Appendix A:

Analysis slides of each case study

a. Type 2 Diabetes
b. Stroke
c. Hip Osteoarthritis
d. Dementia

MANAGED OUTCOMES

An operations management and demand based approach to regional health service delivery systems for Diabetes type 2 patients

Meeting European health care system challenges by learning from differences between management practices in six EU countries

MANAGED OUTCOMES

Contents

1. Background information MO project
2. Results
3. Interpretation of results
4. Key findings

MANAGED OUTCOMES

1 Background MO project

MANAGED OUTCOMES

The Managed Outcomes Project

- ✓ All EU countries are experiencing the same problems in healthcare: the population is aging, causing an increasing demand for healthcare services: availability of trained personnel and funding is limited, while new medical treatments are more effective but more expensive. In order to cope with these constraints, the European healthcare systems need to improve to better consider the cost-beneficial provision of health outcomes, rather than just health outputs.
- ✓ The MANAGED OUTCOMES project is based on the notion that healthcare outcomes and cost-benefits are affected by the efficiency of service production, the regional structure of healthcare delivery and the degree to which people are empowered to participate in the co-production of their care. These relationships are insufficiently understood and need to be studied to meet the objectives of the European health strategy.
- ✓ The main objective of Managed Outcomes is to develop and disseminate rich but practical conceptual models and a toolkit for improving the health service production system.

The Managed Outcomes project

- ✓ The project is performed by a consortium of universities and consultancy organisations:
  - Aalto University (AALTO) - Finland
  - Erasmus University Rotterdam (EUR)- Netherlands
  - Otto-Friedrich-Universität Bamberg (Universität Bamberg) - Germany
  - Universidad Politechnica de Valencia (UPVLC) - Spain
  - European Hospital and Healthcare Federation (HOPE)- Belgium
  - Riel Miller - Xperidox Futures Consulting - France
  - Ethniki Scholi Dimosias Ygeias Eidikos Llogariasmos Erevnon (NSPH) - Greece
  - Balance of Care Group - UK
  - Innovation in Leraning Institute (ILI) - Germany
  - Forum Virium - Finland
- ✓ In six EU countries (FI, FG, GR, NL, SP, UK) cases studies are performed for four costly health care demands that are challenging EU healthcare systems:
  - Diabetes type 2
  - diabetes type 2
  - Hip-osteoarthritis
  - Dementia

Diabetes type 2 services as EU healthcare challenge

- Diabetes type 2 is a disease with growing prevalence in the ageing population in Europe.
- The cost of insulin dependent patients place a large burden on healthcare expenditures.
- Though healthcare systems differ much between countries in the EU, the treatment protocols used by medical, nursing and paramedical professionals are the same, so therefore there is a lot to learn from how we organize and manage the services for diabetes type 2 patients at operational level
- The differences in outcomes of diabetes type 2 health services in different countries might be explained to a considerable extent in the way we organize the processes for delivering the services

Diabetes type 2 as a health systems challenge

- ✓ 96% of diabetes mellitus cost is spent for type 2
- ✓ A high proportion of patients with risk factors for diabetes-related complications are not adequately controlled. Improvements in disease management and monitoring are therefore required to ensure that guideline targets are met, thus reducing the long-term complications of Type II diabetes.

Reference:

A. Liebl, M. Mata, E. Eschwège (2002). *Evaluation of risk factors for development of complications in Type II diabetes in Europe.* Diabetologia, 45:S23–S28

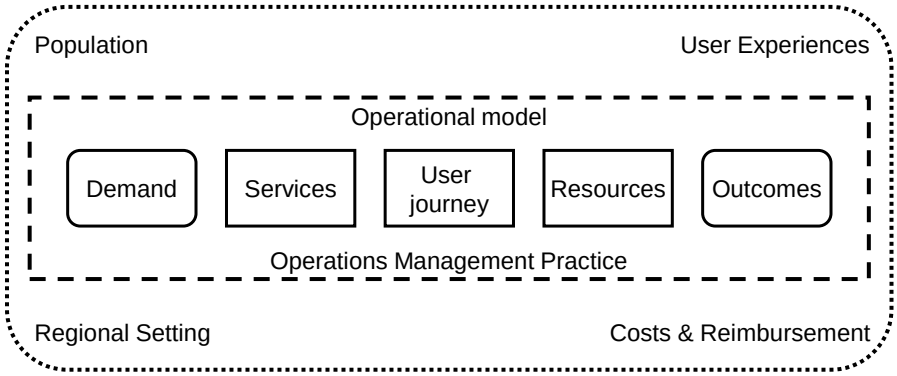
Reference: to be added

Literature on diabetes type 2 (services)

- European Diabetes Policy Group (1999) Guidelines for diabetes care: a desktop guide to type II diabetes mellitus. International Diabetes Federation (European Region). Diabet Med 16: 716–730
- Jönsson B (2000) Revealing the cost of Type II diabetes in Europe. Diabetologia supplement (Code 2 study)
- A. Liebl, M. Mata, E. Eschwège (2002). *Evaluation of risk factors for development of complications in Type II diabetes in Europe.* Diabetologia, 45:S23–S28

- additional literature also in WP3-report

Methodology

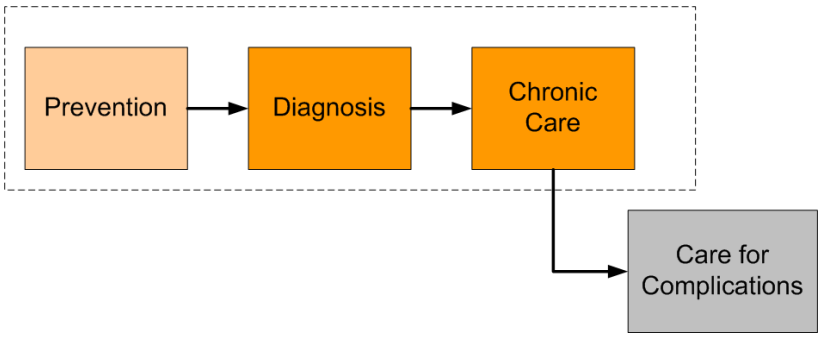


Methodology

- Operational model: formal description of the demand, services, user journey, resources and outcomes, and their quantitative relationships
- Operations management practice: the planning, management and innovation of services; the collaboration between partners providing services
- Outcomes: the impact of services on health status, measured by providers (quality indicators) and experienced by users (satisfaction)
- User experiences: the view of users on services and their performance, measured in a survey
- Costs & reimbursement: the costing of resources for services and the financing of services

MANAGED OUTCOMES

Demarcation



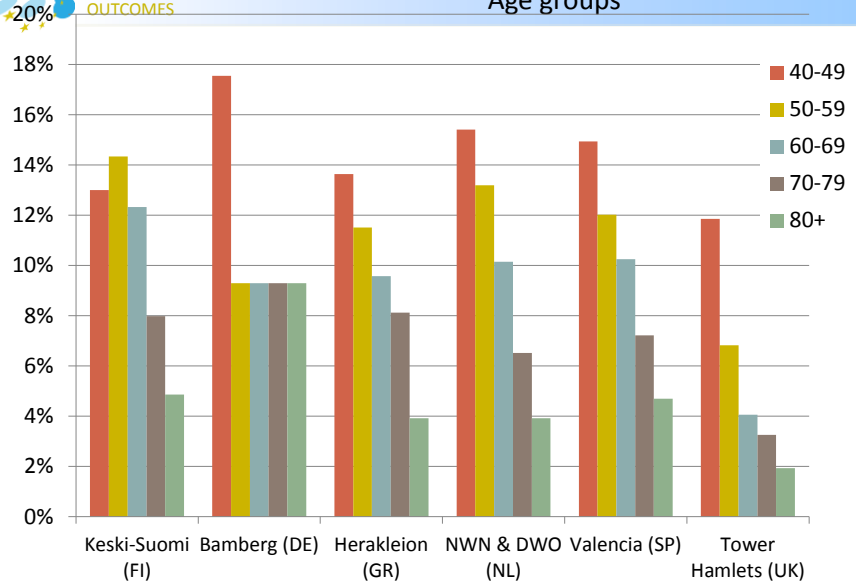
MANAGED OUTCOMES

Case instance regions

Region	Keski-Suomi (Finland)	Herakleion (Greece)	NWN & DWO (Netherlands)	Tower Hamlets (UK)	Valencia, La Fé (Spain)	Bamberg (Germany)
Region	Keski-Suomi regiona	Herakleion Regional Unit	Nieuwe Waterweg…	Tower Hamlets (London)	La Fé (Valencia)	Bamberg
Population	247246 (2009)	304270 (2011)	443281 (2008)	233329 (2010)	202621 (2009)	214269 (2009)
%population >40 years	53%	47%	49%	28%	49%	55%
Area (km2)	14474	2641	273	21	133	1223
Population density (hab./km2)	17	115	1623	11272	8201	175

MANAGED OUTCOMES

Age groups



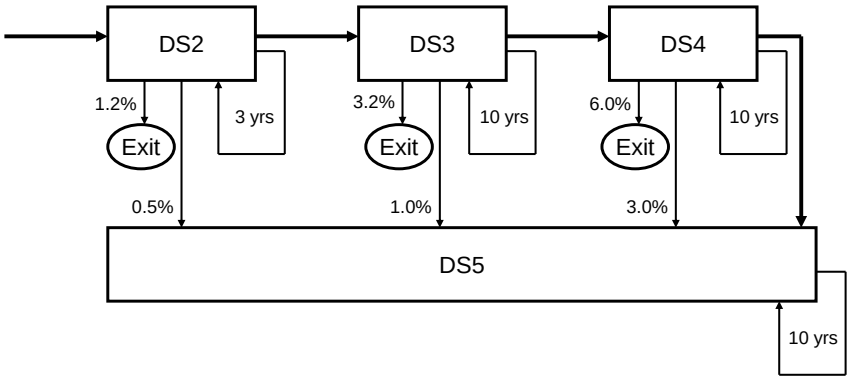
MANAGED OUTCOMES

2 Results

Demand segments

Number	*Name*	*Description*
DS1	Prevention care	Population that is targeted for prevention care.
DS2	Diabetes care stage 1	Patients with diabetes type II needing lifestyle advice.
DS3	Diabetes care stage 2	Patients with diabetes type II needing lifestyle advice and oral medication.
DS4	Diabetes care stage 3	Patients with diabetes type II needing lifestyle advice, oral medication and insulin injections.
DS5	Diabetes care stage 4	Patients with complicated diabetes type II needing specialized care.

Patient journey - model



MANAGED OUTCOMES

Patients per DS

Patients	Keski-Suomi (Finland)	Herakleion (Greece)	NWN & DWO (Netherlands)	Tower Hamlets (UK)	Valencia, La Fé (Spain)	Bamberg (Germany)
DS1						
DS2	4758	2331	2683		5156	121
DS3	10086	13040	8084		4052	2090
DS4	2723	5991	1451		1516	1732
DS5	63					
Total	17630	21362	12218	11203	10724	3943
Population	272784	299689	443281 330464*	233329*	202621	214269

* Population registered at GP's, not population in area

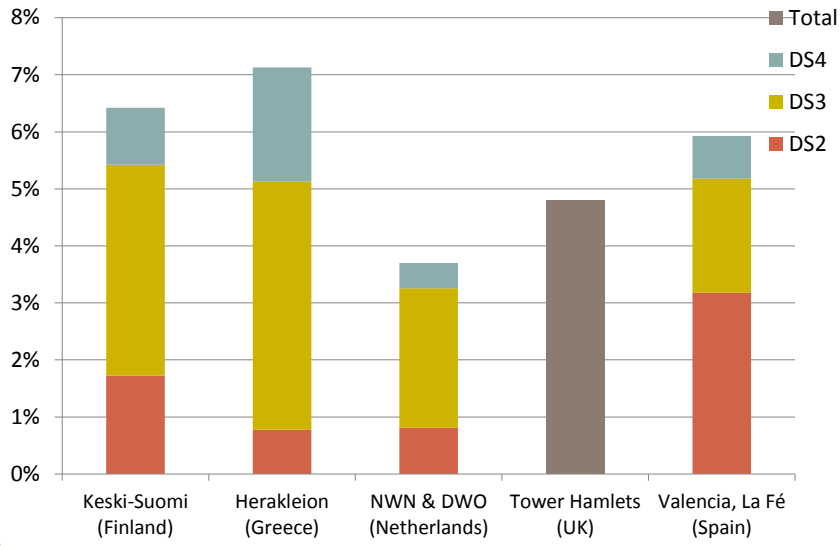
MANAGED OUTCOMES

Prevalence of Diabetes

	Keski-Suomi (Finland)	Herakleion (Greece)	NWN & DWO (Netherlands)	Tower Hamlets (UK)	Valencia, La Fé (Spain)	Bamberg (Germany)
DS1						
DS2	1.72%	0.78%	0.81%		3.18%	0.06%
DS3	3.70%	4.35%	2.45%		2.00%	0.98%
DS4	1.00%	2.00%	0.44%		0.75%	0.81%
DS5	0.02%	N/A	N/A		N/A	N/A
Total/ Area						
Total	6.4%	7.1%	3.7%	4,8%	5.9%	1.8%
Prevalence DM (I+II) OECD data 2011 Age 20-79	5.7%	6.0%	5.3%	3,5%	6.6%	8.9%

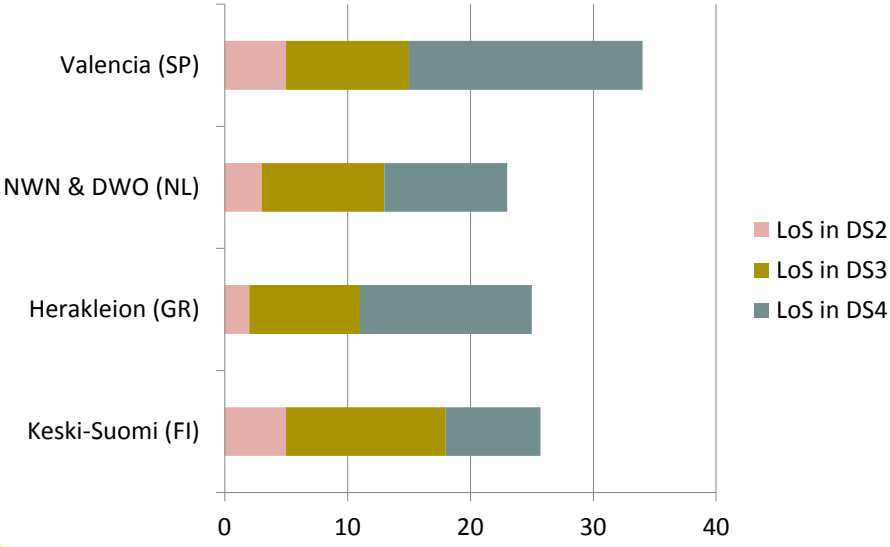
MANAGED OUTCOMES

Prevalence of diabetes



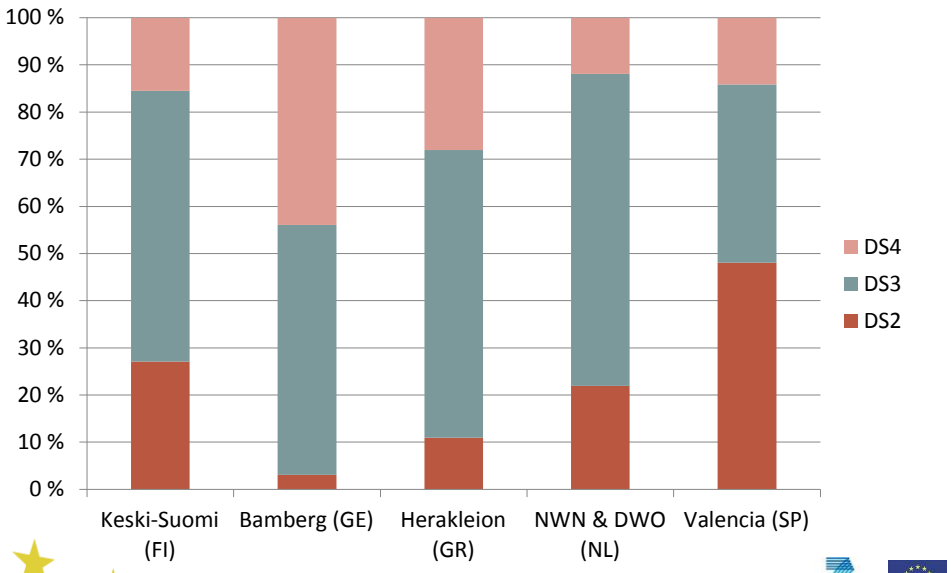
MANAGED OUTCOMES

Length of stay in demand segments



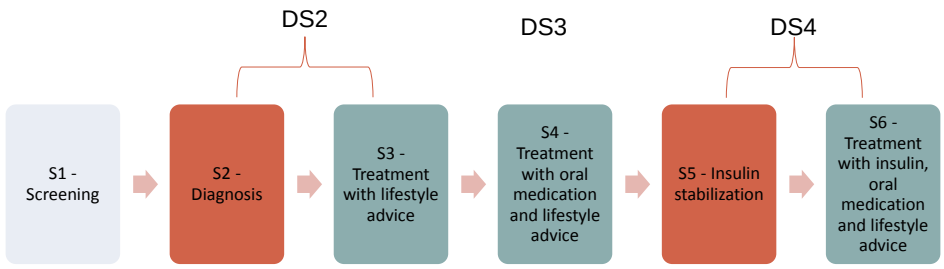
MANAGED OUTCOMES

Relative distribution of DS2-DS4



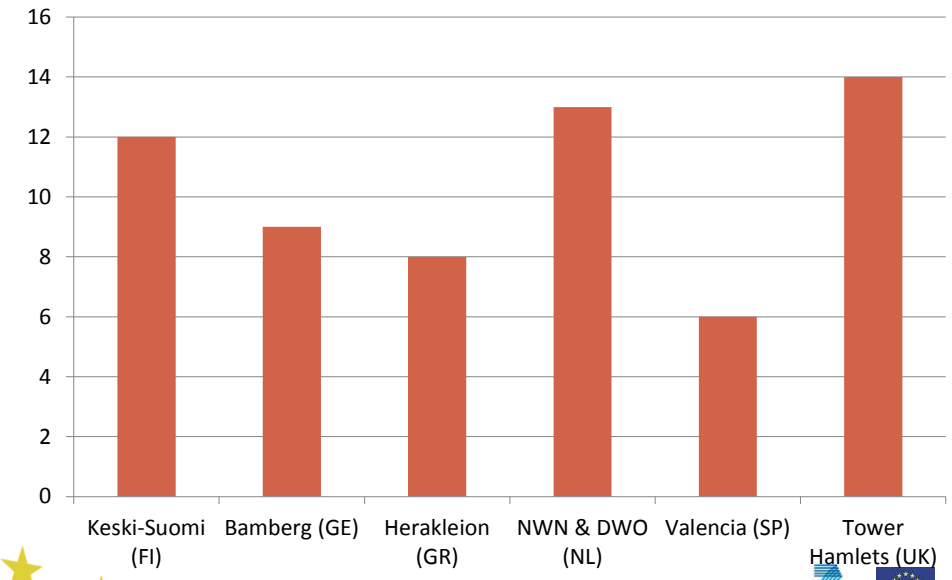
MANAGED OUTCOMES

Services



MANAGED OUTCOMES

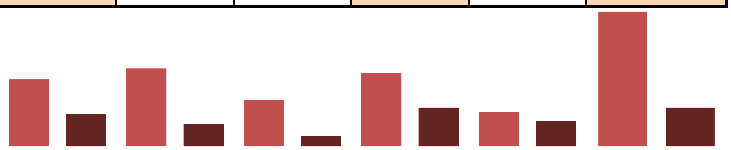
Number of resources in diabetes care



MANAGED OUTCOMES

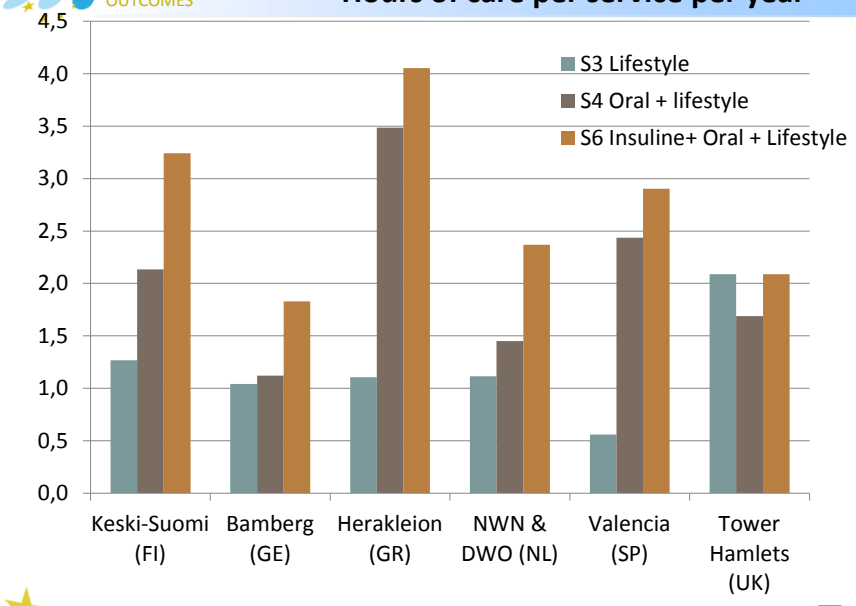
Resources: main care provider

	Keski-Suomi (FI)	Bamberg (GE)	Herakleion (GR)	NWN & DWO (NL)	Valencia (SP)	Tower Hamlets (UK)
GP resource	60 € / hour	70 € / hour	42 € / hour	66 € / hour	31 € / hour	120 € / hour
Nurse resource	29 € / hour	20 € / hour	10 € / hour	35 € / hour	23 € / hour	35 € / hour



