ITU-T X.681] Recommendation ITU-T X.681 (2008) | ISO/IEC 8824-2 (2008), *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification*.
- [ITU-T X.682] Recommendation ITU-T X.682 (2008) | ISO/IEC 8824-3 (2008), *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification*.
- [ITU-T X.683] Recommendation ITU-T X.683 (2008) | ISO/IEC 8824-4 (2008), *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications*.
- [ITU-T X.690] Recommendation ITU-T X.690 (2008) | ISO/IEC 8825-1 (2008), *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*.
- [ITU-T X.691] Recommendation ITU-T X.691 (2008) | ISO/IEC 8825-2 (2008), *Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)*.
- [ITU-T X.693] Recommendation ITU-T X.693 (2008) | ISO/IEC 8825-4 (2008), *Information technology – ASN.1 encoding rules: XML Encoding Rules (XER)*.
- [IETF RFC 5652] IETF RFC 5652 (2009), *Cryptographic Message Syntax (CMS)*.

### 3 Definitions

#### 3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

None.

#### 3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

**3.2.1 medical-staff-scheme:** An identification scheme produced by some authority which identifies medical practitioners and pharmaceutical staff and observers.

### 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

- ASN.1      Abstract Syntax Notation One
- CMS        Cryptographic Message Syntax
- ISCO       International Standard Classification of Occupations
- ITUEHP    ITU-T E-Health Protocol
- OID        Object Identifier
- OID-IRI    OID-Internationalized Resource Identifier

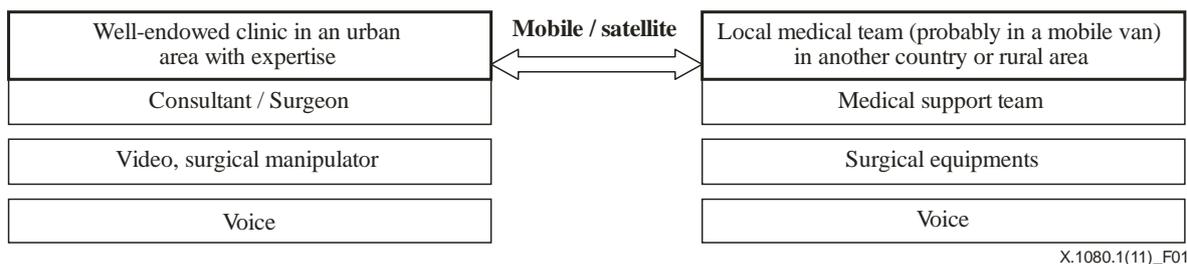
### 5 Conventions

None.

### 6 Architectural overview

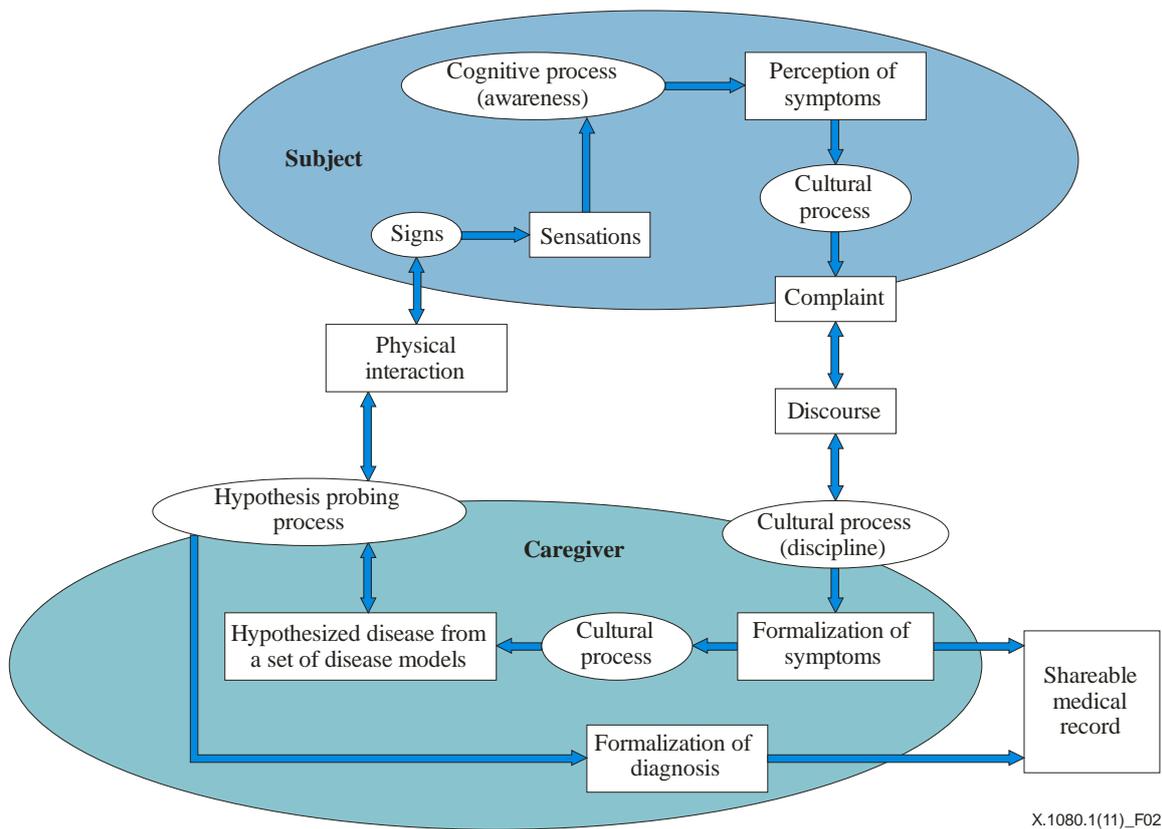
#### 6.1 General

**6.1.1** The general architecture of an e-Health system is shown in Figure 1.



**Figure 1 – General architecture of an e-Health system**

Figure 2 gives details of the interaction between the medical staff and the patient.



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**Figure 2 – Interaction between the medical staff (caregiver) and the patient (subject)**

## 6.2 Objects requiring allocation of International Object Identifier arcs

**6.2.1** There are a number of objects that need identification in the protocol exchanges. In most cases, the identification scheme used will be defined by (multiple) other parties, often on a country basis. Thus, most of these objects are identified by an identification scheme that is either international or country based, and that then needs a further OID/OID-IRI which allocates OIDs and OID-IRIs to the actual objects.

**6.2.2** The aim in all cases is to provide maximum flexibility in the allocation of identifiers to the various objects.

**6.2.3** This Recommendation identifies the following top-level types of object that need identification in the protocol exchanges, and require top-level arcs under `"/Telebiometrics/E_Health_Protocol"`. The information needed to identify one of these objects is outlined below, but is specified more fully in later clauses.

- a) patients (usually identified by a patient record identifier from some country, but otherwise just identity information);
- b) medical staff involved in diagnosis, consultancy, or involved in an intervention, usually (but not necessarily) identified by a registration number issued by some country and/or by the hierarchical code of occupation like the ISCO defined by the International Labour Organization (ILO) (see [b-ILO ISCO]);
- c) observers for training and/or audit purposes; these may only have a name and location or affiliation;
- d) pharmaceutical staff involved in dispensing; again, it is expected that there will be a registration number issued by some country and by the hierarchical code of the occupation like the ISCO defined by ILO (see [b-ILO ISCO]);

- e) laboratories which provide analysis, probably identified by name and location and their qualifications;
- f) drug manufacturing companies and associated laboratories, probably identified by name and location of head office, or by country and company registration number and other types of remedial devices and service providers;
- g) types of medical sensor or intervention device, probably identified by the name and location of the manufacturer, and by their designation of the type and serial number of the device;
- h) software associated with driving a medical sensor or intervention device;
- i) medical insurance companies, probably identified by name and location of head office, or by country and company registration number;
- j) medical (including dental) record formats; again, the format will usually be based on the country defining the format, but some formats will be international.

