Renal Telemedicine & Telehealth
Where Do We Stand?

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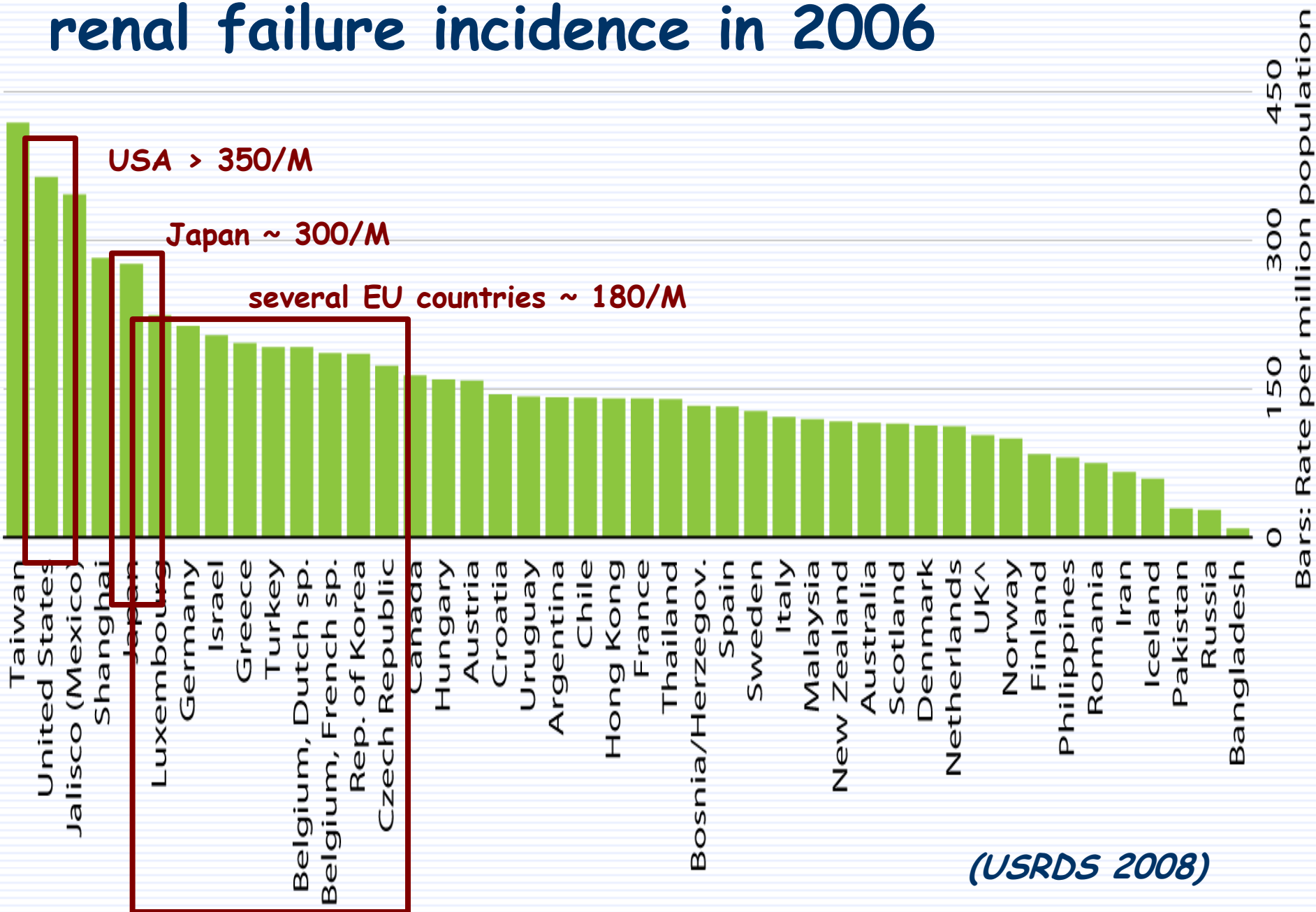
renal disease

early diagnosis, efficient & agile management and prognosis are imperative, as kidney chronic disease may lead to