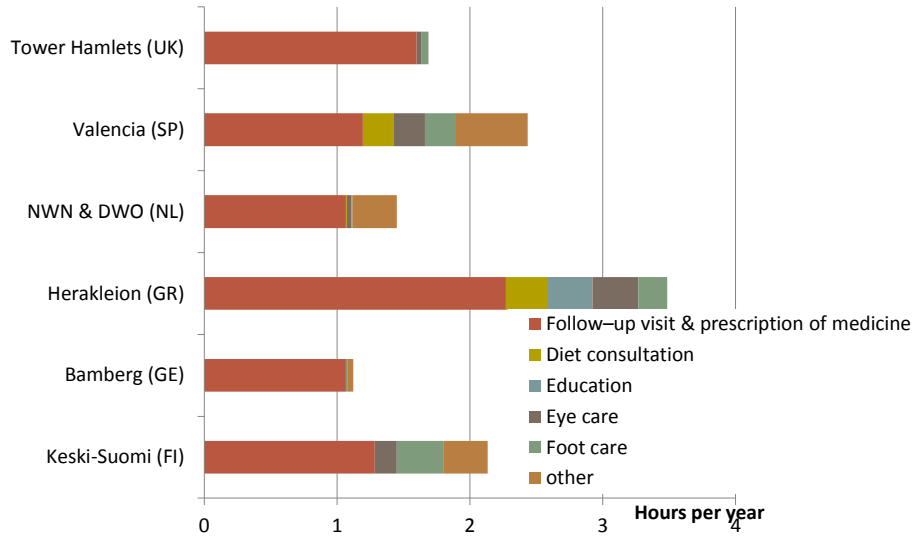
MANAGED OUTCOMES

Hours of care per service per year



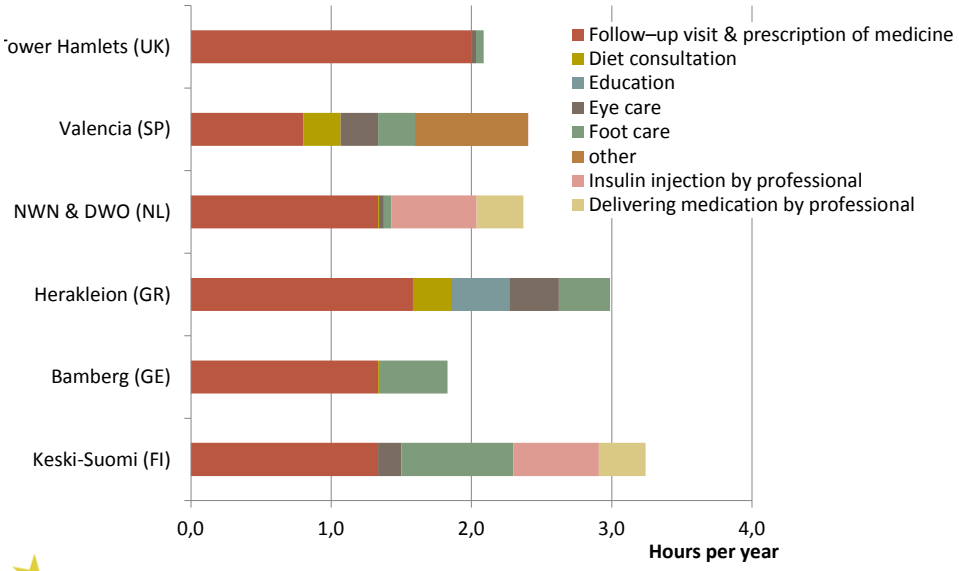
MANAGED OUTCOMES

Hours of care service S4 (oral medication)



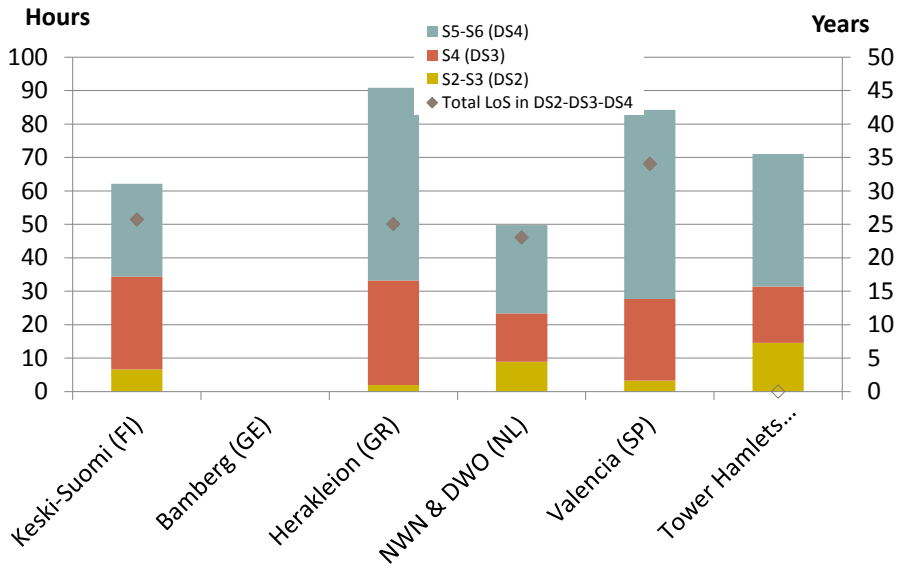
MANAGED OUTCOMES

Hours of care service S6 (insulin care)



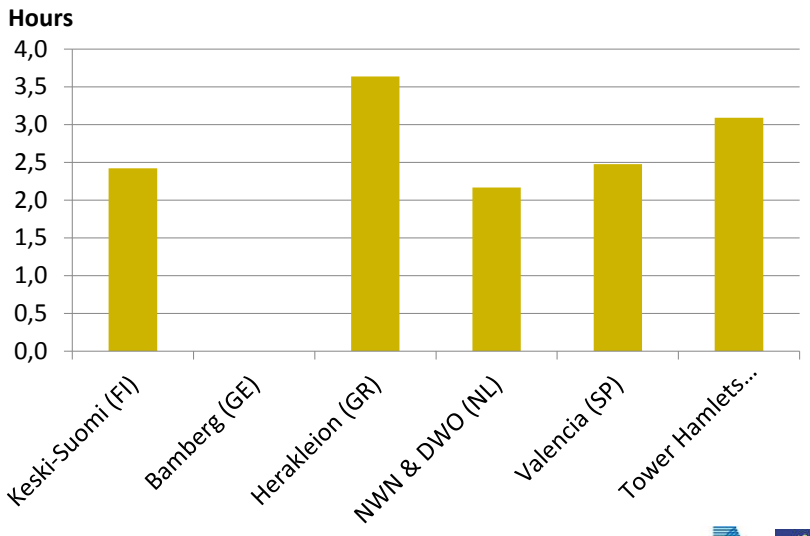
MANAGED OUTCOMES

Hours of care over patient lifetime and LoS DS2-DS4



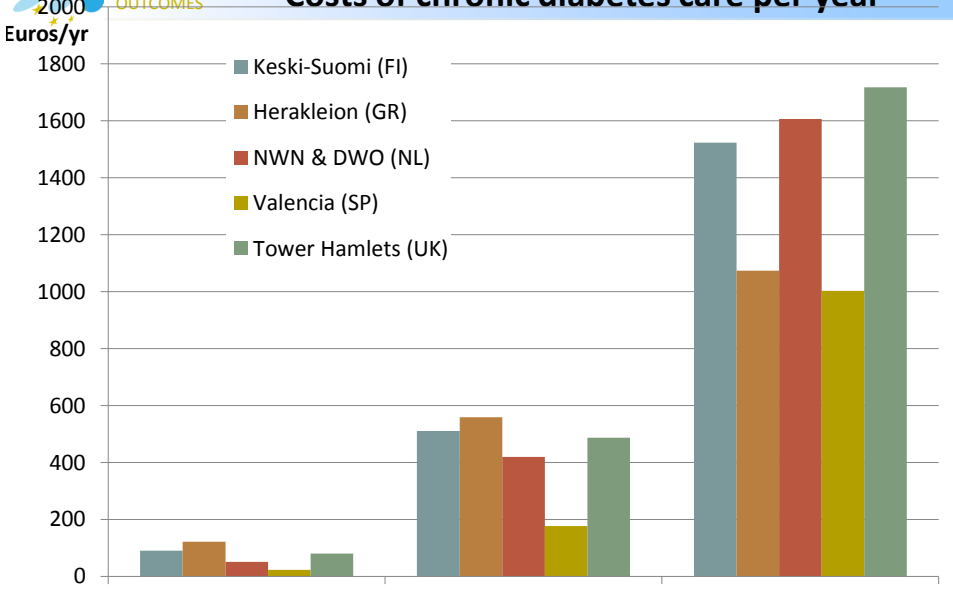
MANAGED OUTCOMES

Average hours of care per year during patient life time DS2-DS4



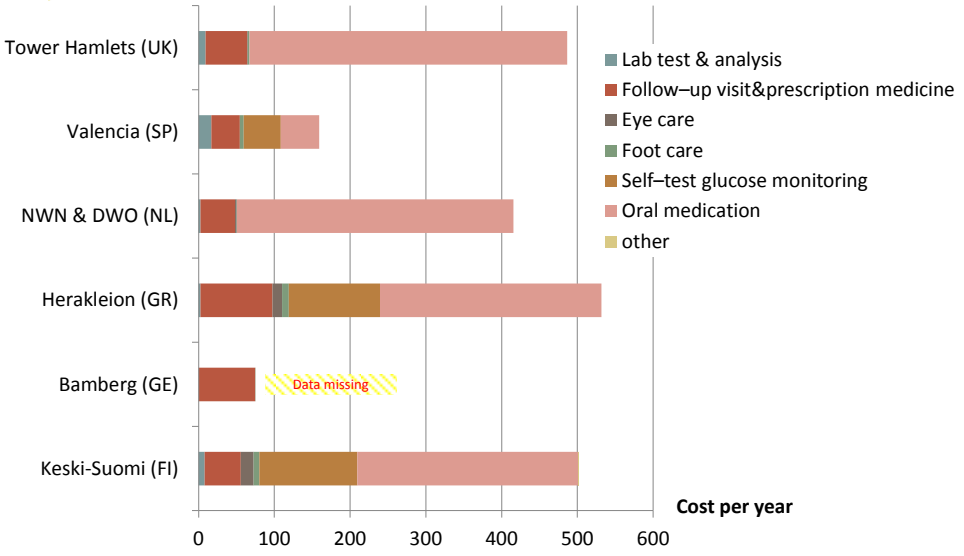
MANAGED OUTCOMES

Costs of chronic diabetes care per year



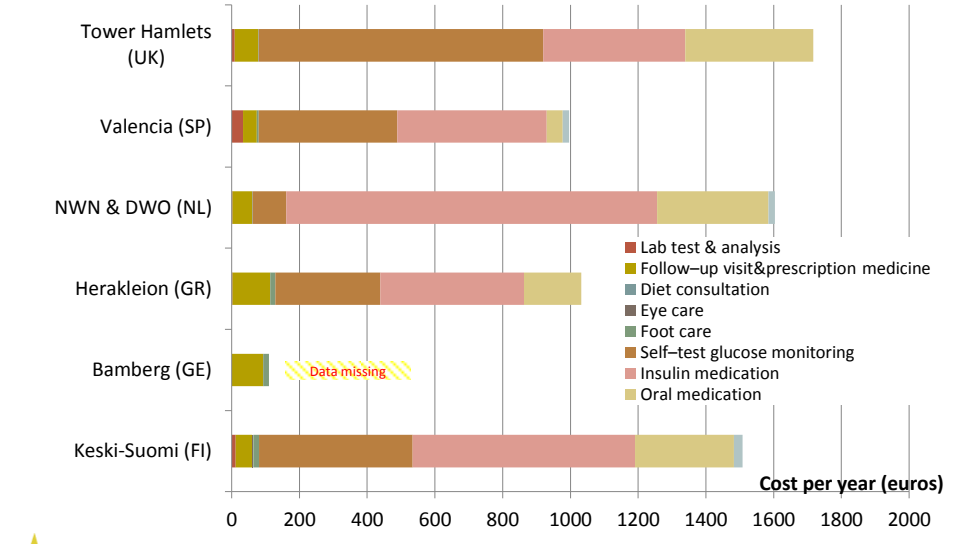
MANAGED OUTCOMES

Costs of S4 per patient per year



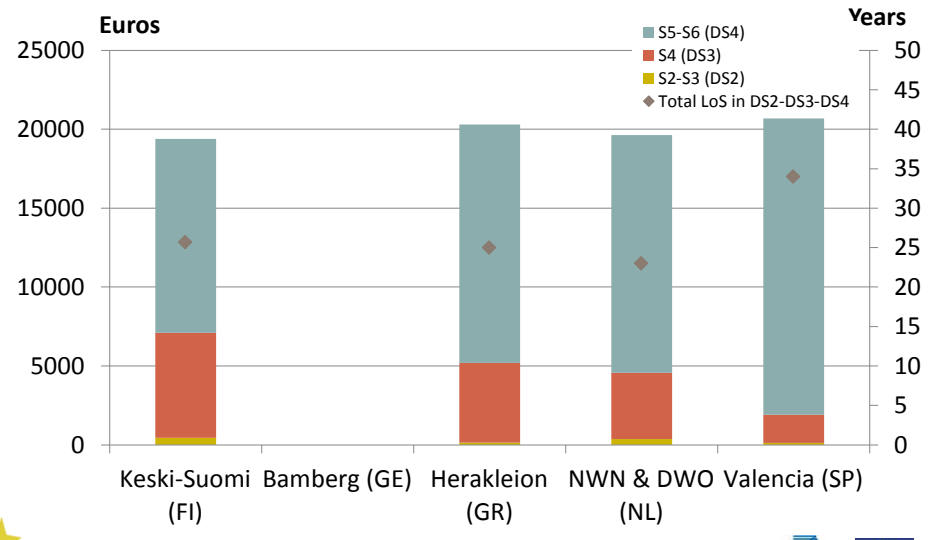
MANAGED OUTCOMES

Costs of S6 per patient per year



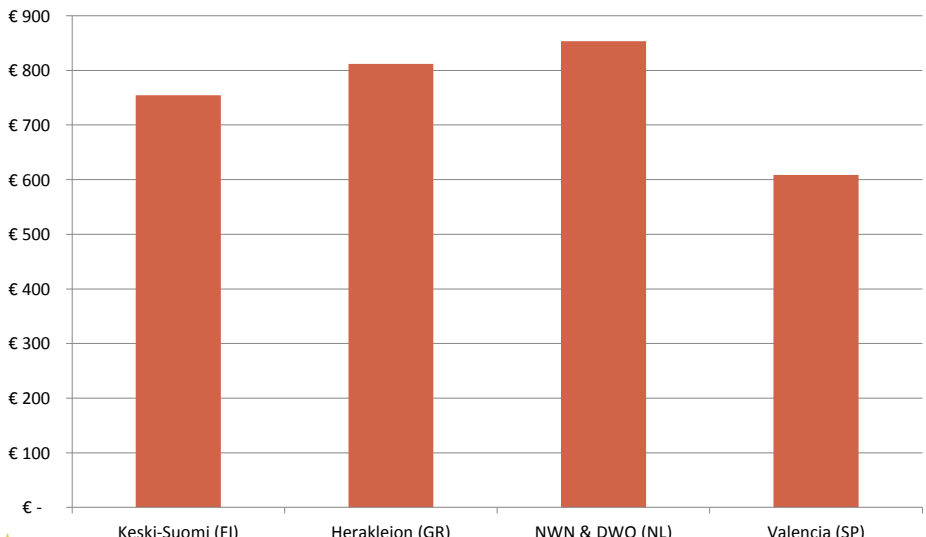
MANAGED OUTCOMES

Costs of care over patient lifetime and LoS in DS2-DS4



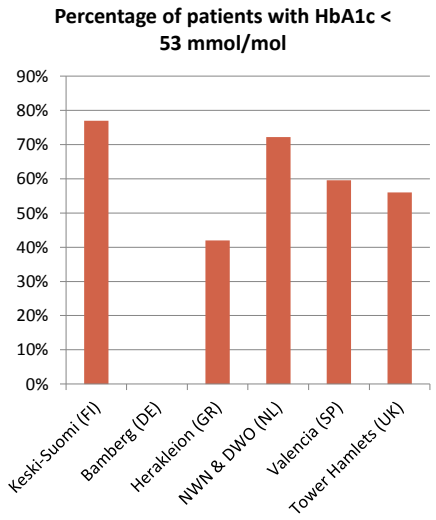
MANAGED OUTCOMES

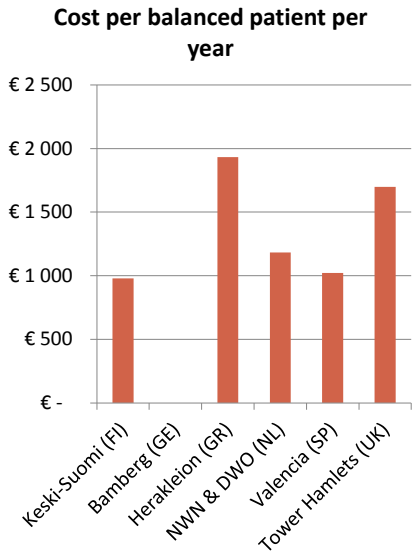
Average costs of care per year per patient (lifetime)



MANAGED OUTCOMES

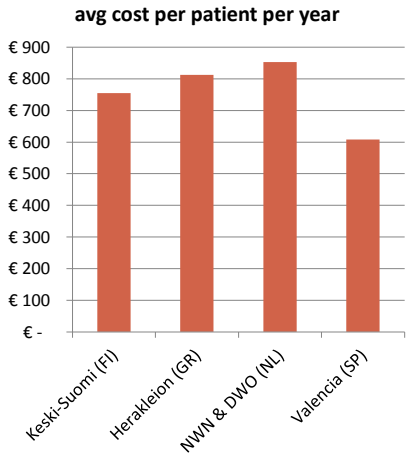
Costs per balanced patient

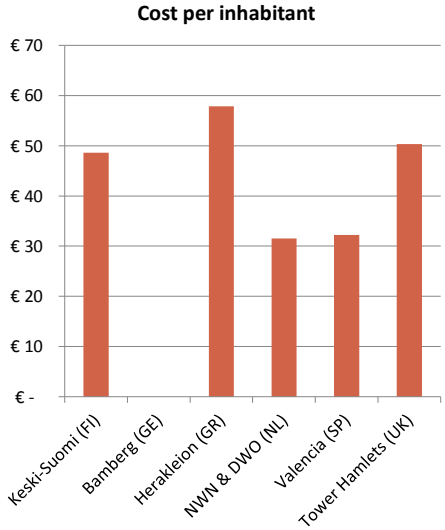




MANAGED OUTCOMES

Average costs per year





MANAGED OUTCOMES

Operations managment and planning

Components	*Type*	*Description*
Planning models	Strategic	This refers to the planning of services at the aggregation level of the unit or the organization with a relatively long time horizon (in years).
	Tactical	This refers to the planning of services at an aggregate level (e.g. a group of patients) and at a medium time horizon (e.g. months or years).
	Operational	This refers to the day to day planning of services for individual patients in which resources are allocated to an individual patient.
	Executional	This addresses the real time management and planning of service operations.
Operations management responsibilities and structure	Organizational structure and hierarchy	This refers to organizational structure and hierarchy (division into e.g. medical disciplines, service provision points, segments, et cetera).
Improvement and organizational development	Quality certificates	European Foundation for Quality Management (EFQM) model, or EFQM based models and certificates.
	Quality strategy	Quality management approaches, such as Total Quality Management, Lean Management, Six Sigma,
	Process optimization	Process optimization methods, such as Business Process Reengineering, Theory of Constraints, et cetera.
Information management	IT support systems	- Tracking and tracing - Electronic Patient Records - Service Planning Software - Demand management - Workforce planning - Financial information systems

MANAGED OUTCOMES

Operations management and planning

Components	*Type*	*Finland*	*Germany*	*Greece*	*Netherlands*	*Spain*	*United Kingdom*
Planning models	Strategic				Plan for access time		
	Tactical						
	Operational						
	Executional				- Task division - Detailed work procedures in GP offices - Referral procedure		
Operations management responsibilities and structure	Organizational structure and hierarchy				-Organization to coordinate all practices in the region		
Improvement and organizational development	Quality certificates						
	Quality improvement				-Visitatie (for GPs and Physiotherapist) -Guideline-based practices -Podoscreeners -Fundusscreeners		
	Process optimization						
Information management	IT support systems				-IPCI -Zorgdomein -Labsystem		

MANAGED OUTCOMES

Operations Management

	Keski-Suomi (FI)	Bamberg (DE)	Herakleion (GR)	NWN & DWO (NL)	Valencia (SP)	Tower Hamlets (UK)
Screening program	Yes				Yes	
Patient out-of-pocket for medication				0	0 - 10%	
Patient segmentation method	Type of care	Type of care	Type of care	Type of care	Type of care	Care balance
National/regional diabetes care standard	Yes			Yes		Yes
Patient freedom of choice	Low	High		High		
Collaboration						
1 organized form of collaboration	Some			Yes		
2 partners in diabetes service				Some		
3 steering group						
4 working groups				Some		
5 development programme	Yes			Yes		

MANAGED OUTCOMES

Operations Management

	Keski-Suomi (FI)	Bamberg (DE)	Herakleion (GR)	NWN & DWO (NL)	Valencia (SP)	Tower Hamlets (UK)
Information management						
1 Diabetes patient IT system	partial			Yes	No	
2 electronic patient record system	fragmented				Yes	Yes
3 patient tracking system	no				Yes	
4 performance measurement system	no			Yes		Yes
Process management						
1 case manager	Nurse			GP		GP
2 performance monitoring	No			Yes		Yes (GP funding principle)
Innovation						
1 Quality improvement				Yes	Yes	Yes
2 Process improvement	Yes			Yes	Yes	
3 Information systems improvement	Yes					
4 Regional diabetes plan				Yes	Yes	Yes

