Università degli Studi di Trieste

Corso di Laurea Magistrale in
INGEGNERIA CLINICA

THE e-PRESCRIBING PROCESS

Corso di Informatica Medica

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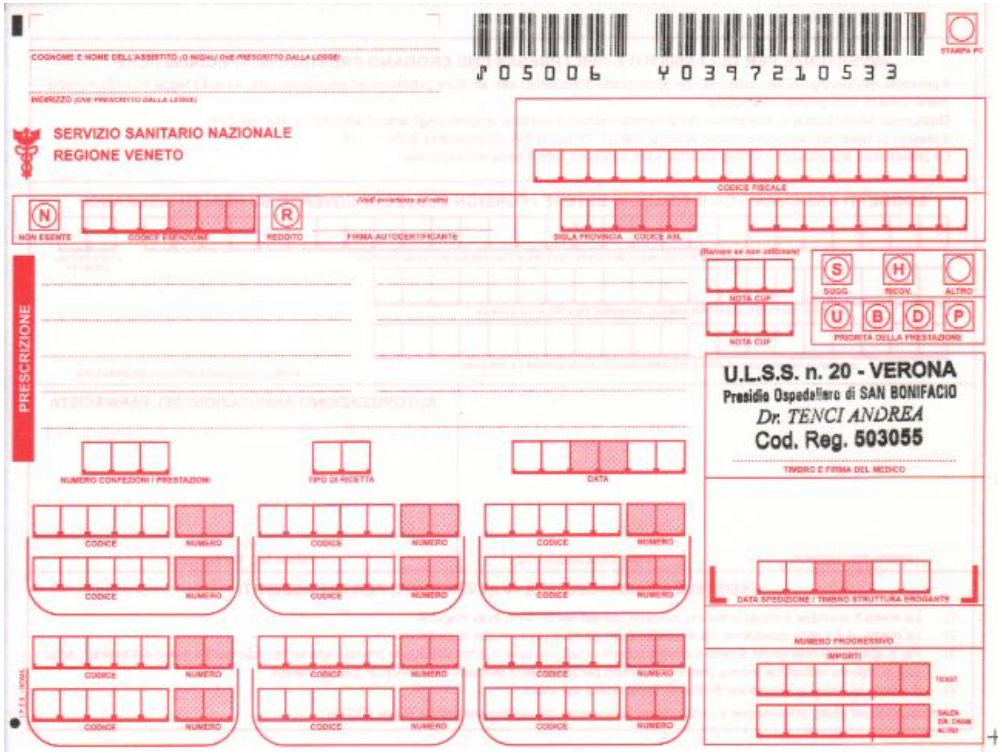
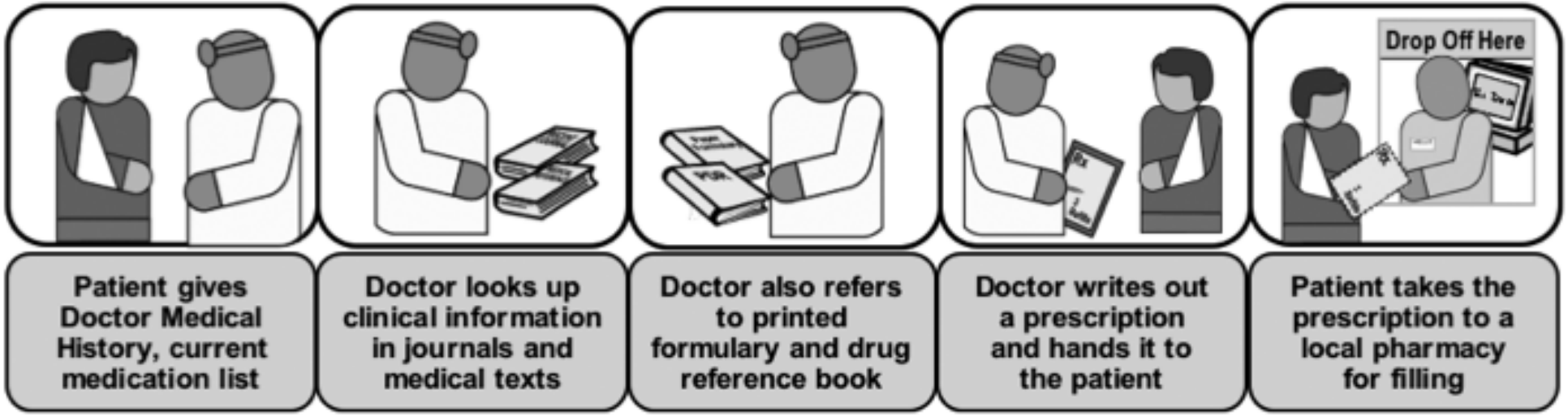
WHAT IS e-PRESCRIBING?



THE USUAL PRESCRIBING PROCESS

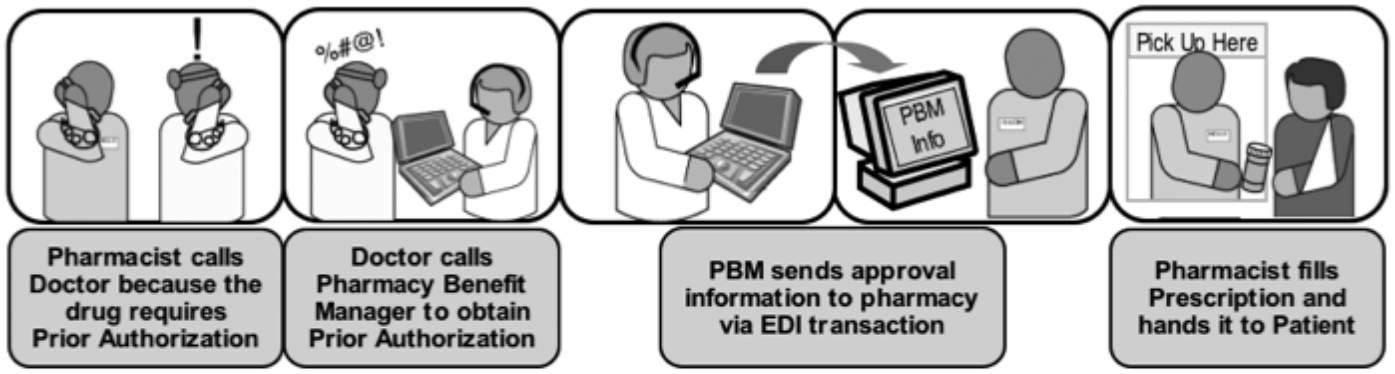
How most people think of the prescribing process

…BUT THERE ARE OTHER ACTIONS…



The "prescribing" phase (assignement of the prescribed drug) is also part of the process

THE US CASE: PRESCRIBING AND REFILL



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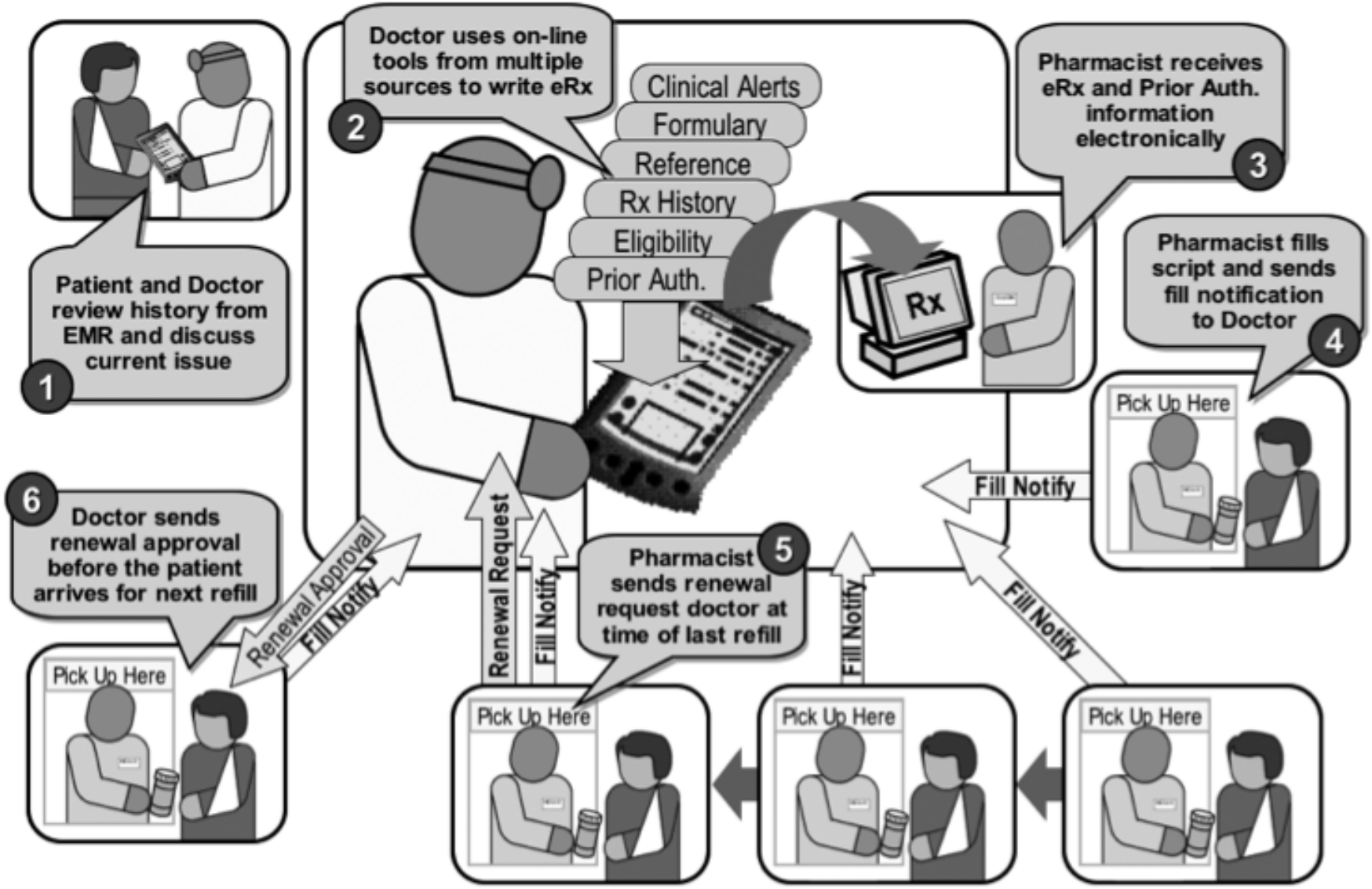
A MORE COMPLEX e-PRESCRIBING PROCESS