NOTE – Additional objects, with ASN.1 identifications of an information object class, specified in a manner similar to clauses 6.3 and 6.4 can also be defined.

### 6.3 Allocation of International Object Identifier arcs for object categories

6.3.1 There are ten arcs allocated for identifying object categories beneath "/Telebiometrics/E\_Health\_Protocol". The first five are shown in Figure 3, and the others in Figure 4.

6.3.2 The allocation of the first five arcs is:

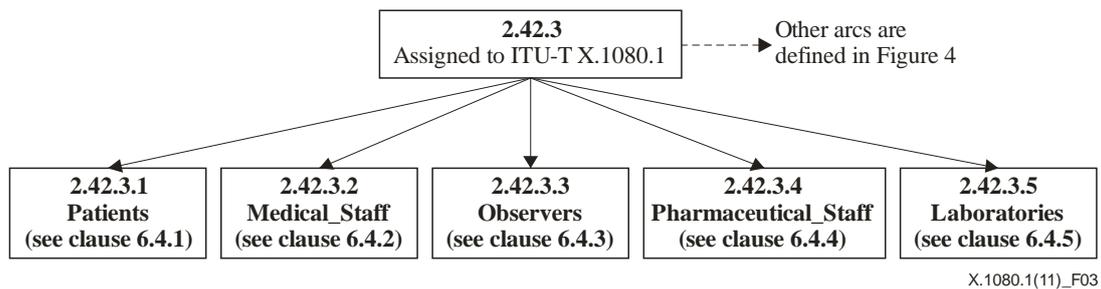


Figure 3 – The first five arcs allocated beneath "/Telebiometrics/E\_Health\_Protocol"

6.3.3 The allocation of the next five arcs is:

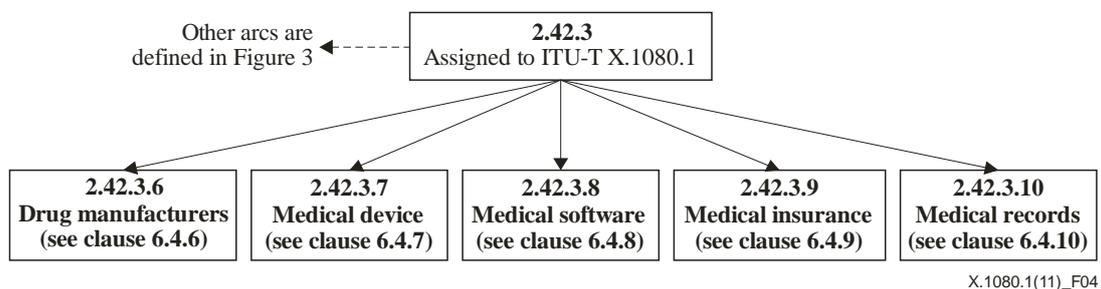


Figure 4 – The five last arcs allocated beneath "/Telebiometrics/E\_Health\_Protocol"

## 6.4 Identification of objects

The ten categories of objects are defined using the following information object class:

```
IDENTIFICATION ::= CLASS {
    &category    OID UNIQUE,
    &Identification }
WITH SYNTAX {
    CATEGORY &category IDENTIFIED WITH &Identification }
OID ::= OBJECT IDENTIFIER
```

and the following sequence type:

```
Identification ::= SEQUENCE {
    category      IDENTIFICATION.&category({Categories}),
    identification IDENTIFICATION.&Identification({Categories}{@category})}
```

The ten objects of the following `Categories` object set are defined in clauses 6.4.1 to 6.4.10.

```
Categories    IDENTIFICATION ::= {
    patientIdentification |
    medicalStaffIdentification |
    observerIdentification |
    pharmaceuticalStaffIdentification |
    laboratoryIdentification |
    manufacturerIdentification |
    deviceIdentification |
    softwareIdentification |
    insuranceIdentification |
    medicalRecordIdentification,
    ...
}
```

### 6.4.1 Identification of patients

**6.4.1.1** A patient is identified using the ASN.1 type `PatientIdentification`:

```
patientIdentification    IDENTIFICATION ::= {
    CATEGORY {id-th 1} IDENTIFIED WITH PatientIdentification }
PatientIdentification    ::= SEQUENCE {
    scheme                PATIENT-SCHEME.&id
                        ({PatientSchemes}),
    schemeName            PATIENT-SCHEME.&name
                        ({PatientSchemes}{@.scheme}) OPTIONAL,
    patientId             PATIENT-SCHEME.&Identification
                        ({PatientSchemes}{@.scheme})}
```

**6.4.1.2** The information object class `PATIENT-SCHEME` is used to define patient schemes. `Patient-schemes` is the object set containing all the supported patient schemes.

```
PATIENT-SCHEME ::= CLASS {
    &id                OID UNIQUE,
    &name              SchemeName OPTIONAL,
    &Identification   }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification }
SchemeName          ::= CHOICE {
    string            ISO646String,
    iri               OID-IRI,
    ... }
PatientSchemes PATIENT-SCHEME ::= {...}
```

NOTE – The `Patient-schemes` set of objects is an open set.

**6.4.1.3** The `PATIENT-SCHEME.&id` is unique, and identifies any patient identification scheme that has been defined and allocated an object identifier value.

**6.4.1.4** The `PATIENT-SCHEME.&name` is a choice of an `ISO646String` or `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

**6.4.1.5** The `PATIENT-SCHEME.&identification` is the identification of the patient within that scheme, and is a type specified when an information object of class `PATIENT-SCHEME` is established. It will typically include at least a unique number and the patient's name.

NOTE – Establishment of patient identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them.

## 6.4.2 Identification of medical staff

**6.4.2.1** A member of the medical profession (including doctors, surgeons, nurses, dentists, physiotherapies, psychologists, etc., but excluding pharmaceutical staff, which are a separate category) is identified using the ASN.1 type `MedicalStaffIdentification`:

```

medicalStaffIdentification  IDENTIFICATION ::= {
    CATEGORY {id-th 2} IDENTIFIED WITH MedicalStaffIdentification }
MedicalStaffIdentification ::= SEQUENCE {
    scheme          MEDICAL-STAFF-SCHEME.&id
                   ({MedicalStaffSchemes}),
    schemeName     MEDICAL-STAFF-SCHEME.&name
                   ({MedicalStaffSchemes}{@.scheme}) OPTIONAL,
    medicalStaffId MEDICAL-STAFF-SCHEME.&Identification
                   ({MedicalStaffSchemes}{@.scheme}),
    qualifications MEDICAL-STAFF-SCHEME.&Qualifications
                   ({MedicalStaffSchemes}{@.scheme}) OPTIONAL}
MEDICAL-STAFF-SCHEME      ::= CLASS {
    &id             OID UNIQUE,
    &name           SchemeName OPTIONAL,
    &Identification,
    &Qualifications,
    &Observer}
    WITH SYNTAX {
        SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification
        WITH &Qualifications AND &Observer }
MedicalStaffSchemes      MEDICAL-STAFF-SCHEME ::= {...}

```

**6.4.2.2** The information object class `MEDICAL-STAFF-SCHEME` is used to define medical staff schemes and covers this clause and clauses 6.4.3 and 6.4.4. `MedicalStaffSchemes` is the object set containing all the supported medical staff schemes.

NOTE – The Medical-staff-schemes set of objects is an open set.

**6.4.2.3** The `MEDICAL-STAFF-SCHEME.&id` is unique, and identifies any health professional identification scheme that has been defined and allocated an object identifier value.

**6.4.2.4** The `MEDICAL-STAFF-SCHEME.&name` is a choice of an `ISO646String` OR `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

**6.4.2.5** The `MEDICAL-STAFF-SCHEME.&identification` is the identification of the health professional within that scheme, and is a type specified when an information object of class `MEDICAL-STAFF-SCHEME` is established. It will typically include at least a unique number and the health professional's name and category or role.