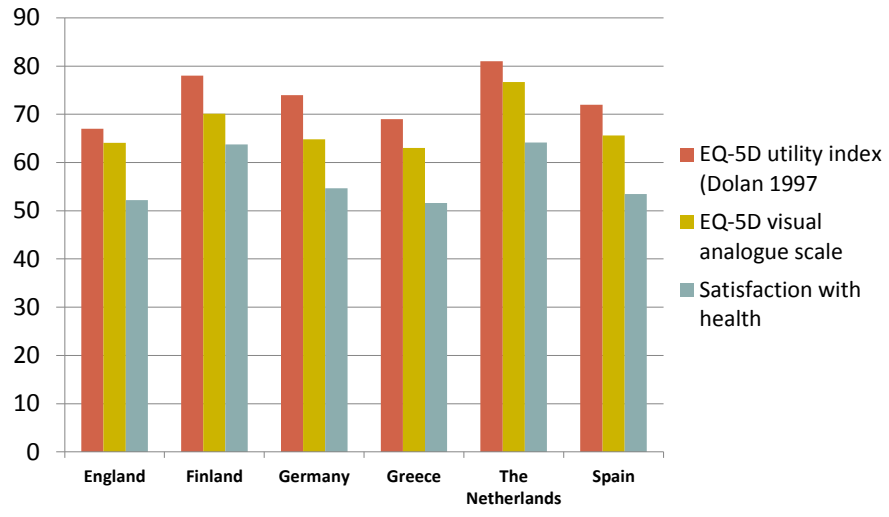
MANAGED OUTCOMES

Questionnaires

Country	Investigated institutions	Distributed	Returned	Response rate	Included
England	7	3343	475	14.2%	313
Finland	9	436	183	42.0%	183
Germany	5	462	286	61.9%	282
Greece	4	600	179	29.8%	179
The Netherlands	5	779	400	51.3%	387
Spain	1	625	115	18.4%	115
Total	31	6245	1638	26.2%	1459

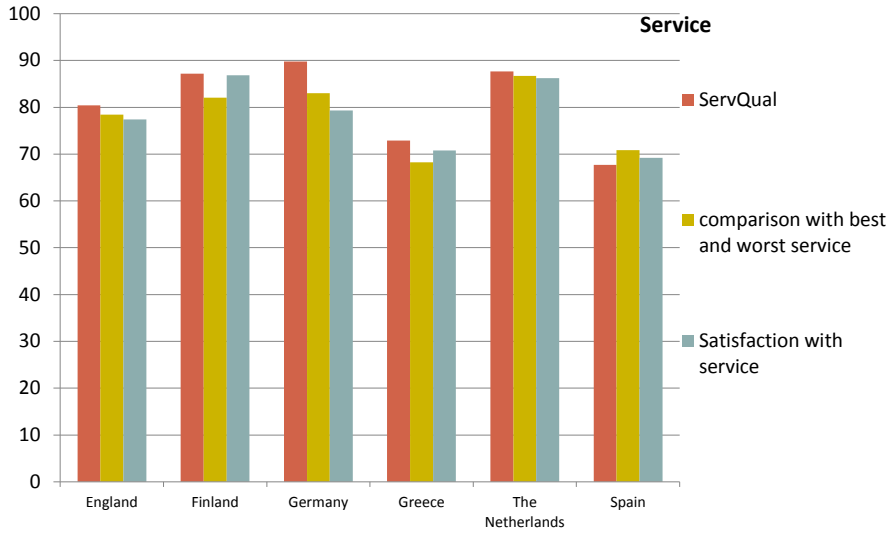
MANAGED OUTCOMES

Health status (Survey)



MANAGED OUTCOMES

Service (Survey)1

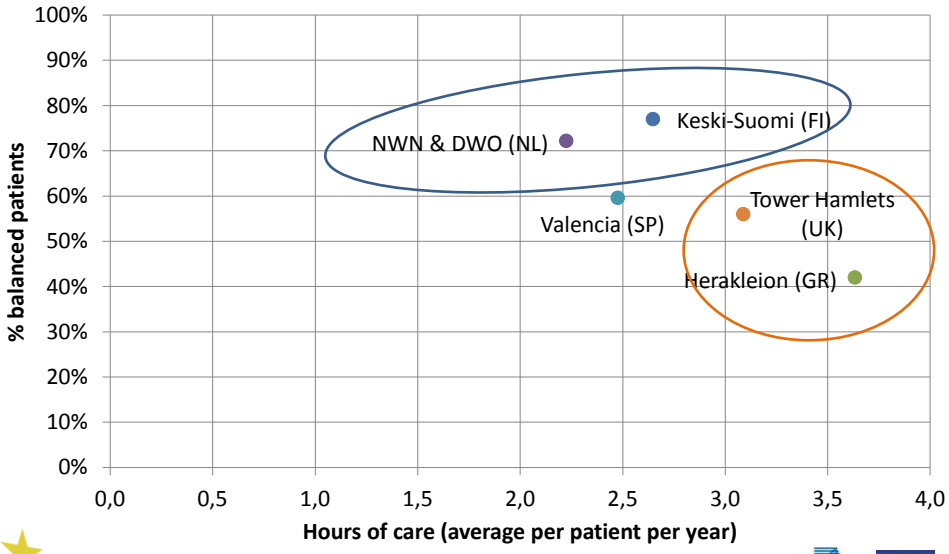


MANAGED OUTCOMES

3 Interpretation of results

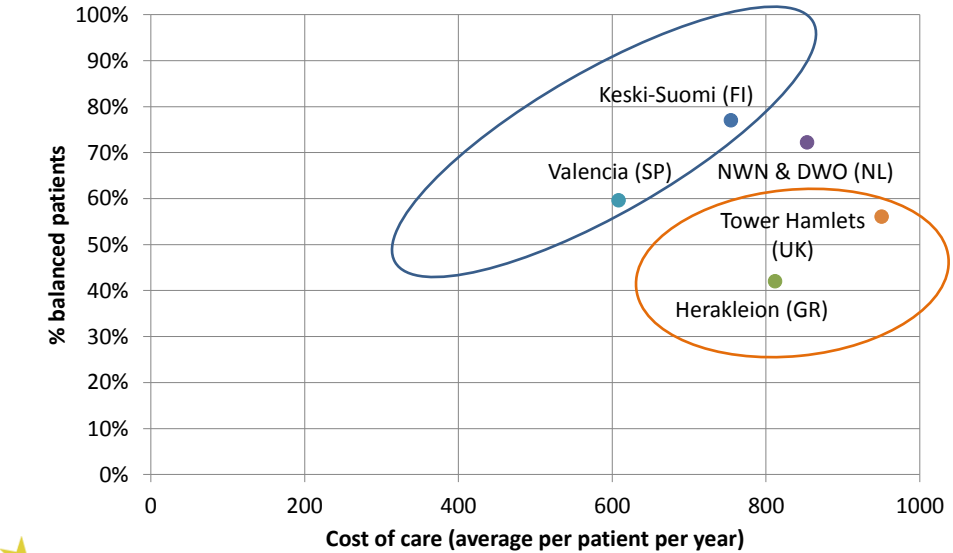
MANAGED OUTCOMES

Hours of care & balanced patients



MANAGED OUTCOMES

Cost of care & balanced patients



Comparative analyses

- Method: Fixed Proportion Technology

  Comparisons by calculating indices:

  1. Calculate indices: $input_i$/ $outcome_j$
  2. Normalize and compare each index with the minimum (best practice)
  3. Calculate average over all indices

Darold T. Barnum and John M. Gleason, Measuring efficiency under fixed proportion technologies, Journal of Productivity Analysis, Volume 35, Number 3 (2011), 243-262.

- Adaptations for Managed Outcomes Project
  1. Use one country as reference point
  2. Calculate the difference with reference country for each case instance

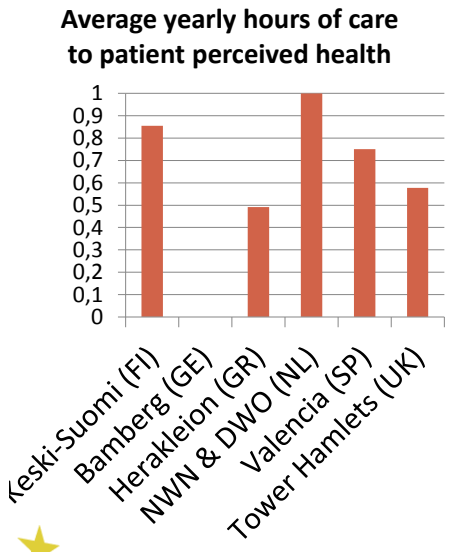
- Remarks:
  - We are studying further how we can apply this technique for presenting our results. At the moment we have sometimes interpreted input and output in a less strict sense which is not impeccable; also when we use survey results as output and calculate ratios, this is not fully appropriate, as the underlying scale is an interval scale and the FPT method assumes linearity.
  - Therefore the results in slides 46-56 will be confirmed only after peer-review in scientific journal publication process. All the results are aimed to be published by the consortium and the partners.

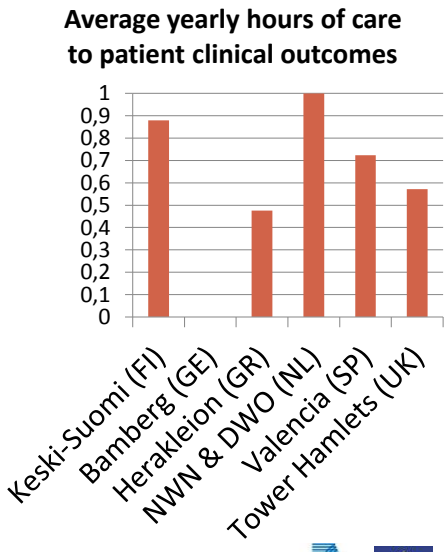
Hours of care compared with patient outcomes

Analysis	Input	Output
Hours of care to perceived health	• Average yearly hours of care S2-S6	• EQ-5D utility index • EQ-5D visual analogue scale • Satisfaction with health
Hours of care to health status	• Average yearly hours of care S2-S6	• HbA1c % < 53 mmol/mol • Problems with lower extremities • Problems with sight

MANAGED OUTCOMES

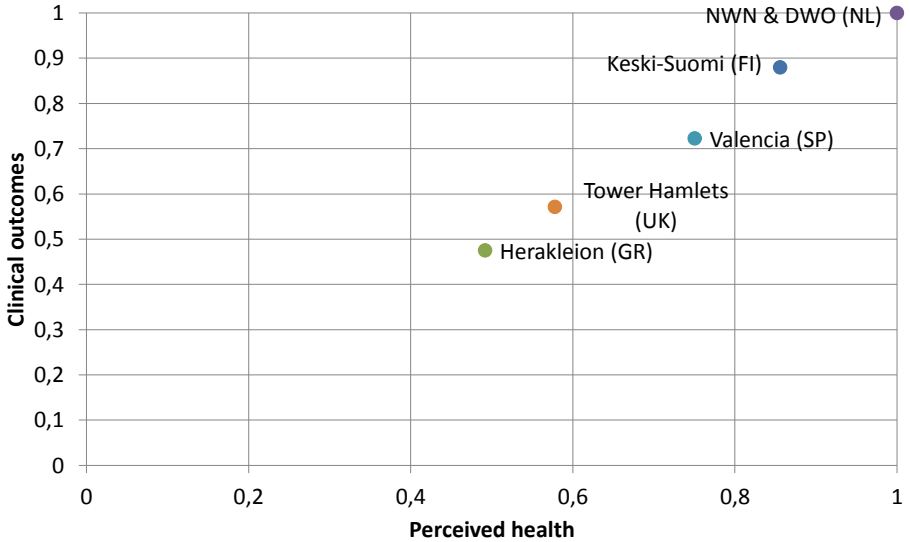
Average yearly hours of care to health outcomes





MANAGED OUTCOMES

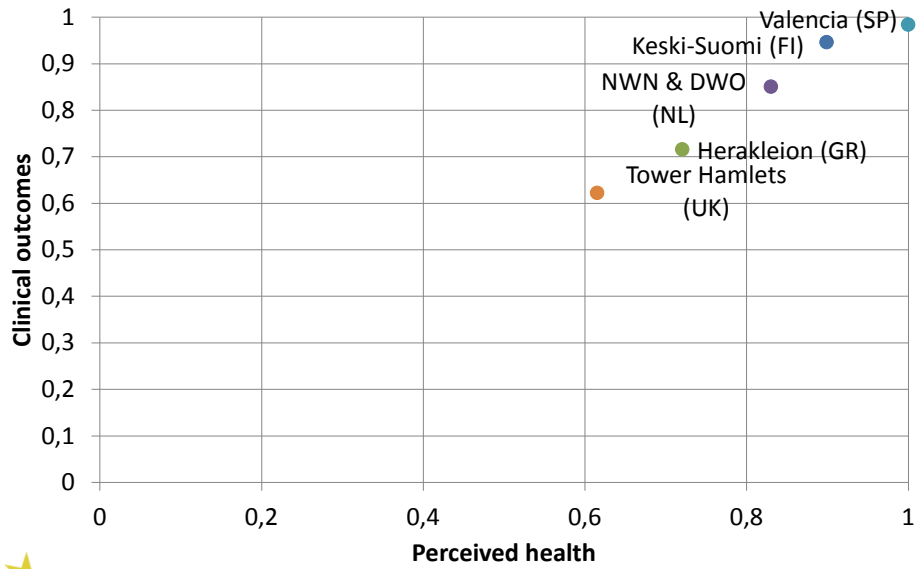
Average yearly hours of care, perceived health and clinical outcomes



Average yearly cost of care compared with patient outcomes

Analysis	Input	Output
Costs of care to perceived health	• Average yearly cost	• EQ-5D utility index • EQ-5D visual analogue scale • Satisfaction with health
Costs of care to health status	• Average yearly cost	• HbA1c % < 53 mmol/mol • Problems with lower extremities • Problems with sight

Costs of care, perceived health and clinical outcomes



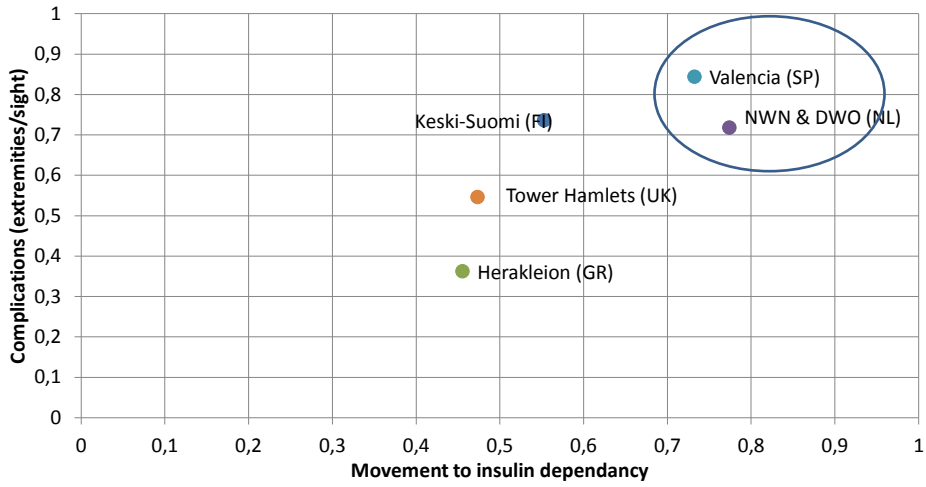
MANAGED OUTCOMES

Secondary prevention

Analysis	Input	Output
prevention for complications	• Service volume S3 • Service Volume S4	• No problems with lower extremities • No problems with sight
prevention for insulin dependancy	• Service volume S3 • Service Volume S4	• Avg time before insulin treatment

MANAGED OUTCOMES

Secondary prevention (service hours against outcomes



MANAGED OUTCOMES

4 Key findings

MANAGED OUTCOMES

Key findings: main differences in key demand and operations parameters

- Relative distribution of patients over demand segments:
  - DS2: 11-48%
  - DS4: 12-28%
- The length of stay in demand segments:
  - DS2: 2-5 yrs
  - DS3: 9-13 yrs
  - DS4: 8-19 yrs
- The number of hours of direct care per patient lifetime:
  - 70-90 hrs
- The main care-giver:
  - GP or nurse
- Costs per patient year during patient lifetime:
  - 609 – 1081 Euro's

Key findings: main differences in key outcome parameters

- Health status (EQ5D, survey)
  - 0.67-0.81 (Dolan index)
- Quality of services
  - 68-90 (SERVQUAL-score)
- Percentage of patients with HbA1c < 53 mmol/mol
  - 42-77%
- Complications
  - Lower extremities: 6-17%
  - Eyesight: 9-29%

Key findings: regional systems

- The number of care-givers and impact on outcomes
- The main care-giver and outcomes
- The primary-secondary roles in diabetes care

Key findings: good practices

- The amount of care delivered does not necessarily corresponds with the best health outcomes
- There are huge differences in the costs per demand segment. Regions that are successful in keeping patients in the lower demand segments (Keski Suomi and Valencia) are more cost-effective. However, Keski-Suomi is spending much more money.
- NWO-DWD and Valencia are doing well in finding a balance between efficiency and outcomes
  - Valencia puts less efforts in it and has relative good outcomes
  - NWN DWO puts more efforts in it and has better outcomes, as well as perceived as clinical
- NWO-DWD and Valencia are doing well preventing complications and insulin dependency
- Care frequency and adherence to diet and medication

Key findings: recommendations

- The Managed Outcomes approach provides a multiperspective view on the design and the performance of the regional diabetes care delivery system;
  This facilitates a systematic approach to improvement of diabetes care.
- There is a lot of difference between health care practices in provision of services; further study to relate the operational description to evidence based clinical guidelines
- Improving the operational modelling (now aggregate description) by collecting operations data to individual patients

MANAGED OUTCOMES

An operations management and demand based approach to regional health service delivery systems for stroke patients

Meeting European health care system challenges by learning from differences between management practices in six EU countries

Contents

1. Background information MO project
2. Results
3. Relating inputs to outcomes
4. Key findings

MANAGED OUTCOMES

1 Background MO project

MANAGED OUTCOMES

The Managed Outcomes Project

- ✓ All EU countries are experiencing the same problems in healthcare: the population is aging, causing an increasing demand for healthcare services: availability of trained personnel and funding is limited, while new medical treatments are more effective but more expensive. In order to cope with these constraints, the European healthcare systems need to improve to better consider the cost-beneficial provision of health outcomes, rather than just health outputs.
- ✓ The MANAGED OUTCOMES project is based on the notion that healthcare outcomes and cost-benefits are affected by the efficiency of service production, the regional structure of healthcare delivery and the degree to which people are empowered to participate in the co-production of their care. These relationships are insufficiently understood and need to be studied to meet the objectives of the European health strategy.
- ✓ The main objective of Managed Outcomes is to develop and disseminate rich but practical conceptual models and a toolkit for improving the health service production system.

The Managed Outcomes project

- ✓ The project is performed by a consortium of universities and consultancy organisations:
  - Aalto University (AALTO) - Finland
  - Erasmus University Rotterdam (EUR)- Netherlands
  - Otto-Friedrich-Universität Bamberg (Universität Bamberg) - Germany
  - Universidad Politechnica de Valencia (UPVLC) - Spain
  - European Hospital and Healthcare Federation (HOPE)- Belgium
  - Riel Miller - Xperidox Futures Consulting - France
  - Ethniki Scholi Dimosias Ygeias Eidikos Llogariasmos Erevnon (NSPH) - Greece
  - Balance of Care Group - UK
  - Innovation in Learning Institute (ILI) - Germany
  - Forum Virium - Finland
- ✓ In six EU countries (FI, FG, GR, NL, SP, UK) cases studies are performed for four costly health care demands that are challenging EU healthcare systems:
  - Diabetes type 2
  - Stroke
  - Hip-osteoarthritis
  - Dementia

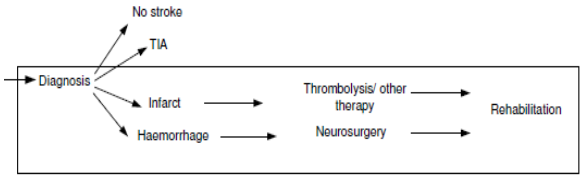
Stroke networks as EU healthcare challenge

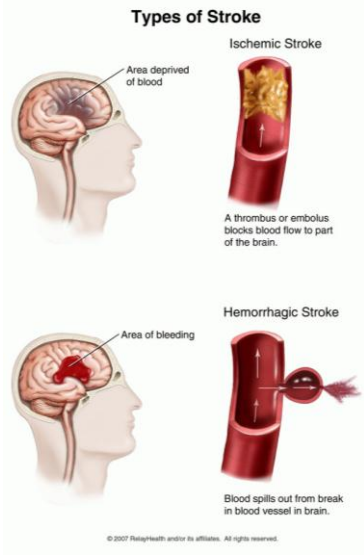
- Stroke is one of the most occurring causes of death in the EU
- The services required for treating stroke and care for stroke patients are very costly and place a large burden on health care systems, patients and families
- Though healthcare systems differ much between countries in the EU, the treatment protocols used by medical, nursing and paramedical professionals are the same, so therefore there is a lot to learn from how we organize and manage the services for stroke patients at operational level
- The huge differences in outcomes of stroke services in different countries might be explained to a considerable extent in the way we organize the processes for delivering the services

MANAGED OUTCOMES

Stroke disease

Rapidly developing clinical signs of focal or global disturbance of cerebral function leading to death or lasting more than 24 hours with no apparent cause other than a vascular one.