e-PRESCRIBING RATIONALE – US

- In the US the healthcare system is based on insurances

- In the US the 1.5-4% of prescriptions contain errors
- Adverse Drug Events (ADEs) occur in the 5 to 18% cases due to:
  - Difficulty in reading the prescription
  - Drugs with similar names
  - Uncorrect dosage
  - Drug-drug interactions
  - Allergies unchecked
- The refill process costs 900 mln calls between the GP and the pharmacy

e-PRESCRIBING RATIONALE - Europe

- In Europe the majority of the healthcare systems are National and based on universal public insurances sustained by taxations

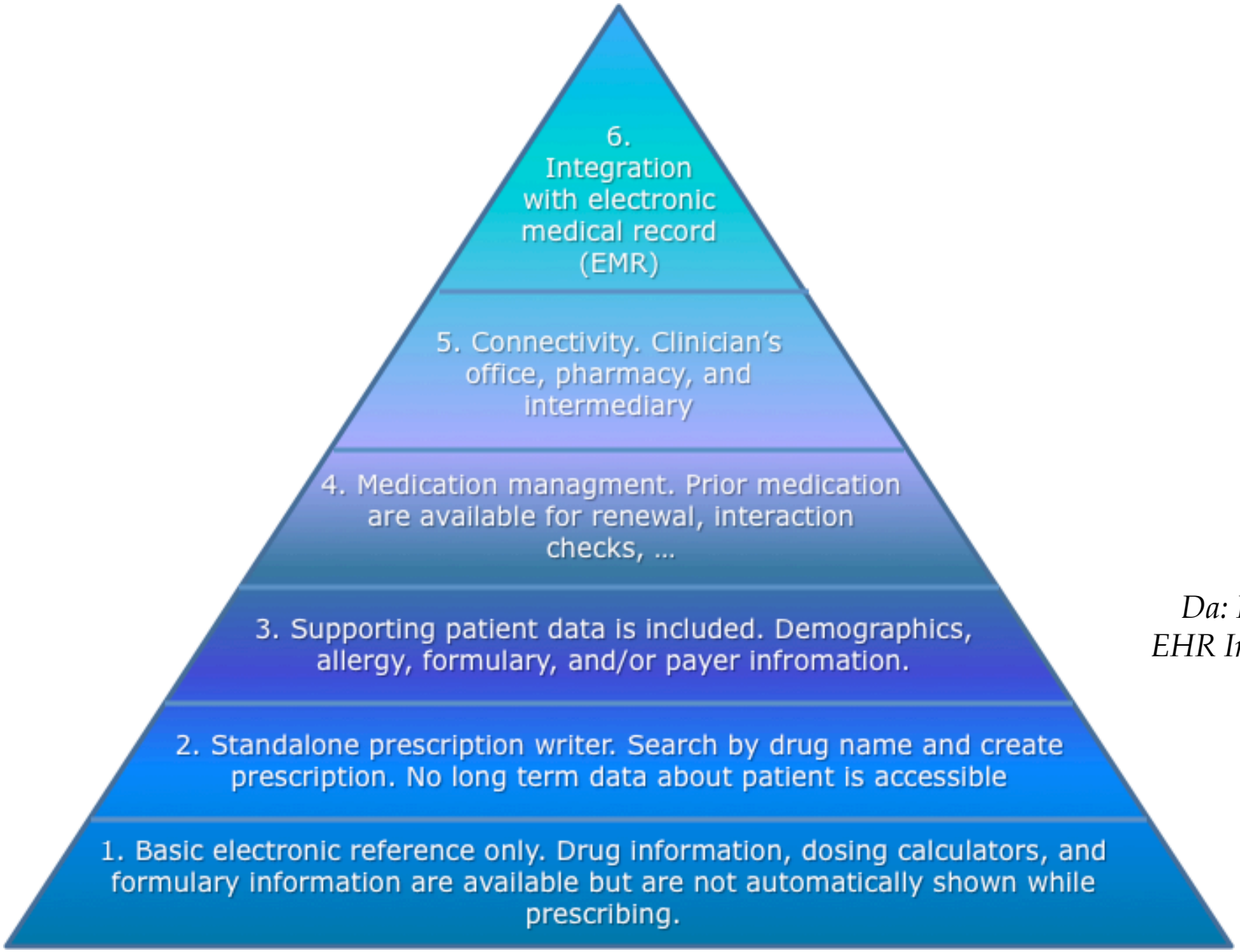
- There is a recurrent aim of reducing drug-related expenses
- The Regional expenses must be kept under control
- There is need of fraud preventions

- The control of ADEs and drug-drug interactions is important as well

DEFINITIONS

DEFINITION	AUTHOR	SOURCE
A prescriber's ability to electronically send an accurate, error-free and understandable prescription directly to a pharmacy from the point-of-care prescriber's ability	US department for Health and Human Services, Centers for Medicare and Medicaid Services (CMS)	Available at: https://www.cms.gov/EPrescribing/ retrieved 22nd July 2010
A solution that eliminates hand-written prescriptions from the health care services provided by physicians, other prescribers, and pharmacists. It has to be seen as a combination of three other separate services- Decision Support, Electronic Transmission of Prescriptions and Electronic Medical Records.	Ayapradha Edavalath, Research Analyst, Frost & Sullivan	"E-PRESCRIPTION: IMPENDING ACCEPTANCE IN EUROPE" Published on 1st April 2009 Available at: http://www.frost.com/prod/servlet/market-insight-top.pag?docid=163558282
Computer-based support for the creation, transmission, dispensing, and monitoring of pharmacological therapies	Miller RA and colleagues	[10]
The use of electronic tools to prescribe drug prescriptions.	HIMMS - Healthcare Information and Management Systems Society	Available at: http://www.himss.org/ASP/topics_eprescribing.asp retrieved 22nd July 2010
An electronic way to generate prescriptions through an automated data-entry process utilizing e-prescribing software and a transmission network which links to	**Ursula Pennell, EMRConsultant**	"What is E-prescribing and What are the benefits?"