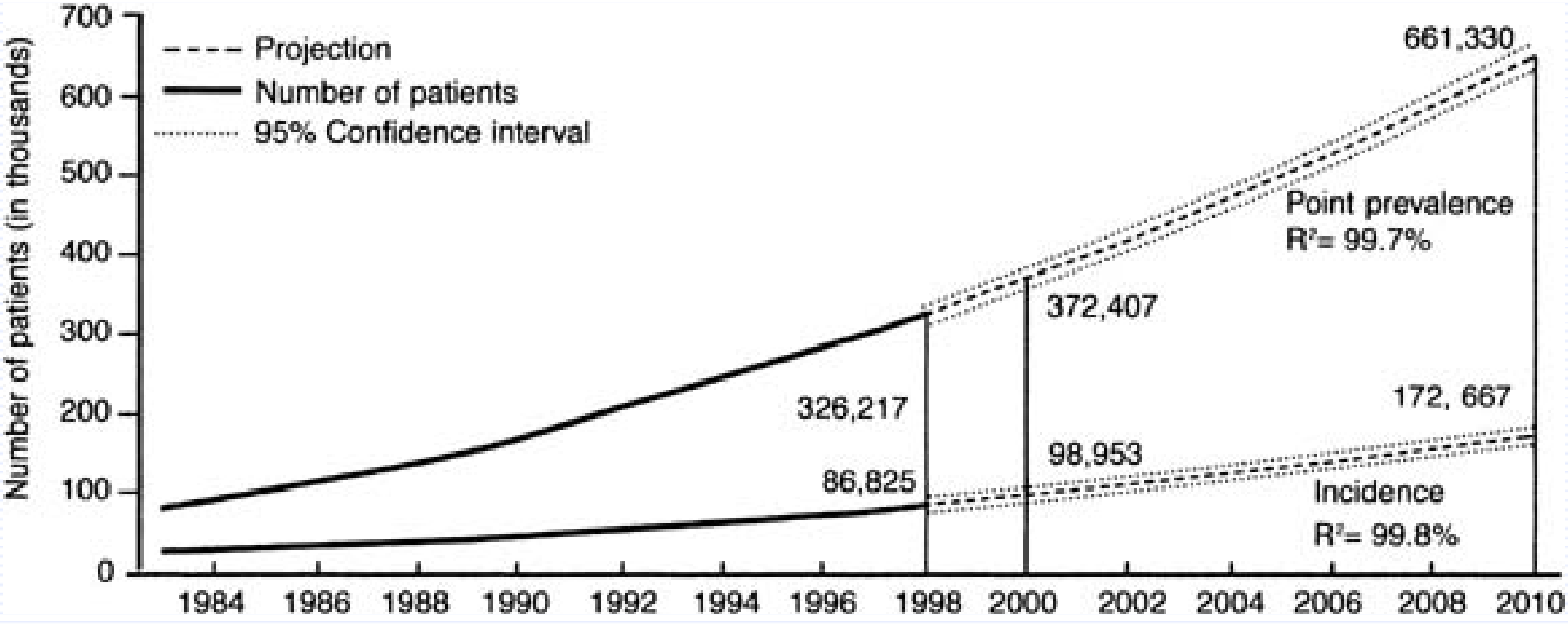
- several and severe health complications (hypertension, nephrogenic anemia, peripheral neuropathy, cardiovascular disease, …)
- kidney failure
- considerably reduced quality of life
- (eventually) death

renal failure incidence in 2006



(USRDS 2008)

renal failure projection



patients with renal failure increase, mainly due to increased incidents of diabetes and hypertension

