

# GNU Health in the Public Health System

## New Features in 3.0

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TUBA 2015 : Tryton Unconference – Buenos Aires  
November 2015

Luis Falcon  
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# About GNU Solidario

*"Delivering Health and Education with Free Software"*



GNU Solidario first project :Santiago del Estero, Argentina, 2006

## GNU Health

The Free Health and Hospital Information System.  
([health.gnu.org](http://health.gnu.org))

## IWEEE

International Workshop on E-Health in Emerging Economies.  
([www.iweee.org](http://www.iweee.org))



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# GNU Health : Functionality Areas



## Person and Community

Person, family, Socioeconomics, lifestyle ...

Domiciliary Units, Operational Areas, Institutions,

## Patient

Evaluations, Genetics, prescriptions, History, surgeries...

## Health Institution Management

Hospitalizations, Finances, Laboratory, stock, HR, ..

## Health Authorities / MoH

Health campaigns, epidemiology, ...



# GNU Health is Free/Libre Software

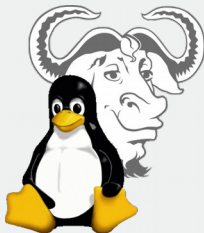
**Freedom** to run , adapt, improve and redistribute

Official GNU Package, from the Free Software Foundation

Open Documentation

Relies on free technology

International community (100+ language teams)





# GNU Health and Social Medicine



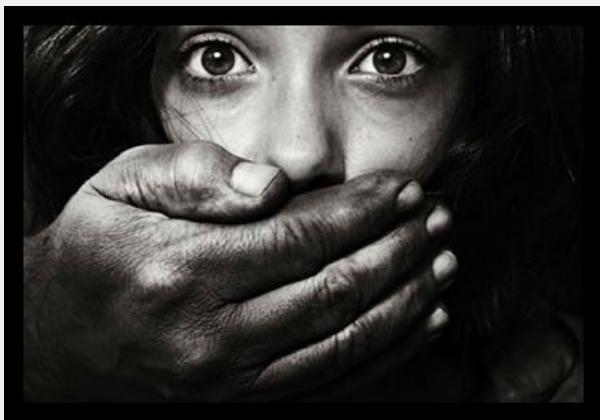
Child Vaccination on Kibati Camp - RDC - By Julien Harneis



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# Over 20000 Children die every day from Social Diseases



Human Trafficking  
Contaminated Water  
Malnutrition  
Cholera  
Drug abuse  
Prostitution  
Chagas  
Tuberculosis  
Ebola  
Child Labour  
War  
Family Violence  
Malaria  
HIV

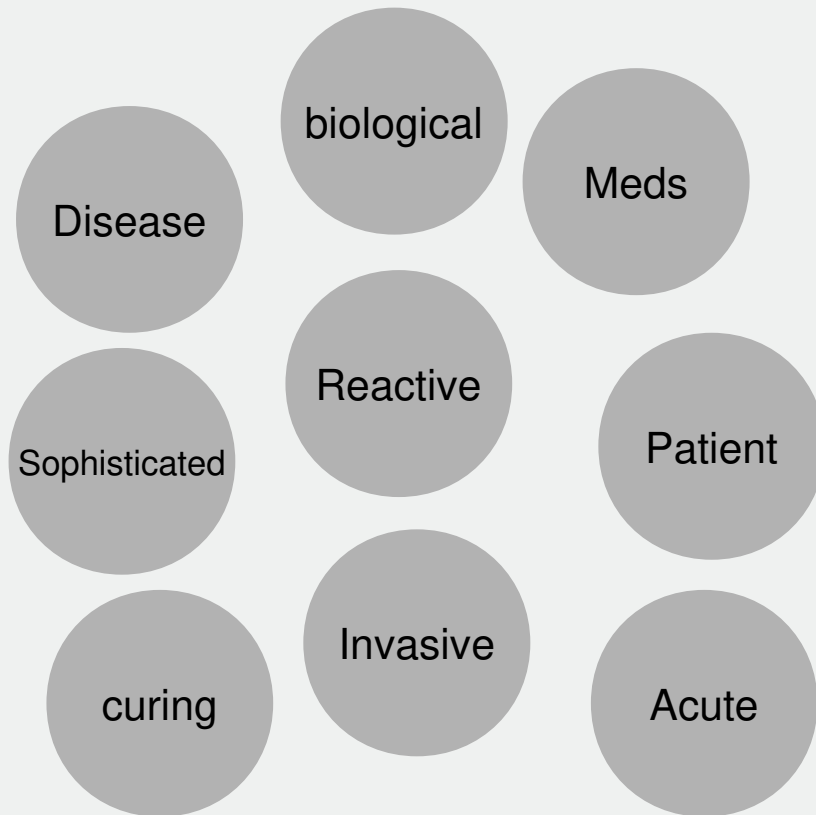


...

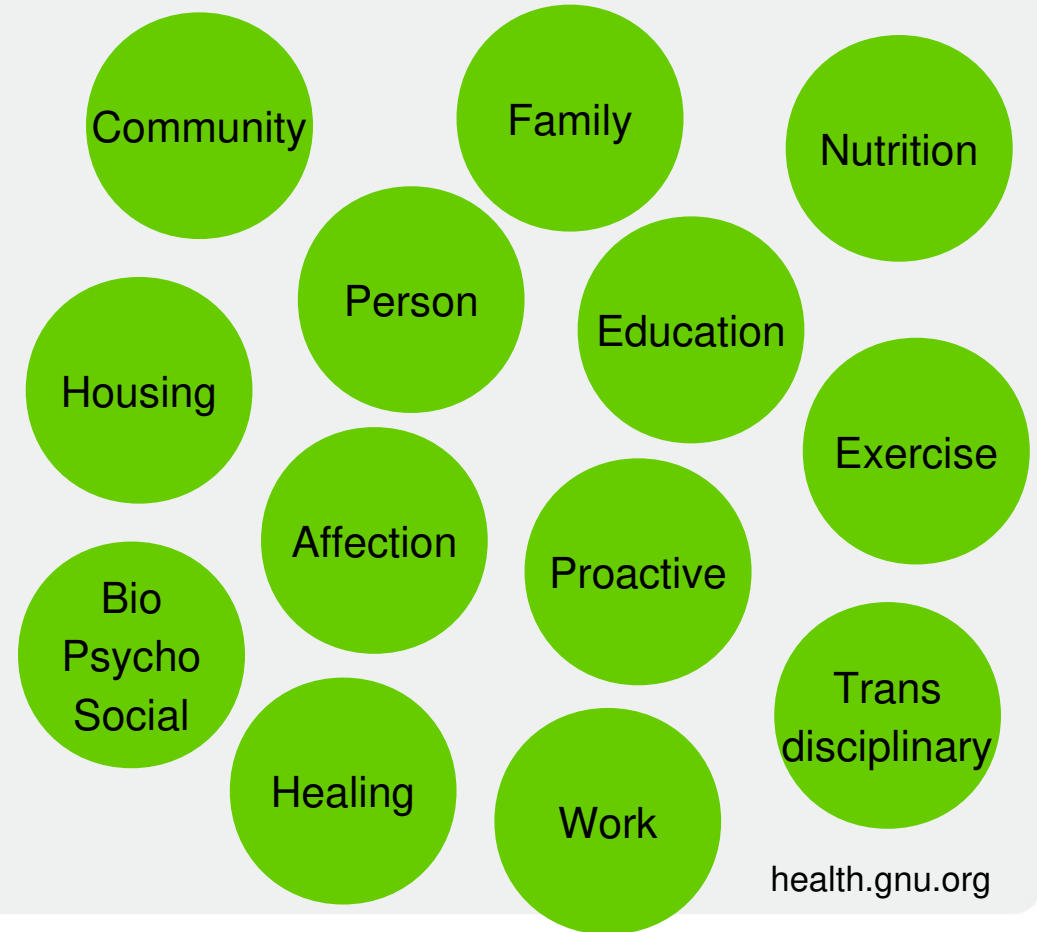


# The System of Health Paradigm

## System of Disease



## System of Health



health.gnu.org





# The Domiciliary Units (DUs)

Address / Location

Construction material

Number of rooms

Sanitary conditions

Bathrooms

Sewers

Electricity

...

The DU shows the people currently living in it at any given moment

The DU can be geolocated / linked to OpenStreetMap

The screenshot shows the 'Domiciliary Units' application window. The form contains the following fields and data:

- Code:** Valse-LeonyCastillo1
- Desc:** House by the city town hall.
- Street:** Leon y Castillo
- Number:** 1
- Apartment:** (empty)
- District:** (empty)
- Municipality:** Valsequillo
- City:** (empty)
- Zip Code:** 35217
- Country:** Spain
- Province:** Las Palmas
- Latitude:** 27.99189100000000
- Longitude:** -15.49462800000000
- OSM Map:** <http://openstreetmap.org/?mlat=27.99189100000000&mlon=-15.49462800000000>
- Conditions:** Comfortable and good sanitary conditions
- Infrastructure:**
  - Material:** Concrete
  - Roof:** Concrete
  - Bathrooms:** 2
  - Running Water:** ☒
  - Gas supply:** ☐
  - Telephone:** ☒
- Members:**

Code	Name	Last Name	SSN
2	Ana	Betz	55567890
5	John	Zenón	40556644
4	Matt	Zenon Betz	97234436

At the bottom of the window, it says 'Administrator - GNU SOLIDARIO HOSPITAL [Euro]' and 'Waiting requests: 0 received - 0 sent'.