[1]WHO Stroke control programme, 1972

MANAGED OUTCOMES

Helsingborg declaration on stroke

- Pan European Consensus meeting on stroke management in 1995 in Helsinborg Sweden, organised by the WHO
  Aboderin I, Venables G, Asplund K. Stroke management in Europe. *Journal of Internal Medicine*, 1996, 240:173-180
- Second Helsingborg meeting in 2006. Targets for stroke to be realised in 2015 on:
  - Organization of stroke services: all patients with stroke will have access to a continuum of care from organized stroke units in the acute phase to appropriate rehabilitation and secondary prevention measures
  - Management of acute stroke: more than 85% of stroke patients survive the first month after stroke
  - Prevention: stroke mortality is reduced with at least 20% from the level of 2005
  - Rehabilitation: more than 70% of surviving patients are within three months independent in their activities of daily living
  - Evaluation: established system for routine collecting of data required for evaluation of services
- K. Kjellström, B. Norving, A. Shatchkute. Helsingborg declaration 2006 on European stroke strategies. Cerebrovascular diseases 2007;23:229-241

MANAGED OUTCOMES

The six EU case study settings

Region	Population	Population density	Age 70+ (%) Case – National	Incidence ischemic stroke Case - National	Incidence haemorrhagic stroke Case - National
FI: Keski-Suomi	273 000	14	13% - 12%	197 - 182	40 – 48
FG: Erlangen	236.264	368	12% - 15%	110 -	23 -
GR: Athens	3 191 329*	1076	10% - 10%	107 -	19 -
NL: Tilburg	341.313	492	10% - 10%	198 – 239	26 – 42
SP: Valencia	266 320	2002	11% - 12%	179 - 188	107 -
UK: Brighton	365 000	3044	12% - 12%	123 - 185	36 - 33*

*National incidence data based on NICE/England

MANAGED OUTCOMES

The six stroke case studies

Region	Hospitals involved	Size (# beds)	Total cases	Ischemic strokes	Hemorrhagic Strokes
FI: Keski-Suomi	Keski-Suomi Central Hospital (KSCH)	400	756	538	238
FG: Erlangen	University Hospital Erlangen	1300	613	508	105
GR: Athens	Alexandra University General Hospital of Athens (AUGHA)	482	181	150	26
NL: Tilburg	St. Elisabeth Hospital (EH) Tweesteden Hospital (TH)	673 576	773	657	88
SP: Valencia	Hospital La Fe (FH)	1297*	763	478	285
UK: Brighton	Royal Sussex County Hospital (RSCH)	600	579	449	130

*Number of beds reduced in new built hospital 2010

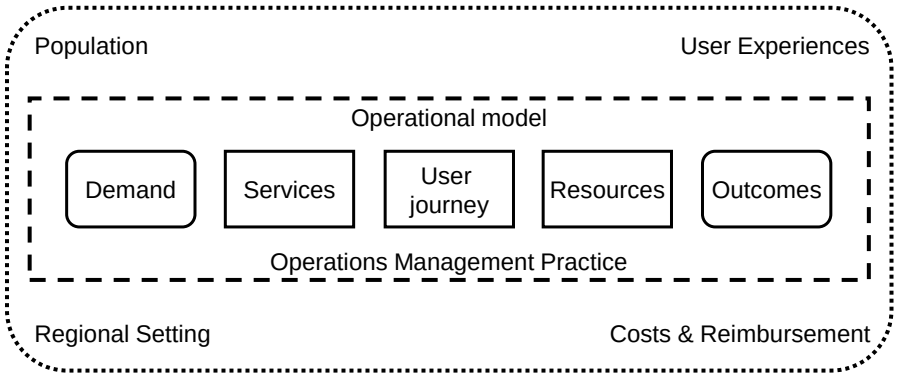
MANAGED OUTCOMES

The six stroke networks

Region	Partners in stroke network
FI: Keski-Suomi (KSCH)	Ambulance, Emergency department (24/7), stroke unit / neurology ward, neurosurgery / neurosurgical ward (Kuopio University hospital), rehabilitation centres in primary care, nursing homes
FG: Erlangen	Ambulance, Emergency department (24/7), stroke unit / neurology ward, neurosurgery / neurosurgical ward, homecare / rehabilitation centre
GR: Athens (AUGHA)	Ambulance, Emergency department (24/every 4th day, shared service with 13 other hospitals), stroke unit (5 beds) / internal medicine ward, neurosurgery / neurosurgical ward (other hospital)
NL: Tilburg (EH, TH)	Ambulance, Emergency department (24/7), stroke unit / neurology ward, neurosurgery / neurosurgical ward (EH), homecare, rehabilitation centre , nursing homes
SP: Valencia (FH)	Ambulance, Emergency department (24/7), stroke unit / neurology ward, neurosurgery / neurosurgical ward, rehabilitation unit, hospital at home, nursing homes
UK: Brighton (RSCH)	Ambulance, Accident & Emergency department (24/7), stroke unit / neurology ward, neurosurgery / neurosurgical ward (other hospital), community rehabilitation team / step down facility

MANAGED OUTCOMES

Methodology



Methodology

- Operational model: formal description of the demand, services, user journey, resources and outcomes, and their quantitative relationships
- Operations management practice: the planning, management and innovation of services; the collaboration between partners providing services
- Outcomes: health status, measured by providers (quality indicators) and experienced by users, satisfaction
- User experiences: the view of users on services and their performance, measured in a survey
- Costs & reimbursement: the costing of resources for services and the financing of services

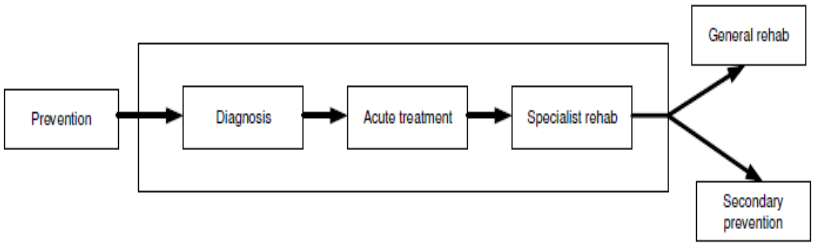
Literature on stroke (services)

- Leonid Churilov, Geoffrey A. Donnan. Operations Research for stroke care systems: an opportunity for *The Science of Better* to do much better. *Operations Research for Health Care*, Volume 1, Issue 1, March 2012, pp. 6-15.
- Soojin Park and Lee. H. Schwamm. Organizing regional stroke systems of care. *Current Opinion in Neurology*, 2008,21, pp.43-55.

MANAGED OUTCOMES

Demarcation

Focusing on acute hospital care involving specialist stroke services. Excluding prevention and long term rehabilitation



MANAGED OUTCOMES

2 Results

MANAGED OUTCOMES

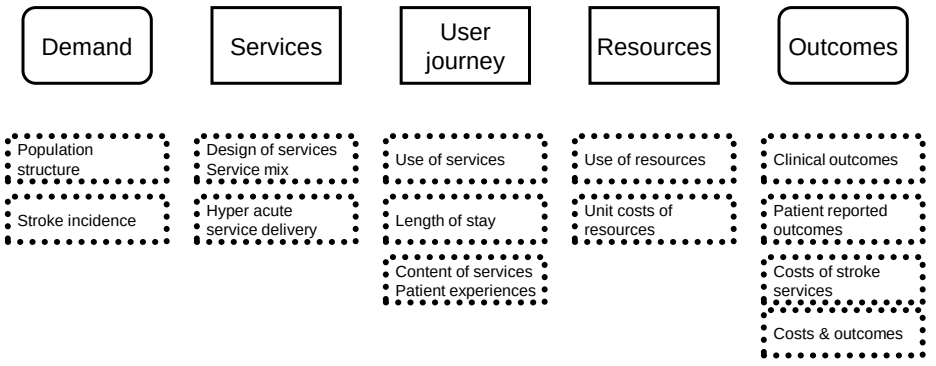
Data

- Operational model: incidence, number of stroke cases, services, resources, costs: 2009/2010 data
- Operational performance: access time, percentage trombolysis, door-to-needle time, length of stay, mortality : 2009/2010 data
- Patient survey: questionnaire in 2011

	Keski-Suomi (FI)	Erlangen (G)	Athens (GR)	Tilburg (NL)	Valencia (SP)	Brighton (UK)
Questionnaires distributed	600	366	126	625	306	346
Response rate	31.7%	34.4%	51.6%	35.8%	33.0%	34.7%
Questionnaires included	160	110	52	210	72	94
percentage males (s.)	42,0%	61,2%	46,2%	60,2%	62,9%	67,0%
average age (s.)	69,8	67,0	73,9	70,1	66,0	73,9
percentage ischemic strokes	NA	88,2%	80,8%	91,4%	NA	100,0%

MANAGED OUTCOMES

Analysis stroke process and performance



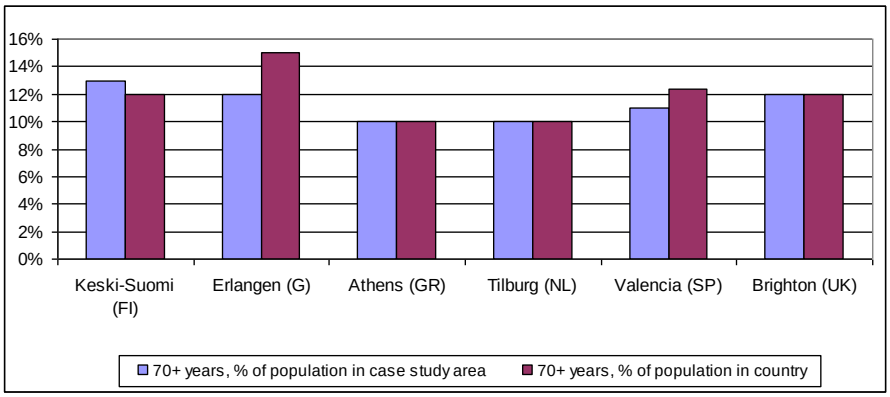
MANAGED OUTCOMES

Results Contents

Demand	Services	User journey	Resources	Outcomes
Population structure	Design of services Service mix	Use of services	Use of resources	Clinical outcomes
Stroke incidence	Hyper acute service delivery	Length of stay	Unit costs of resources	Patient reported outcomes
		Content of services Patient experiences		Costs of stroke services
				Costs & outcomes

MANAGED OUTCOMES

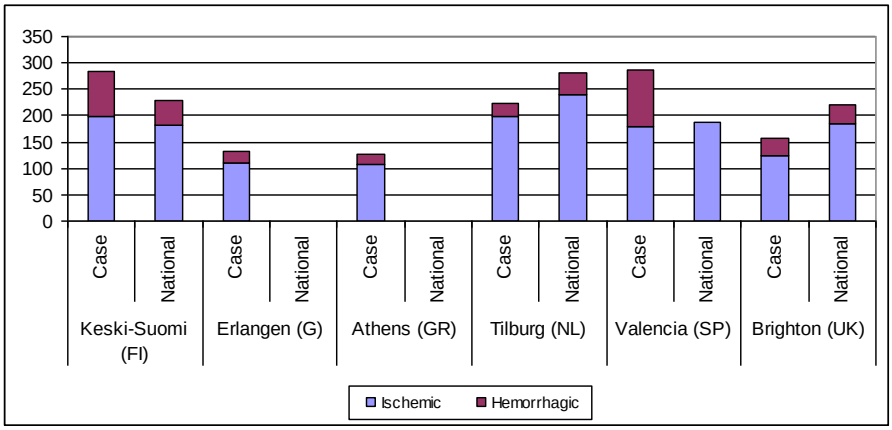
Population structure (operational model)



GR national data = 1st Attica region; UK national data = Sussex region

MANAGED OUTCOMES

Incidence ischemic & hemorrhagic strokes
(operational model)



GR: incidence of 319,4 per 100.000 inhabitants 45-84 years based on paper from 1999, translated to overall incidence figure

MANAGED OUTCOMES

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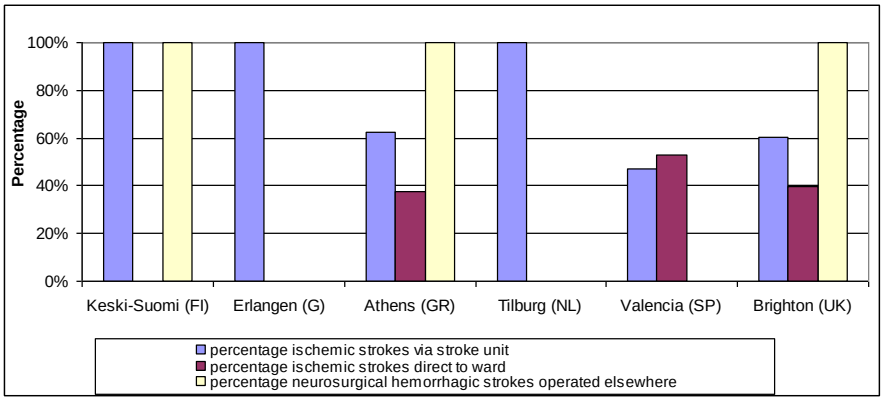
MANAGED OUTCOMES

Design of services (operational model)

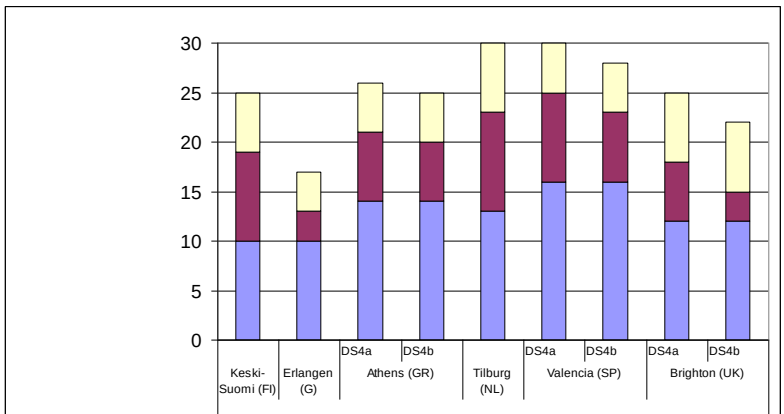


Criteria for stroke unit GR/SP/UK: ischemic stroke less than 24 hours evolution or Ischemic stroke in progression or TIA repetition. Excluding: patients with Barthel < 85, Rankin > 2, disabilities, short life expectancy, dementia

For case instances with a split of flows, we will use DS4a as the flow via the stroke unit and DS4b as the flow directly to a medical ward

MANAGED OUTCOMES

Service mix (operational model)



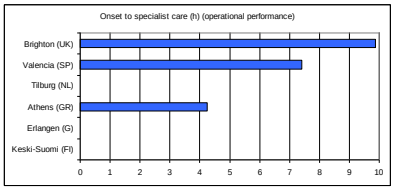
	Keski-Suomi (FI)	Erlangen (G)	Athens (GR) DS4a	Athens (GR) DS4b	Tilburg (NL)	Valencia (SP) DS4a	Valencia (SP) DS4b	Brighton (UK) DS4a	Brighton (UK) DS4b
Rehabilitation (S4)	6	4	5	5	7	5	5	7	7
Treatment ischemic stroke (S2)	9	3	7	6	10	9	7	6	3
Diagnosis (S1)	10	10	14	14	13	16	16	12	12

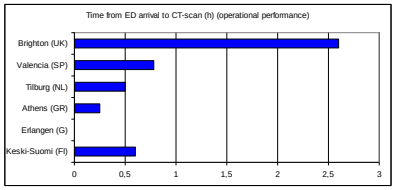
DS4a flow via stroke unit, DS4b: flow directly to medical ward

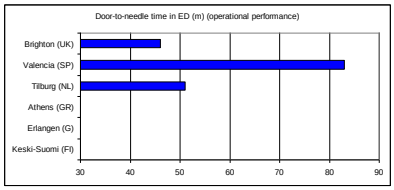
Erlangen data incomplete

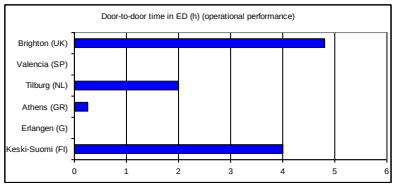
MANAGED OUTCOMES

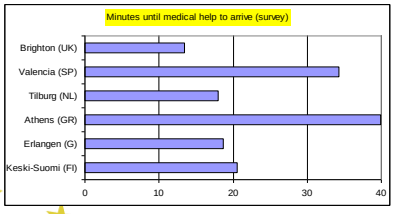
Hyper acute phase: service delivery

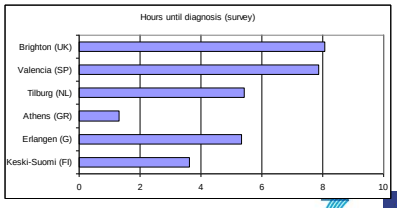






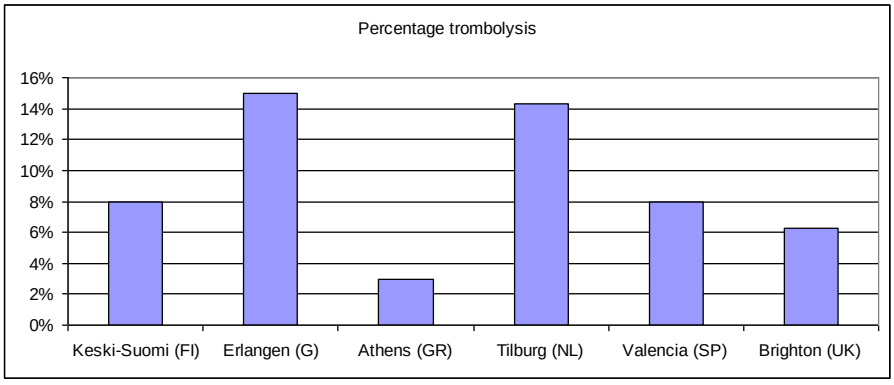






MANAGED OUTCOMES

Thrombolysis



MANAGED OUTCOMES

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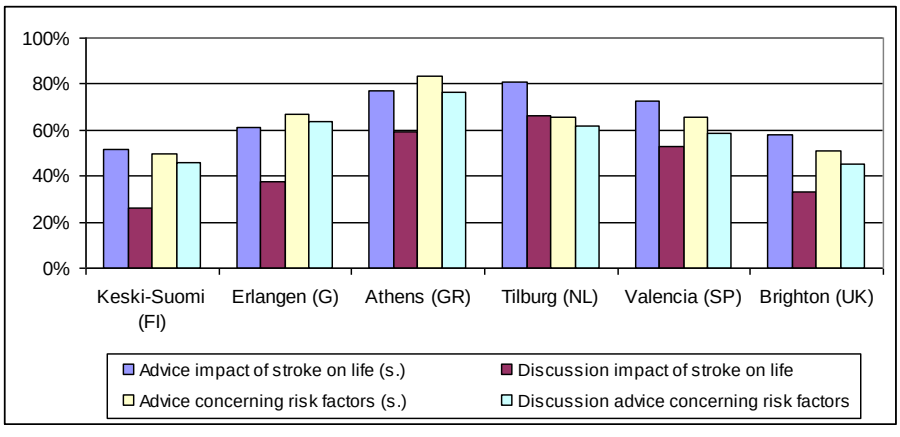
				Costs & outcomes

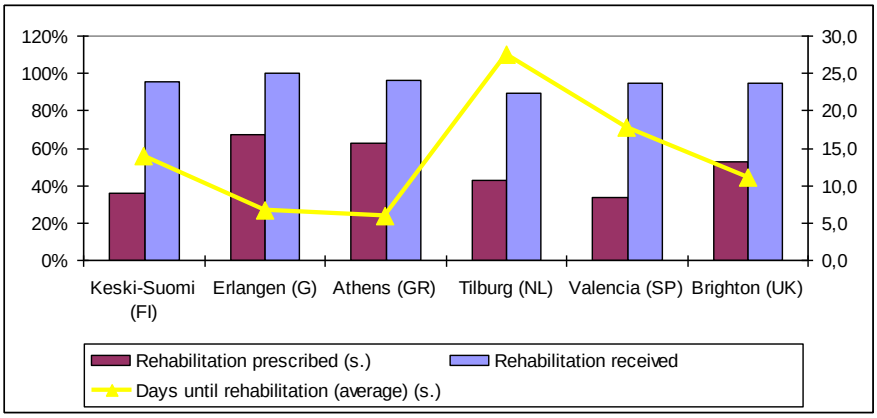
MANAGED OUTCOMES

Consultation and advice (survey)



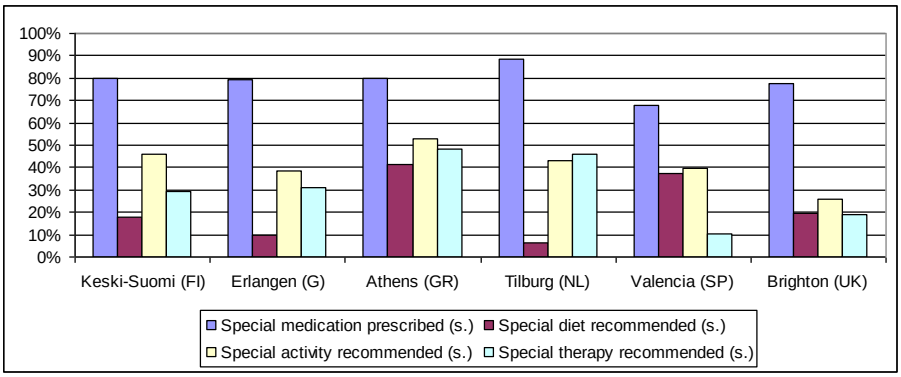
MANAGED OUTCOMES

Rehabilitation practices (survey)



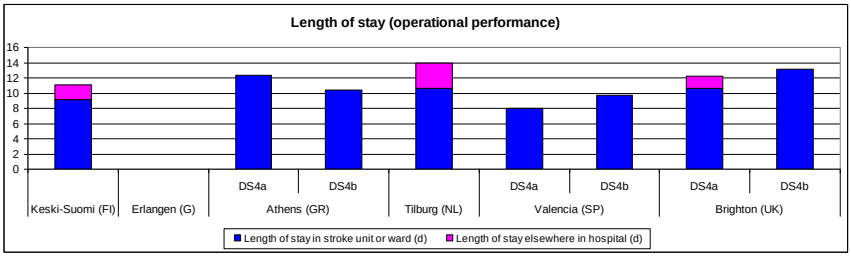
MANAGED OUTCOMES

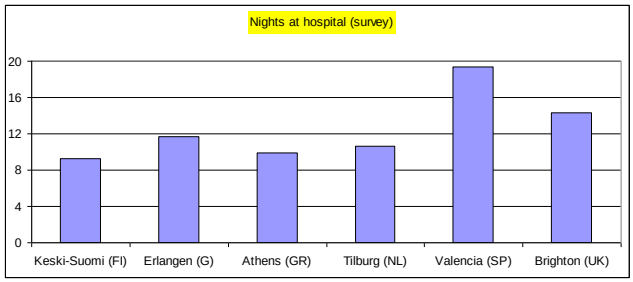
Therapeutic actions (survey)