NOTE – Establishment of health professional identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them.

**6.4.2.6** The `MEDICAL-STAFF-SCHEME.&qualifications` is the identification of the professional qualifications recognized within that identification scheme. It is a type specified when an information object of class `MEDICAL-STAFF-SCHEME` is established. It will typically include the identification of some qualification(s) issued by known authorities, and signed by those authorities. Thus, the type will typically include ITU-T X.509 certificates to support the signatures on the qualifications.

NOTE – Definition of health professional qualifications is outside the scope of this Recommendation, but future amendments may record in an appendix types that have been defined for use with any given scheme.

### 6.4.3 Identification of observers

6.4.3.1 An observer may be a law enforcement officer, a medical student, etc. and will generally not have a qualification recognized by the health professional identification scheme. An observer is identified by the ASN.1 type `ObserverIdentification`:

```
observerIdentification  IDENTIFICATION ::= {
    CATEGORY {id-th 3} IDENTIFIED WITH ObserverIdentification }
ObserverIdentification ::= SEQUENCE {
    scheme      MEDICAL-STAFF-SCHEME.&id
                ({MedicalStaffSchemes}),
    schemeName  MEDICAL-STAFF-SCHEME.&name
                ({MedicalStaffSchemes}{@.scheme}) OPTIONAL,
    observerId  MEDICAL-STAFF-SCHEME.&Observer
                ({MedicalStaffSchemes}{@.scheme}) }
```

6.4.3.2 The information object class `MEDICAL-STAFF-SCHEME` is used to define medical staff schemes. `MedicalStaffSchemes` is the object set containing all the supported medical staff schemes.

NOTE – The Medical-staff-schemes set of objects is an open set.

6.4.3.3 The `MEDICAL-STAFF-SCHEME.&id` is unique, and identifies any health professional numbering scheme that has been defined and allocated an object identifier value.

6.4.3.4 The `MEDICAL-STAFF-SCHEME.&name` is a choice of an `ISO646String` or `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

6.4.3.5 The `MEDICAL-STAFF-SCHEME.&observer` is the identification of observers in remote interactions using the ITUEHP protocol. It is a type specified when an information object of class `MEDICAL-STAFF-SCHEME` is established. It is unlikely to contain any unique identification, but will normally be descriptive of the role of the observer and their name.

### 6.4.4 Identification of pharmaceutical staff

6.4.4.1 A member of the pharmaceutical profession, including laboratory staff performing analyses, is identified using the ASN.1 type `PharmaceuticalStaffIdentification`:

```
pharmaceuticalStaffIdentification  IDENTIFICATION ::= {
    CATEGORY {id-th 4} IDENTIFIED WITH PharmaceuticalStaffIdentification }
PharmaceuticalStaffIdentification ::= SEQUENCE {
    scheme      MEDICAL-STAFF-SCHEME.&id
                ({MedicalStaffSchemes}),
    schemeName  MEDICAL-STAFF-SCHEME.&name
                ({MedicalStaffSchemes}{@.scheme}) OPTIONAL,
    medicalStaffId  MEDICAL-STAFF-SCHEME.&Identification
                ({MedicalStaffSchemes}{@.scheme}),
    qualifications  MEDICAL-STAFF-SCHEME.&Qualifications
                ({MedicalStaffSchemes}{@.scheme}) OPTIONAL }
```

6.4.4.2 The information object class `MEDICAL-STAFF-SCHEME` is used to define pharmaceutical schemes. `MedicalStaffSchemes` is the object set containing all the supported medical staff schemes.

NOTE – The Medical-staff-schemes set of objects is an open set.

6.4.4.3 The `MEDICAL-STAFF-SCHEME.&id` is unique, and identifies any health professional identification scheme that has been defined and allocated an object identifier value.

6.4.4.4 The `MEDICAL-STAFF-SCHEME.&name` is a choice of an `ISO646String` or `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

**6.4.4.5** The `MEDICAL-STAFF-SCHEME.&identification` is the identification of the pharmaceutical professional within that scheme, and is a type specified when an information object of class `MEDICAL-STAFF-SCHEME` is established. It will typically include at least a unique number and professionals name and category or role.

NOTE – Establishment of health professional identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them.

**6.4.4.6** The `MEDICAL-STAFF-SCHEME.&qualifications` is the identification of the professional qualifications of a pharmaceutical or laboratory professional recognized within that identification scheme. It is a type specified when an information object of class `MEDICAL-STAFF-SCHEME` is established. It will typically include the identification of some qualification(s) issued by known authorities, and signed by those authorities. Thus, the type will typically include ITU-T X.509 certificates to support the signatures on the qualifications.

NOTE – Definition of professional qualifications is outside the scope of this Recommendation, but future amendments may record in an appendix types that have been defined for use with any given scheme.

## 6.4.5 Identification of laboratories

**6.4.5.1** A laboratory performing analyses is identified using the ASN.1 type `LaboratoryIdentification`:

```

laboratoryIdentification          IDENTIFICATION ::= {
    CATEGORY {id-th 5} IDENTIFIED WITH LaboratoryIdentification }
LaboratoryIdentification ::= SEQUENCE {
    scheme          LABORATORY-SCHEME.&id
                   ({LaboratorySchemes}),
    schemeName     LABORATORY-SCHEME.&name
                   ({LaboratorySchemes}{@.scheme}) OPTIONAL,
    qualifications LABORATORY-SCHEME.&Qualifications
                   ({LaboratorySchemes}{@.scheme}) OPTIONAL}

LABORATORY-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name       SchemeName OPTIONAL,
    &Qualifications }

WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id WITH &Qualifications }
LaboratorySchemes    LABORATORY-SCHEME ::= {...}

```

**6.4.5.2** The information object class `LABORATORY-SCHEME` is used to define laboratory schemes. `LaboratorySchemes` is the object set containing all the supported laboratory schemes.

NOTE – The `Laboratory-schemes` set of objects is an open set.

**6.4.5.3** The `LABORATORY-SCHEME.&id` is unique, and identifies any laboratory scheme that has been defined and allocated an object identifier value.

**6.4.5.4** The `LABORATORY-SCHEME.&name` is a choice of an `ISO646String` OR `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

**6.4.5.5** The `LABORATORY-SCHEME.&qualifications` is the qualifications of laboratory within that identification scheme. It is a type specified when an information object of class `LABORATORY-SCHEME` is established. It will typically include the identification of some qualification(s) issued by known authorities, and signed by those authorities. Thus, the type will typically include ITU-T X.509 certificates to support the signatures on the qualifications.

NOTE – Definition of laboratory qualifications is outside the scope of this Recommendation, but future amendments may record in an appendix types that have been defined for use with any given scheme.

## 6.4.6 Identification of drug manufacturers and drugs

6.4.6.1 A drug manufacturer or laboratory producing drugs is identified using the ASN.1 type

```
manufacturerIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 6} IDENTIFIED WITH ManufacturerIdentification }
ManufacturerIdentification ::= SEQUENCE {
    scheme          MANUFACTURER-SCHEME.&id
                    ({ManufacturerSchemes}),
    schemeName      MANUFACTURER-SCHEME.&name
                    ({ManufacturerSchemes}{@.scheme}) OPTIONAL,
    manufacturerId  MANUFACTURER-SCHEME.&Manufacturer
                    ({ManufacturerSchemes}{@.scheme}),
    drugId          MANUFACTURER-SCHEME.&Drug
                    ({ManufacturerSchemes}{@.scheme})
MANUFACTURER-SCHEME ::= CLASS {
    &id             OID UNIQUE,
    &name           SchemeName OPTIONAL,
    &Manufacturer,
    &Drug }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
    PRODUCING &Drug }
ManufacturerSchemes  MANUFACTURER-SCHEME ::= {...}
```

6.4.6.2 The information object class **MANUFACTURER-SCHEME** is used to define manufacturer schemes. **ManufacturerSchemes** is the object set containing all the supported manufacturer schemes.