# Health Institutions and Operational Sectors

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Search

- Party
- Product
- Financial
- Currency
- Inventory & Stock
- Calendar
- Health
  - Patients
  - Institutions**
  - Appointments
  - Prescriptions
  - Demographics
  - Laboratory
  - Imaging
  - Hospitalizations
  - Surgeries
  - Pediatrics
  - Archives
  - Nursing
  - Health Services
  - Reporting
  - Configuration
  - Administration

**Institutions** 1 / 1

**Institutions**

Institution: GNU SOLIDARIO HOSPITAL

Type: General Hospital

Public Level: Public

Heliport: ☒

Trauma Center: ☒

Beds: 750

ORs: 15

Code: SPAIN-LASPALMAS-GNUSOLIDARIO-GRAL\_H

Specialty:

Teaching: ☒

Trauma Level: Level I

Operating Room: ☒

**Specialties** (1/5)

Specialty

Nutrition

Cardiovascular

**Operational Sector** (1/1)

Operational Sector

Las Palmas de Gran Canaria

The GNU Solidario General Hospital (GSGH), is a major fictional teaching hospital in Las Palmas, and core of the automomic region health network.

GNU Solidario General Hospital has research units covering nearly all major specialties of medicine and is the primary teaching hospital in the island.

The hospital's emergency department is certified as a level I trauma center for adults and pediatrics. It is the sample health center used in the demo system.

tryton://localhost:8000/health26/model/gnuhealth.institution/1;views=%5B603%2C+604%5D





# People Before Patients : Demographics

Name:  Last Name:  PUID:

Active: ☒

HHealth General Accounting Stock

Person: ☒ Patient: ☒ Health Prof: ☐ Institution: ☐ Insurance Company: ☐ Pharmacy: ☐

Demographics

DoB:  Sex:

Occupation:  Education Level:

Mother:  Father:

Marital Status:  Citizenship:


Country of Residence:  Domiciliary Unit:

Ethnic group:  Alternative IDs: ☒

Alternative IDs

Code	ID type	Comments
93674665J	Passport	Spanish Passport
PAC001	Medical Record	

Picture



# Families

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Search

Health

- Patients
- Institutions
- Appointments
- Prescriptions
- Demographics
  - Domiciliary Units
  - Birth certificates
  - Death certificates
  - Families**
  - Family Members
- Operational Areas
  - Laboratory
  - Imaging
  - Hospitalizations
  - Surgeries
  - Pediatrics

Domiciliary Units Families

**Families** 1 / 1

Family: Zenon-Betz

Members

Family Members



Party	Role
Betz, Ana	Mother
Zenon, John	Father
Zenon Betz, Matt	Son

Extra Info

tryton://health.gnusolidario.org:8000/health28/model/gnuhealth.family/1;views=%5B167%2C+168%5D



# Empowering the person, family and community

	<b>Name :</b> Betz, Ana <b>DoB :</b> 1985-10-04 <b>Blood Type :</b> A +	<b>55567890</b> 
<b>Female</b>	<b>Universal Person Identifier</b>	

Socioeconomics  
Education  
Lifestyle  
Physical exercise  
Nutrition  
Working conditions

...



Family Members and their roles  
Family Affection / Functionality Level  
Domiciliary Units conformants  
Contacts info : **Key for quickly locating them in outbreaks**

...

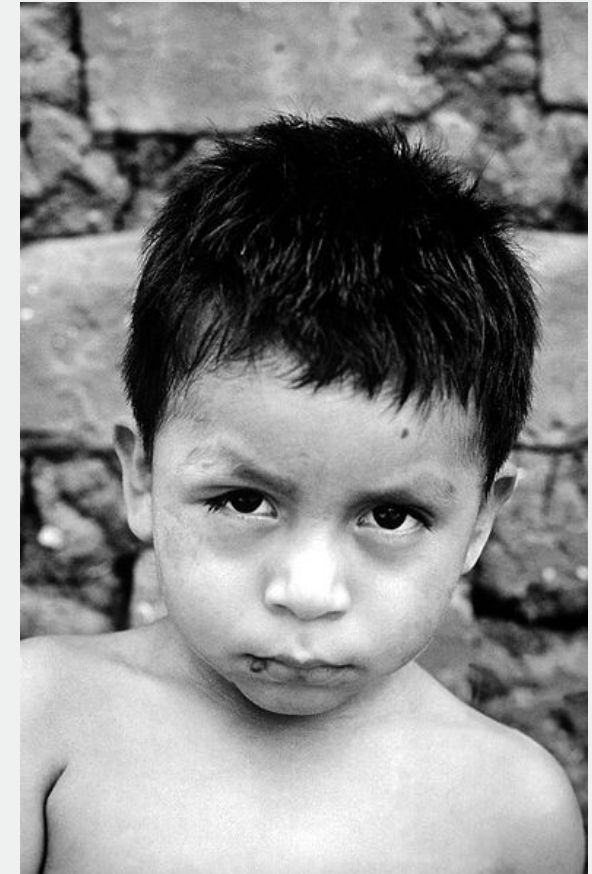
**GNU Health promotes transdisciplinary work, and makes the person an active member of the system of health**



# GNU Health WHO modules to fight against social diseases



MDG 6 : Fight HIV, Malaria & Tuberculosis



NTD: Fight Neglected Tropical Diseases (Chagas, Dengue... )





# Domiciliary Units Survey example : Chagas

Tryton

File User Options Favorites Help

Search

- Party
- Product
- Financial
- Currency
- Inventory & Stock
- Purchase
- Sales
- Calendar
- Health
  - Patients
  - Appointments
  - Prescriptions
  - Demographics
    - Domiciliary Units**
    - Families
    - Family Members
    - Operational Areas
    - Laboratory

Domiciliary U ... Chagas DU S ...

Chagas DU Survey 1 / 1

Survey Code: CHAGAS-DU-2013/001 DU: DUsample-X1230 Date: 07/28/2013 Status: Initial

Presence of triatomines—

Triatomines: ☒ Nymphs: ☐ Domiciliary: ☐ Peri-Domiciliary: ☒ Vector: T. infestans

Areas to Improve—

Roof: ☒ Walls: ☐ Floor: ☐

Preventive Measures—

Bug traps: ☐ Fumigation: ☒ Fumigation Date: 07/27/2013

Notes

Triatomines found in the roof section of the bedroom.


Action : House has been sprayed and the social worker notified the family to place bug traps for further evaluation

Next survey: 08/03/2013

Administrator - GNU SOLIDARIO HOSPITAL [EGP] Waiting requests: 0 received - 0 sent admin@health.gnusolidario.org:8000/health20

vinchucachaco.jpg

Image Edit View Go Help





## Medical Practice and Health Center Management



# GNU Health : Modularity and Interoperability

## GNU Health Modular Design



# Centralized Patient Information

The screenshot shows the Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro] interface. The main window displays patient information for Betz, Ana. The interface includes a menu bar (File, User, Options, Favorites, Help) and a sidebar with various modules (Party, Product, Financial, Currency, Inventory & Stock, Purchase, Calendar, Health, etc.). The main content area shows the patient's name, age (29y 4m 8d), and a photo. A dropdown menu is open, showing options like Appointments, Evaluations, Imaging Test Request, etc. The patient's personal history of allergy to penicillin and insulin-dependent diabetes mellitus is listed. The bottom section shows the patient's GP (Cordara, Cameron), family (Zenon-Betz), insurance (Universal Health : 1257457), and a Notepad area. The URL at the bottom is tryton://health.gnusoalidario.org:8000/health28/model/gnuhealth.patient/1;views=%5B223%2C+224%5D.

Female

Name : Betz, Ana

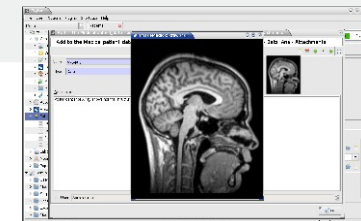
DoB : 1985-10-04

Blood Type : A +

55567890

Critical Info : T1D

Test	Result	Unit	Reference
Glucose	100	mg/dL	70-100
Hemoglobin	15	g/dL	12-16
White Blood Cells	10000	/mm3	4000-11000
Platelets	250000	/mm3	150000-400000
Urea Nitrogen	10	mg/dL	7-20
Creatinine	1.2	mg/dL	0.6-1.2
Bilirubin	1.2	mg/dL	0.1-1.2
Alkaline Phosphatase	100	U/L	30-120
Aspartate Aminotransferase	20	U/L	0-40
Alanine Aminotransferase	15	U/L	0-40
Lactate Dehydrogenase	1000	U/L	100-250



# Obstetrics & Pediatrics

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Pat: Neonatal Info... 1 / 1

**Neonatal Info**

Main Endings and Tests

Baby: Zenon Betz, Matt DoB: 03/15/2010 12:18:09 Sex: Male

Mother: Betz, Ana Length: 52 Weight: 3,600 CP: 36

APGAR scores

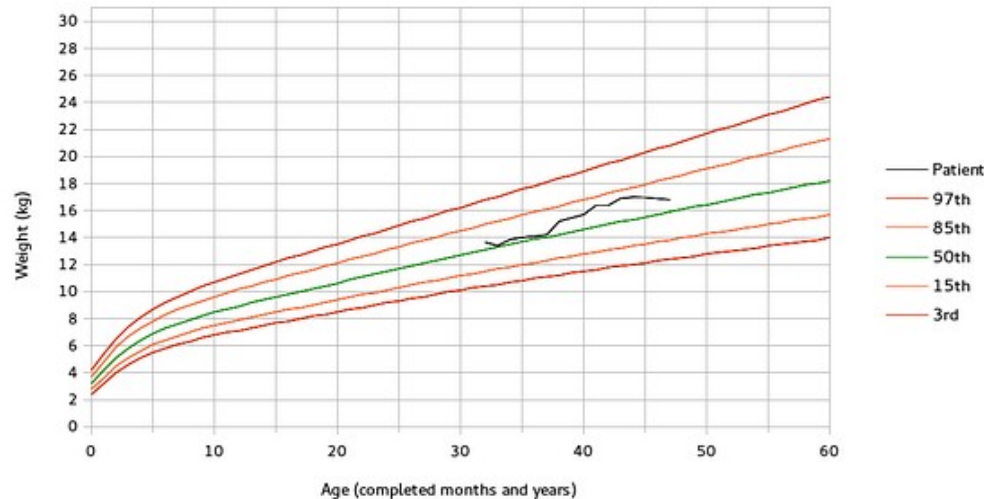
Minute	APGAR	Appearance	Pulse	Grimace	Activity	Respiration
1	9	acrocyanosis > 100	cry or pull away when stimulated	flexed arms and legs	strong	
5	10	no cyanosis > 100	cry or pull away when stimulated	flexed arms and legs	strong	