MANAGED OUTCOMES

Length of stay (operational performance & survey)

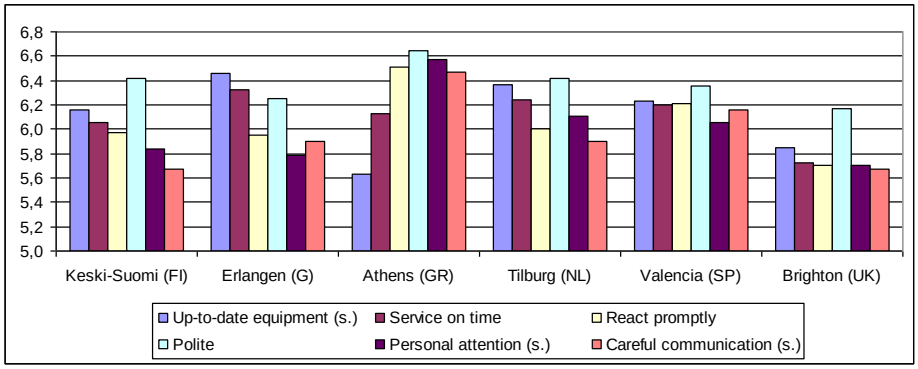




SP:
RHB unit in hospital

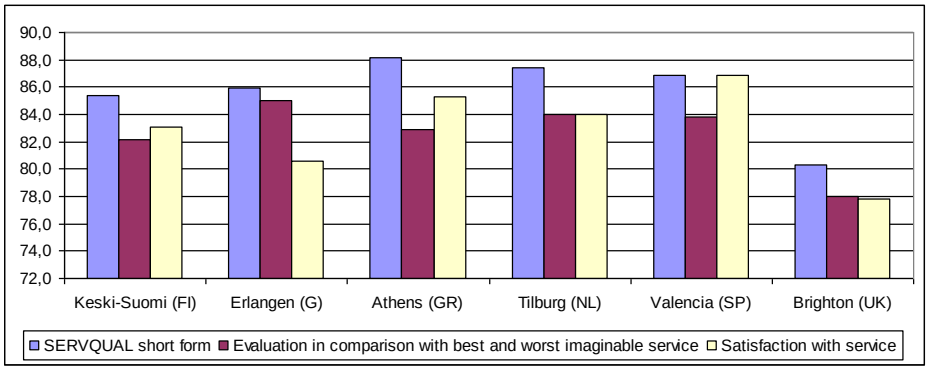
MANAGED OUTCOMES

Quality of services (survey)



MANAGED OUTCOMES

Quality of services (survey)



MANAGED OUTCOMES

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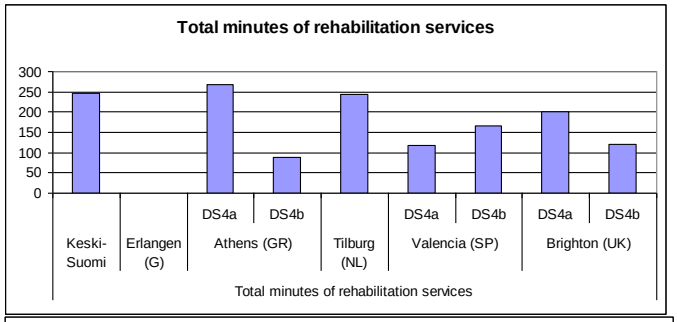
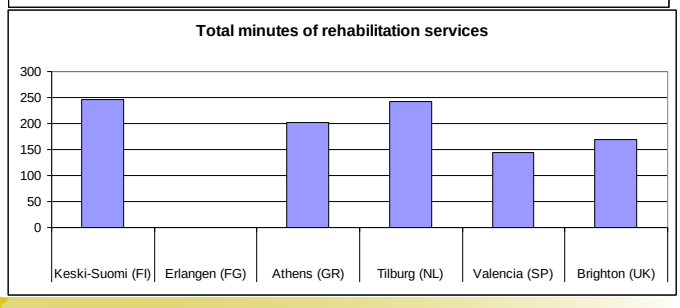
MANAGED OUTCOMES

Use of rehabilitation resources (operational model)

(physio, speech, occupational, social worker, diet)





MANAGED OUTCOMES

Unit costs of resources (selection operational model)

	Keski-Suomi (FI)	Erlangen (FG)	Athens (GR)	Tilburg (NL)	Valencia (SP)	Brighton (UK)
Ambulance	500		37,5	310	310	310
ED care	302		11	180	124	124
Stroke unit	1300		661	412	584	450
Neurology ward	500			299	320	
Medical ward			560			400
Physiotherapy	76		6	33	20	20
Discharge ward	150			150		
Shortstay ward					224	

MANAGED OUTCOMES

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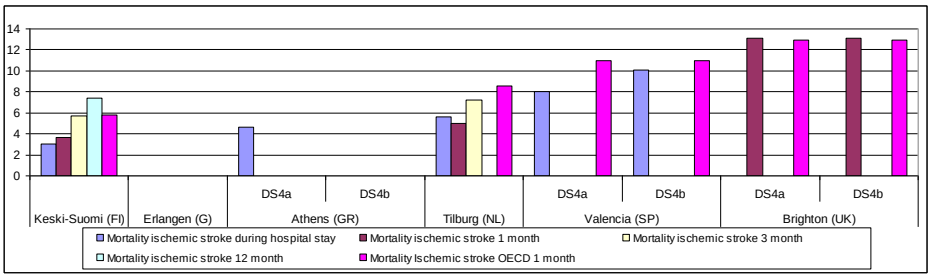
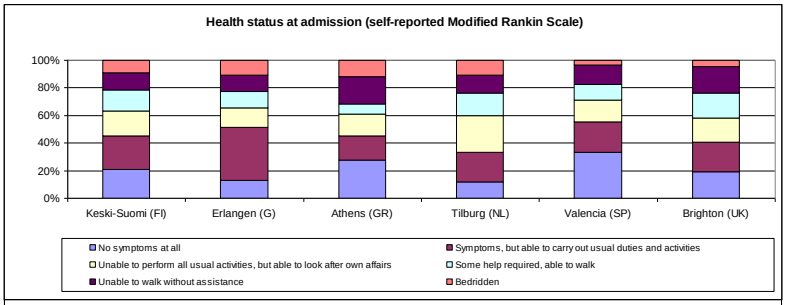
MANAGED OUTCOMES

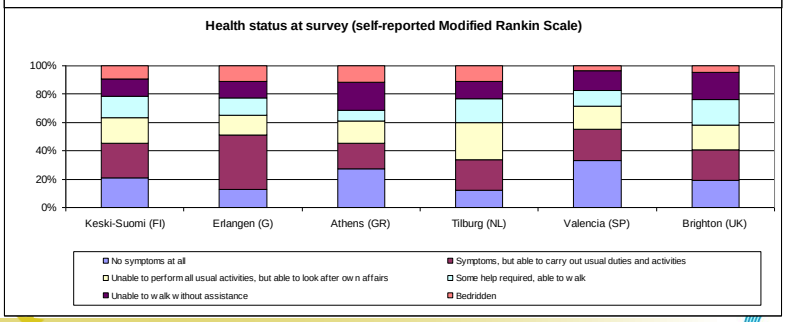
Clinical Outcomes (operational performance)



MANAGED OUTCOMES

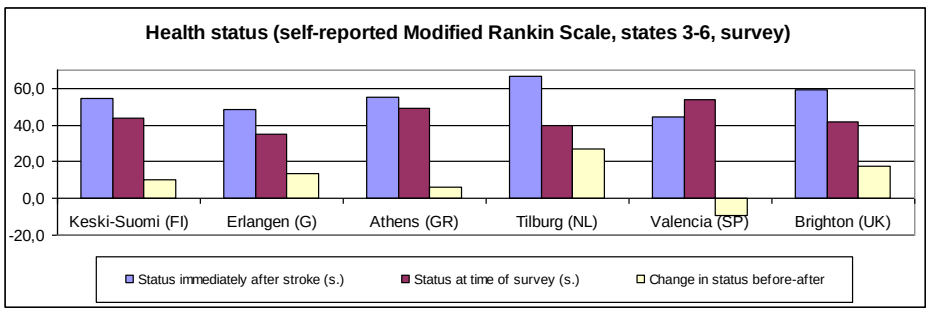
Patient reported Outcomes (survey)





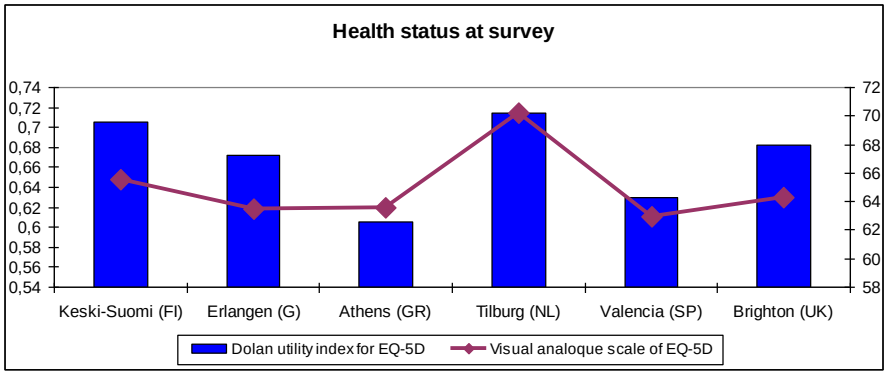
MANAGED OUTCOMES

Patient reported Outcomes (survey)



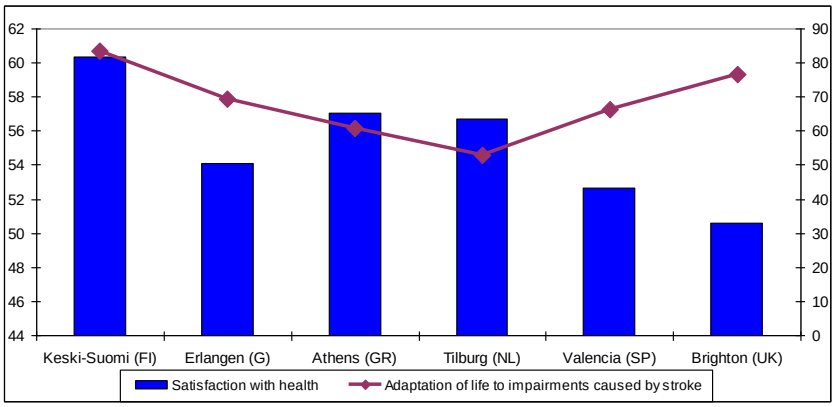
MANAGED OUTCOMES

Patient reported Outcomes (survey)



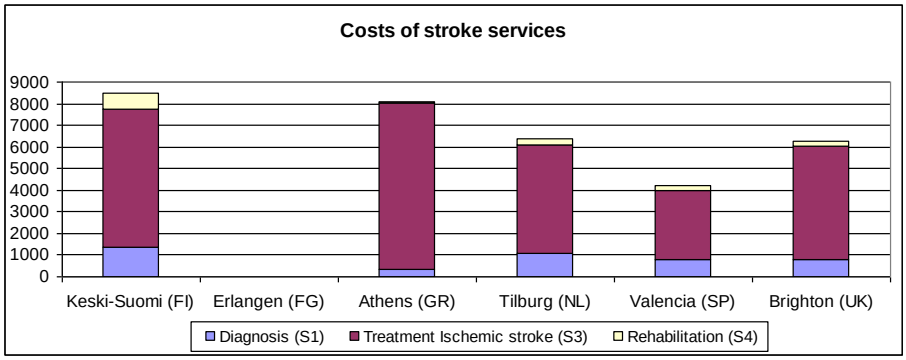
MANAGED OUTCOMES

Patient reported Outcomes (survey)



MANAGED OUTCOMES

Costs of stroke services



MANAGED OUTCOMES

3 Comparative analysis

Relating inputs to outcomes

Comparative analyses input-outcomes

- Method: Fixed Proportion Technology (FPT)

  Comparisons by calculating indices:

  1. Calculate indices: $input_i$/ $output_j$
  2. Standardize and compare index with minimum (best practice)
  3. Calculate average over all indices

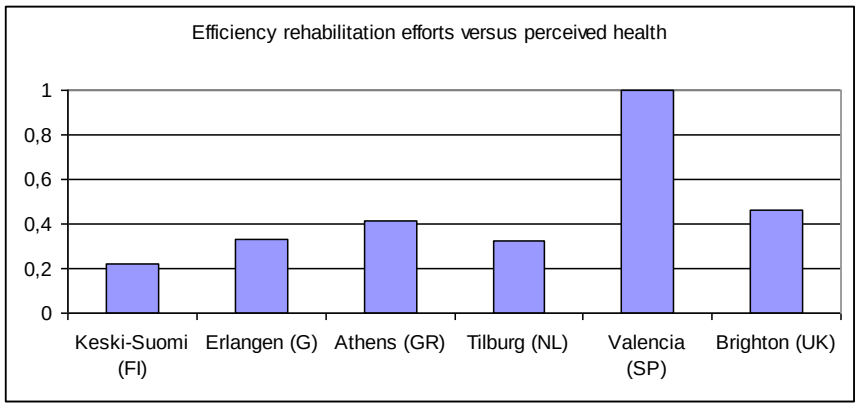
  Darold T. Barnum and John M. Gleason, Measuring efficiency under fixed proportion technologies, Journal of Productivity Analysis, Volume 35, Number 3 (2011), 243-262.

- Remarks:
  - We are studying further how we can apply this technique for presenting our results. At the moment we have sometimes interpreted input and output in a less strict sense which is not impeccable; also when we use survey results as output and calculate ratios, this is not fully appropriate, as the underlying scale is an interval scale and the FPT method assumes linearity.
  - Therefore the results in slides 46-56 will be confirmed only after peer-review in scientific journal publication process. All the results are aimed to be published by the consortium and the partners.

1 rehabilitation efforts and health outcomes

Analysis	Input	Output
Rehabilitation efforts versus perceived health	• Minutes of rehabilitation services provided	• EQ-5D Dolan utility index • EQ-5D visual analogue scale • Satisfaction with health • Change in health status

Rehabilitation efforts versus perceived health

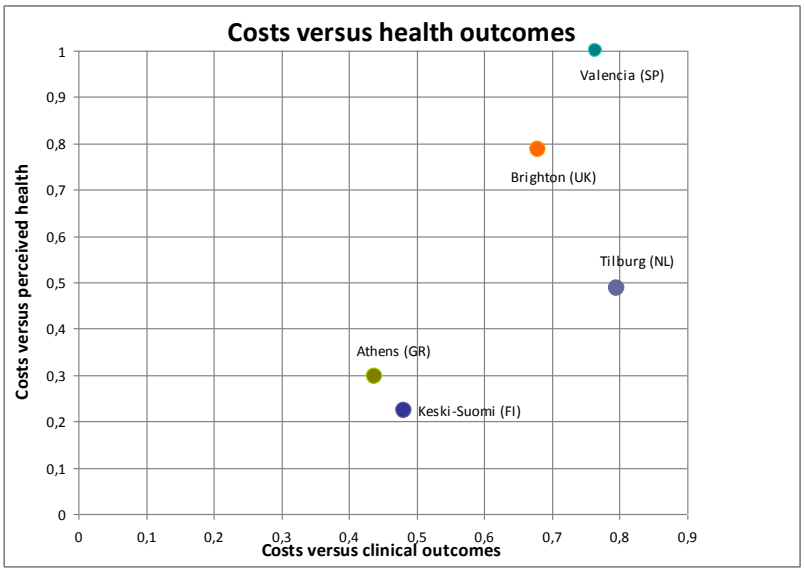


2 Costs of stroke service and health outcomes

Analysis	Input	Output
Cost of stroke service versus perceived health	• Costs of ischemic stroke	• EQ-5D Dolan utility index • EQ-5D visual analogue scale • Satisfaction with health • Change in health status
Costs of stroke service versus clinical outcomes	• Costs of ischemic stroke	• Mortality ischemic stroke, during hospital stay • Mortality ischemic stroke, one month

MANAGED OUTCOMES

Costs of stroke service and health outcomes



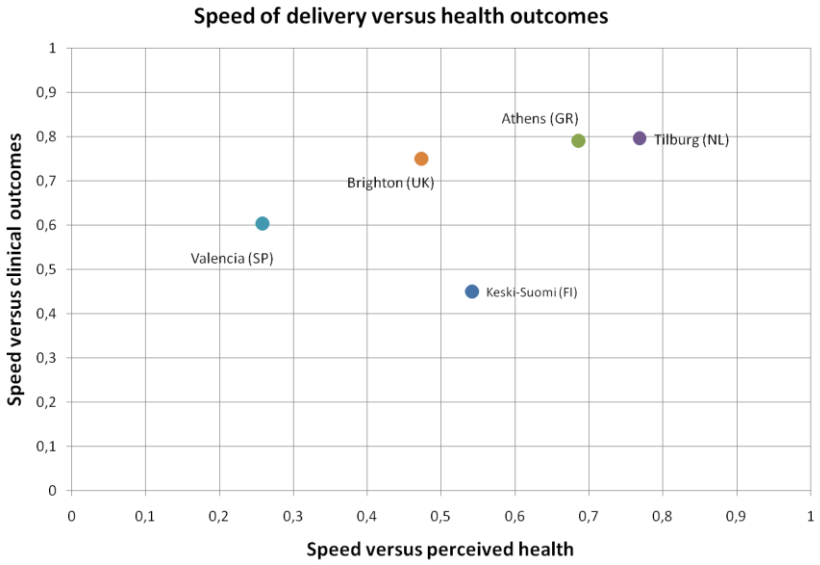
MANAGED OUTCOMES

3 Speed of delivery and health outcomes

Analysis	Input	Output
Speed of delivery in hyper-acute phase versus perceived health	• Onset to specialist care • Arrival ED to CT-scan • Door-to-needle time • Minutes until medical help • Hours until diagnosis	• EQ-5D Dolan utility index • EQ-5D visual analogue scale • Satisfaction with health • Change in health status
Speed of delivery in hyper-acute phase versus clinical outcomes	• Onset to specialist care • Arrival ED to CT-scan • Door-to-needle time • Minutes until medical help • Hours until diagnosis	• Mortality ischemic stroke, during hospital stay • Mortality ischemic stroke, one month

MANAGED OUTCOMES

Speed of delivery and health outcomes



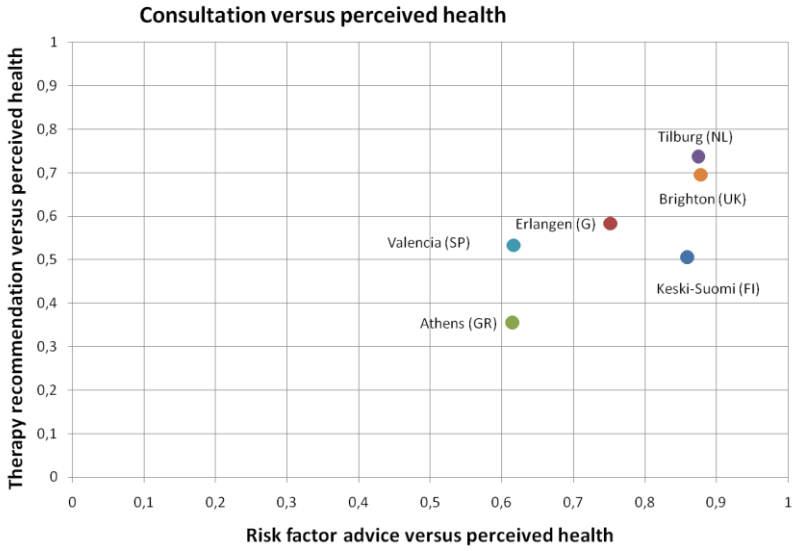
MANAGED OUTCOMES

4 Consultation and perceived health

Analysis	Input	Output
Risk advice versus perceived health	• Advice on impact on life • Discussion on impact • Advice on risk factors • Discussion on rik factors	• EQ-5D utility index • EQ-5D visual analogue scale • Satisfaction with health • Change in health status
Therapy advice versus perceived health	• Special medication • Special diet • Special activity • Special therapy	• Mortality ischemic stroke during hospital stay • Mortality ischemic stroke, one month

MANAGED OUTCOMES

Consultation versus perceived health



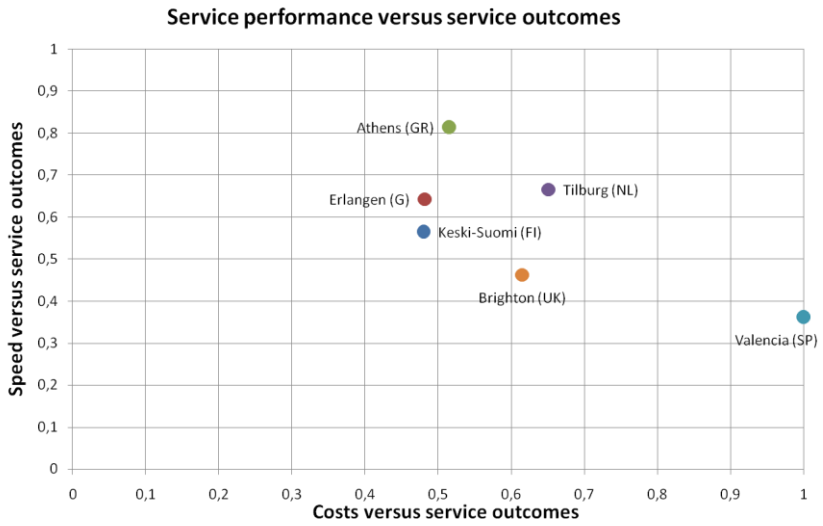
MANAGED OUTCOMES

5 Service performance and service outcomes

Analysis	Input	Output
Speed versus service outcomes	• Onset to specialist care • Arrival ED to CT-scan • Door-to-needle time • Minutes until medical help • Hours until diagnosis	• ServQUAL • Evalation in comparison with best and worst scenario • Satisfaction with services
Costs versus service outcomes	• Costs of ischemic stroke	• ServQUAL • Evalation in comparison with best and worst scenario • Satisfaction with services