NOTE – The Manufacturer-schemes set of objects is an open set.

6.4.6.3 The **MANUFACTURER-SCHEME.&id** is unique, and identifies any manufacturer identification scheme that has been defined and allocated an object identifier value.

6.4.6.4 The **MANUFACTURER-SCHEME.&name** is a choice of an **ISO646String** or **OID-IRI** that describes the scheme. If the **ISO646String** choice is used, it is not necessarily unique.

6.4.6.5 The **MANUFACTURER-SCHEME.&manufacturer** is the identification of the manufacturer within that scheme, and is a type specified when an information object of class **MANUFACTURER-SCHEME** is established. It will typically include the name of the manufacturer or the laboratory and location of head office, and perhaps a unique reference such as a company number.

6.4.6.6 The **MANUFACTURER-SCHEME.&drug** is the identification of a drug produced by the manufacturer or laboratory identified in **MANUFACTURER-SCHEME.&manufacturer**, and is a type specified when an information object of class **MANUFACTURER-SCHEME** is established. It will typically include the name of the manufacturer or the laboratory and location of head office, and perhaps a unique reference such as a company number.

NOTE – Establishment of manufacturer identification schemes is outside the scope of this Recommendation, but future amendments to other parts of the ITU-T X.1080 series may record in an appendix schemes that have been defined and the organization defining them.

## 6.4.7 Identification of medical devices

6.4.7.1 A medical device is identified using the ASN.1 type **DeviceIdentification**:

```
DEVICE-SCHEME ::= CLASS {
    &id             OID UNIQUE,
    &name           SchemeName OPTIONAL,
    &Manufacturer,
    &Device,
    &supportedFormats Supported-formats }
```

```

WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
        PRODUCING &Device SUPPORTING &supportedFormats}
Supported-formats ::= CHOICE {
    oids SEQUENCE OF OID,
    ...
}
deviceIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 7} IDENTIFIED WITH DeviceIdentification }
DeviceIdentification ::= SEQUENCE {
    scheme          DEVICE-SCHEME.&id({DeviceSchemes}),
    schemeName      DEVICE-SCHEME.&name
        ({DeviceSchemes}{@.scheme}) OPTIONAL,
    manufacturerId  DEVICE-SCHEME.&Manufacturer
        ({DeviceSchemes}{@.scheme}) OPTIONAL,
    device          DEVICE-SCHEME.&Device
        ({DeviceSchemes}{@.scheme}),
    formats         DEVICE-SCHEME.&supportedFormats
        ({DeviceSchemes}{@.scheme})}
DeviceSchemes DEVICE-SCHEME ::= {...}

```

**6.4.7.2** The information object class `DEVICE-SCHEME` is used to define device schemes. `DeviceSchemes` is the object set containing all the supported device schemes.

NOTE – The Device-schemes set of objects is an open set.

**6.4.7.3** The `DEVICE-SCHEME.&id` is unique, and identifies any medical device identification scheme that has been defined and allocated an object identifier value.

**6.4.7.4** The `DEVICE-SCHEME.&name` is a choice of an `ISO646String` or `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

**6.4.7.5** The `DEVICE-SCHEME.&manufacturer` is the identification of a manufacturer within that scheme, and is a type specified when an information object of class `DEVICE-SCHEME` is established. It would be optional if a generic term for the device (such as "scalpel") is used in `DEVICE-SCHEME.&device`. Otherwise it will typically include the name of the manufacturer of the device and location of head office, and perhaps a unique reference such as a company number.

**6.4.7.6** The `DEVICE-SCHEME.&device` is the identification of a medical device. It may be a simple generic description of the device, or may be a complete product reference to a device from the specified manufacturer identified in `DEVICE-SCHEME.&manufacturer`, and is a type specified when an information object of class `DEVICE-SCHEME` is established.

**6.4.7.7** The `DEVICE-SCHEME.&supported formats` is the identification of data formats to be used for communication with that device. This will typically be a sequence of object identifiers referencing the specification of available formats and their effect for interaction with that device. The device may be a sensor sending information, or may be an intervention device.

NOTE – Establishment of device identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them for the identification of devices.

## 6.4.8 Identification of medical software

**6.4.8.1** Medical software is identified using the ASN.1 type `SoftwareIdentification`:

```

softwareIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 8} IDENTIFIED WITH SoftwareIdentification }
SOFTWARE-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name        SchemeName OPTIONAL,
    &Manufacturer,
    &Software }

```

```

WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
        PRODUCING &Software }
SoftwareIdentification ::= SEQUENCE {
    scheme          SOFTWARE-SCHEME.&id({SoftwareSchemes}),
    schemeName     SOFTWARE-SCHEME.&name
        ({SoftwareSchemes}{@.scheme}) OPTIONAL,
    manufacturerId SOFTWARE-SCHEME.&Manufacturer
        ({SoftwareSchemes}{@.scheme}) OPTIONAL,
    software       SOFTWARE-SCHEME.&Software
        ({SoftwareSchemes}{@.scheme})}
SoftwareSchemes   SOFTWARE-SCHEME ::= {...}

```

**6.4.8.2** The information object class `SOFTWARE-SCHEME` is used to define software schemes. `SoftwareSchemes` is the object set containing all the supported software schemes.

NOTE – The Software-schemes set of objects is an open set.

**6.4.8.3** The `SOFTWARE-SCHEME.&id` is unique, and identifies any software identification scheme that has been defined and allocated an object identifier value.

**6.4.8.4** The `SOFTWARE-SCHEME.&name` is a choice of an `ISO646String` or `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

**6.4.8.5** The `SOFTWARE-SCHEME.&manufacturer` is the identification of a manufacturer within that scheme, and is a type specified when an information object of class `SOFTWARE-SCHEME` is established. It would be optional if a generic term for the software is used in `SOFTWARE-SCHEME.&software-id`. Otherwise, it will typically include the name of the manufacturer of the software and location of head office, and perhaps a unique reference such as a company number.

**6.4.8.6** The `SOFTWARE-SCHEME.&software` is the identification of piece of medical software. It may be a simple generic description of the software, or may be a complete product reference to software from the specified manufacturer identified in `SOFTWARE-SCHEME.&manufacturer`, and is a type specified when an information object of class `SOFTWARE-SCHEME` is established.

NOTE – Establishment of software identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them for the identification of software.

## 6.4.9 Identification of medical insurances

**6.4.9.1** A medical insurance is identified using the ASN.1 type `Insurance-Identification`:

```

insuranceIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 9} IDENTIFIED WITH InsuranceIdentification }
InsuranceIdentification ::= SEQUENCE {
    scheme          INSURANCE-SCHEME.&id({InsuranceSchemes}),
    schemeName     INSURANCE-SCHEME.&name
        ({InsuranceSchemes}{@.scheme}) OPTIONAL,
    manufacturerId INSURANCE-SCHEME.&Company
        ({InsuranceSchemes}{@.scheme}),
    insurance      INSURANCE-SCHEME.&InsuranceType
        ({InsuranceSchemes}{@.scheme}),
    insuranceCert  INSURANCE-SCHEME.&Certification
        ({InsuranceSchemes}{@.scheme})}
INSURANCE-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name       SchemeName OPTIONAL,
    &Company,
    &InsuranceType,
    &Certification }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Company
        USING &InsuranceType CERTIFIED WITH &Certification }
InsuranceSchemes   INSURANCE-SCHEME ::= {...}

```

**6.4.9.2** The information object class **INSURANCE-SCHEME** is used to define insurance schemes. **InsuranceSchemes** is the object set containing all the supported insurance schemes.

NOTE – Insurance-schemes set of object is an open set.

**6.4.9.3** The **INSURANCE-SCHEME.&id** is unique, and identifies any insurance identification scheme that has been defined and allocated an object identifier value.

**6.4.9.4** The **INSURANCE-SCHEME.&name** is a choice of an **ISO646String** or **OID-IRI** that describes the scheme. If the **ISO646String** choice is used, it is not necessarily unique.