Stimulation: ☐ Aspiration: ☒ Intubation: ☐ Mask: ☐ Oxygen: ☐

Notes

Name at Birth: Matt Newborn ID: 9876894 Discharged: 03/17/2010 12:22:39 Doctor in charge: dara, Cameron

tryton://health.gnusoildario.org:8000/health28/model/gnuhealth.newborn/1.domain=%5B%5B%22patient%22%2C+%22%3D%22%2C+2%5D%5D&views=%5B449%2C+450%5D



Preconception and Prenatal Care

Genetic Risks and counseling

Obstetric evaluations / imaging

Nutrition and growth charts

Socioeconomics

Neonatology

Immunizations

Family Functionality and Affection level

Psychosocial Risk (Mass General Hospital PSC)

	<b>Name : Matt</b> <b>Mother : Betz, Ana</b> <b>Mother's PUID : 55567890</b> <b>DoB : 2010-03-15</b> <b>16:18:09</b>	<b>9876894</b> 
	<b>Male</b>	<b>3600 gr and 52 cm</b>



# Disease Groups

## Tuberculosis example

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Search

Party  
Product  
Currency  
Health  
Patients  
Appointments  
Prescriptions  
Demographics  
Pediatrics  
Reporting  
Configuration  
Diseases  
Procedures  
Health Centers  
Health Professions  
Medicaments  
Misc  
Administration

Patients

1 / 1

Main Info

BETZ, ANA Female Age: 29y 2m 3d PAC001

Critical Information

Personal history of allergy to penicillin  
Personal history of allergy to anaesthetic agent

Other critical info, not encoded in diseases / allergies. For example family violence or recent stressful events.

We can automate other patient related information to be shown at the critical info.

Automated summary of patient allergies and other critical information

General Info Medication Diseases

Diseases

Disease	Status of the disease
Personal history of allergy to penicillin	chronic
Personal history of allergy to anaesthetic agent	chronic
Leptospirosis	healed

tryton://localhost:8000/admin/model/gnuhealth.patient/1/views=%5B215

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Diseases

Record saved! 1 / 108

Main Genetics Extra Info

Name: Respiratory tuberculosis, bac Code: A15 Main Category: I Certain infectious an

Groups

(4/4)

Group

NOTIFIABLE  
RESPIRATORY  
INFECTIOUS  
SOCIAL AND FAMILY

Specify the groups this pathology belongs. Some automated processes act upon the code of the group

Automatic triggers

Patient Critical Info

Reporting





# Some Social and Lifestyle screening tools

CAGE Alcoholism screening

Smilkstein Family functionality test

Henningfield recreational drug classification

Pediatric Psychosocial risk (PSC from MGH)

NIDA recreational drugs Database

**Pediatric Symptom Checklist** 1 / 1

Patient: **Velasco, Sarah** Date: **08/09/2011 10:38:00** Appointment: PSC Total: **49**

Complains of aches and pains: Sometimes	Spends more time alone: Sometimes
Tires easily, has little energy: Often	Fidgety, unable to sit still: Sometimes
Has trouble with teacher: Often	Less interested in school: Often
Acts as if driven by a motor: Often	Daydreams too much: Sometimes
Distracted easily: Often	Is afraid of new situations: Sometimes
Feels sad, unhappy: Often	Is irritable, angry: Often
Feels hopeless: Often	Has trouble concentrating: Sometimes
Less interested in friends: Sometimes	Fights with other children: Sometimes
Absent from school: Often	School grades dropping: Often
Is down on him or herself: Sometimes	Visits the doctor with doctor finding nothing wrong: Sometimes
Has trouble sleeping: Often	Worries a lot: Often
Wants to be with you more than before: Often	Feels he or she is bad: Sometimes
Takes unnecessary risks: Often	Gets hurt frequently: Sometimes
Seems to be having less fun: Sometimes	Acts younger than children his or her age: Sometimes
Does not listen to rules: Sometimes	Does not show feelings: Often
Does not get people feelings: Sometimes	Teases others: Sometimes
Takes things that do not belong to him or her: Sometimes	Refuses to share: Sometimes

## Family APGAR

Help from family: **Very much** Problems discussion: **Moderately** Decision making: **Moderately**

Time sharing: **Moderately** Family affection: **Very much** Score: **7**



Name	Code	Category	Toxicity	Dependence	Street names
Heroin	HEROIN	Opioids	Extreme	Extreme	diacetyl-morphine:
Hydrocodone bitartrate	HYDROCODONEBIT	Opioids	High	High	Vicodin: vike, Wats
Inhalants	INHALANTS	Others	Extreme	High	Solvents (paint thir
Ketamine	KETAMINE	Dissociative Anesthetics	Extreme	Low	Ketalar SV: cat Vali
LSD	LSD	Hallucinogens	Low	Low	Lysergic acid diethy
MDMA methylenedioxy-methamphetamine	MDMA	Stimulants	High	Low	Adam, clarity, ecst
Marijuana	MARIJUANA	Cannabinoids	Low	Low	blunt, dope, ganja,

**CAGE** (1/4)

Date	Hard to Cut	Angry	Guilt	Eye-opene	CAGE Score
02/18/2015	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
01/13/2015	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
03/13/2014	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2
01/08/2014	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4



# Quick retrieval of Person and Patient Info

	<b>Name :</b> Betz, Ana <b>DoB :</b> 1985-10-04 <b>Blood Type :</b> A +	<b>55567890</b> 
<b>Female</b>	<b>Critical Info : T1D</b>	
Demographics		
PUID		
Contact Information		
Critical Information (allergies, diseases)		
....		



Person ID Card  
QR Codes  
Wearables



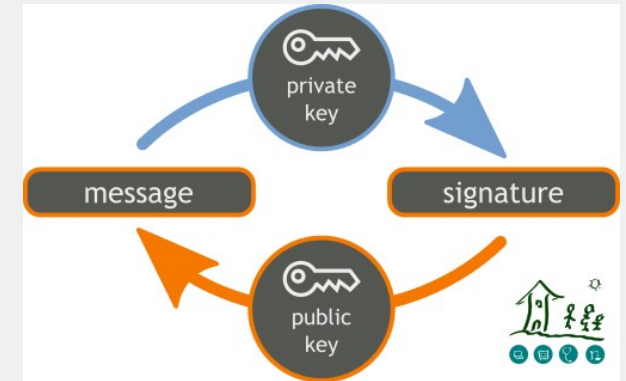
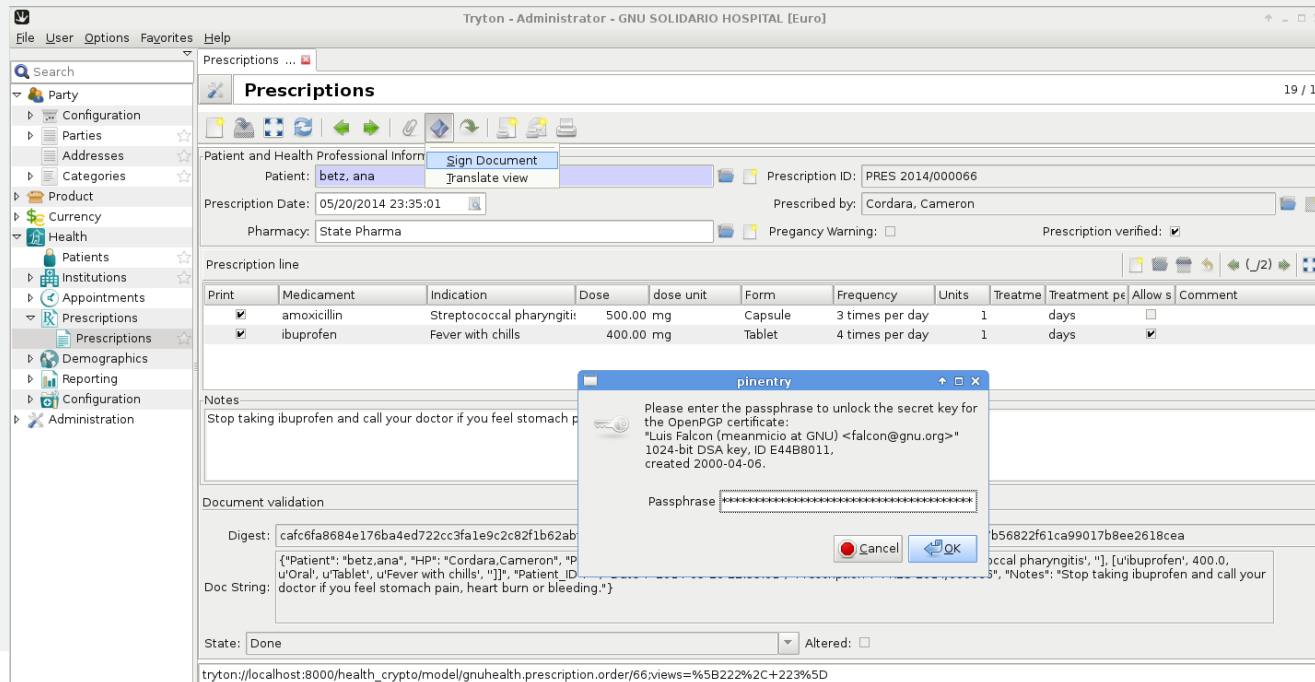
# Digital Signatures & ePrescriptions

Digitally sign documents and medical acts

GNU Privacy Guard (GNUPG) Integration

Authenticity, accountability & non-repudiation

Document validation



ePrescriptions

Evaluations / Encounters

Birth and death certificates

Lab Tests, ...