DEFINITIONS



Da: Rapporto EHR Impact 2009

MILESTONES: USA

- 1950 → telephone-based prescriptions
- 1991 → First CPOE (Computerized Physician Order Entry) at the Beth Israel Medical Center (Boston)
- 1995 → ANSI (Am National Standard Institute) starts working on SCRIPT, an e-prescribing standard
- 1997 → first e-prescribing patent
- 1990-2000→ unsuccesful development of e-prescribing systems (low conncetivity)
- 2001→ two companies (SureScript e RxHub) one providing connectivity and the other providing software
- 2003 → Medicare Modernization Act (Part D) → voluntary adoption of e-prescibing system recommended
- 2005 → SCRIPT 5.0
- 2008 → Final Rule on standards to be adopted (SCRIPT 8.1 e altri)

  → SureScript and RxHub fused in one company

MILESTONES: EUROPE

- 1998 → UK declares e-prescribing as a priority and to be adopted before entro il 2005
- 2004 → Action Plan for a European e-Health area
  - End 2006 → patient identofication in the whole EU + interoperability standards
  - End 2008 → the majority of EU Countries should provide teleconsultation, e-prescription, …
- 2007 → EU Commission states e-Health as priority
- STANDARD → EHR communication CE EN 13606 (da-1 a-5)
- Dicembre 2009 → EHR Impact report
- At present → Denmark, Netherland, Sweden, UK, Italy (Lombardia), Spain (Cataluna)

SYSTEMS' HETEROGENEITY AND MODELLING SCOPES

- 1- **REPRESENTATION of the impact of single systems.** The impact of ePrescribing systems depends on the functions and the processes implemented. For instance, a territorial-based ePrescribing system aims to serve an entire population while a stand-alone ePrescribing system aims to facilitate the general practitioner's (GP) daily practice. A comprehensive analysis should be able to represent this heterogeneity.
- 2- **COMPARISON between different systems.** It is often necessary to establish whether an ePrescribing system better fits specific needs, in a given healthcare setting with specific constraints, in order to choose the most appropriate solution.
- 3- **PORTABILITY of a system to another setting.** An ePrescribing system introducing positive benefits in a specific healthcare setting may be effective also in other settings. To this end, the model underlying the ePrescribing system design should be robust and able to be adapted to the constraints of the new healthcare setting.

EXPECTATIONS FROM e-PRESCRIBING ADOPTION

Quality of care dimension	Access to care dimension	Efficiency of care dimension
• Improved awareness of citizens about their health (better-informed citizens). • Timeliness of care delivery. • Patient's safety that includes, for example, the reduced risk of adverse events. • Streamlined care that ensures a direct approach to care. • Modernized care that include engaged patients in care pathways.	• Improved equity of access to healthcare for all those in need, who have the same right to receive adequate care. • Access to healthcare delivery for citizens who previously had no access.	• Improvement of productivity. • Limitation of resource waste. • Improved allocation of resources. • Improved use of resources.

THE OVERALL e-PRESCRIBING PROCESS

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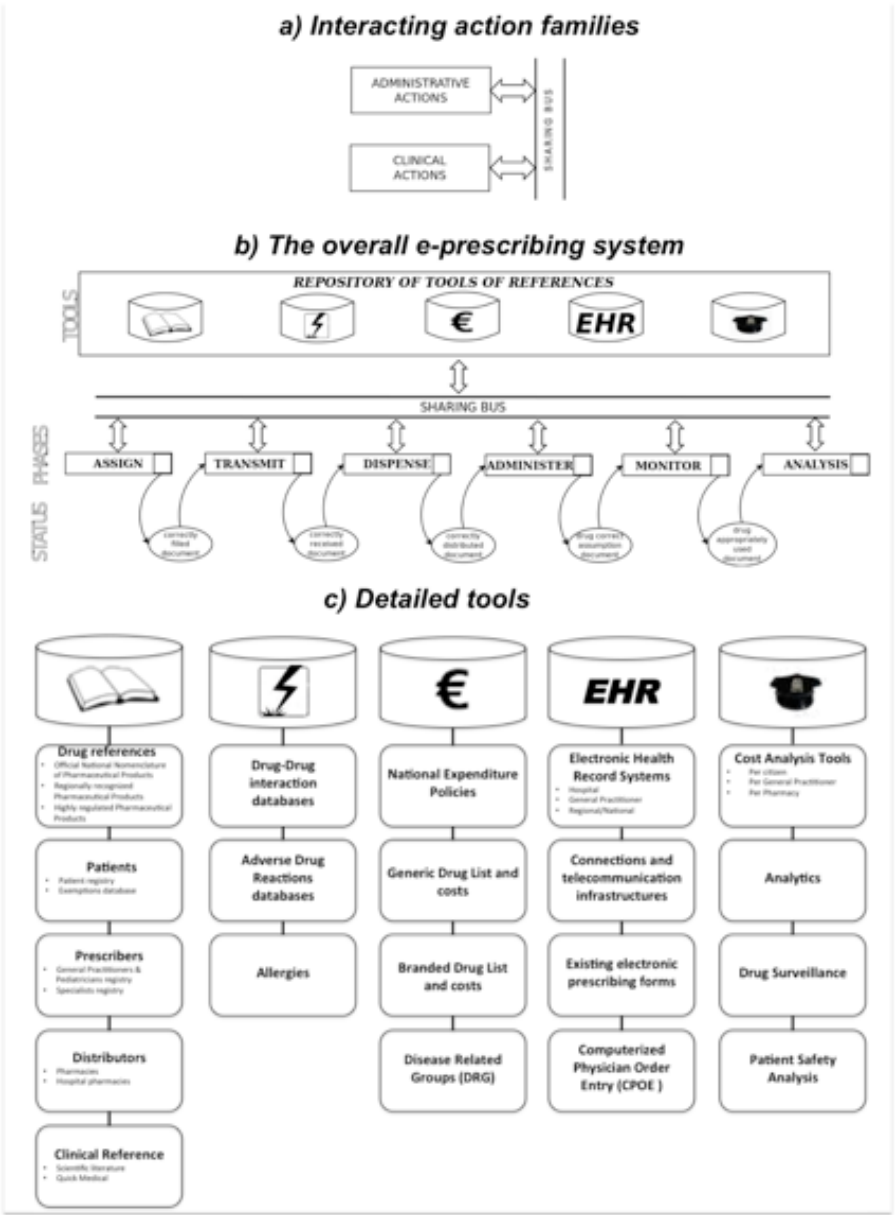
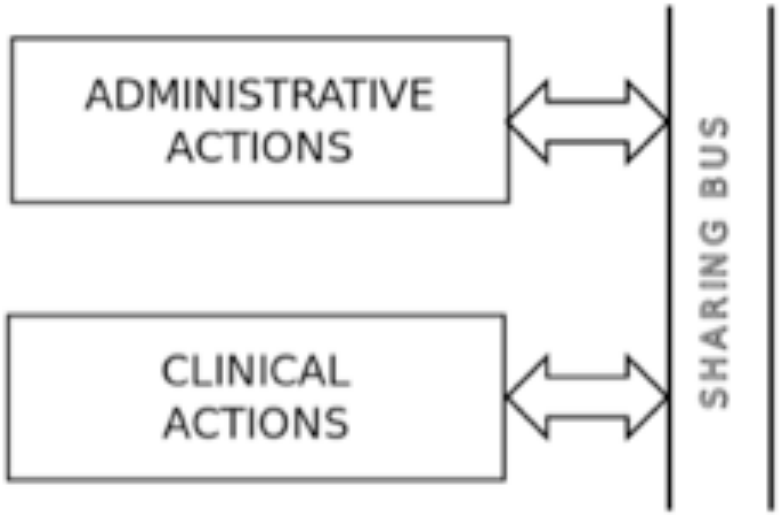