**6.4.9.5** The **INSURANCE-SCHEME.&company** is the identification within that scheme of the company that issued the medical insurance, and is a type specified when an information object of class **INSURANCE-SCHEME** is established. It will typically include the name of the company issuing the medical insurance and location of head office, perhaps a unique reference such as a company number, and typically contact details.

**6.4.9.6** The **INSURANCE-SCHEME.&type** specifies the type of medical insurance (relative to the insurance company) that has been issued.

**6.4.9.7** The **INSURANCE-SCHEME.&certification** is the reference number for the insurance obtained, with identification of the person it was issued to (see also clause 6.4.1). It will be signed by the insurance company, and hence this type will contain an ITU-T X.509 certificate.

NOTE – Establishment of insurance identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them for the identification and certification of insurances.

## **6.4.10 Identification and inclusion of medical and dental records and DNA profiles**

**6.4.10.1** Medical records, including dental records and DNA profiles, can be identified and included using the ASN.1 type **Medical-Record**:

```
medicalRecordIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 10} IDENTIFIED WITH MedicalRecordIdentification }
MedicalRecordIdentification ::= SEQUENCE {
    scheme          MEDICAL-RECORD-SCHEME.&id
                   ({MedicalRecordSchemes}),
    schemeName     MEDICAL-RECORD-SCHEME.&name
                   ({MedicalRecordSchemes}{@.scheme})
                   OPTIONAL,
    definingOrg    MEDICAL-RECORD-SCHEME.&Organisation
                   ({MedicalRecordSchemes}{@.scheme}),
    recordType     MEDICAL-RECORD-SCHEME.&RecordType
                   ({MedicalRecordSchemes}{@.scheme}),
    record         MEDICAL-RECORD-SCHEME.&Record
                   ({MedicalRecordSchemes}{@.scheme})
MEDICAL-RECORD-SCHEME ::= CLASS {
    &id            OID UNIQUE,
    &name          SchemeName OPTIONAL,
    &Organisation,
    &RecordType,
    &Record       }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Organisation
    USING &RecordType WITH FORMAT &Record }
MedicalRecordSchemes MEDICAL-RECORD-SCHEME ::= {...}
```

**6.4.10.2** The information object class **MEDICAL-RECORD-SCHEME** is used to define medical record schemes. **MedicalRecordSchemes** is the object set containing all the supported medical-record schemes.

**6.4.10.3** The **MEDICAL-FORMAT-SCHEME.&id** is unique, and identifies any medical format identification scheme that has been defined and allocated an object identifier value.

**6.4.10.4** The `MEDICAL-RECORD-SCHEME.&name` is a choice of an `ISO646String` or `OID-IRI` that describes the scheme. If the `ISO646String` choice is used, it is not necessarily unique.

**6.4.10.5** `MEDICAL-RECORD-SCHEME.&organisation` is the identification within that scheme of the organization that defined that record format, and is a type specified when an information object of class `MEDICAL-RECORD-SCHEME` is established. It will typically include the name of the organization defining the format, which will typically be a government department of some country, or an international standards organization.

**6.4.10.6** The `MEDICAL-RECORD-SCHEME.&record-type` specifies the type of medical record (relative to the defining organization).

**6.4.10.7** The `MEDICAL-RECORD-SCHEME.&record` contains an instance of a record of the defined record type. The ASN.1 type of `MEDICAL-RECORD-SCHEME.&record` will be defined when an object of the type `MEDICAL-RECORD-SCHEME` is defined. It will typically contain an encrypted form of the medical record, certificates to determine the authenticity, and a security block to provide encryption parameters.

NOTE – Use of the ITUEHP includes the optional application of encryption and integrity using CMS in all transfers, but it is expected that for the type `MEDICAL-RECORD-SCHEME.&record`, there will be an additional layer of encryption and integrity provided within the record type itself.

## 7 Security-related issues

**7.1** All ITUEHP messages can have encryption, integrity or both applied. This is identified at the head of the message by the components `encryptionOptions` and `integrityOptions`. These options use the `ct-SignedData` and `ct-EnvelopedData` content type defined in CMS (see [IETF RFC 5652]).

**7.2** It is out of the scope of this Recommendation to determine the encryption algorithms to be used, or to provide advice on the establishment of a public key infrastructure for ITUEHP exchanges where encryption or integrity is required.

## 8 Interoperability and conformance

**8.1** For interoperability, there should be conformance statements that require a potential receiver to be able to handle all the options allowed to a potential sender, or for some form of negotiation of capabilities to occur. However, as this protocol is generic, with all formats and schemes left as open types specified by the related information objects, it is hard to define conformance.

**8.2** This remark applies to health record formats, security algorithms, drug identification, insurance company identification, sensor and intervention device formats, and all other open-ended provisions in the protocol. For the transmission of test results, a generic data message is proposed in clause I.2. Appendix I also defines an information object class, `CONDITION`, which can be used to define objects related to normal values (usually normal values are dependent of conditions like age of the person).

## 9 Messages of the protocol

Three kinds of messages are defined:

- a) Set-up and termination messages: these messages are used during the initial hand-shake.
- b) Simple SEND and ACK messages: these messages are used for a simple exchange.
- c) Interactive Command/Response: these messages are used during a dialogue according to some pre-established protocol.

## **9.1 Messages to be defined**

The following protocol messages are defined in separate ASN.1 modules (clauses A.2, A.3 and A.4) and are described below:

- a) set-up and termination messages for an ITUEHP session;
- b) simple SEND and ACK messages;
- c) interactive Command/Response messages within an ITUEHP session.

## **9.2 Set-up and termination messages**

**9.2.1** The set-up message is the initial hand-shake. It identifies and authenticates the participants in the subsequent ITUEHP session.

**9.2.2** It determines the mode of operation as one of:

- a) simple "SEND-and-ACK";
- b) interactive Command/Response without video or voice;
- c) interactive Command/Response with synchronized two-way voice;
- d) interactive Command/Response with synchronized reverse video and two-way voice;
- e) interactive Command/Response with synchronized two-way video and two-way voice.

**9.2.3** It also determines the encoding (binary using BER, PER, or XML using XER) to be used during the ITUEHP session. The set-up message is always binary-encoded.

**9.2.4** For synchronized use of video and voice, the video stream should enable the remote controller to position a pointer using Command/Response messages, and to instruct the remote video device to zoom or pan as necessary, including magnifications beyond the human eye limits. The typical use of this is for remote robot control of brain surgery, where the surgeon is able to delicately position the robot instruments using high magnification and high resolution "nudge" positioning of the instrument.

NOTE – This is already available in a local surgical situation.

**9.2.5** The requirements for one or more of these video functions will be identified in the specification of the information object for set-up for the relevant mode of operation. Lack of availability of such a function will be indicated in the appropriate response, and the session may or may not then be terminated. It is possible that requirements on video quality should also be identified in the definition of the setting up of the ITUEHP session.

## **9.3 Simple SEND-and-ACK messages**

**9.3.1** There will be many such messages defined from time to time by various organizations. Each such message will be an information object of a given class, with a common ACK/REJECTED response, and probably a human-text diagnostic.

**9.3.2** Use cases for these messages include transmission of health records and prescriptions.

## **9.4 Interactive Command/Response messages**

**9.4.1** When used without synchronized voice and video, this is a "traditional" protocol, most suited for computer to computer applications, or for display of message content on a monitor at the remote end, probably with an HTML interface for display and response generation.

**9.4.2** It can be used to support remote diagnostics or remote interventions when bandwidth is too limited to permit synchronized voice or video.

**9.4.3** In most (but probably not all) cases (as determined by the information object specification for the messages), these messages can also be used with synchronized two-way voice or one-way or two-way video with voice, depending on the available bandwidth.

**9.4.4** This would be a separate module. The state diagrams and actual messages to be sent and received would be determined only by reference to an object of the class CR-SEQUENCE, whose use would be agreed at set-up time.