USA (USRDS 2008)

treatment for kidney failure

- renal transplantation
- dialysis: removal of water and body wastes that build up in failing kidneys
  - hemodialysis at the hospital (artificial kidney)
  - home hemodialysis
  - peritoneal dialysis (at home)

monitoring renal disease

a good measure for early diagnosis, treatment adjustment and rehabilitation

- chronic renal patients: follow up (esp. when co-morbidity) and prepare for kidney replacement therapy
- patients on peritoneal dialysis: monitor and redesign individual dialysis scheme (solely delivered at home)
- patients on hemodialysis: monitor individual dialysis adequacy and delivered dose – monitor home hemodialysis
- patients on wait-list for transplantation: monitor vital signs and monitor/ensure overall health condition
- transplanted patients: monitor adequate kidney function, health condition, adherence to prescription/diet

telematics for renal patients

- 1998 USA/Australia: teleconsultations (hemodialysis)
- 2000-2007 Europe: teleconsultations (hemodialysis & peritoneal dialysis)
- 2000 Japan/Europe: telemetry of dialysis data
- ~2005 companies of dialysis equipment incorporate telemetry in some home dialysis models
- 2007 Greece: integrated web-based service for telemonitoring and telemetry (home dialysis)
  - the PERKA service – Democritus University of Thrace and collaborating IT companies

problems in current approaches

- treatment method-centric approaches
  - emphasis on a single method, no continuous monitoring for patients switching between treatments
- data/disease-centric approaches
  - emphasis on disease monitoring, no real support for a mobile, active person in their everyday life
- clinically oriented approaches
  - emphasis on supporting management of the individual, no real support for overall management of the desease