INTERACTING ACTION FAMILIES

a) Interacting action families



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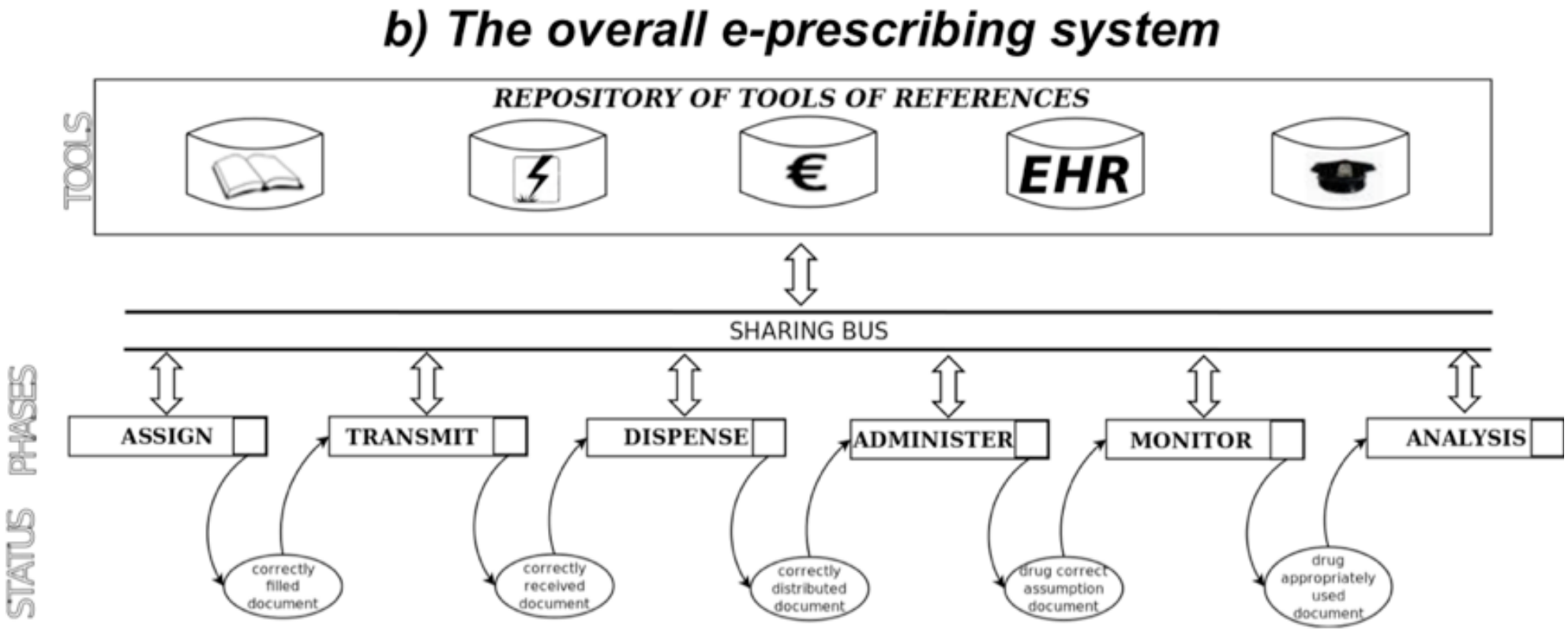
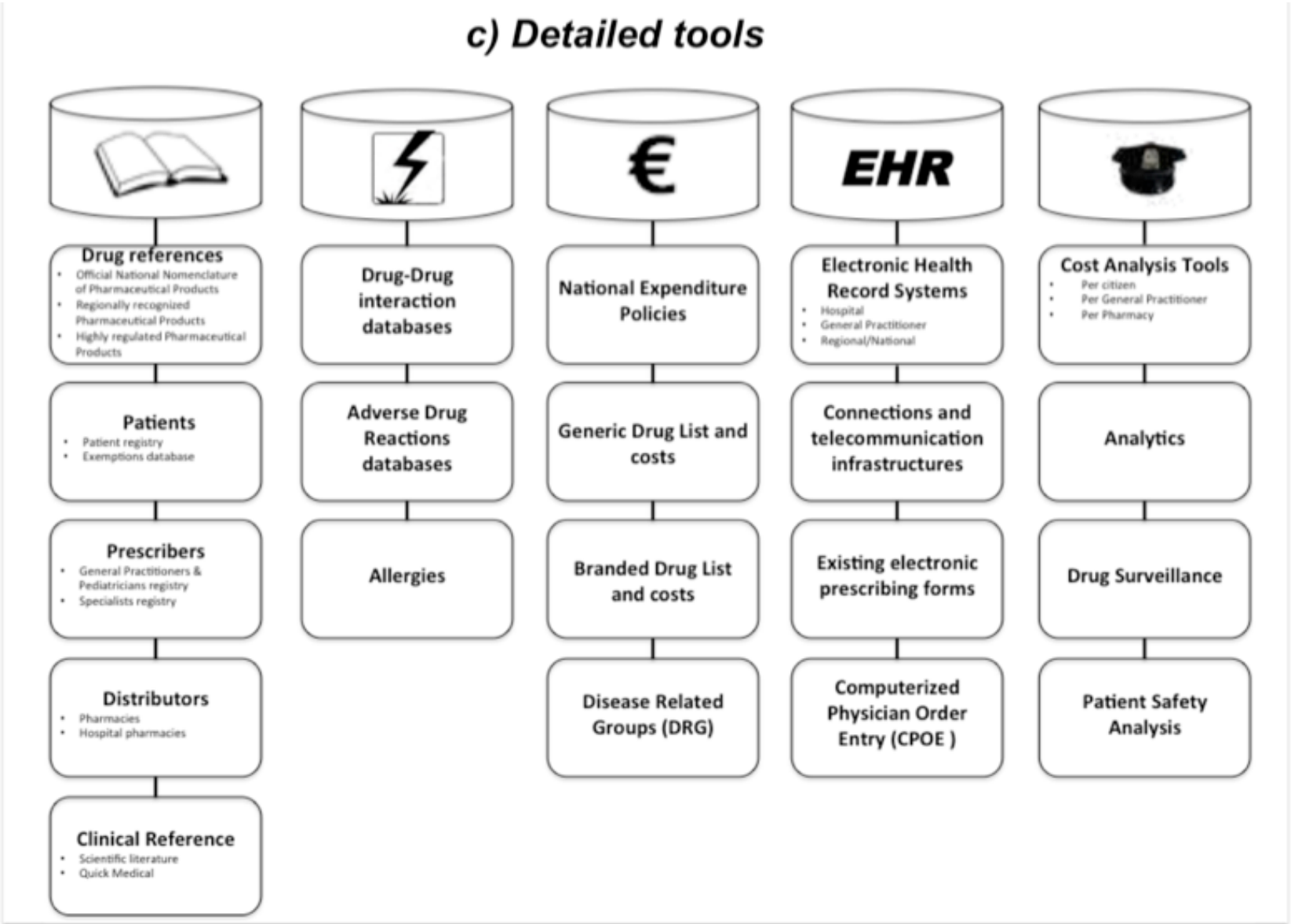
THE OVERALL PROCESS



TOOLS NEEDED



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THE OUTPUT DOCUMENTS (1)

	CORRECTLY FILLED DRUG ASSIGNEMENT DOCUMENT	CORRECTLY RECEIVED DRUG ASSIGNEMENT DOCUMENT	CORRECT DRUG DISTRIBUTION DOCUMENT	CORRECT DRUG ASSUMPTION DOCUMENT	REPORTS ON DRUG APPROPRIATNESS	STATISTICS AND DECISIONS
PATIENT ID & RIGHTS	X	X	X	X	X	
Citizens ID	x		x			
Citizen enrollment as potential patient (example: SS Number)	x		x			
Patient exemptions rights	x		x			
CLINICAL MOTIVATIONS FOR THE DRUG ASSIGNEMENT	X	X	X	X	X	
Diagnosis	x	x	x	x	x	
DRUG ASSIGNEMENT	X	X	X	X	X	
Drug ID: nome, forma farmaceutica, e quanto di pertinenza per la prescrizione	x	x	x	x	x	
Posologia e dintorni	x			x	x	
SPC/CMI	x			x		
ADEs list from SPC/CMI	x				x	
Quantity (number of packages)	x		x			
PRESCRIBER IDENTIFICATION	X	X	X			
GP id	x		x			
VALIDATION: GENERATION	X	X	X			
Signature	x					

THE OUTPUT DOCUMENTS (2)

	CORRECTLY FILLED DRUG ASSIGNEMENT DOCUMENT	CORRECTLY RECEIVED DRUG ASSIGNEMENT DOCUMENT	CORRECT DRUG DISTRIBUTION DOCUMENT	CORRECT DRUG ASSUMPTION DOCUMENT	REPORTS ON DRUG APPROPRIATNESS	STATISTICS AND DECISIONS
Prescription generation timestamp	x					
ELECTRONIC TRASMISSION		X				
Even/Odd parity bits		x				
Securely stored on the central repository		x				
Reception timestamp		x				
VALIDATION: TRANSMISSION		X				
Transmission System Signature		x				
Prescription generation timestamp		x				
DRUG STORE / PHARMACY RECORD			X	X	X	
Drug / Pharmacy Store ID			x			
Pharmacist ID			x			
DRUG PACKAGING DATA			X	X	X	
Batch/lot numbers			x		x	
Discard Dates (à Best before dates)			x	x	x	
Number of repetition left			x			
VALIDATION: DISPENSED			X		X	
Pharmacist Signature			x		x	
Prescription dispensation timestamp			x		x	
DRUG SCHEDULING	X			X	X	
Administration Timestamp				x	x	
Taken	x			x	x	
Assigned schedule	X					
PATIENT DIARY				X	X	
Event Timestamp				x		

THE OUTPUT DOCUMENTS (3)

	CORRECTLY FILLED DRUG ASSIGNEMENT DOCUMENT	CORRECTLY RECEIVED DRUG ASSIGNEMENT DOCUMENT	CORRECT DRUG DISTRIBUTION DOCUMENT	CORRECT DRUG ASSUMPTION DOCUMENT	REPORTS ON DRUG APPROPRIATNESS	STATISTICS AND DECISIONS
Reference Administration Timestamp				x		
personal reactions (potential ADEs)				x	x	
Storing Signature				x	x	
REPORTS					X	X
Parameters array					x	x
Notes					x	x
Evaluation Scales					x	x
AGGREGATED DATA						X
Risk assessment						x
Drug surveillance						x
New laws and recommendations						x
Guidelines on drug usage						x