## Annex A

### ASN.1 module specifications

(This annex forms an integral part of this Recommendation.)

#### A.1 Module: Object Identifier and Information Object Class definitions

```
E-health-identification {joint-iso-itu-t(2) telebiometrics(42)e-health-
protocol(3)
    modules(0) identification(0) version1(1)}
"/Telebiometrics/E_Health_Protocol/Modules/Identification/Version1"
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS id-th
FROM Telebiometrics
    {joint-iso-itu-t(2) telebiometrics(42) modules(0) main(0)
    version(0)};
IDENTIFICATION ::= CLASS {
    &category OID UNIQUE,
    &Identification }
WITH SYNTAX {
    CATEGORY &category IDENTIFIED WITH &Identification }
OID ::= OBJECT IDENTIFIER
Identification ::= SEQUENCE {
    category IDENTIFICATION.&category({Categories}),
    identification IDENTIFICATION.&Identification({Categories}{@category})}
Categories IDENTIFICATION ::= {
    patientIdentification |
    medicalStaffIdentification |
    observerIdentification |
    pharmaceuticalStaffIdentification |
    laboratoryIdentification |
    manufacturerIdentification |
    deviceIdentification |
    softwareIdentification |
    insuranceIdentification |
    medicalRecordIdentification,
    ...
}
patientIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 1} IDENTIFIED WITH PatientIdentification }
PatientIdentification ::= SEQUENCE {
    scheme PATIENT-SCHEME.&id
        ({PatientSchemes}),
    schemeName PATIENT-SCHEME.&name
        ({PatientSchemes}{@.scheme}) OPTIONAL,
    patientId PATIENT-SCHEME.&Identification
        ({PatientSchemes}{@.scheme})}
PATIENT-SCHEME ::= CLASS {
    &id OID UNIQUE,
    &name SchemeName OPTIONAL,
    &Identification }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification }
SchemeName ::= CHOICE {
    string ISO646String,
    iri OID-IRI,
    ... }
PatientSchemesPATIENT-SCHEME ::= {...}
medicalStaffIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 2} IDENTIFIED WITH MedicalStaffIdentification }
MedicalStaffIdentification ::= SEQUENCE {
    scheme MEDICAL-STAFF-SCHEME.&id
        ({MedicalStaffSchemes}),
    schemeName MEDICAL-STAFF-SCHEME.&name
        ({MedicalStaffSchemes}{@.scheme})}
```

```

                                OPTIONAL,
medicalStaffId                 MEDICAL-STAFF-SCHEME.&Identification
                                ({MedicalStaffSchemes}{@.scheme}),
qualifications                 MEDICAL-STAFF-SCHEME.&Qualifications
                                ({MedicalStaffSchemes}{@.scheme})
                                OPTIONAL}
MEDICAL-STAFF-SCHEME ::= CLASS {
    &id             OID UNIQUE,
    &name           SchemeName OPTIONAL,
    &Identification,
    &Qualifications,
    &Observer}
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification
    WITH &Qualifications AND &Observer }
MedicalStaffSchemes           MEDICAL-STAFF-SCHEME ::= {...}
observerIdentification         IDENTIFICATION ::= {
    CATEGORY {id-th 3} IDENTIFIED WITH ObserverIdentification }
ObserverIdentification ::= SEQUENCE {
    scheme           MEDICAL-STAFF-SCHEME.&id
                    ({MedicalStaffSchemes}),
    schemeName       MEDICAL-STAFF-SCHEME.&name
                    ({MedicalStaffSchemes}{@.scheme})
                    OPTIONAL,
    observerId       MEDICAL-STAFF-SCHEME.&Observer
                    ({MedicalStaffSchemes}{@.scheme})}
pharmaceuticalStaffIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 4} IDENTIFIED WITH PharmaceuticalStaffIdentification }
PharmaceuticalStaffIdentification ::= SEQUENCE {
    scheme           MEDICAL-STAFF-SCHEME.&id
                    ({MedicalStaffSchemes}),
    schemeName       MEDICAL-STAFF-SCHEME.&name
                    ({MedicalStaffSchemes}{@.scheme})
                    OPTIONAL,
    medicalStaffId   MEDICAL-STAFF-SCHEME.&Identification
                    ({MedicalStaffSchemes}{@.scheme}),
    qualifications   MEDICAL-STAFF-SCHEME.&Qualifications
                    ({MedicalStaffSchemes}{@.scheme})
                    OPTIONAL}
laboratoryIdentification       IDENTIFICATION ::= {
    CATEGORY {id-th 5} IDENTIFIED WITH LaboratoryIdentification }
LaboratoryIdentification ::= SEQUENCE {
    scheme           LABORATORY-SCHEME.&id
                    ({LaboratorySchemes}),
    schemeName       LABORATORY-SCHEME.&name
                    ({LaboratorySchemes}{@.scheme}) OPTIONAL,
    qualifications   LABORATORY-SCHEME.&Qualifications
                    ({LaboratorySchemes}{@.scheme}) OPTIONAL}
LABORATORY-SCHEME ::= CLASS {
    &id             OID UNIQUE,
    &name           SchemeName OPTIONAL,
    &Qualifications }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id WITH &Qualifications }
LaboratorySchemes             LABORATORY-SCHEME ::= {...}
manufacturerIdentification     IDENTIFICATION ::= {
    CATEGORY {id-th 6} IDENTIFIED WITH ManufacturerIdentification }
ManufacturerIdentification ::= SEQUENCE {
    scheme           MANUFACTURER-SCHEME.&id
                    ({ManufacturerSchemes}),
    schemeName       MANUFACTURER-SCHEME.&name
                    ({ManufacturerSchemes}{@.scheme}) OPTIONAL,
    manufacturerId   MANUFACTURER-SCHEME.&Manufacturer
                    ({ManufacturerSchemes}{@.scheme}),
    drugId           MANUFACTURER-SCHEME.&Drug
                    ({ManufacturerSchemes}{@.scheme})}

```

```

MANUFACTURER-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name        SchemeName OPTIONAL,
    &Manufacturer,
    &Drug }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
    PRODUCING &Drug }
ManufacturerSchemes    MANUFACTURER-SCHEME ::= {...}
DEVICE-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name        SchemeName OPTIONAL,
    &Manufacturer,
    &Device,
    &supportedFormatsSupported-formats }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
    PRODUCING &Device SUPPORTING &supportedFormats}
Supported-formats ::= CHOICE {
    oids SEQUENCE OF OID,
    ...
}
deviceIdentification  IDENTIFICATION ::= {
    CATEGORY {id-th 7} IDENTIFIED WITH DeviceIdentification }
DeviceIdentification ::= SEQUENCE {
    scheme          DEVICE-SCHEME.&id({DeviceSchemes}),
    schemeName     DEVICE-SCHEME.&name
                    ({DeviceSchemes}{@.scheme}) OPTIONAL,
    manufacturerId DEVICE-SCHEME.&Manufacturer
                    ({DeviceSchemes}{@.scheme}) OPTIONAL,
    device         DEVICE-SCHEME.&Device
                    ({DeviceSchemes}{@.scheme}),
    formats        DEVICE-SCHEME.&supportedFormats
                    ({DeviceSchemes}{@.scheme})}
DeviceSchemes DEVICE-SCHEME ::= {...}
softwareIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 8} IDENTIFIED WITH SoftwareIdentification }
SOFTWARE-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name        SchemeName OPTIONAL,
    &Manufacturer,
    &Software }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
    PRODUCING &Software }
SoftwareIdentification ::= SEQUENCE {
    scheme          SOFTWARE-SCHEME.&id({SoftwareSchemes}),
    schemeName     SOFTWARE-SCHEME.&name
                    ({SoftwareSchemes}{@.scheme}) OPTIONAL,
    manufacturerId SOFTWARE-SCHEME.&Manufacturer
                    ({SoftwareSchemes}{@.scheme}) OPTIONAL,
    software       SOFTWARE-SCHEME.&Software
                    ({SoftwareSchemes}{@.scheme})}
SoftwareSchemes    SOFTWARE-SCHEME ::= {...}
insuranceIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 9} IDENTIFIED WITH InsuranceIdentification }
InsuranceIdentification ::= SEQUENCE {
    scheme          INSURANCE-SCHEME.&id({InsuranceSchemes}),
    schemeName     INSURANCE-SCHEME.&name
                    ({InsuranceSchemes}{@.scheme}) OPTIONAL,
    manufacturerId INSURANCE-SCHEME.&Company
                    ({InsuranceSchemes}{@.scheme}),
    insurance      INSURANCE-SCHEME.&InsuranceType
                    ({InsuranceSchemes}{@.scheme}),
    insuranceCert  INSURANCE-SCHEME.&Certification
                    ({InsuranceSchemes}{@.scheme})}