## Tools for the Health Authorities



# Exchanging information



HL7 FHIR





# One person, one history : PUID

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Search

- Party
- Product
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- Inventory & Stock
- Purchase
- Calendar
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  - Demographics
  - Laboratory
  - Imaging
  - Hospitalizations
  - Surgeries
  - Pediatrics
  - Archives
  - Nursing
  - Health Services
  - Reporting
  - Configuration
  - Administration

People Birth Certificate ...

Record saved! 1 / 6

Name: Ana Last Name: Betz PUID: 55567890

Active: ☒

Health General Accounting Stock

Person: ☒ Patient: ☒ Health Prof: ☐ Institution: ☐ Insurance Company: ☐ Pharmacy: ☐

Demographics

DoB: 10/04/1985 Sex: Female

Occupation: Teacher Education Level: University

Mother: Luna Father: Caput, Bonifacio

Marital Status: Married Citizenship: Spain


Country of Residence: Spain Domiciliary Unit: Valse-LeonyCastillo1

Ethnic group: Hispanic Alternative IDs: ☒

Alternative IDs

Code	ID type	Comments
93674665J	Passport	Spanish Passport
PAC001	Medical Record	

Picture



Insurances

Number	Plan	Insurance Ty	Insurance Comp	Category	Member since	Expiration date
1257457	Family Plan	State	Universal Health		05/12/2012	05/12/2015

Unidentified: ☐ Alias: Code: 63dd59be-141c-4ff9-a0a9-e43a6f Activation date: 01/17/2008

tryton://health.gnusolidario.org:8000/health28/model/party.party/2;domain=%5B%5B%22is\_person%22%2C+%22%3D%22%2C+true%5D%5D&views=%5B

63dd59be-141c-4ff9-a0a9-e43a6f754b39-GNU SOLIDARIO HOSPITAL



# Reporting, Epidemiology, Early Warning

Data aggregation / Synchro

Demographics

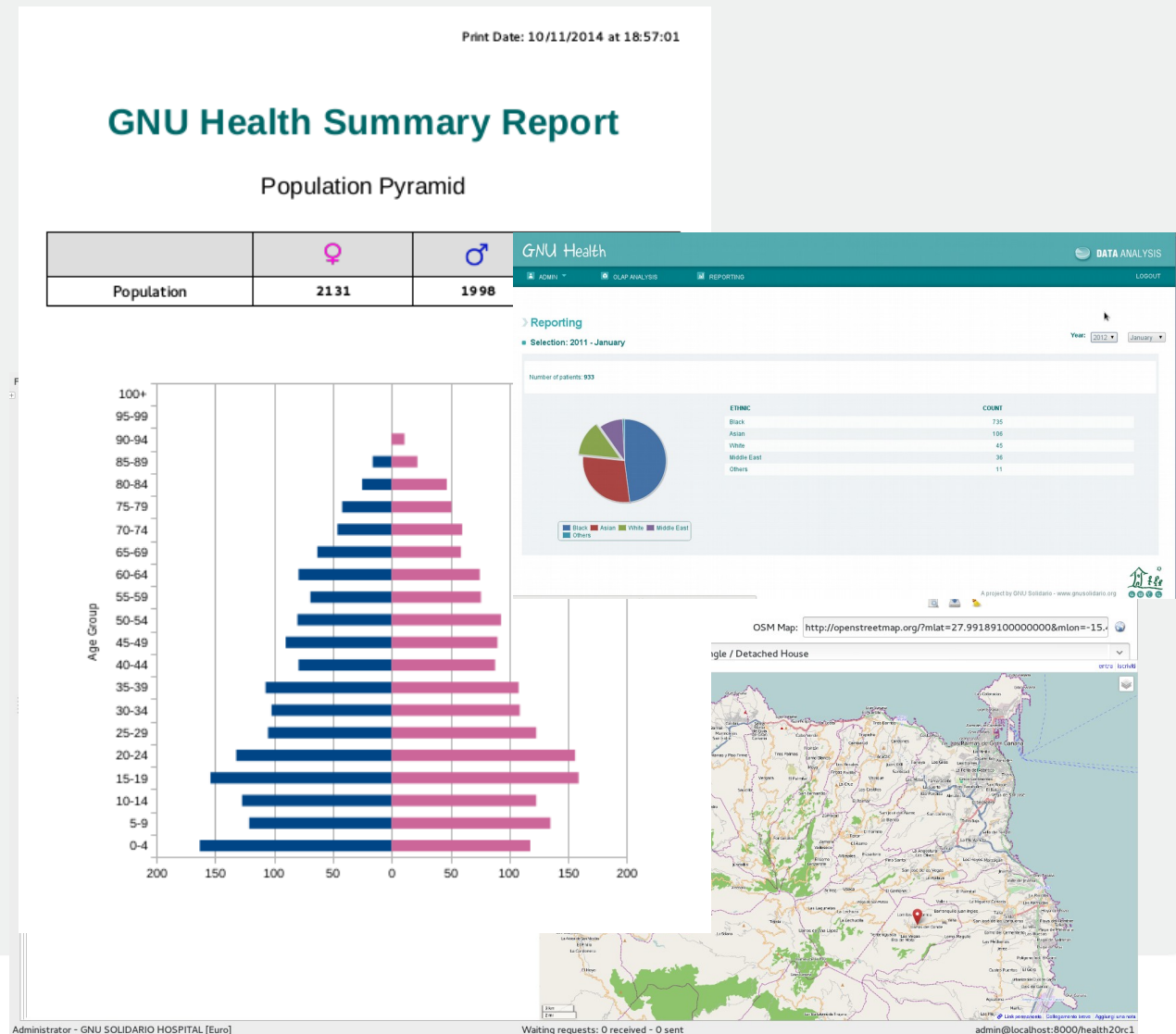
People without health coverage

Vital Records Sytem

Outbrake early warning

Geolocalization (OSM)

Notifiable diseases



# Injury Surveillance System

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Search

Party

Configurati

Parties

Addresses

Categories

Product

Currency

Health

Patients

Institutions

Appointment

Prescription

Demograph

Reporting

Configurati

Administratio

Patients Evaluations Injury Surveil... Parties

**Injury Surveillance System Registration** Record saved! 1 / 1

Code: 3446654656 Institution: GNU SOLIDARIO HOSPITAL

Evaluation: 2014-12-19 10:30:48 Injury Date: 12/19/2014 Registration Date: 12/19/2014

Location

O. Sector: Guanarteme Latitude: 28.1298400000000 Longitude: -15.4473100000000 OSM Map: <http://openstreetmap.org/?ml>

Patient Demographics

Patient: Ana Betz Sex: f Age: 29y 2m 15d

Specifics

Chief Complaint: pain in the wrist Injury Type: Motor Vehicle

Motor Vehicle Accident

Mode: Bicycle User Position: Driver Counterpart: Car Safety Gear: Yes

Alcohol and other Drugs context

Alcohol: No Other Drugs: No

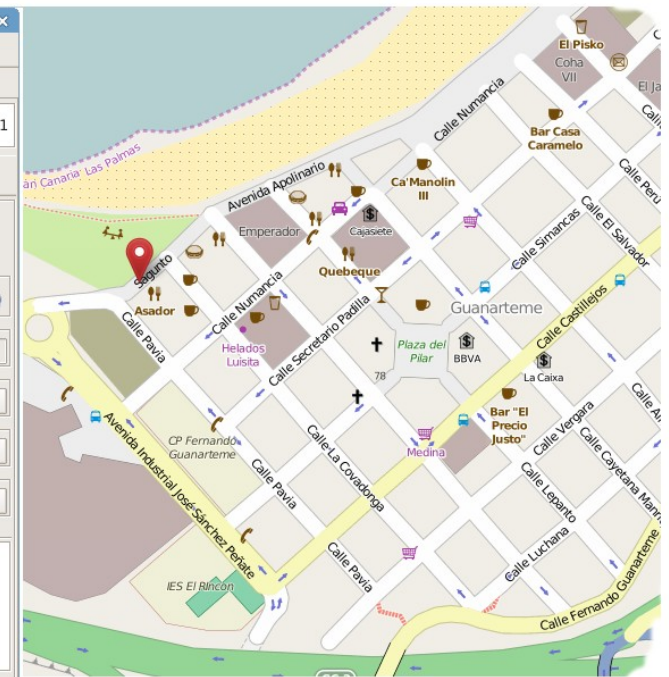
Details

A mother her son are safe, despite a cycling accident that sent the woman to the hospital with minor injuries. At just after 3pm yesterday, police, paramedics, and firefighters were dispatched to the intersection of Sanguto St. and Pavia for an accident involving a pickup truck and a 29-year old woman on a bicycle. Investigators at the scene tell GNU Solidario News that they believe the truck ran a red light and struck the back tire of the young woman's bicycle. The woman was apparently the first of the three bike riders on Sagunto that were crossing Pavia near the Alfredo Kraus Auditorium. The 29-year old woman was taken by ambulance to Negrin Hospital with non-life threatening injuries. Police investigators say speed and alcohol are not considered to be a factor in the accident.