ACTION VERIFICATION AT THE END OF EACH PROCESS PHASE

	TYPE	DRUG ASSIGNEMENT PHASE	TRANSMISSION PHASE	DRUG DISTRIBUTION PHASE	DRUG ASSUMPTION PHASE	REPORTS PHASE ON DRUG APPROPRIATEDNESS
VALID PATIENT (PATIENT VALIDATION)	A	X		X	X	
VALID EXEMPTIONS RIGHTS	A	X		X		X
FILLED OUT DIAGNOSIS	A/C	X				X
VALID DRUG	A	X		X		X
DRUG-DRUG INTERACTION CHECK	C	X			X	
COHERENCE BETWEEN SPC AND DIAGNOSIS	C	X				X
CHECK OF AVAILABLE QUANTITY	A			X		
VALID GP ID	A	X	X	X		X
COMPLETELY FILLED OUT PRESCRIPTION	A/C	X	X			
CORRECTEDLY STORED PRESCRIPTION AFTER TRANSMISSION	A		X			
EXISTING PHARMACY CODE	A			X		
EXISTING PHARMACIST CODE	A			X		
CHECK PHARMACY-PHARMACIST ASSOCIATION	A			X		X
VALID FORMAT PACKAGE DRUG NUMBER	A			X		
EXISTING PACKAGE DRUG NUMBER	A			X	X	X
COHERENCE BETWEEN EXPIRATION DATE AND DISTRIBUTION DATE	A/C			X		
COHERENCE BETWEEN EXPIRATION DATE AND ASSUMPTION DATE	C			X	X	
DRUG ADMINISTERED ON TIME	A/C				X	X
DIARY EVENT CORRECTLY ASSOCIATED TO A PRESCRIPTION	A/C				X	X
CHECK PERSONAL REACTIONS AGAINST KNOWN ADEs	C					X
CHECK PERSONAL REACTIONS TO NEW ADEs	C					X

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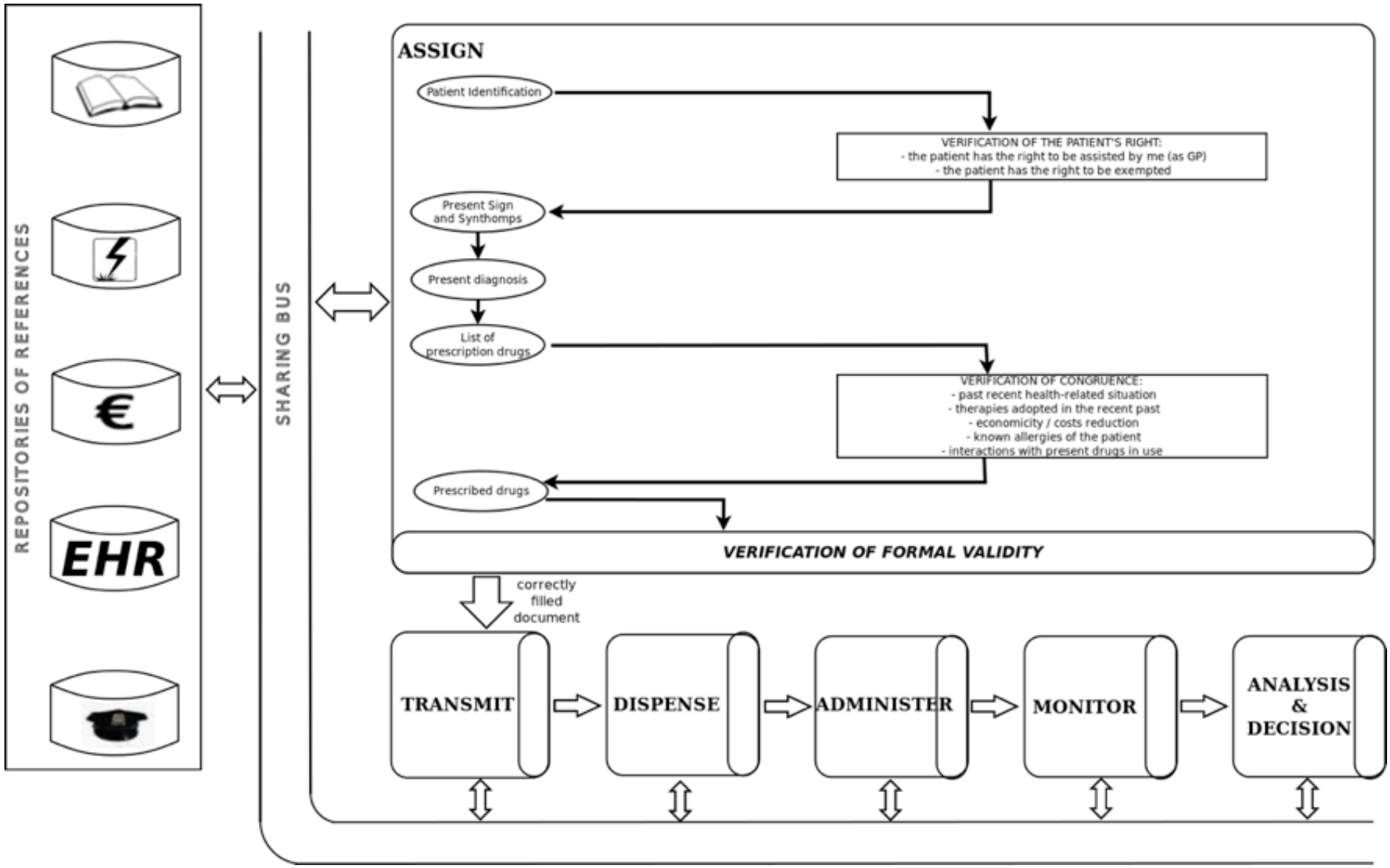
THE ASSIGN PHASE



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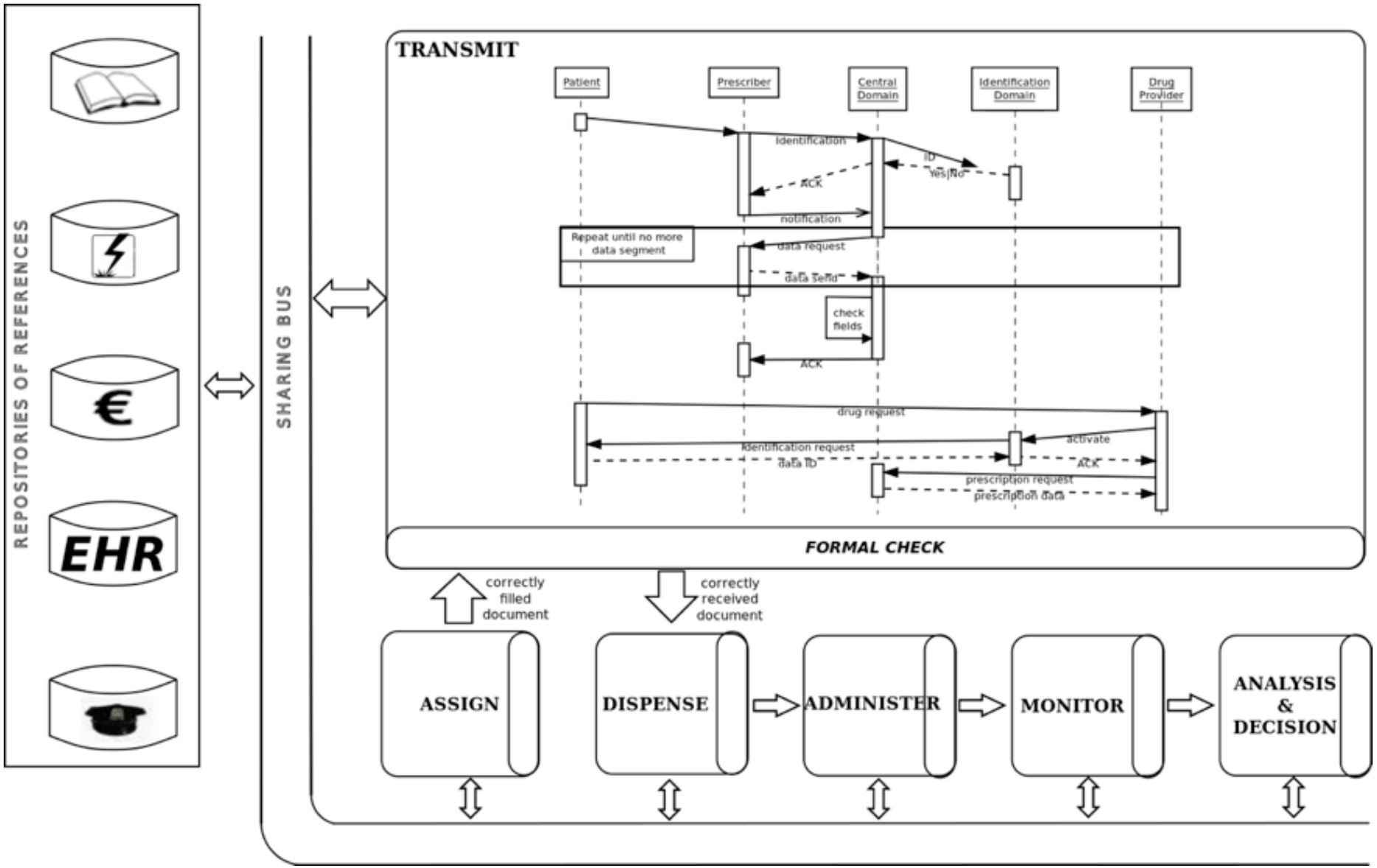
THE TRANSMIT PHASE