```

```

INSURANCE-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name        SchemeName OPTIONAL,
    &Company,
    &InsuranceType,
    &Certification }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Company
        USING &InsuranceType CERTIFIED WITH &Certification }
InsuranceSchemes  INSURANCE-SCHEME ::= {...}
medicalRecordIdentification IDENTIFICATION ::= {
    CATEGORY {id-th 10} IDENTIFIED WITH MedicalRecordIdentification }
MedicalRecordIdentification ::= SEQUENCE {
    scheme          MEDICAL-RECORD-SCHEME.&id
        ({MedicalRecordSchemes}),
    schemeName      MEDICAL-RECORD-SCHEME.&name
        ({MedicalRecordSchemes}{@.scheme})
        OPTIONAL,
    definingOrg     MEDICAL-RECORD-SCHEME.&Organisation
        ({MedicalRecordSchemes}{@.scheme}),
    recordType      MEDICAL-RECORD-SCHEME.&RecordType
        ({MedicalRecordSchemes}{@.scheme}),
    record          MEDICAL-RECORD-SCHEME.&Record
        ({MedicalRecordSchemes}{@.scheme})}
MEDICAL-RECORD-SCHEME ::= CLASS {
    &id          OID UNIQUE,
    &name        SchemeName OPTIONAL,
    &Organisation,
    &RecordType,
    &Record }
WITH SYNTAX {
    SCHEME [NAME &name] IDENTIFIED BY &id FOR &Organisation
        USING &RecordType WITH FORMAT &Record }
MedicalRecordSchemes  MEDICAL-RECORD-SCHEME ::= {...}
END

```

## A.2 Module: Set-up and termination messages

```

E-health-setup {joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3)
    modules(0) set-up(1) version1(1)}
"/Telebiometrics/E_Health_Protocol/Modules/Setup/Version1"
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS CR-SEQUENCE, CR-Sequences
    FROM E-health-command-response
        {joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3)
        modules(0) command-response(3) version1(1)}
    SIMPLE-MESSAGE, Simple-Messages
    FROM E-health-send-and-ack
        {joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3) modules(0)
        send-and-ack(2) version1(1)};
-- SetUp-Message-Request and Response for simple messages and for interactive
-- message sequences
E-health-SetUp-Message-Request ::= CHOICE {
    simple          SIMPLE-MESSAGE.&id({Simple-Messages}),
    interactive     CR-SEQUENCE.&id({CR-Sequences}),
    ... } -- Top-level type
E-health-SetUp-Message-Response ::= CHOICE {
    simple          BOOLEAN -- True is OK, False is Reject--,
        -- Only for response to a simple Request
    interactive CHOICE {
        accept      NULL,
        conditional-accept SEQUENCE {
            id          CR-SEQUENCE.&id
                ({CR-Sequences}),
            reduced-requirements CR-SEQUENCE.&requirements
                ({CR-Sequences}{@.id}),

```

```

                voice-options          OBJECT IDENTIFIER,
                video-options          OBJECT IDENTIFIER},
    reject      NULL } }
EncryptionOptions ::= BOOLEAN
IntegrityOptions ::= BOOLEAN
END

```

### A.3 Module: Simple SEND-and-ACK messages

```

E-health-send-and-ack {joint-iso-itu-t(2) telebiometrics(42)
    e-health-protocol(3) modules(0) send-and-ack(2)version1(1)}
"/Telebiometrics/E_Health_Protocol/Modules/Send-and-ack/Version1"
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS      EncryptionOptions,IntegrityOptions
    FROM E-health-setup
    {joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3)
    modules(0) set-up(1) version1(1)};
-- Type and CLASS definitions for simple messages
SIMPLE-MESSAGE ::= CLASS {
    &id          OBJECT IDENTIFIER UNIQUE,
    &Type,
    &Errors      ERROR,
    &registration-info CHOICE {
        implicit UTF8String,
        -- shall be reference to a web-site
        explicit UniversalString,
        ... }}
WITH SYNTAX {
    MESSAGE IDENTIFIED BY &id USING TYPE &Type POSSIBLE ERRORS &Errors
    REGISTERED AS &registration-info}
ERROR ::= CLASS {
    &code      INTEGER,
    &Parameter
    }
WITH SYNTAX {
    ERROR &code WITH &Parameter
    }
Simple-Messages SIMPLE-MESSAGE ::= {...}
Identified-Simple-Message ::= SEQUENCE {
    sm-Identifier SIMPLE-MESSAGE.&id({Simple-Messages}),
    sm-Content    SIMPLE-MESSAGE.&Type({Simple-Messages}{@sm-Identifier})}
Command ::= SEQUENCE {
    encryptionOptions EncryptionOptions,
    integrityOptions  IntegrityOptions,
    content            OCTET STRING (CONSTRAINED BY
    {-- encoding of an Identified-Simple-Message value by the current --
    -- encoding rules included in a CMS ContentInfo sequence for encryption --
    -- and/or integrity if needed --})}
Ack ::= CHOICE {
    ok      NULL,
    error SEQUENCE {
        code ERROR.&code({Simple-Message-Errors}),
        parameter ERROR.&Parameter({Simple-Message-Errors}{@.code})}
Simple-Message-Errors ERROR ::= {Simple-Messages.&Errors}
Response ::= SEQUENCE {
    encryptionOptions EncryptionOptions,
    integrityOptions  IntegrityOptions,
    content            OCTET STRING (CONSTRAINED BY
    {-- encoding of an Ack value by the current encoding rules --
    -- included in a CMS ContentInfo sequence for encryption and/or --
    -- integrity if needed --})}
END

```

## A.4 Module: Interactive Command/Response messages

```
E-health-command-response {joint-iso-itu-t(2) telebiometrics(42)e-health-
protocol(3)
    modules(0)command-response(3) version1(1)}
"/Telebiometrics/E-Health_Protocol/Modules/Command-response/Version1"
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS    EncryptionOptions,IntegrityOptions
    FROM E-health-setup
    {joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3)
    modules(0) set-up(1) version1(1)};
-- Type and CLASS definitions for CR interactive message sequences
CR-SEQUENCE ::= CLASS {
    &id          OBJECT IDENTIFIER UNIQUE,
    &requirements  ENUMERATED {
        none,
        with-2-way-voice,
        with-reverse-video-and-2-way-voice,
        with-2-way-video-and-voice },
    &voice-options  OBJECT IDENTIFIER,
    &video-options  OBJECT IDENTIFIER,
    &message-sequence-specification  UniversalString,
    &Interactive-Messages  INTERACTIVE-MESSAGE,
    &first          INTERACTIVE-MESSAGE }
    WITH SYNTAX {
        INTERACTIVE-SESSION IDENTIFIED BY &id REQUIRING &requirements
        WITH VOICE OPTIONS &voice-options AND VIDEO OPTIONS &video-options
        SPECIFIED BY &message-sequence-specification
        USING &Interactive-Messages BEGINNING WITH &first }
CR-Sequences CR-SEQUENCE ::= {...}
INTERACTIVE-MESSAGE ::= CLASS {
    &id          INTEGER(0..MAX) UNIQUE,
    &direction  ENUMERATED {
        command,
        response },
    &Type,
    &expected-response  INTERACTIVE-MESSAGE OPTIONAL,
        -- only for a command
    &next SEQUENCE OF INTERACTIVE-MESSAGE.&id OPTIONAL}
    WITH SYNTAX {
        STEP &id DIRECTION &direction USING &Type
        [RESPONSE &expected-response] [FOLLOWED BY &next]}
Identified-Command-Response{INTERACTIVE-MESSAGE:Messages} ::= CHOICE {
    command SEQUENCE {
        message-id INTERACTIVE-MESSAGE.&id({Messages})
            (CONSTRAINED BY {-- direction shall be command --}),
        message-content INTERACTIVE-MESSAGE.&Type
            ({Messages}@.message-id)},
    response SEQUENCE {
        message-id INTERACTIVE-MESSAGE.&id({Messages})
            (CONSTRAINED BY {-- id shall be equal to --
            -- expected-response of the command --}),
        message-content INTERACTIVE-MESSAGE.&Type
            ({Messages}@.message-id) }}
Command-Response ::= SEQUENCE {
    encryptionOptions      EncryptionOptions,
    integrityOptions       IntegrityOptions,
    content                 OCTET STRING (CONSTRAINED BY
    {-- encoding of an Identified-Command-Response value by the current --
    -- encoding rules followed by an encryption operation if --
    -- encryptionOptions is TRUE --})}
END
```