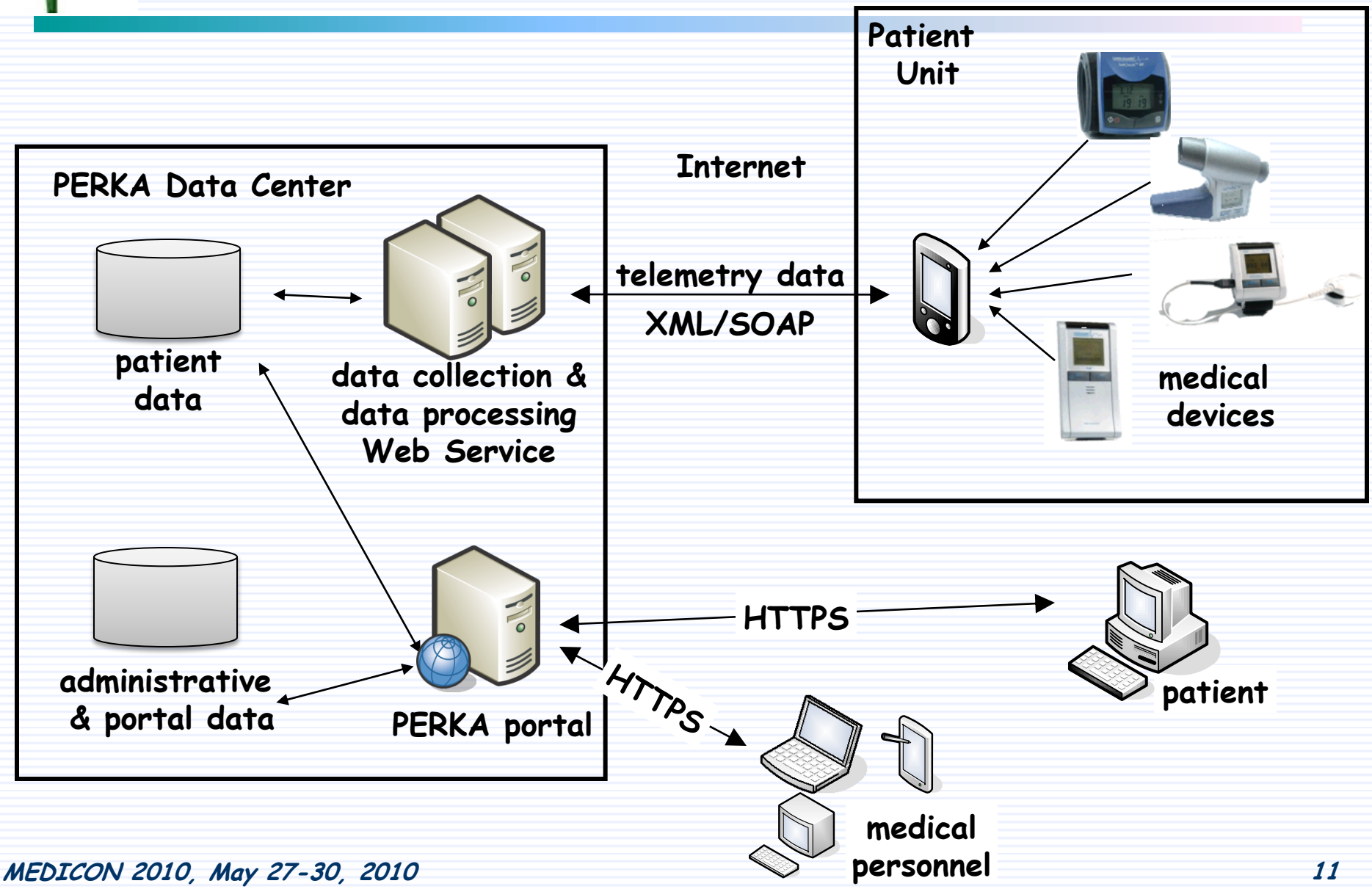
problems in current approaches

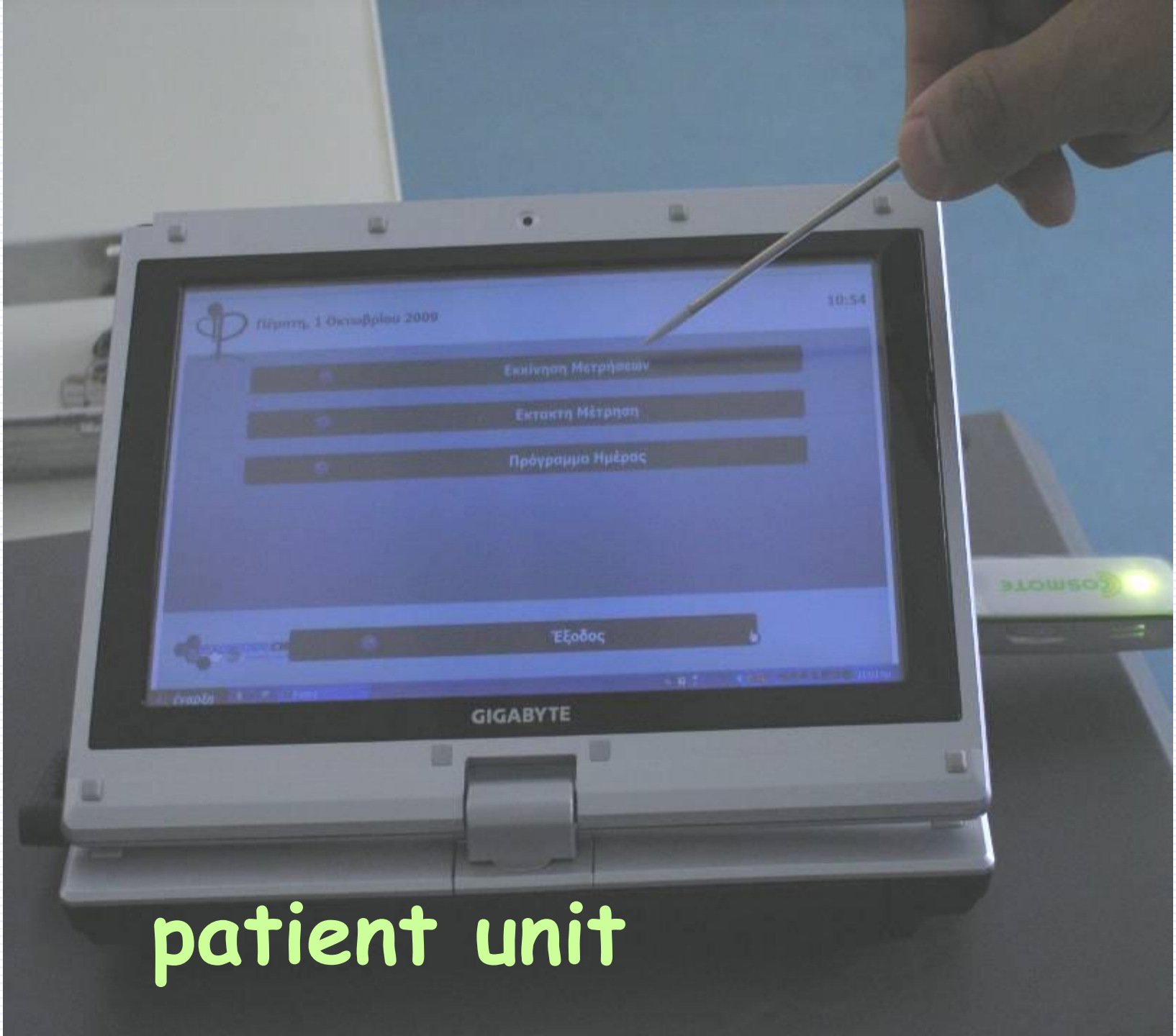
- proprietary technical solutions
  - emphasis on proprietary software, no standardized interfaces or open, service oriented systems
- misleading evaluation of the technological intervention
  - the intervention is seen either as a "drug" or as an "unavoidable research project aftermath"
  - little emphasis on learning and improving