Disposition

Treated and Sent Home

tryton://localhost:8000/health28p/model/gnuhealth.iss/1;domain=%5B%5B%22name%22%2C+%22%3D%22%2C+2%5D%5D&views=%5B253%2C+254%5D



GNU Health Injury Surveillance System  
integration with Open Street Map

<http://health.gnu.org>

Records violent injuries (accidents, robberies, self harm, sexual assaults,... )

Georeferenced

ICD 10 encoded

Contextual information (place, time, subjects involved, ... )

Thanks to Jamaica MoH !



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November 2015

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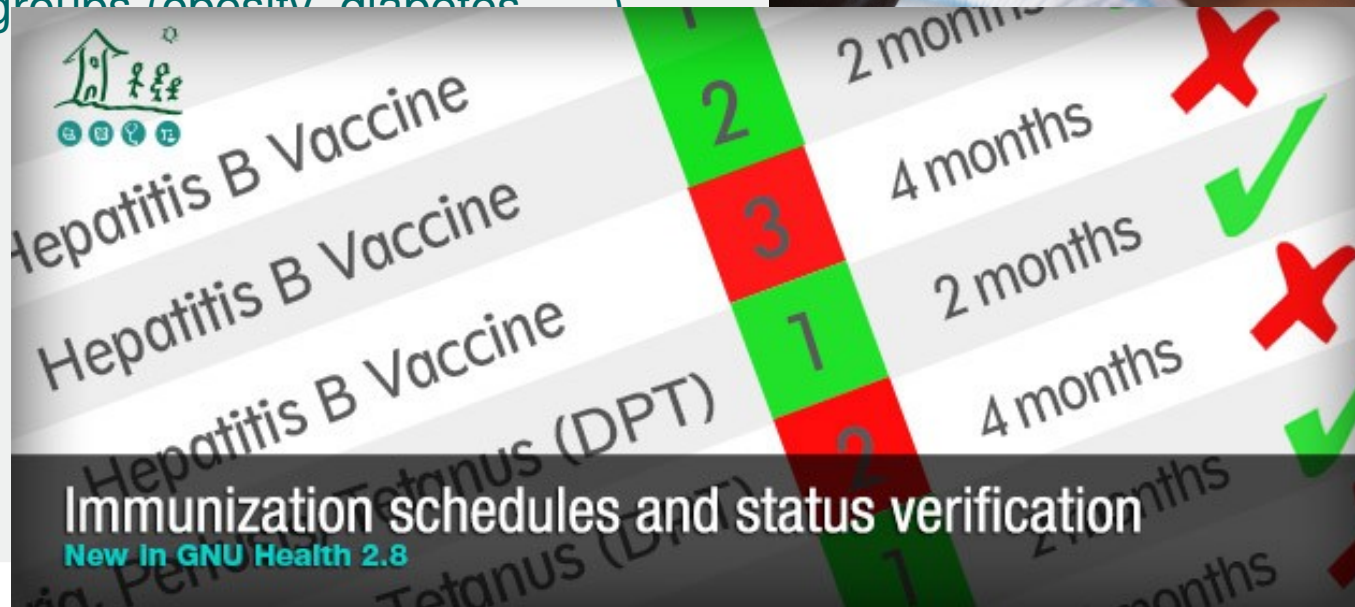


# Health Campaigns

Personalized campaigns (age, sex, social conditions, ... )

Immunization status of the population

Risk groups (obesity, diabetes, ... )





# VRS : Birth and Death Certificates

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Search

Party  
Product  
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Purchase  
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Health  
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Institutions  
Appointments  
Prescriptions  
Demographics  
Domiciliary Units  
Birth certificates  
Death certificates  
Families  
Family Members  
Operational Areas  
Laboratory  
Imaging  
Hospitalizations  
Surgeries  
Pediatrics  
Archives  
Nursing  
Health Services  
Reporting  
Configuration  
Administration

Death certifi...

**Death certificates** Record saved! 1 / 1

Main  
Person: Caput, Bonifacio Date: 01/17/2015 15:00:00 Age: 97y 11m 29d

Place  
Place: Health Center Details:  
DU:  
Institution: GNU SOLIDARIO HOSPITAL Op. Sector: Las Palmas de Gran Canaria  
Country: Spain Subdivision: Las Palmas

Cause  
Rupture of cardiac wall without haemopericardium as current complication following acute myocardial infarction

Underlying Conditions (1/3)

Condition	Interval	Unit
Acute myocardial infarction		4 days
Intracardiac thrombosis, not elsewhere classified		5 months
Atherosclerotic heart disease		7 years

Other  
Type of death: Natural Autopsy: ☐ Code: 9472635

Observations

State: Done Signed by: Cordara, Cameron Certified on: 01/18/2015 19:43:39

Document validation  
Digital Signature  
-----BEGIN PGP SIGNED MESSAGE-----  
Hash: SHA1  
648966aaaf2c660089d5ca4c132eade84cb9a230cc0c53dc00070528cee4c01cd69df2b3c5a57f815cbe0cf1b2fd7b30836aefb9da22c4e81eae20e03e7427  
-----BEGIN PGP SIGNATURE-----  
Original String  
{ "Country": "Spain", "HP": "Cordara, Cameron", "Person": "Caput, Bonifacio", "Cod": "Rupture of cardiac wall without haemopericardium as current complication following acute myocardial infarction", "Person\_ID": "GHE620VFX", "Place\_of\_death": "health\_center", "Person\_dob": "1917-01-19", "Underlying\_conditions": "[[u'Acute myocardial infarction', 4, u'days'], [u'Intracardiac thrombosis, not elsewhere classified', 5, u'months'], [u'Atherosclerotic heart disease', 7, u'years']]", "Type\_of\_death": "natural", "certificate": "9472635", "Country\_subdivision": "Las Palmas", "Date": "2015-01-17 15:00:00", "Autopsy": false, "Observations": "" }

Hashes  
Digest: 648966aaaf2c660089d5ca4c132eade84cb9a230cc0c53dc00070528cee4c0 Altered: ☐

tryton://localhost:8000/health28rc1/model/gnuhealth.death\_certificate/1.views=%5B644%2C+645%5D



Death certificate document as a legal, administrative, epidemiological document

## What is new in upcoming 3.0 ?



# Tryton 3.8 Compatibility



Current Tryton modules	
account	stock_lot
account_invoice	purchase
account_product	account_invoice_stock
calendar	stock_supply
company	
country	
party	
product stock	





**Faster and more efficient medical practice**

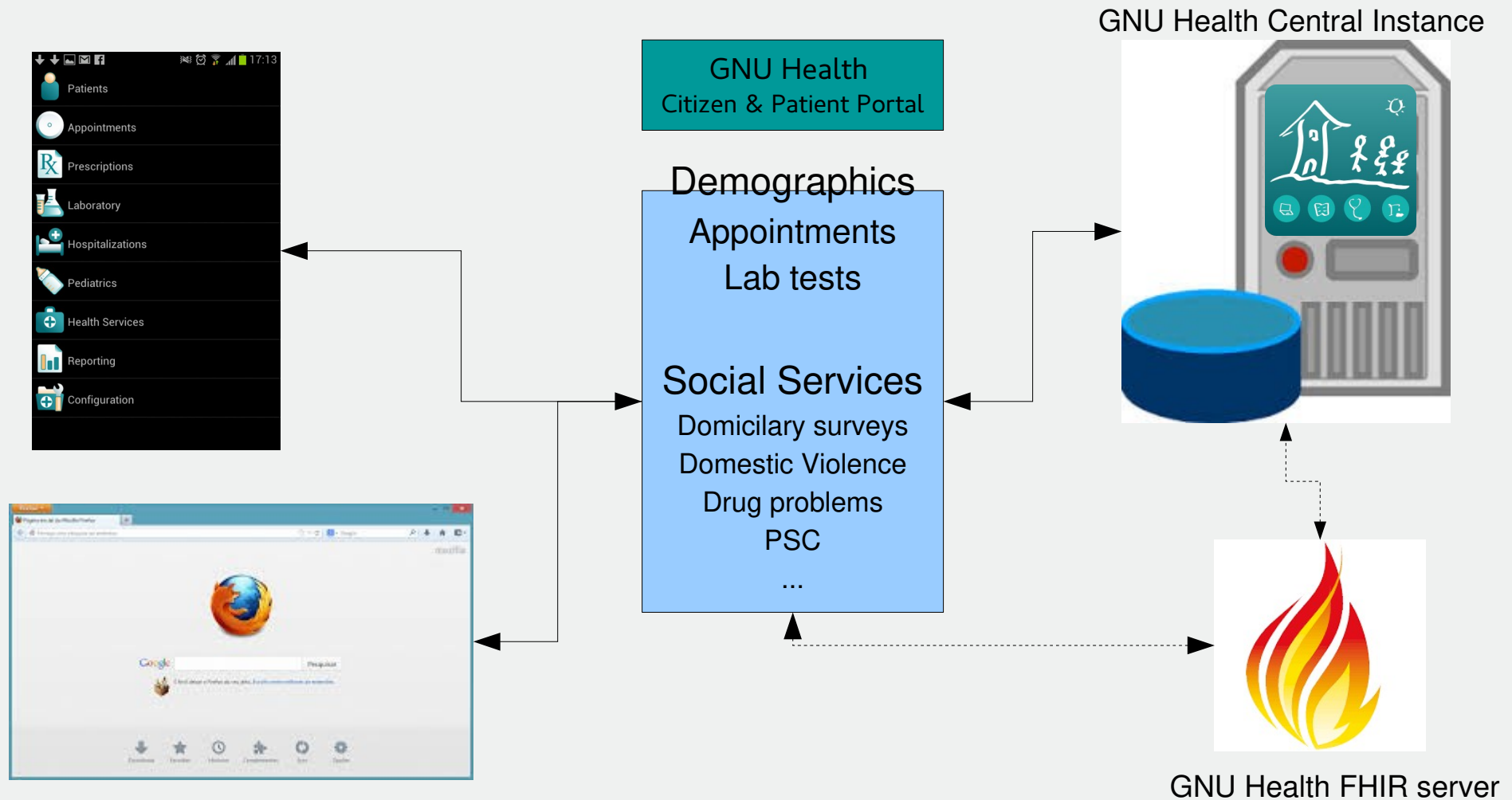
**Networks of health institutions (countries)**

**Data aggregation**

**Synchronization ( Thanks B2CK :- )**



# GNU Health Citizen and Patient Portal (3.0)



# HL7 support - FHIR



# Incorporate HL7 FHIR HumanName

## 1.19.0.12 HumanName

See also [Examples](#), [Detailed Descriptions](#) and [Mappings](#).