MANAGED OUTCOMES

Service performance versus service outcomes



MANAGED OUTCOMES

Overview of analyses on efficiency

Analysis		Keski-Suomi (FI)	Erlangen (G)	Athens (GR)	Tilburg (NL)	Valencia (SP)	Brighton (UK)
1 Rehabilitation efforts versus health outcomes	Service time versus perceived health	0,22	0,33	0,42	0,33	1,00	0,46
2 Costs versus health outcomes	Costs versus perceived health	0,48	0,48	0,44	0,80	0,76	0,68
	Costs versus clinical outcomes	0,22		0,30	0,49	1,00	0,79
3 Speed versus health outcomes	Speed versus perceived health	0,54	0,60	0,69	0,77	0,26	0,47
	Speed versus clinical outcome	0,45		0,79	0,80	0,60	0,75
4 Consult and recommendation versus perceived health	Risk factor advice vs. perceived health	0,86	0,75	0,61	0,87	0,62	0,88
	Therapy recommendation vs. perceived	0,50	0,58	0,35	0,74	0,53	0,70
5 Rehabilitation versus perceived health	Rehabilitation vs. perceived health	0,64	0,64	0,60	0,75	0,60	0,66
6 Service performance and service outcomes	Costs versus service outcomes	0,48	0,48	0,52	0,65	1,00	0,62
	Speed versus service outcomes	0,56	0,64	0,81	0,67	0,36	0,46

MANAGED OUTCOMES

4 Key findings

MANAGED OUTCOMES

Key findings: range in inputs &performance

- There are large variations in practices

	Average	Minimum	Maximum
1 Incidence	152	107	198
2 Thrombolysis	8%	3%	14.3%
3 Minutes of rehabilitation	231	172	319
4 Length of stay	10.6	8.0	13.9
5 Costs	6989	4193	8504

	Average	Minimum	Maximum
1 Time ED-CT	0.95	0.25	2.6
2 Mortality during stay	6.3%	3%	10.1%
3 Mortality 1 month	7.3%	3.7%	13.1%
4 Mortality 1 month OECD	9.9%	5.8%	12.9%
5 Satisfaction with service	83.0	77.8	86.9
6 Satisfaction with health	0.67	0.60	0.72

Key findings: range OM practice

- Differences in production system:
  - All stroke patients via stroke unit and then to neurology ward or triage at ED for split between stroke unit flow medical ward flow
  - Hemorrhagic strokes operated at own hospital or in another more specialized hospital
  - Role of the stroke unit: central focus point of the stroke service or partner in the chain

Key findings: regional systems

- Differences in regional embedding:
  - Some stroke services are consisting of ambulance, stroke unit and medical ward
  - Others are embedded in a regional structure in which all partners in stroke (general practitioners, ambulance, hospital, rehabilitation centre, nursing home, homes for elderly, home care) participate
  - The regional collaboration around stroke services ranges between a very light structure with a meeting of partners once a year to a platform for evaluation and development of the stroke services

Key findings: good practices

- The best performance for costs related to health outcomes is found in the cluster Valencia-Tilburg-Brighton (see slide 51):
  - Valencia due to the low costs despite lower health outcomes
  - Tilburg and Brighton due to the high health outcomes despite high costs
- As there are large differences in unit costs per service, it is better to look at other measures that generate costs such as the amount of efforts put in rehabilitation or the length of stay.
  The best performance in rehabilitation efforts related to perceived health is realized in Valencia, due to the low number of minutes available for rehabilitation during hospital stay.
- The best performance of speed of service delivery in the hyper-acute phase related to health outcomes is realized in Tilburg-Athens-Brighton:
  - Tilburg due to the combined performance on speed and health outcomes
  - Athens and Brighton more due to the high performance on speed
- The best performance of advice efforts on risks and therapies related to perceived health is realized in Tilburg and Brighton
- The best performance of service performance related to service outcomes is realized in Athens-Tilburg-Valencia:
  - Valencia due to the low costs
  - Athens and Tilburg due to the high speed of delivery in the hyper-acute phase

Key findings: recommendations

- The Managed Outcomes approach provides a multiperspective view on the design and the performance of the regional stroke services delivery system. Adoption of this approach in stroke services by management supports a systematic approach to improvement of stroke services.
- There are large differences between health care practices in provision of services; further research is required to relate the operational description to evidence based clinical guidelines
- Improving the operational modelling (now based on aggregate description by experts) by collecting data on operational performance on individual patients.

MANAGED OUTCOMES

An operations management and demand based approach to regional health service delivery systems for hip osteoarthritis patients

Meeting European health care system challenges by learning from differences between management practices in six EU countries

MANAGED OUTCOMES

Contents

1. Background information MO project
2. Results
3. Interpretation of results
4. Key findings

MANAGED OUTCOMES

1 Background MO project

MANAGED OUTCOMES

The Managed Outcomes Project

- ✓ All EU countries are experiencing the same problems in healthcare: the population is aging, causing an increasing demand for healthcare services: availability of trained personnel and funding is limited, while new medical treatments are more effective but more expensive. In order to cope with these constraints, the European healthcare systems need to improve to better consider the cost-beneficial provision of health outcomes, rather than just health outputs.
- ✓ The MANAGED OUTCOMES project is based on the notion that healthcare outcomes and cost-benefits are affected by the efficiency of service production, the regional structure of healthcare delivery and the degree to which people are empowered to participate in the co-production of their care. These relationships are insufficiently understood and need to be studied to meet the objectives of the European health strategy.
- ✓ The main objective of Managed Outcomes is to develop and disseminate rich but practical conceptual models and a toolkit for improving the health service production system.

The Managed Outcomes project

- ✓ The project is performed by a consortium of universities and consultancy organisations:
  - Aalto University (AALTO) - Finland
  - Erasmus University Rotterdam (EUR)- Netherlands
  - Otto-Friedrich-Universität Bamberg (Universität Bamberg) - Germany
  - Universidad Politechnica de Valencia (UPVLC) - Spain
  - European Hospital and Healthcare Federation (HOPE)- Belgium
  - Riel Miller - Xperidox Futures Consulting - France
  - Ethniki Scholi Dimosias Ygeias Eidikos Llogariasmos Erevnon (NSPH) - Greece
  - Balance of Care Group - UK
  - Innovation in Leraning Institute (ILI) - Germany
  - Forum Virium - Finland
- ✓ In six EU countries (FI, FG, GR, NL, SP, UK) cases studies are performed for four costly health care demands that are challenging EU healthcare systems:
  - Diabetes type 2
  - Stroke
  - Hip-osteoarthritis
  - Dementia

Hip osteoarthritis

- Osteoarthritis is the most common type of arthritis, especially among older people
- Osteoarthritis of the hip can result from several different patterns of joint failure
- Osteoarthritis in the hip can **cause pain, stiffness, and severe disability**
- The main curative treatment is surgery:
  - Total Hip Replacement (THR) or
  - Hip Resurfacing

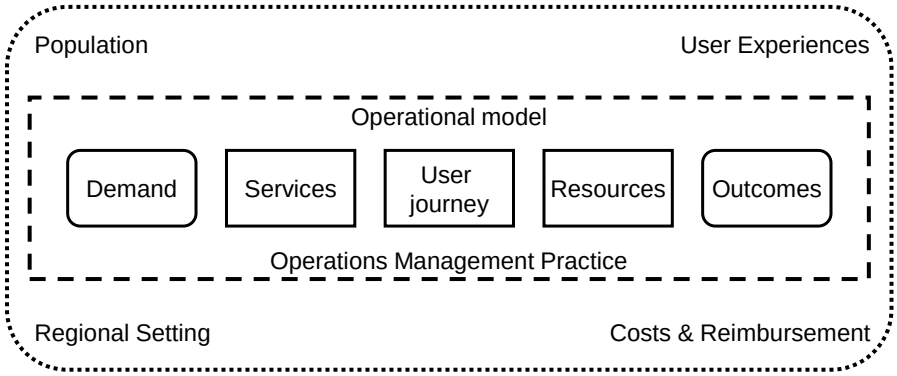
Total Hip Replacements (THR) – provider perspective

- The incidence ratio of THR has been shown to vary from 1.25 to 4.7 between regions of the same country (Keskimäki et al. 1994, Birkmeyer et al. 1998, Pedersen et al. 2005, Dixon et al. 2006)
- 75 % of the costs of THR are related to the surgery process: operation and in-hospital stay (Peltokorpi & Kujala 2006)
- Lower provider volume has been associated with longer hospital stay after THR surgery (Doro et al. 2006, Judge et al. 2006, Mäkelä 2010), with higher costs (Kreder et al. 1997, Martineau et al. 2005, Mitsuyasu et al. 2006) and also by increased mortality and complications (Katz et al. 2011, Kreder et al. 1997, Lavernia & Guzman 1995, Solomon et al 2002)
- High provider volume of arthroplasty operations has been associated with increased productivity (Torkki 2011)

Region – HIP OA

Region	Case hospitals	Population	Hip OA cases	Age 60+ (%)
Finland (Keski-Suomi)	Keski-Suomi Central Hospital	273 000	444	24 %
Germany (Erlangen)				
Greece (Larisa)	University General Hospital of Larisa	730 115	103	24 %
Netherlands (Tilburg)	St Elisabeth Ziekenhuis Tweesteden Ziekenhuis	430 955	340 104	22 %
Spain (Valencia)	Hospital La Fe	266 320	97	22 %
UK (Brighton)	SWLondon Elective Orthopaedic Centre	2 484 500	1273	24 %

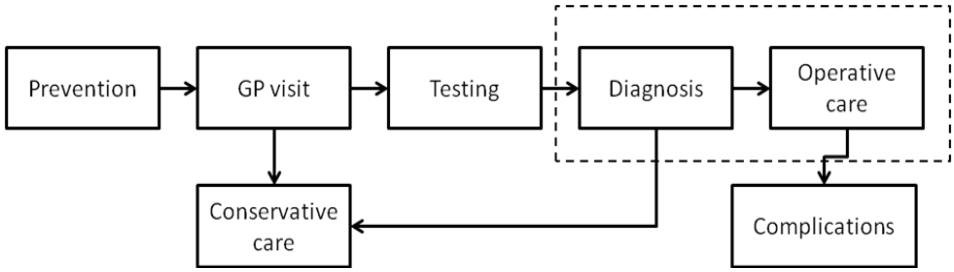
Methodology



Methodology

- Operational model: formal description of the demand, services, user journey, resources and outcomes, and their quantitative relationships
- Operations management practice: the planning, management and innovation of services; the collaboration between partners providing services
- Outcomes: the impact of services on health status, measured by providers (quality indicators) and experienced by users (satisfaction)
- User experiences: the view of users on services and their performance, measured in a survey
- Costs & reimbursement: the costing of resources for services and the financing of services

Demarcation



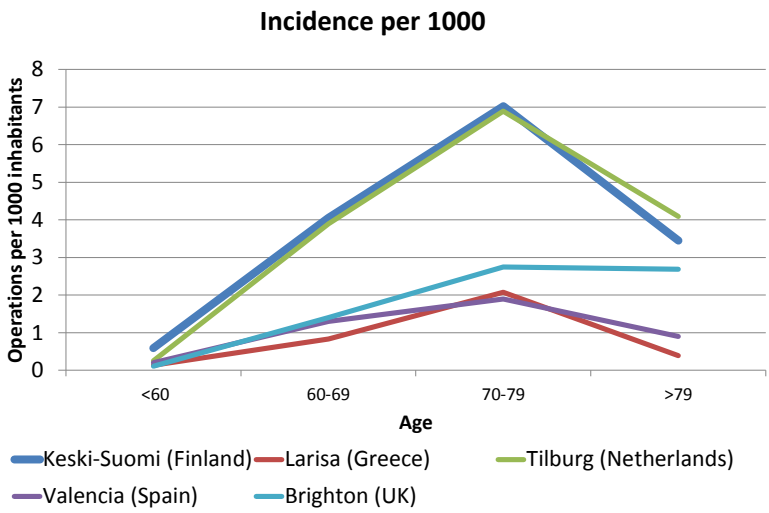
This study focuses on operative phase of the care: hip replacement operations

MANAGED OUTCOMES

2 Results

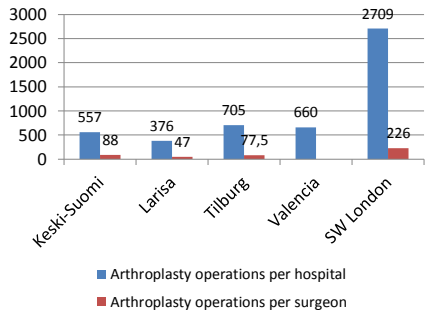
MANAGED OUTCOMES

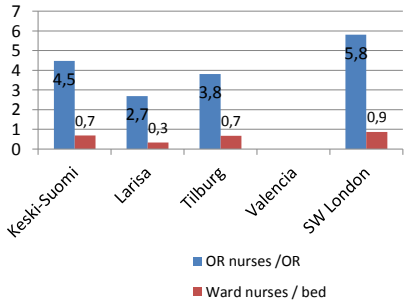
Incidence of Total Hip Replacements (THR)



MANAGED OUTCOMES

Supply analysis – HIP OA

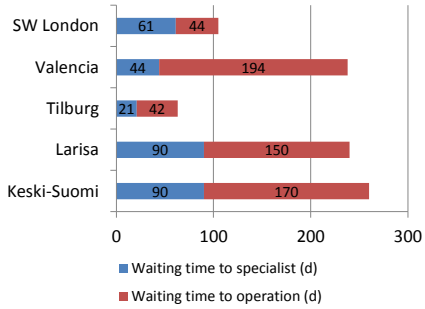


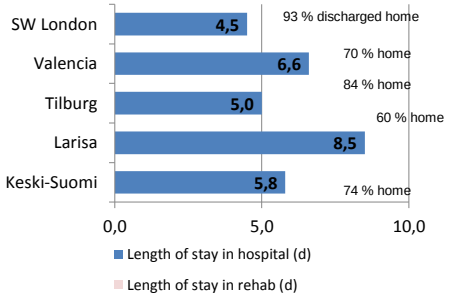


- Annual TJA (Total joint arthroplasty) volume of 376 – 2709 (UK)
- Annual TJA volume per surgeon 47-226
- Nurse intensity per OR and per bed is highest in UK and lowest in Greece

MANAGED OUTCOMES

Patient Journey analysis – HIP OA

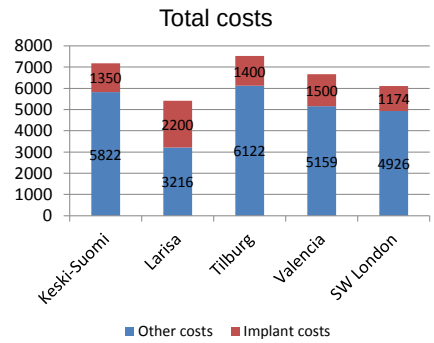


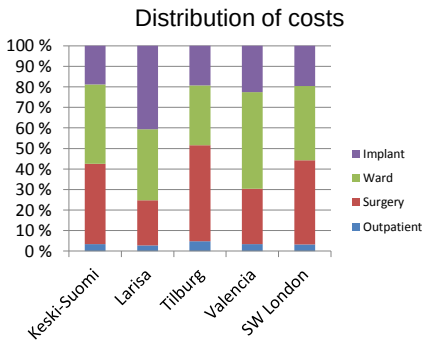


- The waiting times are shortest in Netherlands (~60 days)
- The waiting time of hip arthroplasty operation is approximately 250 days in Spain, Greece and Finland

MANAGED OUTCOMES

Cost analysis – HIP OA

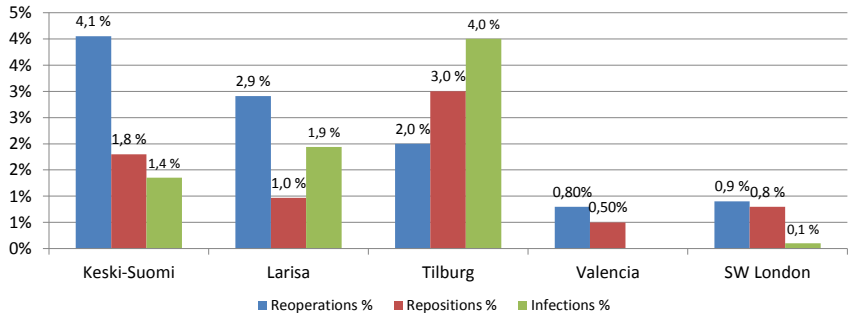




- The implant costs are lowest in UK (high volume?) and greatest in Greece
- The total costs per operation varies from 5500 eur (Greece) to 7500 eur (Finland)

MANAGED OUTCOMES

Outcomes – clinical indicators



- The number of complication is lowest in UK, especially in Reoperations
- In infections, classifications may be different?

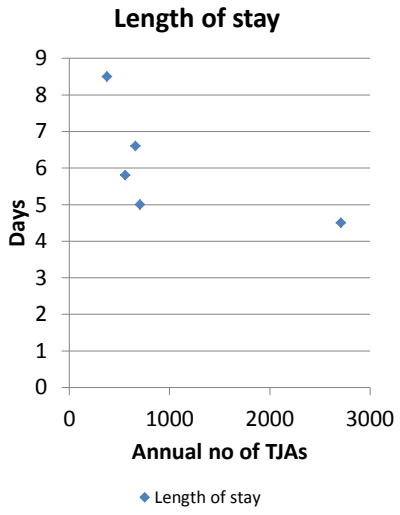
MANAGED OUTCOMES

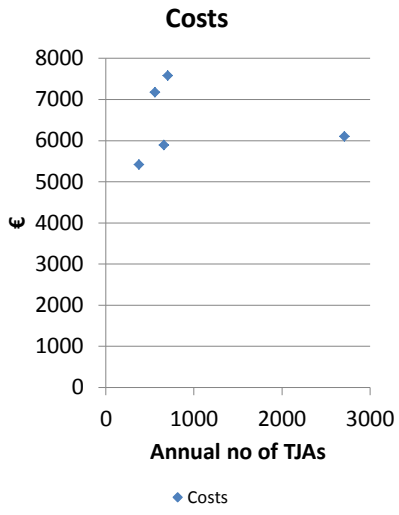
3 Interpretation of results

Differences in production system

- The majority of the hospitals were quite similarly organized in terms of volume and specialization
  - Exceptionally, the SW London Hospital was focused only joint replacements and the annual volume was multiple compared to the other units
- The differences in process practices are difficult to be found
  - In upper level “the hospitals have similar processes”
  - the differences in results may become from daily management and detailed process prescriptions

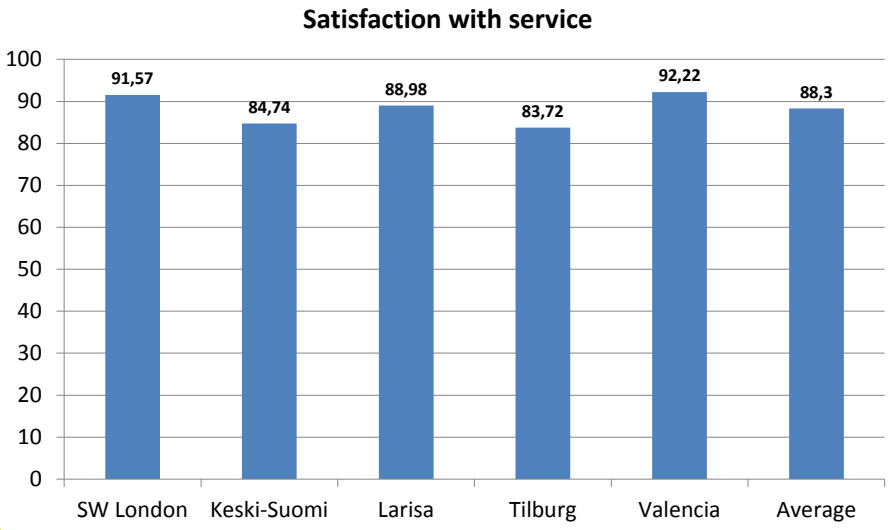
Productivity vs unit size





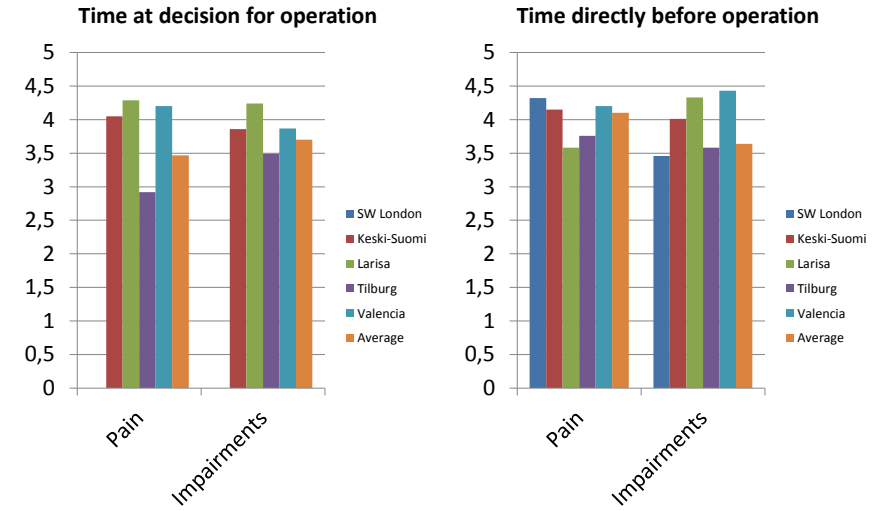
MANAGED OUTCOMES

Differences in user experiences I



MANAGED OUTCOMES

Differences in user experiences II

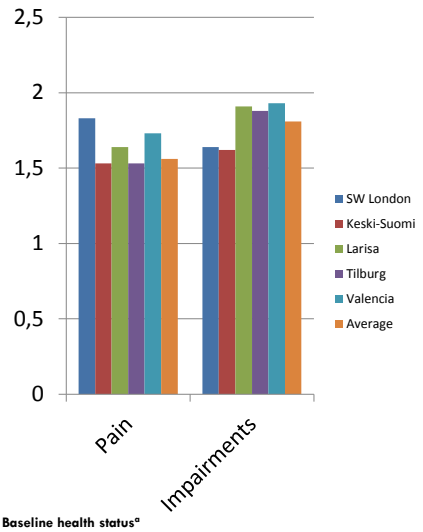


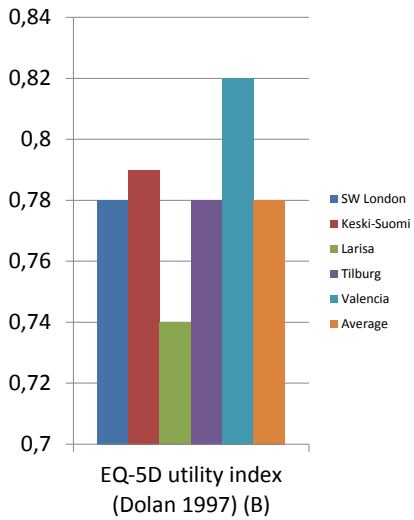
: Baseline health status[a]

[a]The scales are scored from 1 for 'no pain at all' or 'no impairments at all' respectively to 5 'extreme pain' or 'extreme impairments' respectively.