## A.5 Module for definition of quantities and units

This module defines information object classes for definition of information objects related to quantities, units and symbols.

```
E-health-quantities-and-units
{joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3) modules(0)
 quantity-and-units(4) version1(1)}
"/Telebiometrics/E_health_Protocol/Modules/Quantities_And_Units/
Version1"
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
SYMBOLS ::= CLASS {
    &String          UniversalString,
    &attributes      StringAttributes OPTIONAL,
    &id              OBJECT IDENTIFIER UNIQUE,
    &relative-oid-iri RELATIVE-OID-IRI
}
WITH SYNTAX {
    &String [WITH ATTRIBUTES &attributes] IDENTIFIED BY &id AND &relative-oid-iri
}
StringAttributes ::= BIT STRING {
    italic(0),
    betweenParenthesis(1)
}
UNIT ::= CLASS {
    &name            PrintableString,
    &symbols         SYMBOLS,
    &id              OBJECT IDENTIFIER UNIQUE,
    &relative-oid-iri RELATIVE-OID-IRI,
    &Units1          UNIT OPTIONAL,
    &Units2          UNIT OPTIONAL,
    &multipleBaseUnit UNIT OPTIONAL,
    &multipleFactor  REAL(WITH COMPONENTS {
        ...,
        mantissa(1),
        base(10)
    }) OPTIONAL
}
WITH SYNTAX {
    &name USING SYMBOLS &symbols IDENTIFIED BY &id AND &relative-oid-iri
    [DERIVED BY [PRODUCT OF &Units1] [DIVIDED BY &Units2]]
    [MULTIPLE OF &multipleBaseUnit WITH FACTOR &multipleFactor]
}
QUANTITY ::= CLASS {
    &name            PrintableString,
    &frenchName     UniversalString OPTIONAL,
    &symbols         SYMBOLS,
    &Units          UNIT,
    &Modalities     OBJECT IDENTIFIER,
    &direction      ENUMERATED {in,out} OPTIONAL,
    &id              OBJECT IDENTIFIER UNIQUE,
    &relative-oid-iri RELATIVE-OID-IRI
}
WITH SYNTAX {
    &name [FRENCH &frenchName] USING SYMBOLS &symbols MEASURED IN &Units
    FOR MODALITIES &Modalities [DIRECTION &direction]
    IDENTIFIED BY &id AND &relative-oid-iri
}
END
```

# Appendix I

## Examples of messages

(This appendix does not form an integral part of this Recommendation.)

### I.1 Example of interactive Command/Response messages

This module is an example of interactive Command/Response session.

```
COMMAND-RESPONSE-EXAMPLE {joint-iso-itu-t(2) telebiometrics(42)e-health-
protocol(3)modules(0)examples(5) command-response(0)}
"/Telebiometrics/E_health_Protocol/Modules/Examples/Command_Response"
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS CR-SEQUENCE, INTERACTIVE-MESSAGE, Identified-Command-Response{}
FROM E-health-command-response
{joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3) modules(0)
command-response(3) version1(1)};
example-Sequence CR-SEQUENCE ::= {
INTERACTIVE-SESSION IDENTIFIED BY
{joint-iso-itu-t(2) telebiometrics(42) e-health(3) examples(1)
command-response(3)}
REQUIRING none WITH VOICE OPTIONS {2 42 3 1 1}
AND VIDEO OPTIONS {2 43 3 1 2}
SPECIFIED BY "Example" USING {Example-Messages}
BEGINNING WITH example-1}
example-1 INTERACTIVE-MESSAGE ::= {
STEP 1 DIRECTION command USING INTEGER
RESPONSE example-2 FOLLOWED BY {2,3,4}}
example-2 INTERACTIVE-MESSAGE ::= {
STEP 2 DIRECTION response USING BOOLEAN
FOLLOWED BY {3,4}}
example-3 INTERACTIVE-MESSAGE ::= {
STEP 3 DIRECTION command USING OCTET STRING
RESPONSE example-4 FOLLOWED BY {4}}
example-4 INTERACTIVE-MESSAGE ::= {
STEP 4 DIRECTION response USING BOOLEAN}
Example-Messages INTERACTIVE-MESSAGE ::= {
example-1 |
example-2 |
example-3 |
example-4 }
Example-Command-Response ::= Identified-Command-Response{{Example-Messages}}
END
```

### I.2 Module for definition of generic data messages

This module is a generic module for transmission of health data. It allows transmission of quantity, unit, symbol, the measured value, the normal values under some conditions and the method used for measurement.

```
E-health-Data-Message {joint-iso-itu-t(2) telebiometrics(42)e-health-
protocol(3)modules(0)examples(5) data-message(1)}
"/Telebiometrics/E_health_Protocol/Modules/Examples/Data_Message"
DEFINITIONS AUTOMATIC TAGS ::=
BEGIN
IMPORTS SYMBOLS, UNIT, QUANTITY
FROM E-health-quantities-and-units
{joint-iso-itu-t(2) telebiometrics(42) e-health-protocol(3) modules(0)
quantity-and-units(4) version1(1)};
DataMessage{QUANTITY:Quantities} ::= SEQUENCE {
quantity QUANTITY.&id({Quantities}),
unit UNIT.&id({Quantities.&Units}) OPTIONAL,
symbol SYMBOLS.&id({Quantities.&Units.&symbols})
```

```

        method          OPTIONAL,
        value            OBJECT IDENTIFIER,
        normalValues    REAL,
        normalValues    NormalValues    OPTIONAL,
        ...
    }
NormalValues ::= SEQUENCE OF NormalValue
NormalValue  ::= SEQUENCE {
    value CHOICE {
        range SEQUENCE {
            minimum REAL,
            maximum REAL
        },
        low-limit REAL,
        high-limit REAL
    },
    conditions SEQUENCE OF Condition OPTIONAL
}
Condition ::= SEQUENCE {
    id          CONDITION.&id({Conditions}),
    value       CONDITION.&Type({Conditions}){@id}
}
CONDITION ::= CLASS {
    &name UniversalString,
    &id OBJECT IDENTIFIER,
    &Type
}
WITH SYNTAX {
    &name TYPE &Type IDENTIFIED BY &id
}
Conditions ::= CONDITION ::= {
    ...
}
END

```

## Bibliography

- [b-ILO ISCO] International Labour Organization (2007), *Resolution Concerning Updating the International Standard Classification of Occupations*.  
<<http://www.ilo.org/public/english/bureau/stat/isco/docs/resol08.pdf>>





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