A name of a human with text, parts and usage information.

Names may be changed or repudiated. People may have different names in different contexts. Names may be divided into parts of different type that have variable significance depending on context, though the division into parts is not always significant. With personal names, the different parts may or may not be imbued with some implicit meaning; various cultures associate different importance with the name parts and the degree to which systems SHALL care about name parts around the world varies widely.

### Structure










### UML

### XML

### JSON

### All

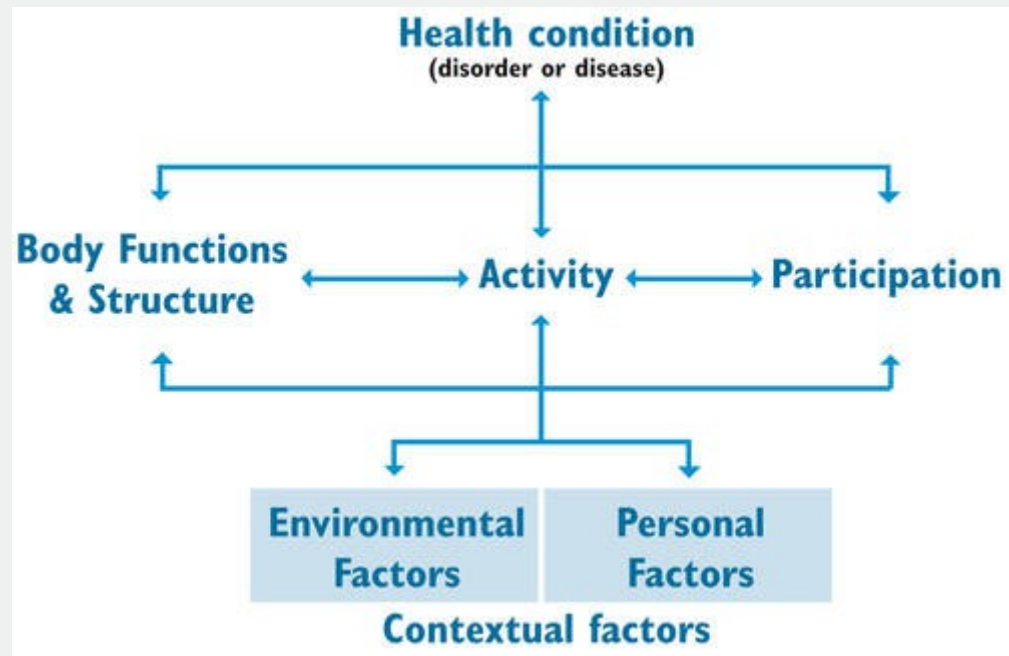
### Structure

Name	Flags	Card.	Type	Description & Constraints 
 HumanName	Σ		Element	Name of a human - parts and usage
 use	?! Σ	0..1	code	usual   official   temp   nickname   anonymous   old   maiden <a href="#">NameUse (Required)</a>
 text	Σ	0..1	string	Text representation of the full name
 family	Σ	0..*	string	Family name (often called 'Surname')
 given	Σ	0..*	string	Given names (not always 'first'). Includes middle names
 prefix	Σ	0..*	string	Parts that come before the name
 suffix	Σ	0..*	string	Parts that come after the name
 period	Σ	0..1	Period	Time period when name was/is in use

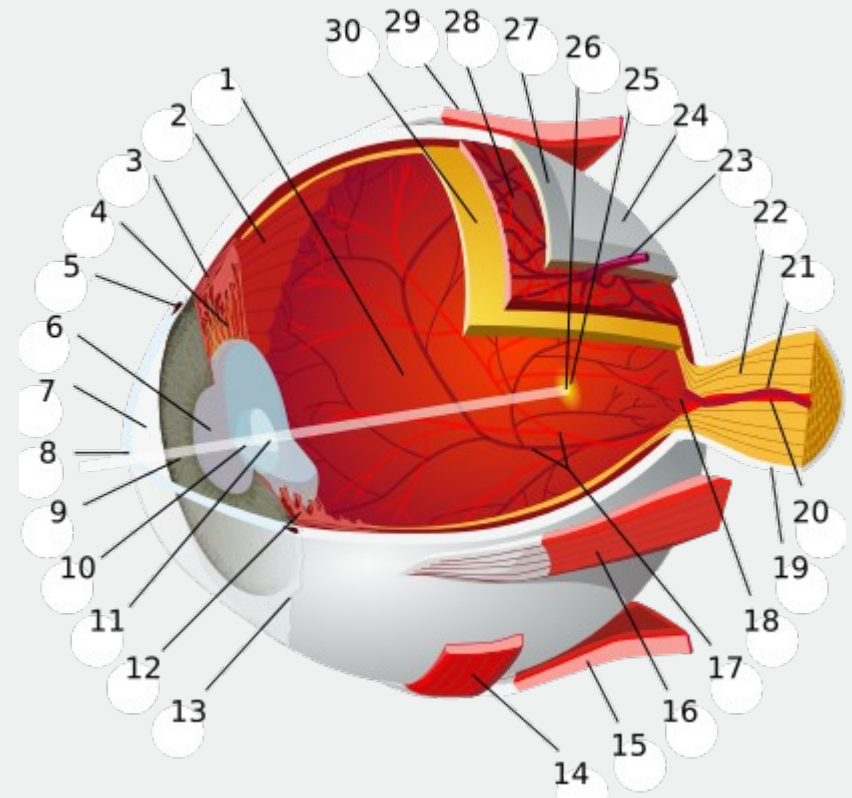




# Functioning and Disability Module



# Ophthalmology Module



# Enhanced Health Services integration

Lab Tests Results

Main Info

ID: TEST001 Test type: COMPLETE BLOOD COUNT

Date of the Analysis: 06/30/2013 23:09:19

Patient: Betz, Ana Pathologist: Hadley, Remy

Date requested: 07/01/2013 02:05:03 Physician: Cordara, Cameron

Lab Test Criteria

Warn	Excluded	Analyte	Value	Result - Text	Lower Limit	Upper Limit	Units	Remarks
<input type="checkbox"/>	<input type="checkbox"/>	Hemoglobin	12.00		11.00	16.00	g/dL	
<input type="checkbox"/>	<input type="checkbox"/>	RBC	4.50		3.50	5.50	10 <sup>6</sup> /uL	
<input type="checkbox"/>	<input type="checkbox"/>	HCT	39.00		37.00	50.00	%	
<input type="checkbox"/>	<input type="checkbox"/>	MCV	83.00		82.00	95.00	fL	
<input type="checkbox"/>	<input type="checkbox"/>	MCH	28.00		27.00	31.00	pg	
<input type="checkbox"/>	<input type="checkbox"/>	MCHC	33.00		32.00	36.00	g/dL	
<input type="checkbox"/>	<input type="checkbox"/>	RDW-CV	13.00		11.50	14.50	%	
<input type="checkbox"/>	<input type="checkbox"/>	RDW-SD	40.00		35.00	56.00	fL	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	WBC	13.00		4.50	11.00	10 <sup>3</sup> /uL	Patient with bacterial pneumonia
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	NEUT	75.00		40.00	70.00	%	
<input type="checkbox"/>	<input type="checkbox"/>	LYMP	22.00		20.00	45.00	%	
<input type="checkbox"/>	<input type="checkbox"/>	MON	5.00		2.00	10.00	%	
<input type="checkbox"/>	<input type="checkbox"/>	EOS	3.00		1.00	6.00	%	
<input type="checkbox"/>	<input type="checkbox"/>	PLT	0.00		0.00	2.00	10 <sup>3</sup> /uL	

Administrator - GNU SOLIDARIO HOSPITAL [Euro] Waiting requests: 0 received - 0 sent admin@localhost:8000/health20r1

Service templates

Automatic addition from different health sectors to service model

Patient Evaluation integration



# Incorporate visual aids in tree views

Tryton - Administrator - GNU SOLIDARIO HTAL [Euro]

File User Options Favorites Help

Search

- Party
- Product
- Financial
- Currency
- Health
  - Patients
  - Appointments
  - Prescriptions
  - Institutions
  - Health Professionals
  - Demographics
  - Reporting
  - Configuration
    - Diseases
    - Procedures
    - Institutions
    - Medicaments
      - Medicaments
      - Medication Frequencie
      - Drug Dose Units
      - Drug Administration R
      - Drug Forms
      - Medicament categorie
    - Immunization Schedule