MANAGED OUTCOMES

Differences in user experiences III



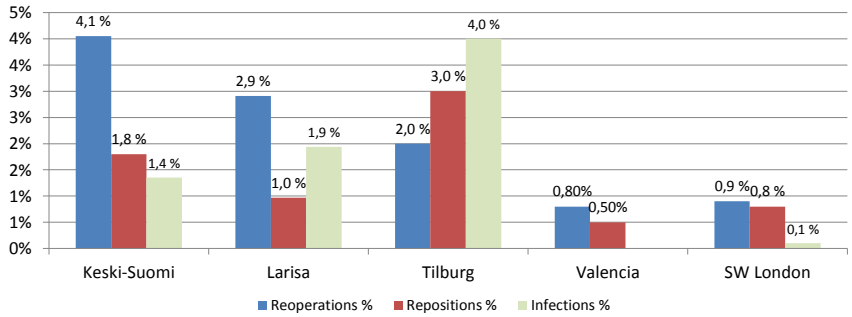


: **Baseline health status**[a]

[a]The scales are scored from 1 for 'no pain at all' or 'no impairments at all' respectively to 5 'extreme pain' or 'extreme impairments' respectively.

MANAGED OUTCOMES

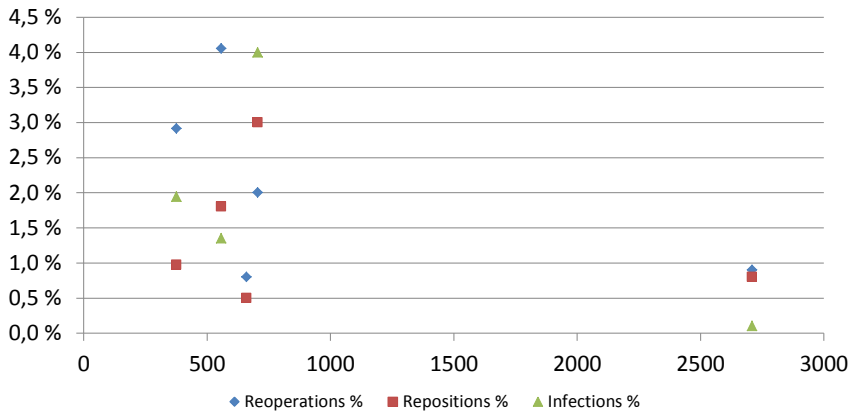
Differences in outcomes



- The number of complication is lowest in UK and Spain, especially in Reoperations
- In infections, classifications may be different?

MANAGED OUTCOMES

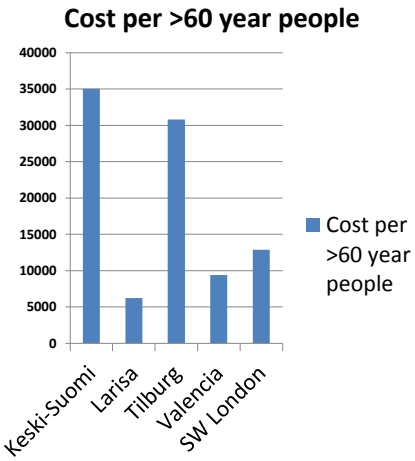
Clinical Quality vs unit size

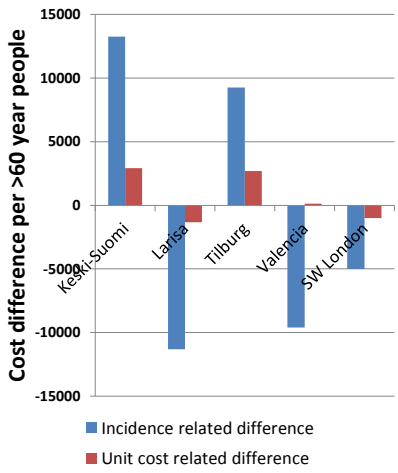


This study supports the results of earlier studies: the clinical quality of high-volume units is better than low-volume units (Katz et al. 2011, Kreder et al. 1997, Lavernia & Guzman 1995, Solomon et al 2002)

MANAGED OUTCOMES

Differences in regional costs

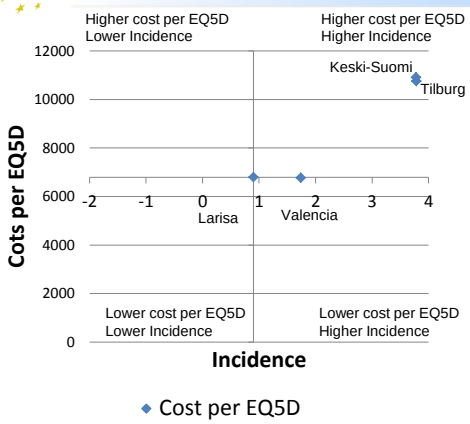


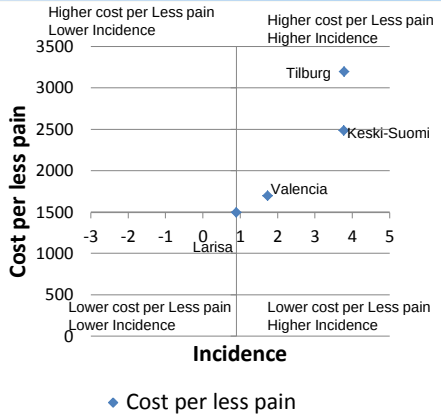


The regional cost is calculated by unit cost x regional incidence of operations
- The right figure indicates that the regional costs are more influenced by incide than the unit costs (process efficiency)

MANAGED OUTCOMES

Cost-effectiveness compared to the incidence ratio of THR





The regions with higher incidence have higher cost per EQ5D and higher cost per less pain

MANAGED OUTCOMES

Summary of results based on MO data

- In terms of regional cost-effectiveness the results indicate that:
  - The differences in outcomes are minor
  - The differences in regional costs are mostly derived from incidence of operations: the unit costs (process efficiency) have minor role
    - Our data shows that there are multiple differences in incidences (operations per population) between regions
    - The differences in unit costs are less than 40 % between hospitals
  - → The key question in improving the regional cost-effectiveness is to understand the reasons for differences in incidences
- In care processes the biggest differences are in ward care: the length of stay and patients discharged to home
  - These may become from differences in rehabilitation practices, attitude and intensity, which are hard to measure
- In terms of processes, the SW London has lowest complication level, shortest length of stay and short waiting times
  - The major observed differences in service producer perspective are the annual volume of arthroplasty operations and focus on those operations
  - Could the volume be an explanation?

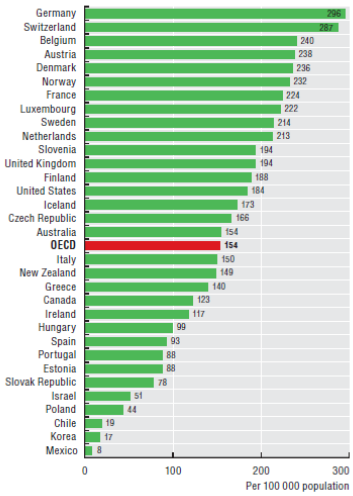
MANAGED OUTCOMES

4 Discussion with the literature and other data sources based on MO results

MANAGED OUTCOMES

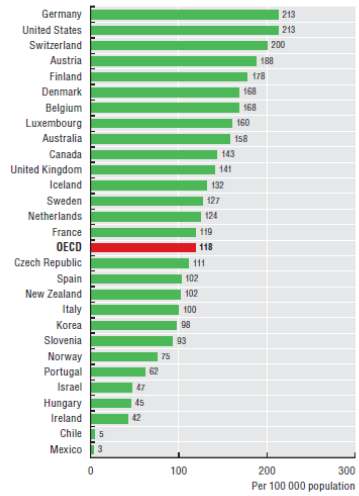
The OECD data has similar results in terms of incidences compared to MO data

4.7.1 Hip replacement surgery, per 100 000 population, 2009 (or nearest year)



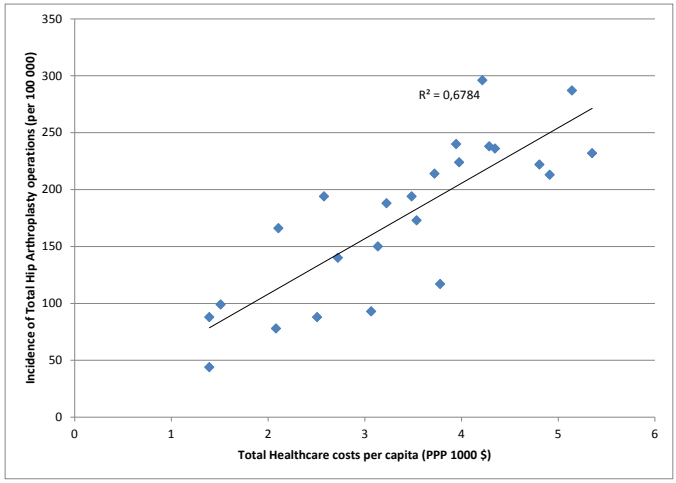
Source: OECD Health Data 2011.

4.7.2 Knee replacement surgery, per 100 000 population, 2009 (or nearest year)



Source: OECD Health Data 2011.

There seems to be correlation between total Healthcare costs per capita and incidence of Total Hip Arthroplasty operations per capita (OECD)



- Based on interviews, the decision to operate is subjective: can the availability of resource increase the incidence?

Datapoints European Countries belonging to OECD Source: OECD Health Data 2011

Literature on association between volume and process quality

- Solomon et al 2002 suggested, that surgeon volume and hospital volume are the best indicators of orthopaedic adverse events in patients undergoing THR surgery
- Lower provider volume has been associated with longer hospital stay after THR surgery (Doro et al. 2006, Judge et al. 2006)
- Katz et al. (2001): patients treated with THR at hospitals and by surgeons with higher annual caseloads had lower rates of dislocation.
- Battaglia et al. (2006) and Shervin et al. (2007): a positive association between higher hospital and surgeon volumes and lower rates of hip dislocation was found. (Literature reviews)
- Kreder et al. (1997): association between high surgeon volume and low rate of revisions within three months and within one year.
- Lavernia and Guzman (1995): Surgeons with a low volume of THAs were associated with a higher mortality rate than high volume surgeons.
- Doro et al. (2006) Mortality increased with decreasing hospital case volume, and the lowest volume hospitals had an adjusted odds ratio of 1.9.

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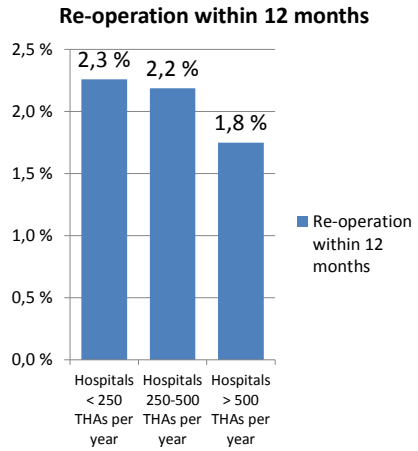
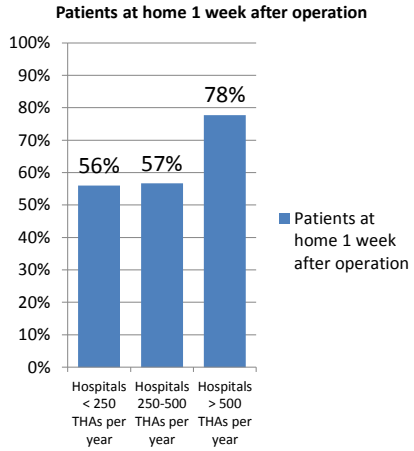
The complete Finnish data of public hospitals performing THAs (34 hospitals)

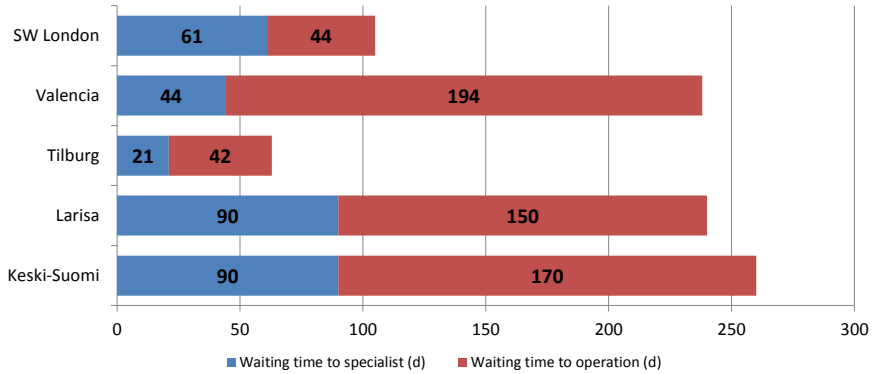




The share of complications is lowest and inpatient episode shortest In hospitals having greater annual volume of THAs

MANAGED OUTCOMES

Patient Journey analysis – HIP OA



- The waiting time of operation is a common problem in the EU
- Since the healthcare costs per capita (resources) have correlation with incidence of operations:
  - Does the increase of resources lead to increased number of operations or shortened waiting times?

Summary

- The other data sources and earlier literature supports our findings
  - The reasons for differences in incidences is a key question to understand in publicly-funded or insurance-based regional systems
  - From service provision point of view, the volume of specific operations of the service provider seems to be a critical factor in terms of process quality
  - The differences in outcomes or in process practices are minor from regional cost-effectiveness point of view

MANAGED OUTCOMES

4 Key findings

Key findings: general notions

- The regional costs and cost-effectiveness are mostly related to the incidence ratio
  - There are multiple differences in incidences of operations between regions
  - The technical efficiency has less significant role
- The waiting time to operation is a common problem in European regions
  - Further research concerning balance between waiting times, service level and cost-efficiency is proposed
- Higher volume of Joint replacements is associated with better productivity and lower level of complications

Key findings: regional systems

- The hip replacements are typically performed in multi-specialty units: central or university hospitals
- The typical volume of hospital is few hundred replacement operations per year
- In the literature, many studies propose focusing the operations to the focused units having > 1000 operations annually

Key findings: good practices

- Fast track surgery combined to the optimum level of nurses in the ward
  - The need of special care in hip replacement operations is 3-5 days
- Volume of specific operations per service production unit is essential not the volume of hospital
  - In addition, the literature suggests also specialization in resource level

Key findings: recommendations

- From regional perspective, the key question in terms of costs and cost-effectiveness is defining the incidence-level of elective operations
  - The decision to operate is subjective: "how mild/severe symptoms lead to operation?"
  - In publicly-funded (or insurance) system the marginal utility of the money do not limit the demand: prioritization (public) vs. out-of-pocket (private) -system to be considered in elective operations
- From service provision or production perspective, the results and earlier literature indicate that the productivity and clinical quality are increased in specialized high-volume centers
- From customer perspective, the focus should be in shortening the waiting time to operation
  - This problem is strongly linked to the first problem (incidence)
  - The problem can be solved by hierarchy (defined incidence-level → number of resources needed) or markets (competition)

MANAGED OUTCOMES

An operations management and demand based approach to regional health service delivery systems for dementia patients

Meeting European health care system challenges by learning from differences between management practices in six EU countries

The Managed Outcomes Project

- The main objective of the MANAGED OUTCOMES project is to develop and disseminate practical conceptual models and a toolkit for improving the health service production system
- It is based on the premise that healthcare outcomes and cost-benefits are affected by:
  - the efficiency of service production
  - the regional structure of healthcare delivery
  - the degree to which people are empowered to participate in the co-production of their care
- Case studies have been undertaken in six EU countries (FI, FG, GR, NL, ES, UK) for four costly and challenging demands for all EU healthcare systems:
  - Type 2 Diabetes
  - Stroke
  - Hip-osteoarthritis
  - Dementia

Project partners

- These include a mix of university and consultancy organisations:
  - Aalto University - Finland
  - Erasmus University Rotterdam - Netherlands
  - Balance of Care Group - UK
  - Otto-Friedrich-Universität Bamberg - Germany
  - Ethniki Scholi Dimosias Ygeias Eidikos Llogariasmos Erevnon - Greece
  - Universidad Politechnica de Valencia – Spain
  - Xperidox Futures Consulting - France
  - Innovation in Learning Institute - Germany
  - Forum Virium - Finland
  - European Hospital and Healthcare Federation - Belgium

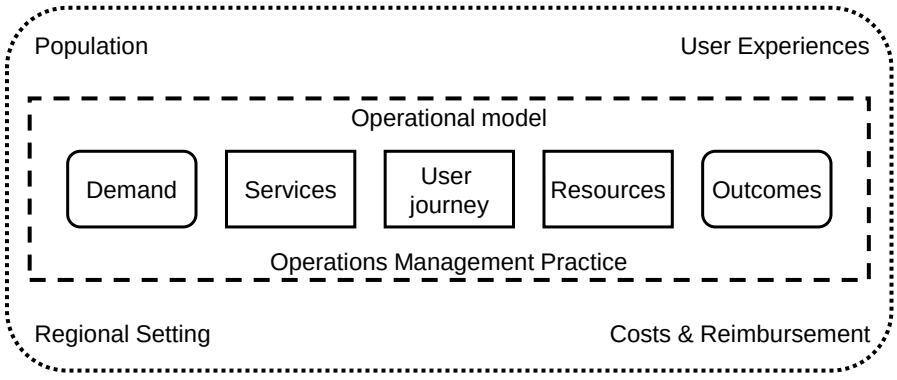
The challenge of dementia

- Dementia is an increasing issue for both care management and resource usage for older populations across the EU
- The services required are costly and can be complex to organise over a long time period. There is a large burden on health care systems, patients and families
- Integrated care is assumed to be an important process characteristic
- Little research has been done in this field to explore the link between care processes and quality, and this case study, in particular, represents an innovative experiment

References

- National Audit Office (2007), Improving services and support for people with dementia. (London: NAO) *ISBN: 9780102945614*
- Burns A, Iliffe S, 2009, Dementia. BMJ 2009;338:b75 doi:10.1136/bmj.b75
- Burns A, Iliffe S, 2009, Alzheimer's disease. BMJ 2009;338:b158 doi:10.1136/bmj.b158
- Kümpers S, Mur I, Hardy B, Van Raak A, Maarse H, 2006, Integrating dementia care in England and The Netherlands: four comparative local case studies. Health & Place 12 (2006) 404–420

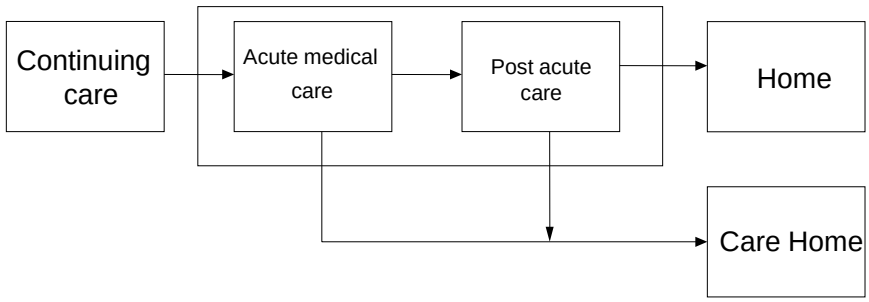
Managed Outcomes project methodology - I



Managed Outcomes project methodology - II

- Operational model: formal description of the demand, services, user journey, resources and outcomes, and their quantitative relationships
- Operations management practice: planning, management and innovation in services, and the collaboration between partners providing services
- Outcomes: the impact of services on health status, measured by user survey (EQ-5D), and by providers (quality indicators)
- User views and satisfaction on services and their performance
- Economic modelling of resources

Dementia case study demarcation



The starting point for this case study is the notion that the 'degree of integration' of services has an important impact on health outcomes and that the best way of understanding this is to look at the impact which the regional framework of community services impacts on the lengths of stay of dementia patients in acute hospital settings.