the PERKA service

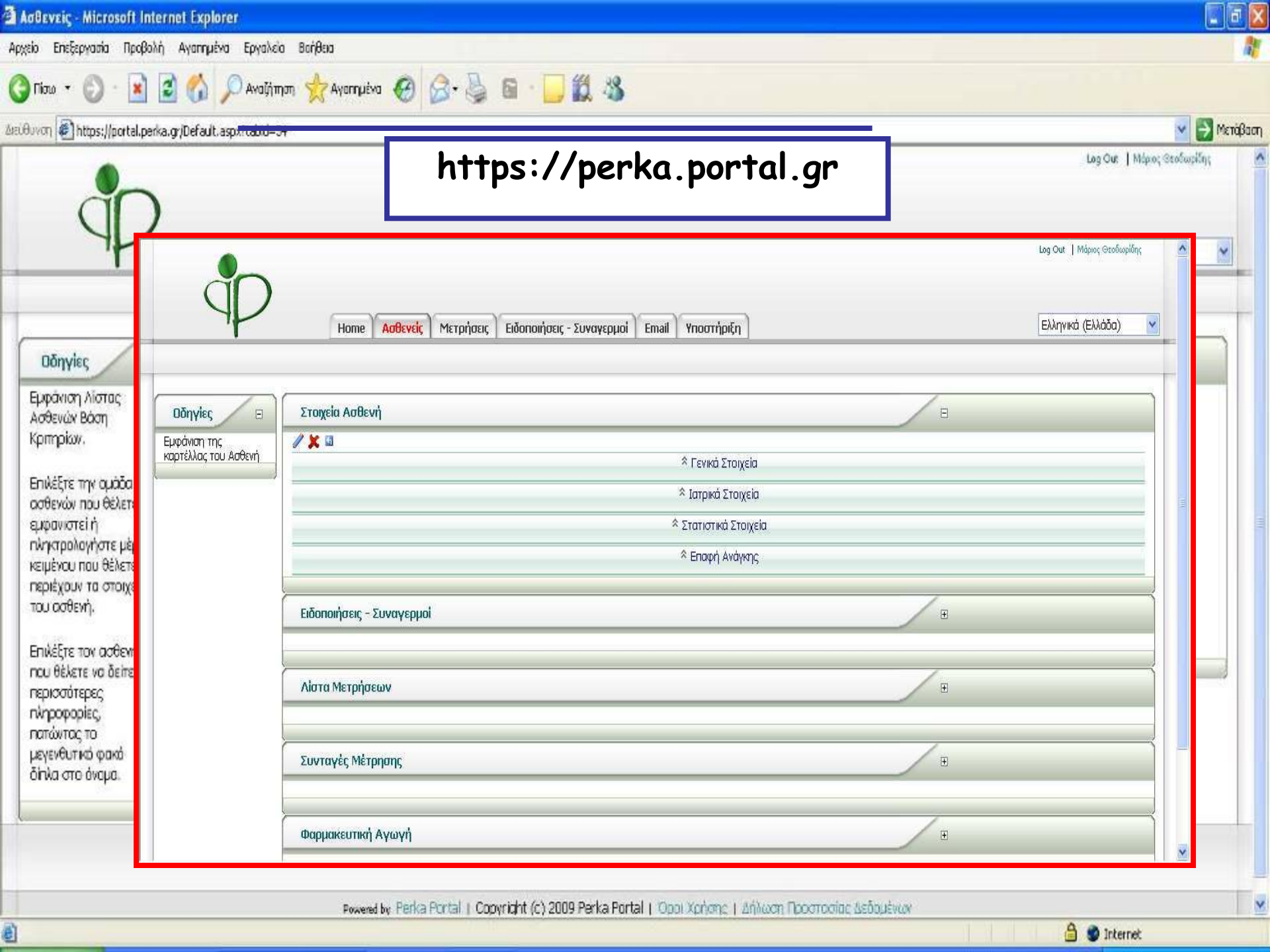
- main features
  - web based service - web service architecture (with standard XML/SOAP interfaces)
  - data transfer via mobile telephony
  - dynamic, personalized measurement set-up by clinician (can be tailored to support monitoring requirements of different treatment methods)
- current deployment
  - region of East Macedonia and Thrace, Greece
  - https://portal.perka.gr/