Medicaments ... Modules

**Medicaments** 259 / 445

Filters Search

Product	Active component	Vaccine	Category	Pregnancy We	Pregnancy Categor	Adverse Reactions
meningococcal meni	meningococcal meni	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	C	
mercaptopurine	mercaptopurine	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	D	
mesna	mesna	<input type="checkbox"/>	Medicaments / WHO essential	<input type="checkbox"/>	B	
metformin	metformin	<input type="checkbox"/>	Medicaments / WHO essential	<input type="checkbox"/>	B	
metformin	metformin	<input type="checkbox"/>	Medicaments / WHO essential	<input type="checkbox"/>	B	
methadone	methadone	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	D	
methotrexate	methotrexate	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	X	
methotrexate	methotrexate	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	X	
methyldopa	methyldopa	<input type="checkbox"/>	Medicaments / WHO essential	<input type="checkbox"/>	B	
methylprednisolone	methylprednisolone	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	C	
methylthioninium chl	methylthioninium chl	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	C	
metoclopramide	metoclopramide	<input type="checkbox"/>	Medicaments / WHO essential	<input type="checkbox"/>	B	
metronidazole	metronidazole	<input type="checkbox"/>	Medicaments / WHO essential	<input type="checkbox"/>	B	
metronidazole	metronidazole	<input type="checkbox"/>	Medicaments / WHO essential	<input type="checkbox"/>	B	
miconazole	miconazole	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	C	
midazolam	midazolam	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	D	
midazolam	midazolam	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	D	
mifepristone - misop	mifepristone - misop	<input type="checkbox"/>	Medicaments / WHO essential	<input checked="" type="checkbox"/>	X	

tryton://localhost:8000/tryton38/model/gnuhealth.medicament;context=%7B%22date\_format%22%3A+%22%25m%2F%25d%2F%25Y%22%7D





# Optimize daily practice

**Optimize encoding and management of appointments and evaluations**

Confirmed	Checked in	Free	No Shows	All								
Checked in	11/11/2015	12:44:38	BETZ, ANA	No show	Confirmed							
	11/12/2015	09:23:52	BETZ, ANA	No show	Confirmed	New health condition	Ambulatory	Urgent	Cardiology	Cordara, Cami		
	11/11/2015	12:44:39	BETZ, ANA		Done		Ambulatory	Normal		Cordara, Cami		
	11/11/2015	03:03:18	BETZ, ANA		Checked in		Ambulatory	Normal		Cordara, Cami		
	11/11/2015	03:00:03	BETZ, ANA		Done	Followup	Ambulatory	Normal		Cordara, Cami		
	11/11/2015	02:58:12	BETZ, ANA		Done	Followup	Ambulatory	Normal		Cordara, Cami		
	11/09/2015	19:14:05	BETZ, ANA		Done	Followup	Ambulatory	Normal		Cordara, Cami		
	11/09/2015	19:07:57	BETZ, ANA		Done	New health condition	Ambulatory	Normal	Gynecology	Cordara, Cami		
	11/07/2015	20:16:33	BETZ, ANA		Checked in		Ambulatory	Normal		Cordara, Cami		
	10/31/2015	21:38:48	BETZ, ANA		No show		Ambulatory	Normal		Cordara, Cami		
	10/31/2015	21:38:41	BETZ, ANA		Done	Followup	Ambulatory	Normal		Cordara, Cami		
	10/31/2015	17:44:15	BETZ, ANA		Done		Ambulatory	Normal		Cordara, Cami		
	10/31/2015	17:43:59	BETZ, ANA		Checked in	Followup	Ambulatory	Normal		Cordara, Cami		
	10/31/2015	17:42:10	BETZ, ANA		No show	Followup	Ambulatory	Normal	Gynecology	Cordara, Cami		
	10/29/2015	12:17:40	BETZ, ANA		Done		Ambulatory	Normal		Cordara, Cami		

**Prescriptions**

Patient and Health Professional Information

Patient: BETZ, ANA Prescription ID: PRES 2015/000063

Prescription Date: 11/11/2015 02:44:33 Prescribed by: Cordara, Cameron

Pharmacy: Pregnancy Warning: Prescription verified: ☒

Prescription line

Units	Valid Un	Medicament	Indication	Dose	dose unit	Form	Frec	Trea	Treatme	Comment	Hi
1		SALBUTAMOL Susp. para inhal. envase a presión 100 mcg/dosis	Asthma	100.0	ug	Aerosol metered-d		days			

**Auto-fill default prescription details from the medicament**

Allow including the medication on the list of the patient relevant meds



# New procedures (ICD-9 v3)

Tryton - Administrator - GNU SOLIDARIO HOSPITAL [Euro]

File User Options Favorites Help

Search

- Patients
- Appointments
- Prescriptions
- Health Professionals
- Institutions
- Laboratory
- Demographics
- Health Services
- Reporting
- Configuration
- Conditions
- Functioning and Disability
- Procedures
- Institutions
- Laboratory
- Medicaments
- Immunization Schedule
- Misc
- Administration
- User Interface
- Models
- Sequences
- Scheduler
- Localization
- Modules
- Users

Procedures

15 / 1000 of 3882

Filters Search

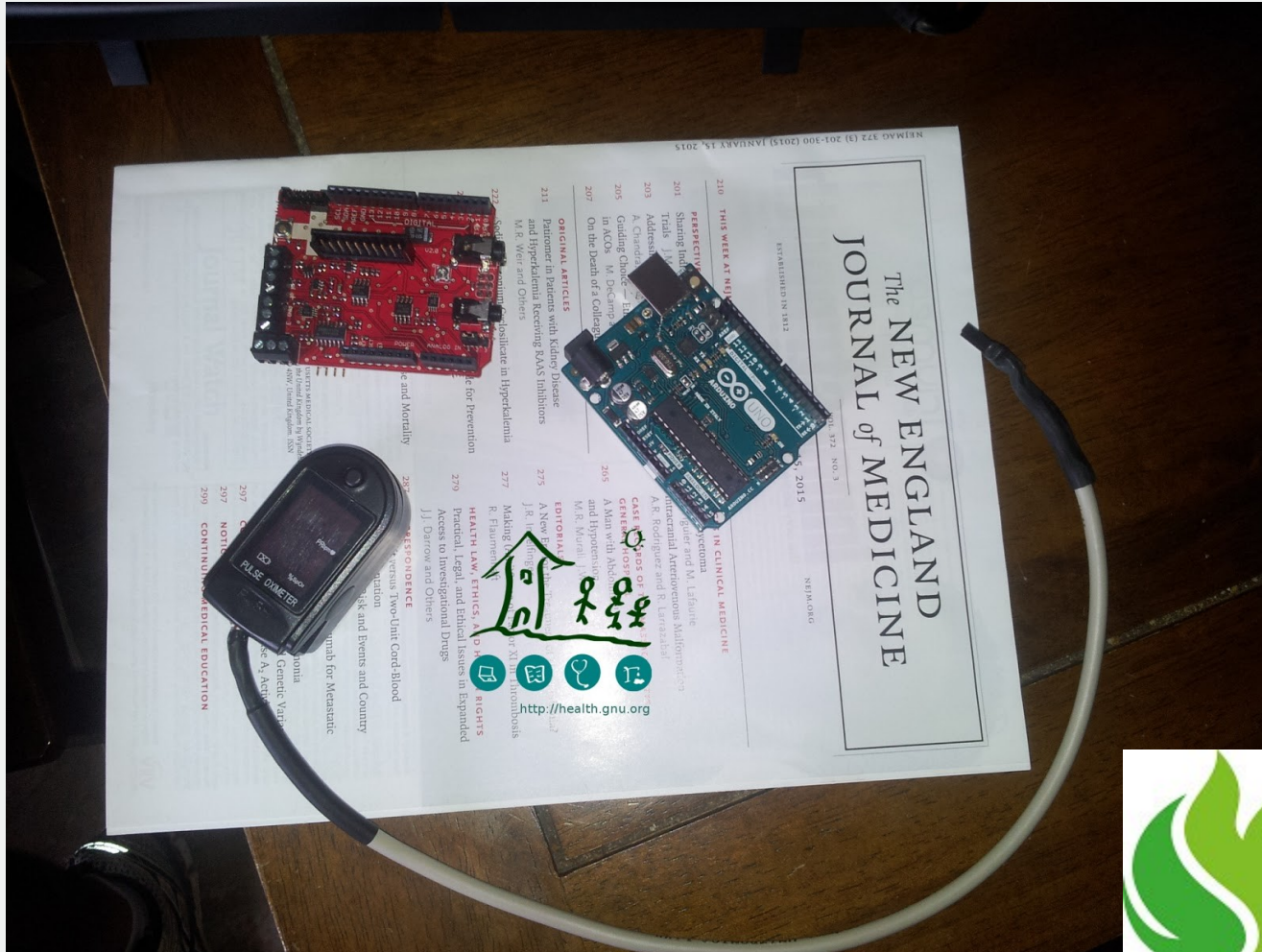
Code	Long Text
00.01	Therapeutic ultrasound of vessels of head and neck
00.02	Therapeutic ultrasound of heart
00.03	Therapeutic ultrasound of peripheral vascular vessels
00.09	Other therapeutic ultrasound
00.10	Implantation of chemotherapeutic agent
00.11	Infusion of drotrecogin alfa (activated)
00.12	Administration of inhaled nitric oxide
00.13	Injection or infusion of nesiritide
00.14	Injection or infusion of oxazolidinone class of antibiotics
00.15	High-dose infusion interleukin-2 [IL-2]
00.16	Pressurized treatment of venous bypass graft [conduit] with pharmaceutical substance
00.17	Infusion of vasopressor agent
00.18	Infusion of immunosuppressive antibody therapy
00.19	Disruption of blood brain barrier via infusion [BBBD]
00.21	Intravascular imaging of extracranial cerebral vessels
00.22	Intravascular imaging of intrathoracic vessels
00.23	Intravascular imaging of peripheral vessels
00.24	Intravascular imaging of coronary vessels
00.25	Intravascular imaging of renal vessels
00.28	Intravascular imaging, other specified vessel(s)
00.29	Intravascular imaging, unspecified vessel(s)
00.31	Computer assisted surgery with CT/CTA

tryton://localhost:8000/health29/model/gnuhealth.procedure;context=%7B%22date\_format%22%3A+%22%25m%2F%25d%2F%25Y%22%7D&views=%5B214%2C+213%5D