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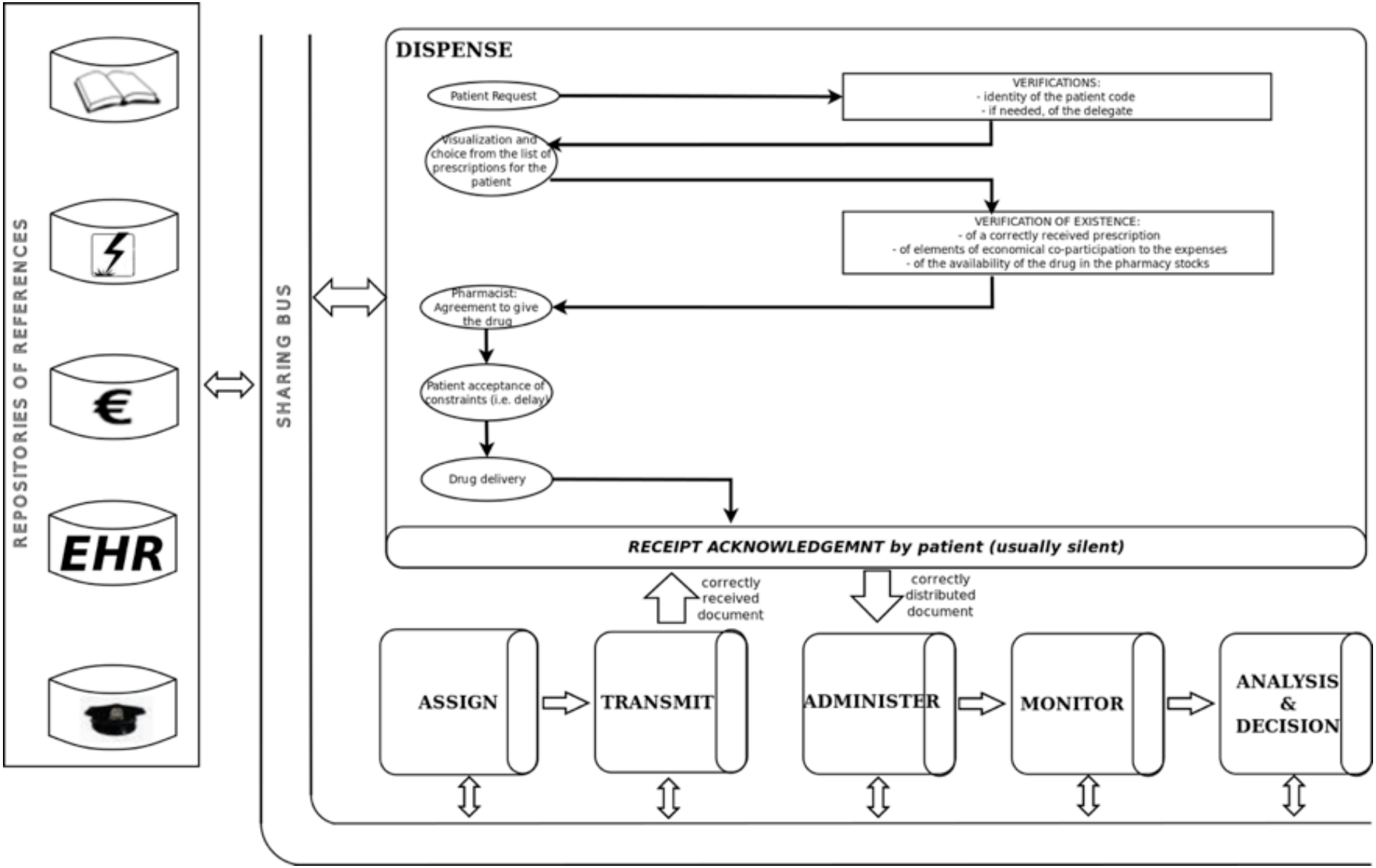
THE DISPENSE PHASE



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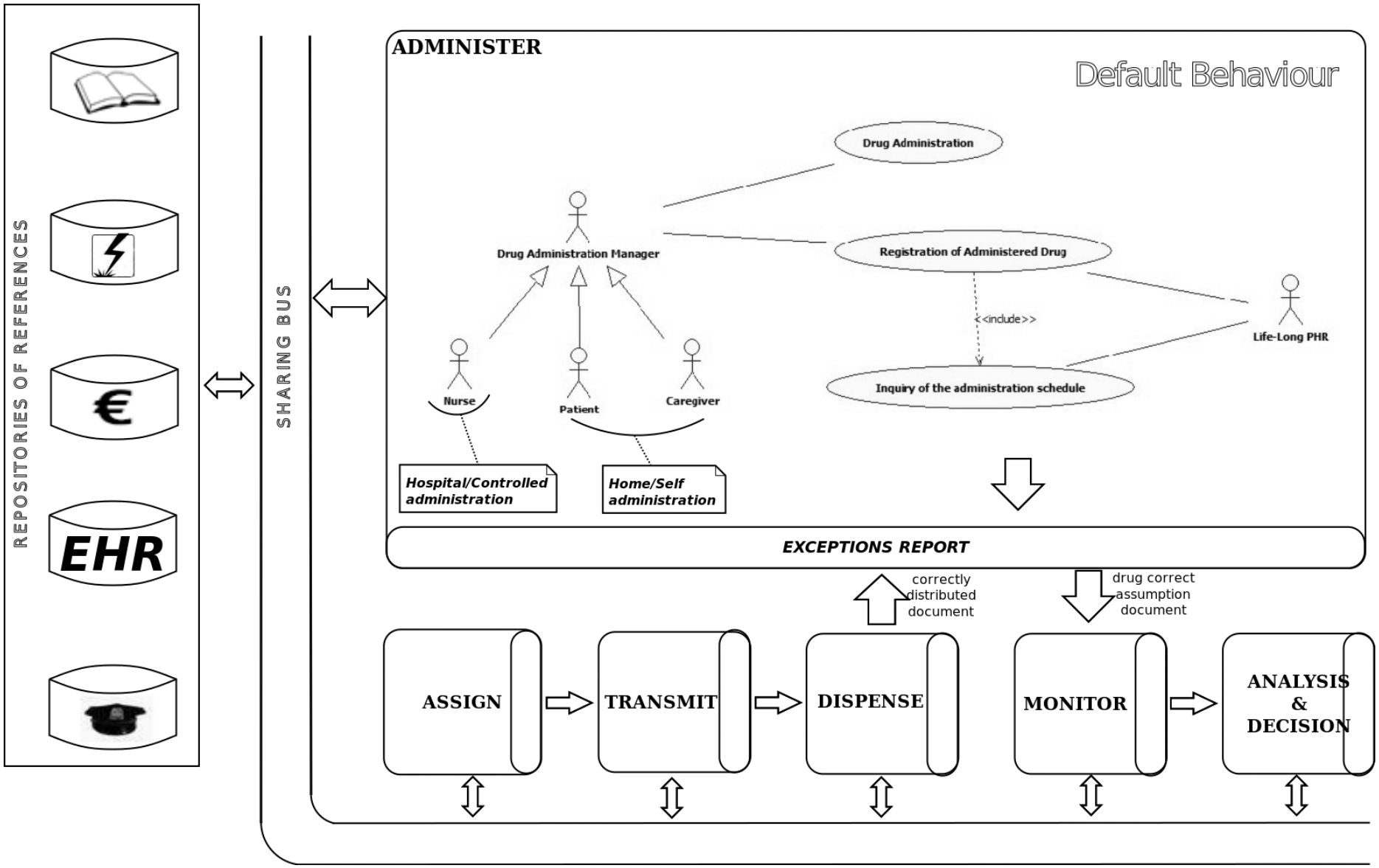
THE ADMINISTER PHASE