PERKA


Patient Unit
PERKA Data Center
Internet
telemetry data
XML/SOAP
patient data
data collection & data processing Web Service
medical devices
administrative & portal data
PERKA portal
HTTPS
HTTPS
patient
medical personnel



patient unit


Ασθενείς - Microsoft Internet Explorer
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Στοιχεία Ασθενή
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Επαφή Ανάγκης
Ειδοποιήσεις - Συναγερμοί
Λίστα Μετρήσεων
Συνταγές Μέτρησης
Φαρμακευτική Αγωγή
Οδηγίες
Εμφάνιση Λίστας Ασθενών Βάση Κριτηρίων.
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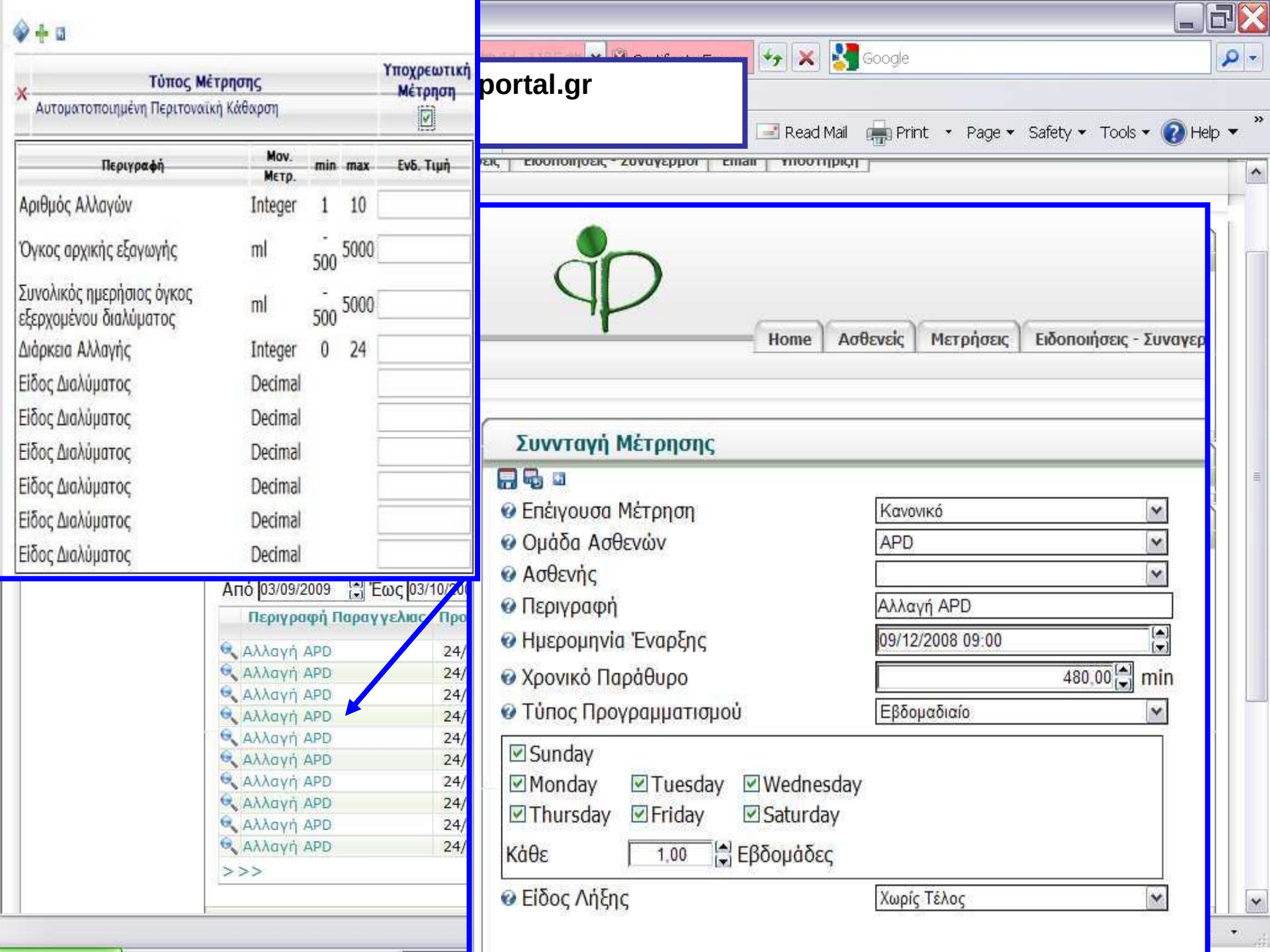
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Περιγραφή
Μον. Μετρ.
min
max
Ενδ. Τιμή
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Print
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Tools
Help
Home
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Μετρήσεις
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Από 03/09/2009
Έως
Περιγραφή Παραγγελίας
Αλλαγή APD
Συνταγή Μέτρησης
Επείγουσα Μέτρηση
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Είδος Λήξης
Χωρίς Τέλος

Λίστα Μετρήσεων

Από 23/09/2009 Έως 03/10/2009 Τύπος Μέτρησης Αρτηριακή Πίεση Κατάσταση Κλειστή

Περιγραφή Παραγγελίας	Προγρ. Ημερομηνία	Ημερομηνία Μέτρησης	Τύπος Μέτρησης	Τιμή Μέτρησης
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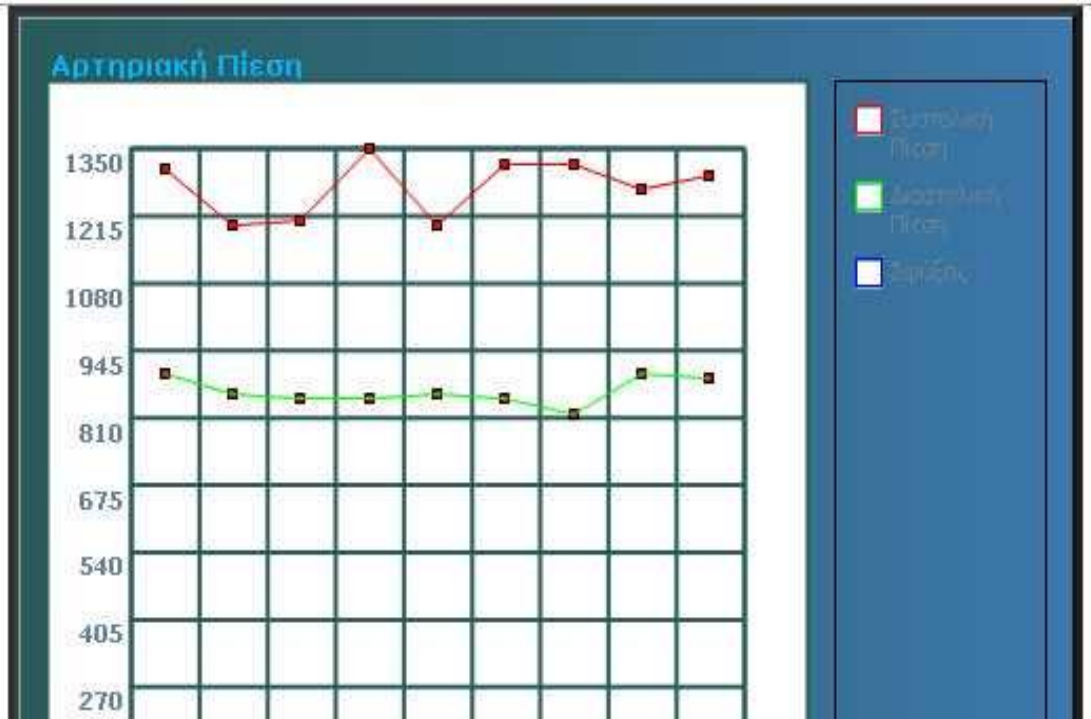