Current Procedures codes : ICPM, ICD10-PCS, ICD9 v3



# Free Hardware



Arduino integration



SHUTTLEWORTH  
FUNDED



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November 2015

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# Summary of Improvements on current modules

**Surgery** : Surgery teams, Operating Room reservation and management, surgery progress, length,

**Core** : Move ECG to core from ICU; include demographics on patient evaluation view; appointment, prescription and evaluation improvements

**Hospitalization / Inpatient** : Meal order management, special needs, bed cleaning



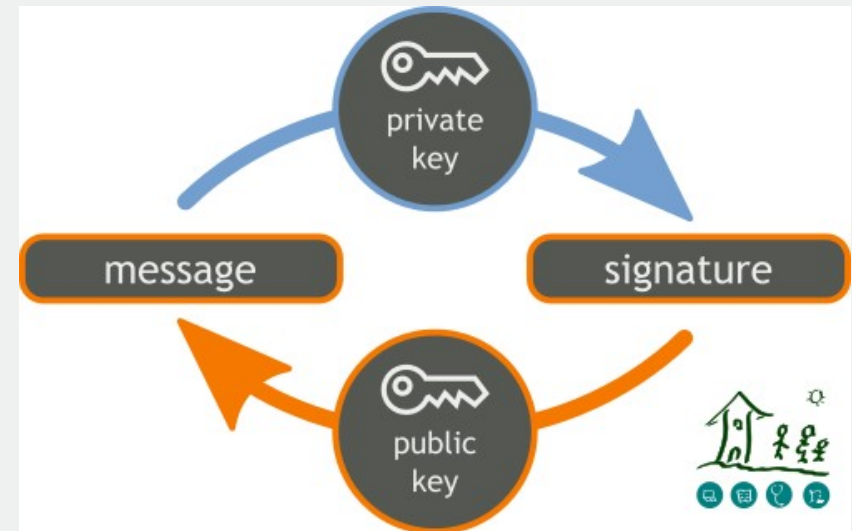
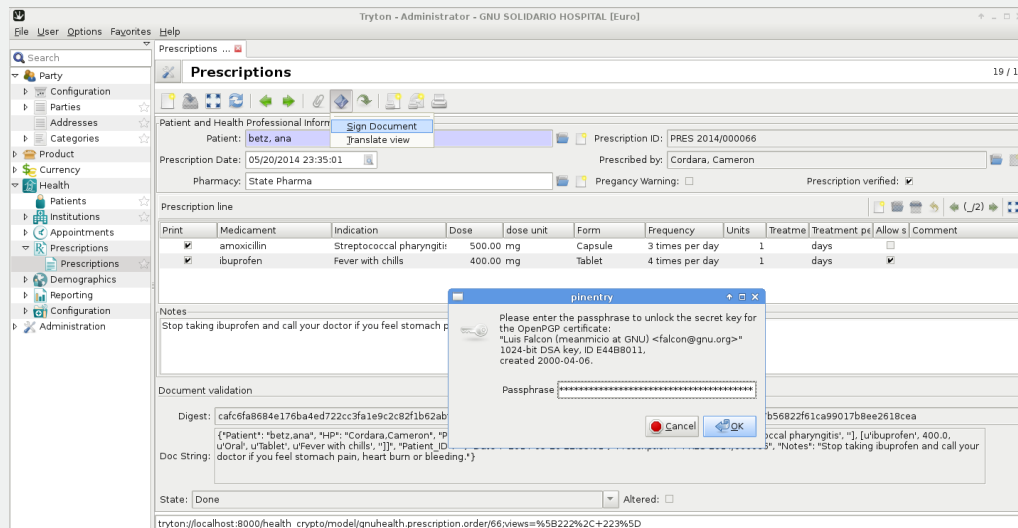
# Additional models in Health Crypto

Digitally sign documents and medical acts

GNU Privacy Guard (GNUPG) Integration

Authenticity, accountability & non-repudiation

Document validation



Prescriptions

Evaluations

Birth and death certificates

...





# ./gnuhealth-update

Update manager

Critical Patches

Large  
installations

Can be run non-  
interactively

```
Terminal
File Edit View Terminal Tabs Help
usage: gnuhealth-update command [options]

Command:

    version : Show version
    backup  : Backup the gnuhealth kernel, attach dir and database
    install : Download and install the patches

Options:

    --nobackup : Don't do a backup previous to the update.
    --backupdest : destination of the backup file
    --dry-run : Check, download and preview, but don't actually update process
    --database : database name to use with the install or backup command

lfm@beastie:~/health/tryton $
```



# ./serverpass

```
usage: serverpass.py [-h] [-c CONFIG]

optional arguments:
  -h, --help            show this help message and exit
  -c CONFIG, --config CONFIG
                        Specify alternative Tryton configuration file
```

Harden security at installation level (**cracklib**)

Integrated in the installation script gnuhealth-  
install.sh

Can be used as a stand-alone process



# Pootle as the Translation Platform



# 1-Year Release Cycle



# Community





# Role of the Academia



United Nations University, Kuala Lumpur, Malaysia

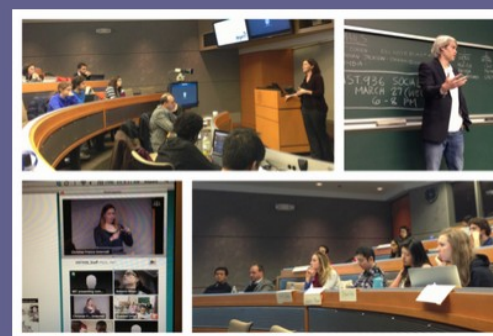


University of Entre Rios, Argentina

## HST.936: Global Health Informatics to Improve Quality of Care

The 2015 iteration of our course will focus on Public Health Emergencies and Humanitarian Crises.

**Classes begin: February 6, 2015**  
Fridays 9am – 11am ET (GMT -5)  
Room: **09-057**



Harvard-MIT, Boston, United States



TUBA 2015 : Tryton Unconference – Buenos Aires  
November 2015

# GNU Health & WHO



MDG6 : Malaria, TB, HIV

Essential list of medicines

Neglected Tropical Diseases

ICD-10

ICPM

MDG4 : Reduce Child mortality

Immunization schedules

Pediatric growth charts



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# GNU Health at the Government of Jamaica



Unique ID for each individual across the country

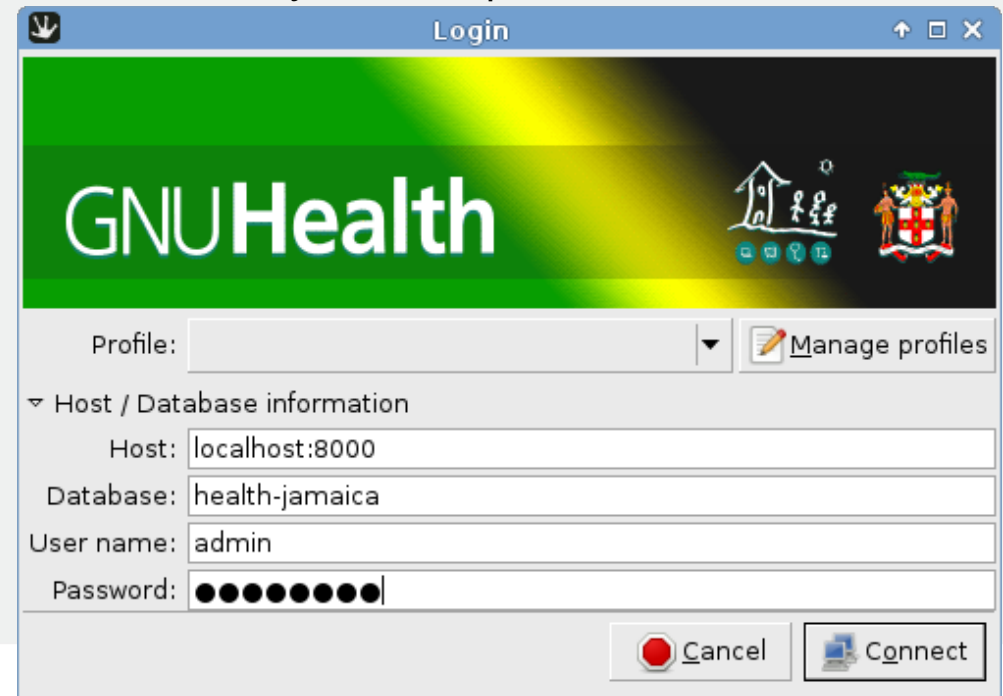
Data aggregation at MoH

GNU/Linux on both workstations and servers

Started as a joint project between Government of Jamaica Ministry of Health and GNU Solidario

Local team

Sustainability and independence



GNU Health Synchro engine, ICPM and ISS modules were born in Jamaica !

# 350+ "GNU" Health facilities nation-wide





# GNU Health at Laos Public Health System





# Philippines – Navotas City





# South Africa : Visit to Nelson Mandela Children Hospital





# GNU Health in Mexico Morelos Public Health



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# Thank you !

**<http://health.gnu.org>**

**IRC** : #gnu-health

**Twitter** : @gnuhealth