MANAGED OUTCOMES

Dementia pathways representation

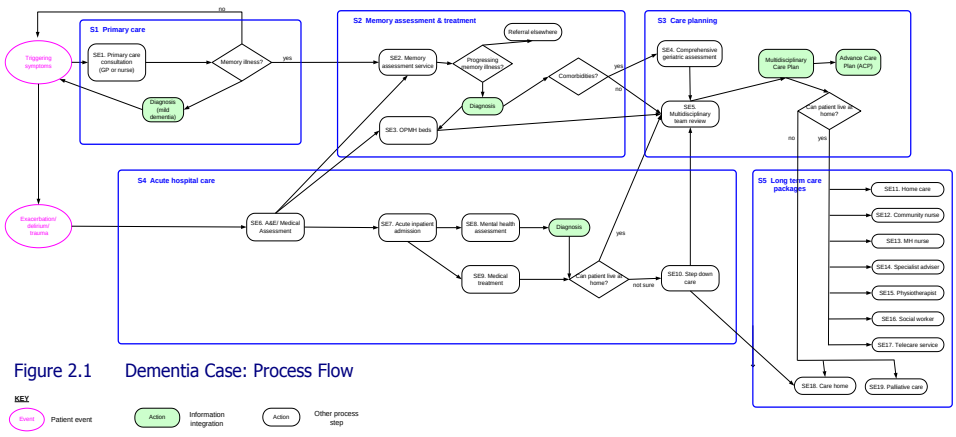


Figure 2.1 Dementia Case: Process Flow

This simplified process flow illustrates the complexity of the potential pathways crossing between primary, secondary and long-term care settings.

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Dementia case study settings

	Area (sq km)	Total population	% 65+ years
Keski-Suomi (FI)	19,950	272,784	17.7 %
Syros (GR)	84	19,793	19.5 %
Lincolnshire (UK)	5,921	745,575	20.2 %
Valencia (SP)	134	204,569	16.4 %
Rotterdam (NL)	319	60,000	12.7 %
Nuremberg (DE)	187	505,664	20.7 %

Dementia prevalence

	Estimated dementia prevalence	Estimated prevalence % of 65+	Diagnosed cases	Diagnosed as % of prevalence
Keski-Suomi (FI)	4,915	10.2 %	2,622	53.3 %
Syros (GR)	228	5.9 %	166	72.8 %
Lincolnshire (UK)	10,833	7.2 %	4,005	37.0 %
Valencia (SP)	3,491	10.4 %	2,208	63.2 %
Rotterdam (NL)	480	6.3 %	-	-
Nuremberg (DE)	6,699	6.4 %	-	-

NB: Local data systems do not enable some figures to be defined

Prevalence estimates can be contentious. For example, in the UK, the national estimate is based on age-based extrapolation of research data from early 1990s which may not take full account of improvements in dependency levels generally of older people (due to improvements in their health).

Patient and carer survey

- Complex to initiate given the nature of the condition and ability to access patients
- Carer inclusion important:
  - as proxy for patient where necessitated by their condition
  - in their own right (health status, burden of caring)
- Variable response rates:

Case Study	Total returned	Used in main analyses
Lincolnshire (UK)	62	39
Keski-Suomi (FI)	70	20
Nurembourg (DE)	59	23
Syros (GR)	84	40
Rotterdam (NL)	7	4
Valencia (SP)	39	29

Notes:

Not all respondents answered all questions, so many analyses based on smaller numbers.

NL excluded from most survey-related analyses due to very small numbers of respondents.

MANAGED OUTCOMES

Characteristics of people with dementia in the survey

	% female	Mean age in years at the time of survey	Mean age in years at the time of admission[a]	Mean year of admission	Mean number of months between admission and survey	% patients permanently in care home at the time of survey
Lincolnshire (UK)	56	84	83	2011/11	5	32
Keski-Suomi (FI)	53	78	77	2010/09	14.8	29
Nuremberg (DE)	62	83	82	2011/11	8.3	59
Syros (GR)	71	84	82	2009/10	23	18
Rotterdam (NL)[b]	40	84	83	2011/07	7.7	17
Valencia (SP)	73	79	78	2011/02	9.2	22
All countries	62	82	80	2011/02	12.1	32

[a]Estimated by subtracting the mean number of months since survey divided by 12 from mean age at the time of survey.
[b]based on 6 respondents only.

MANAGED OUTCOMES

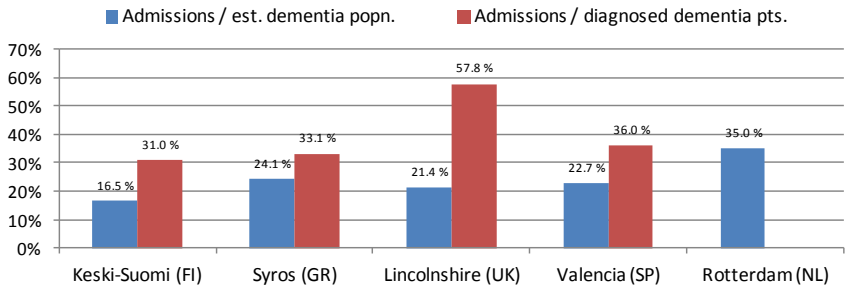
Characteristics of carers in survey

	% women	Mean age at time of survey	% carers with higher education	% who are spouses of patients	% carers with other paid work
Lincolnshire (UK)	57	67	38	60	17
Keski-Suomi (FI)	46	61	93	50	35
Nuremberg (DE)	44	66	83	50	32
Syros (GR)	70	60	54	32	30
Rotterdam (NL)	-	-	-	-	-
Valencia (SP)	72	66	32	43	14

NB: Rotterdam excluded due to small numbers reporting

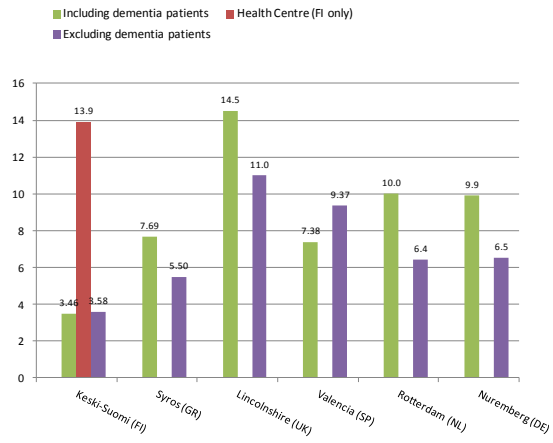
MANAGED OUTCOMES

Dementia and acute hospital admissions



MANAGED OUTCOMES

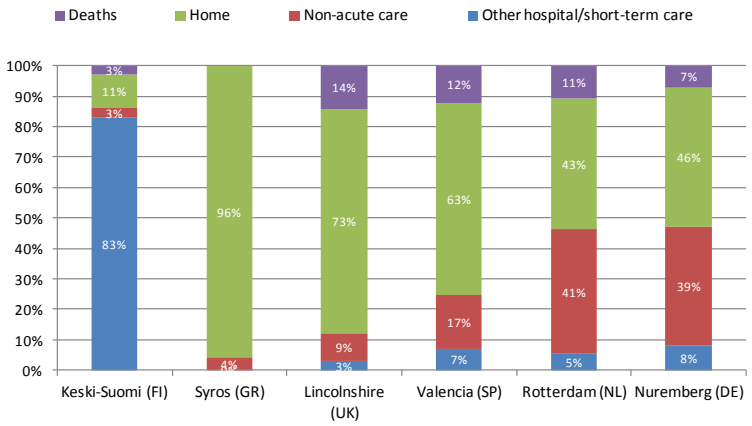
Average lengths of stay in hospital settings



Comparisons of average length of stay in hospital for patients with and without dementia

MANAGED OUTCOMES

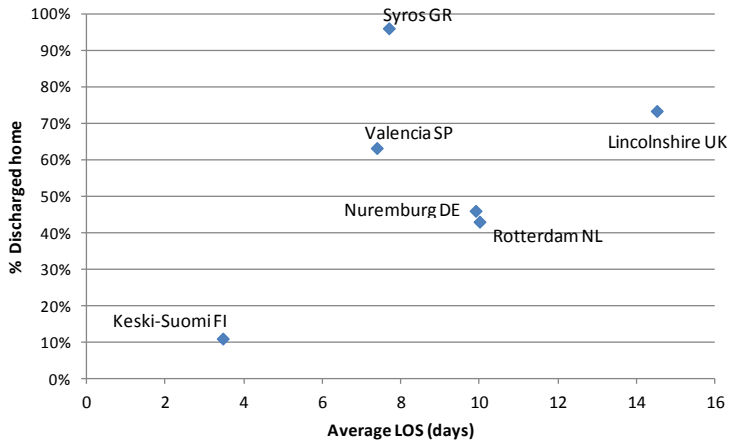
Discharge destinations following acute hospital episode



Non-acute care: eg Spain (hospital at home); UK (intermediate care home placement)

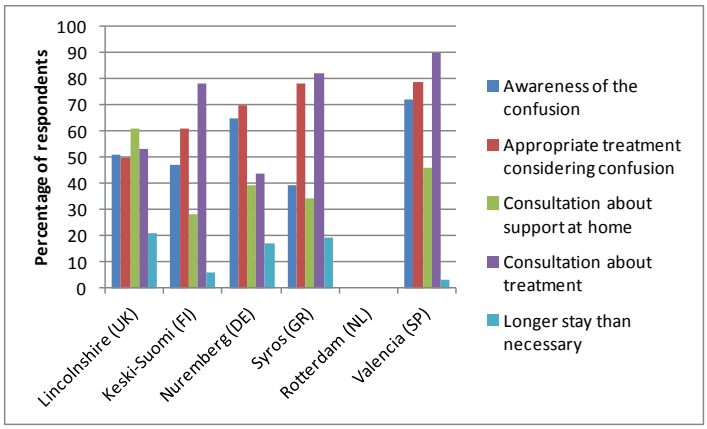
MANAGED OUTCOMES

Length of stay and % discharged home



MANAGED OUTCOMES

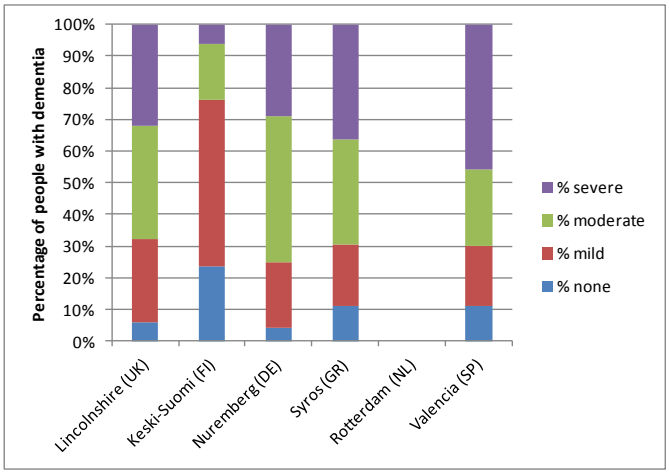
Carer opinions of hospital-based dementia services



NB: Rotterdam excluded due to small numbers reporting

MANAGED OUTCOMES

Levels of confusion in patients living at home

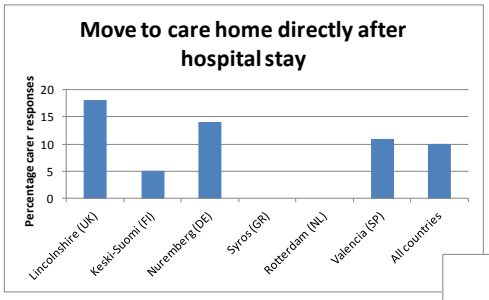


NB: Rotterdam excluded due to small numbers reporting

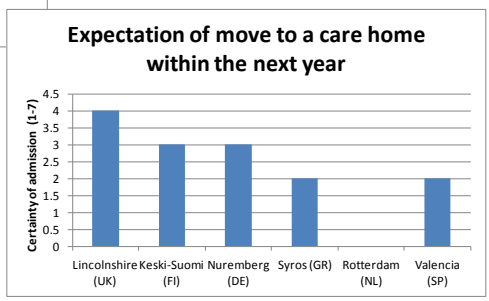
This shows the carer's estimation of the patient's level of dementia at home at the time of the survey. Note FI values in particular implying many more patients with moderate to severe dementia are in care homes.

MANAGED OUTCOMES

Long-term care home placements: actual and expected



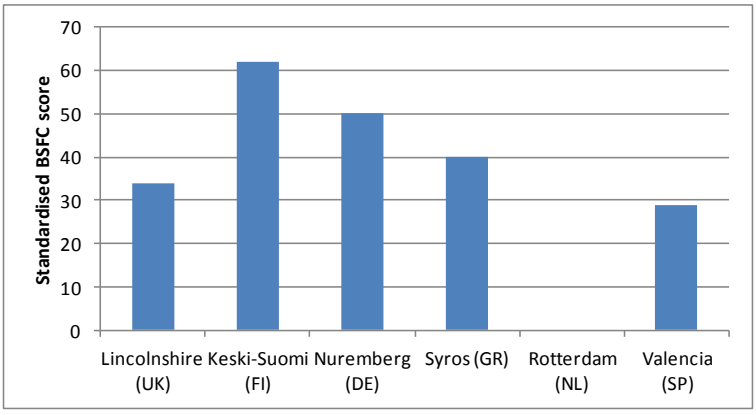
NB: Syros value based on 36 responses
Rotterdam excluded due to small numbers reporting



NB: Rotterdam excluded due to small numbers reporting

MANAGED OUTCOMES

Burden to informal carer

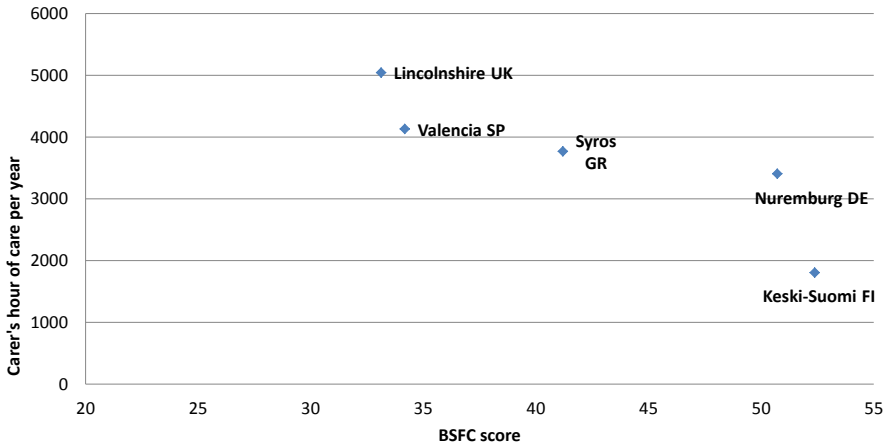


NB: Rotterdam excluded due to small numbers reporting

Standardised 'Burden Scale for Family Caregivers'. 100 = no burden; 0 = maximum burden

MANAGED OUTCOMES

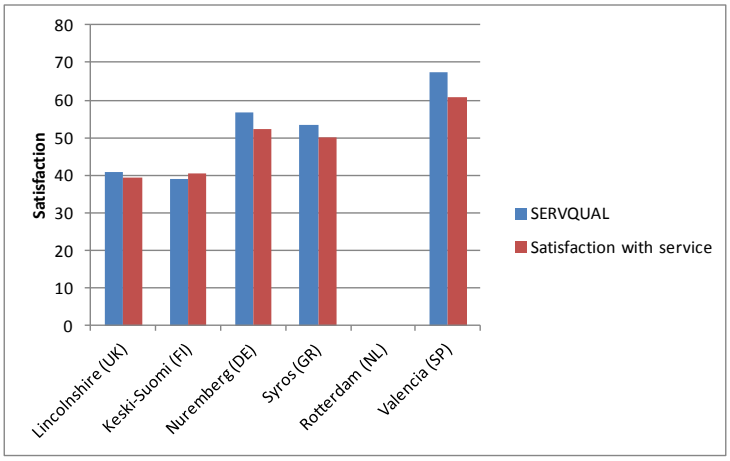
Carer hours of care per year by BSFC score



NB: Rotterdam excluded due to small numbers reporting

MANAGED OUTCOMES

Mean overall measures of perceived service quality

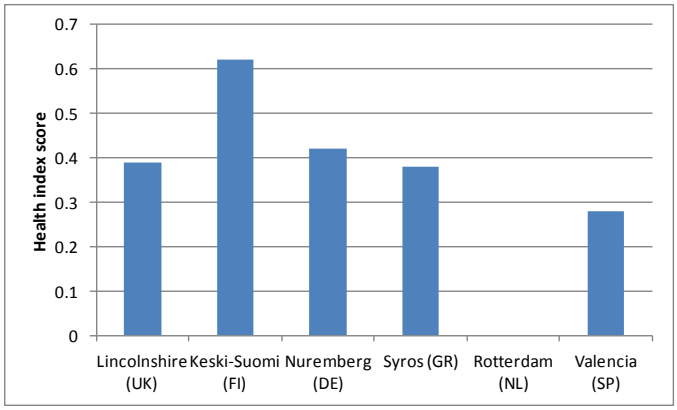


NB: Rotterdam excluded due to small numbers reporting

Satisfaction scale: 0 = worst, 100 = best possible
Survey form completed by informal care giver as proxy for the patient.
SERVQUAL = A multiple-item scale for measuring consumer perceptions of service quality.

MANAGED OUTCOMES

Health of patient (EQ-5D) - as reported by carer

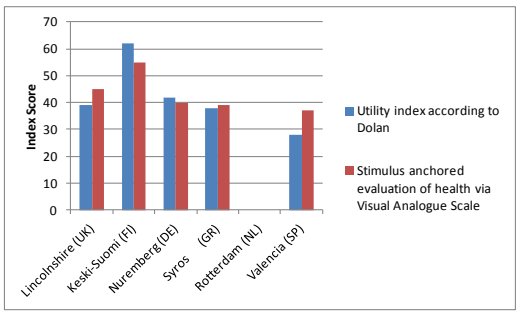


NB: Rotterdam excluded due to small numbers reporting

This shown standardised across the five EQ-5D dimensions (Dolan index):
0 for death and 0.91 for best imaginable health state.

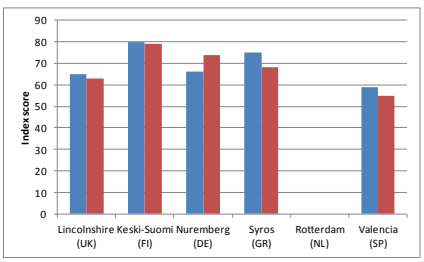
MANAGED OUTCOMES

Comparison between quality of life of people with dementia and their carers



People with dementia

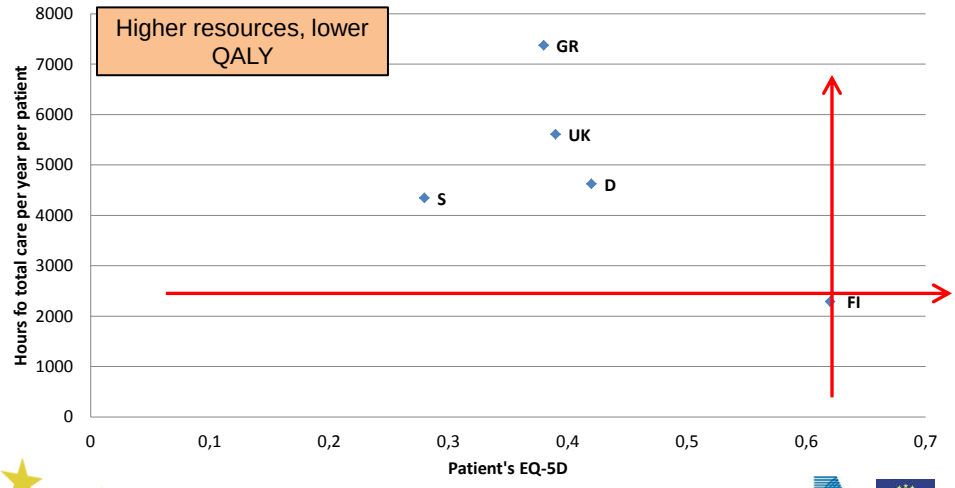
NB: Rotterdam excluded due to small numbers reporting



Carers

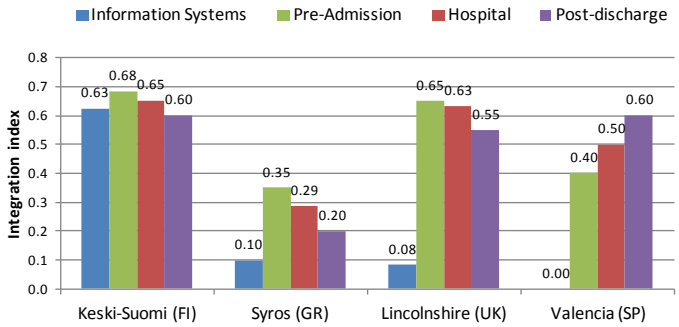
MANAGED OUTCOMES

Hours of total care (health professionals + carer) per year per patient by patient's EQ-5D



MANAGED OUTCOMES

Key characteristics of dementia services



This analysis summarises a checklist of groups of processes undertaken for each case study area. This may involve more than one organisation.
The 'Integration index' represents the proportion of respondents giving positive answers for each group of processes (max = 1.0)

Notes:

- Keski-Suomi: high use of shared information systems and access to information held by other agencies
- Syros: lower intensity of skilled assessment/memory clinic; no training program for professionals; good early dementia screening; no guidelines
- Lincolnshire: use training programs in hospital; involvement of patient and carers in discharge planning
- Valencia: emphasis on community-based multidisciplinary teams, and guidelines for overall care of dementia

Key findings: general notions

- Complex care network needs integration and coordination
- Development of community based services is tied to the willingness of carers to support people with dementia, and the extent of support given to them to do so
- Finnish patients at home had much lower levels of confusion recorded than elsewhere; also earlier diagnosis of dementia than elsewhere, which appears to lead to earlier permanent admission to care home
- Uncertainty over value of memory clinics, given lack of possible processes that could be initiated by early diagnosis.

Key findings: scenarios

- Full integration
  - Integrated community-based care
  - Identification of patients
  - Early and comprehensive response to problems
  - Carer involvement
- Hospital coordination
  - Assessment on admission to acute hospital
  - Liaison and outreach nurses
  - Data sharing with PHC and social care
- PHC coordination
  - Opportunistic assessment by GPs
  - Community liaison staff (nurses or social care)
  - Data sharing with other providers

MANAGED OUTCOMES

Key findings: regional systems

- Developing role of PHC
- Good information systems central to development of processes
- Viability dependent on good support to carers

MANAGED OUTCOMES