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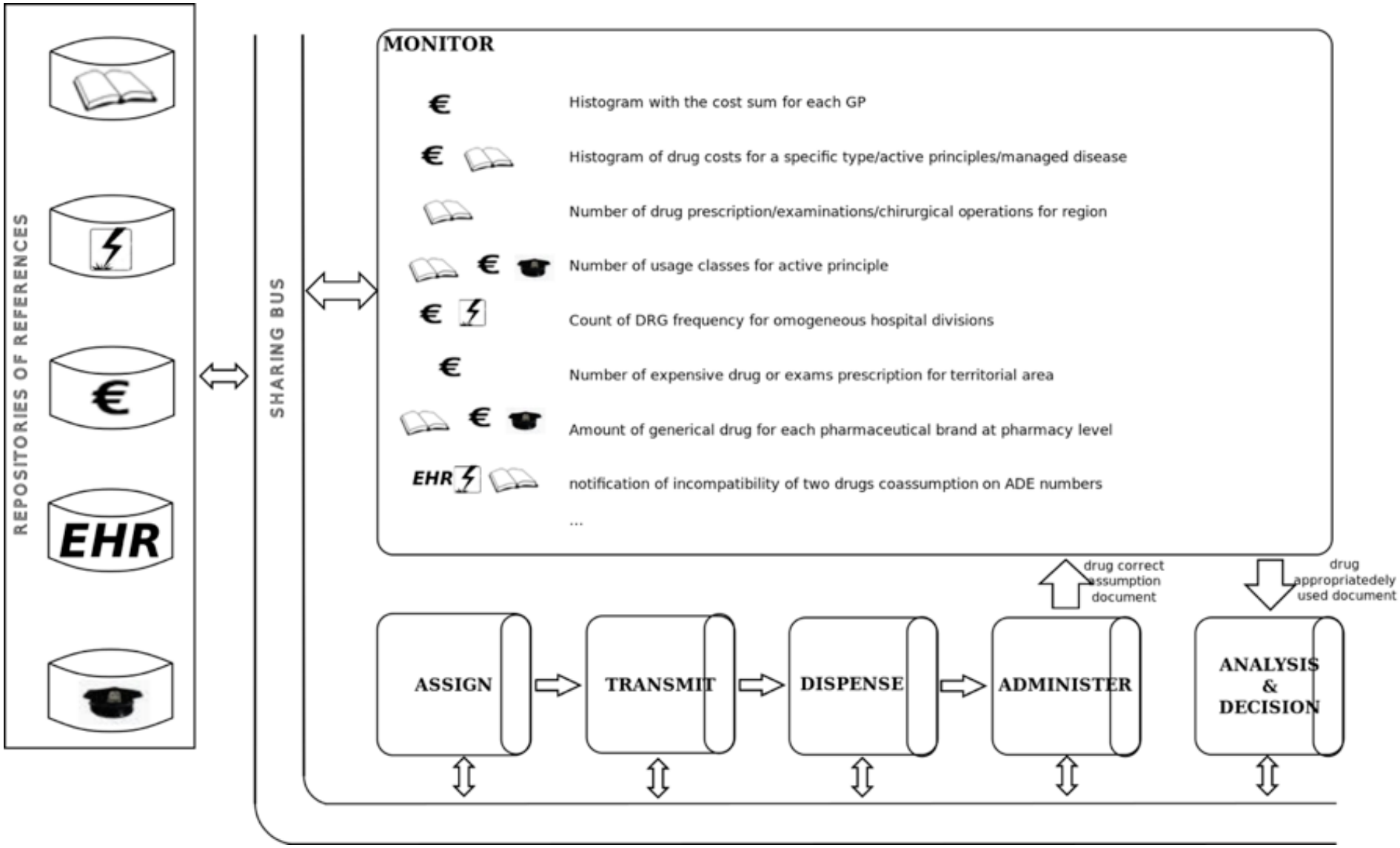
THE MONITOR PHASE



THE ANALYSIS PHASE

•How available data and information (individual or aggregated) are used to support decision making:

- at the clinical level
- at the managerial level (for example indications for supporting new Government laws, guidelines or recommendations).

- Examples are:
- the risk assessment regarding drug use and misuse;
- the definition of appropriateness criteria for drug use;
- the identification of frauds;
- the identification of drug misuse (such as over-prescription or usage of drugs already known as being not tolerated by the patient);
- the definitions of appropriate governmental leverages on healthcare providers to promote, for instance, the reduction of expenses by promoting generic drugs instead of branded drugs.

MODEL EVALUATION FRAMEWORK

- The evaluation framework was based on the verification of the correct implementation of specific functions that were called “verification actions”.
- In each phase of the process, the model defines these “verification actions” that guarantee a specific benefit, with a fine granularity.

	TYPE	DRUG ASSIGNEMENT PHASE	TRANSMISSION PHASE	DRUG DISTRIBUTION PHASE	DRUG ASSUMPTION PHASE	REPORTS PHASE ON DRUG APPROPRIATEDNESS
VALID PATIENT (PATIENT VALIDATION)	A	X		X	X	
VALID EXEMPTIONS RIGHTS	A	X		X		X
FILLED OUT DIAGNOSIS	A/C	X				X
VALID DRUG	A	X		X		X
DRUG-DRUG INTERACTION CHECK	C	X			X	
COHERENCE BETWEEN SPC AND DIAGNOSIS	C	X				X
CHECK OF AVAILABLE QUANTITY	A			X		
VALID GP ID	A	X	X	X		X
COMPLETELY FILLED OUT PRESCRIPTION	A/C	X	X			
CORRECTEDLY STORED PRESCRIPTION AFTER TRANSMISSION	A		X			
EXISTING PHARMACY CODE	A			X		
EXISTING PHARMACIST CODE	A			X		
CHECK PHARMACY-PHARMACIST ASSOCIATION	A			X		X

USING THE MODEL TO EVALUATE EXPECTED BENEFITS

VERIFICATION ACTIONS \ BENEFITS		QUALITY	ACCESS	EFFICIENCY
ASSIGN	Valid patient (patient validation)	Identity error avoided	Ensures patient's existence within the National Healthcare System	Avoided time waste due to erroneous patient's identification
	Valid exemptions rights		Ensures that the patient has the right of an exemption	Possibility to analyze the relationship between a prescribed drug and a certain exemption, thus preventing possible frauds.
	Filled out diagnosis	Ensures that the prescription is the result of a new/previous diagnosis		Possibility to track the relationship between the diagnosis and a specific drug
	Valid drug			Ensures that the drug is included in the official national nomenclature Avoided time waste due to non-existent drug
	Drug-drug interaction check	Decreased risk of interactions with drugs already in use by the patient		Possibility to have a more efficient system of ADEs and drug-drug interaction reporting
	Coherence between SPC and diagnosis	Decreased risk of incorrect drug assignment		
	Valid GP identification			Ensures that the GP is recognized by the healthcare system as having the right to prescribe
	Completely filled out prescription	Ensures that all the information needed also for continuity of care are provided		
TRANSMIT	Valid GP identification			Possibility to check the relationship between GP and prescribed drug, also to prevent frauds
	Completely filled out prescription			Avoided time waist due to lack of information on the prescribed drug
	Correctly stored prescription after transmission	Ensures that the prescription is transmitted without errors to the pharmacy or to the system	Facilitated drug retrieval for the patient who is sure that the prescription will be available in all the pharmacies or in the pharmacy of choice	Ensures the availability of the prescription for the pharmacy
DISPENSE	Valid patient (patient validation)	Identity error avoided		Prevents from the possibility to use the patient identification for other prescriptions (fraud prevention)
	Valid exemptions rights			Ensures the correct reimbursement to the pharmacy
	Valid drug			Ensures the correct reimbursement to the pharmacy
	Check of available quantity	Less time to retrieve the drug		More efficient drug distribution

USING THE MODEL TO EVALUATE EXPECTED BENEFITS

BENEFITS / VERIFICATION ACTIONS		QUALITY	ACCESS	EFFICIENCY
	Valid GP identification			Possibility to check the relationship between GP and the pharmacy Ensures the correct reimbursement to the pharmacy
	Existing pharmacy code			Possibility to check the distribution of drugs sold in a certain pharmacy
	Existing pharmacist code	Ensures that the drug is given to the patient by a recognized professional		Possibility to track the responsibility of drug distribution
	Check pharmacy-pharmacist association			Possibility to avoid frauds (i.e., using an existing pharmacist code to access the system)
	Valid format drug package number			Prevents from errors in inserting the drug package number in the system
	Existing package drug number	Complete track of the drug distribution Possibility to associate the single drug package to the patient		
	Coherence between expiration date and distribution date	Decreased probability to sell expired or nearly expired drugs		
	Coherence between expiration date and assumption date	Decreased probability to use expired drug		More effective management of drug storage
ADMINISTER	Valid patient (patient validation)	Possibility to associate the drug assumption schedule to the specific patient		
	Drug-drug interaction check	Decreased risk of interactions with drugs already in use by the patient		Possibility to have a more efficient system of ADEs and drug-drug interaction reporting
	Existing package drug number	Ensures that the package provided by the pharmacy is the same as used by the patient		
	Coherence between expiration date and assumption date	Ensures that the administered drug is not expired		
	Drug administered on time	Decreased error probability		Possibility to check patient's adherence to therapy
	Diary event correctly associated to a prescription	Less time dedicated to ADE reporting		
MONITOR	Valid exemption rights		Collect information on the patient-exemption association	
	Filled out diagnosis			Verify the correct drug use
	Valid drug			Collect information on the drug
	Check pharmacy-pharmacist association			Collect information on the pharmacy activity