evaluating PERKA within context

- evaluation draws on interpretivism (subjectivism)
- emphasis on trying to understand the context of the service, and the process whereby this service influences and is influenced by its context
- based on a two-dimensional evaluation framework (adapted from Cornford T, Doukidis GI, Forster D.- 1994)
  - study structure, process, and outcome
  - for the service functions, human users, and organizational context

evaluation framework by Cornford et al

	System functions	Human perspectives	Organizational context
Structure	technical detail	changed work conditions and implied requirements	sustainability, opportunity costs, management needs, skill requirements
Process	information processing correct and valid	human participation in tasks; social interaction	altered delivery and practice
Outcome	relevant, applicable, reliable	quality of service and outcomes	effect in the world

Cornford T, Doukidis GI, Forster D.(1994)

adapting the framework for home telecare

	System functions	Human perspectives			Organizational context
		Physicians	Patients	Admins.	
Structure	*what* are the real hardware and software requirements; does the full set of system components work together in a technical sense?	*what* are the changes to working conditions and practices, in terms of the physical, environment and skill requirements?	are patients required to modify their behaviour in any way?	is the system a reasonable, cost-effective alternative to existing tools or materials in use?	Could such technology be sustained and supported within the organizational context?
Process	*is* the method by which the system transforms its data, the information processing, correct and valid?	*how* was the user's mode of operation changed? Are these changes seen as desirable to the user as an individual, and in general to the user's organizational role?	*how* is the patient's experience of health care altered at the point of contact with the system?	*does* the system imply change in the health care delivery activities for which the administrator is responsible? Does it change the character of the administrator's job?	Could such a system function within the confines of broader health policy?
Outcome	*are* the results relevant, applicable and reliable? Does it meet the requirement specifications?	*was* the overall effectiveness of the clinician within the health care system enhanced?	*does* the use of the system result in changes in the quality of service and better health for the patient?	*does* the system improve specific health provision on a reasonable metric?	*could* such a system improve the health status and potential of the population it serves?

evaluating PERKA

phase 1

during design, development and prototype pilot implementation

- 18 months of design, development, lab testing (Oct. 06 – Mar 08)
- 3 months of pilot implementation (Apr 08 – Jun 08)
- access function and incorporate user requirements

phase 2

deployment as experimental clinical protocol

- 24 months of experimental deployment (Dec 08 – Nov 10)
- ~10 patients in a regional setting
- to assess user satisfaction and clinical outcome

progress beyond the state-of the-art

requires

- model and integrate context
  - health and social context
  - for patients and healthcare personnel
- integrate patient education via participative approaches
- provide tools for overall disease (not only patient) monitoring, management and planning (coupled to real-time disease monitoring)

acknowledgement

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