USING THE MODEL TO EVALUATE EXPECTED BENEFITS

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BENEFITS / VERIFICATION ACTIONS	QUALITY	ACCESS	EFFICIENCY
Coherence between SPC and diagnosis	Collect information on the SPC to improve the usability of the SPC by the patient		Verify the correct drug use
Valid GP identification			Collect information on the GP activity
Existing package drug number			Collect information on the distribution of single packages
Drug administered on time			Analysis of patient's adherence to therapy
Diary event correctly associated to a prescription	Facilitated reporting of ADEs to the GP or the prescriber		Effective reporting of ADEs or other events associated to a drug therapy
Check personal reactions against known ADEs	Facilitated reporting of ADEs to the GP or the prescriber		Effective reporting of ADEs or other events associated to a drug therapy
Check personal reactions to new ADEs	Facilitated reporting of ADEs to the GP or the prescriber		Effective reporting of ADEs or other events associated to a drug therapy

SPC = summary of product characteristic; GP = general practitioner; ADE = adverse drug event;

METRICS (1/2)

VERIFICATION ACTIONS IN THE ASSIGN PHASE	BENEFITS FOR QUALITY OF CARE	BENEFITS FOR ACCESS TO CARE	BENEFITS FOR EFFICIENCY OF CARE	POSSIBLE METRICS
Valid patient (patient validation)	Identity error avoided	Ensures patient's existence within the National Healthcare System	Avoided time waste due to erroneous patient's identification	Number (or %) of prescriptions with incorrect, missed or unknown patient ID
Valid exemptions rights		Ensures that the patient has the right of an exemption	Possibility to analyze the relationship between a prescribed drug and a certain exemption, thus preventing possible frauds.	Number (or %) of prescriptions with: - Invalid exemption code - Invalid patient ID/exemption code pair - Invalid exemption code /drug code pair
Filled out diagnosis	Ensures that the prescription is the result of a new/previous diagnosis		Possibility to track the relationship between the diagnosis and a specific drug	Number (or %) of prescriptions with: - Diagnosis reported - Correctly coded diagnosis reported

METRICS (2/2)

VERIFICATION ACTIONS IN THE ASSIGN PHASE	BENEFITS FOR QUALITY OF CARE	BENEFITS FOR ACCESS TO CARE	BENEFITS FOR EFFICIENCY OF CARE	POSSIBLE METRICS
Valid drug			Ensures that the drug is included in the official national nomenclature Avoided time waste due to non-existent drug	Number (or %) of prescriptions with valid drug code % of generic drug prescribed vs branded drugs
Drug-drug interaction check	Decreased risk of interactions with drugs already in use by the patient		Possibility to have a more efficient alerting system of drug-drug interactions and ADEs reporting	Number (or %) of prescriptions avoiding drug-drug interactions Number of reported ADEs Number of new ADEs identified
Coherence between summary of product characteristics and diagnosis	Decreased risk of incorrect drug assignment			Number (or %) of prescriptions with reported diagnosis/drug pair in accordance with indications
Valid GP identification			Ensures that the GP is recognized by the healthcare system as having the right to prescribe	Number (or %) of prescriptions with unknown or missed GP ID

THREE CASE STUDIES

- 1**- The case of Lombardy Region** (Italy) having as main objective the control of drug expenditure per citizen. In fact, when the Italian National Healthcare System was regionalized in 2000, Regional Governments were entitled of controlling the whole healthcare expenses that now represent more than the two thirds of the Regional budget.
- 2**- The case of the Italian Government** having as main objective the control of inter-regional equity within a national regulatory framework. In fact, even though the National government provides common laws for all the Regions regarding the minimum quality levels of healthcare services, the local applications might differ. The National Government should hence ensure that such equity is implemented.
- 3**- The case of the Andalucia Region** in Spain where the introduction of ePrescribing aimed to improve healthcare quality, and was embedded in a wider framework involving also the creation of a shared EHR system.

COMPARISONS OF CASE STUDIES - TOOLS

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			Lombardy Region	Italian Government	Andalucia Region
	Drug references	Official National Nomenclature of Pharmaceutical Products	X	X	X
		Regionally recognized Pharmaceutical Products	X	X	X
		Highly regulated Pharmaceutical Products	X	X	X
	Patients	Patient registry	X	X	X
		Exemptions database	X		X
	Prescribers	General Practitioners & Pediatricians registry	X		X
		Specialists registry	X		X
	Distributors	Pharmacies	X		X
		Hospital pharmacies	X		X
	Clinical reference	Scientific literature	X		X
		Quick Medical Reference	X		X
	Drug-drug interaction database				X
	Allergies				X
	Adverse Drug Events				X
€	National Expenditure Policies		X	X	X
	Generic Drug List and costs		X	X	X
	Branded Drug List and costs		X	X	X
	Disease Related Groups (DRG)		X	X	X
EHR	Electronic Health Record	Hospital	X		*Integrated in the "Diraya" Andalucia EHR system*
		General Practitioners	X		
		Regional/National	X		
	Connections and telecommunication infrastructures		X		
	Existing electronic prescribing forms		X		
	Computerized Physician Order Entry		X		
	Cost analysis tool		X		X
	Analytics			*Integrated System for Personal Health Data (NSIS)*	X
	Drug Surveillance				X
	Patient Safety Analysis				X

COMPARISONS OF CASE STUDIES – BENEFITS (1)

	Lombardy Region	Italian Government	Andalucia Region
Quality	• Identity error avoided • Ensures that the prescription is the result of a new/previous diagnosis • Ensures that all the information needed also for continuity of care are provided • Ensures that the prescription is transmitted without errors to the pharmacy or to the system • Ensures that the drug is given to the patient by a recognized professional	• Collect information on the SPC to improve the usability of the SPC by the patient	• Identity error avoided • Ensures that the prescription is the result of a new/previous diagnosis • Decreased risk of interactions with drugs already in use by the patient • Decreased risk of incorrect drug assignment • Ensures that all the information needed also for continuity of care are provided • Ensures that the prescription is transmitted without errors to the pharmacy or to the system • Ensures that the drug is given to the patient by a recognized professional • Collect information on the SPC to improve the usability of the SPC by the patient
Access	• Ensures patient's existence within the National Healthcare System • Ensures that the patient has the right of an exemption • Facilitated drug retrieval for the patient who is sure that the prescription will be available in all the pharmacies or in the pharmacy of choice	• Collect information on the patient-exemption association	• Ensures patient's existence within the National Healthcare System • Ensures that the patient has the right of an exemption • Facilitated drug retrieval for the patient who is sure that the prescription will be available in all the pharmacies or in the pharmacy of choice • Collect information on the patient-exemption association

COMPARISONS OF CASE STUDIES – BENEFITS (2)

Efficiency	• Avoided time waste due to erroneous patient's identification • Possibility to analyze the relationship between a prescribed drug and a certain exemption, thus preventing possible frauds. • Possibility to track the relationship between the diagnosis and a specific drug • Ensures that the GP is recognizedby the healthcare system as having the right to prescribe • Possibility to check the relationship between GP and prescribed drug, also to prevent frauds • Avoided time waist due to lack of information on the prescribed drug • Ensures the availability of the prescription for the pharmacy • Prevents from the possibility to use the patient identification for other prescriptions (fraud prevention) • Ensures the correct reimbursement to the pharmacy • Possibility to check the distribution of drugs sold in a certain pharmacy • Possibility to track the responsibility of drug distribution • Possibility to avoid frauds (i.e., using an existing pharmacist code to access the system)	• Verify the correct drug use • Collect information on the drug • Collect information on the pharmacy activity • Verify the correct drug use • Collect information on the GP activity • Collect information on the distribution of single packages	• Avoided time waste due to erroneous patient's identification • Possibility to analyze the relationship between a prescribed drug and a certain exemption, thus preventing possible frauds • Possibility to track the relationship between the diagnosis and a specific drug • Ensures that the drug is included in the official national nomenclature • Avoided time waste due to non-existent drug • Possibility to have a more efficient system of ADEs and drug-drug interaction reporting • Ensures that the GP is recognized by the healthcare system as having the right to prescribe • Possibility to check the relationship between GP and prescribed drug, also to prevent frauds • Avoided time waist due to lack of information on the prescribed drug • Ensures the availability of the prescription for the pharmacy • Prevents from the possibility to use the patient identification for other prescriptions (fraud prevention) • Ensures the correct reimbursement to the pharmacy • Possibility to check the relationship between GP and the pharmacy • Ensures the correct reimbursement to the pharmacy • Possibility to check the distribution of drugs sold in a certain pharmacy • Possibility to track the responsibility of drug distribution • Possibility to avoid frauds (i.e., using an existing pharmacist code to access the system) • Verify the correct drug use • Collect information on the drug • Collect information on the pharmacy activity • Verify the correct drug use • Collect information on the GP activity • Collect information on the distribution of single packages

SPC = summary of product characteristic; GP = general practitioner; ADE = adverse drug event