

Determinants of hospital costs and performance variation of hip replacement

- *A comparative analysis across Europe*



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Relative importance

- Hip replacement is elective surgery and part of the benefit basket in many European countries
- Surgery is performed with great frequency (e.g. Germany ~230 000/year)
- Demand for hip replacement has increased over the past ten years and is likely to continue
- Procedure is subject to waiting times in some European countries (e. g. Denmark, Finland, Norway, the Netherlands and UK)

Project HealthBASKET (2005-2008)

- 10 case vignettes (“service packages”) were designed around episodes of care
- To ensure homogeneity within case vignettes (i.e. to avoid risk adjustment), health status and indication of each patient was defined in detail for each vignette
- To ensure comparability across vignettes, each was divided into detailed path components e.g. diagnostic procedures, care before operation etc.
- Partners in each country documented technology use, service intensity and costs (prices) for case vignettes with data from representative providers
- Costs (and prices) compared and differences analysed

Vignette hip replacement

- Female, 65-75 years old, with hip osteoarthritis requiring hip replacement because of considerable impairment is finally (after waiting time if normal in the hospital) admitted for her first hip replacement (one side).

(= standardised severity)

- The patient is without co-morbidity (i.e. expensive drugs due to treating co-morbidity should be excluded), the surgeon uses the most frequently used implant for female patients; the operation is without severe complications

(= standardised outcome)

- End of case vignette: discharge (home or to separate rehabilitation institution).

Results I

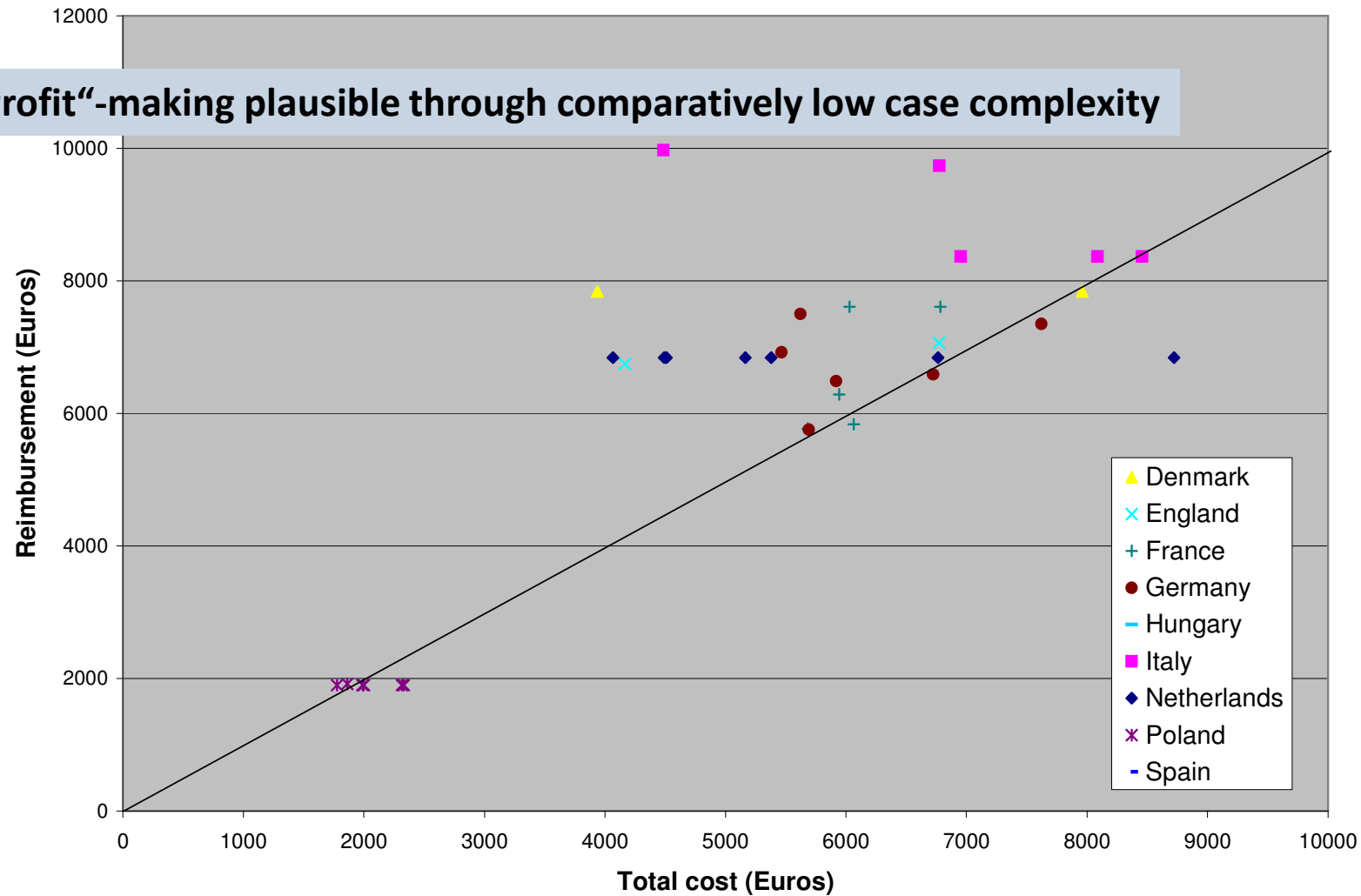
	Denmark	England	France	Germany	Hungary	Italy	Netherlands	Poland	Spain
Diagnostic Procedures									
- Imaging	141.0	88.0	60.0	79.8	7.8	63.4	32.9	33.8	42.5
- Laboratory	35.0	5.7	100.6	137.0	10.0	58.4	45.1	14.0	54.6
- Other	a)	6.2	0.0	107.4	2.9	18.1	19.1	15.3	2.5
Normal/Intensive Ward									
- Physician	18.0	450.9	88.8	414.4	135.5	171.9	a)	236.6	203.7
- Nursing	471.0	1237.2	428.1	1167.6	341.2	104.6	538.4	192.4	278.2
- Other Staff	111.4	274.8	193.1	249.2	0.5	78.0	189.6	46.0	0.0
- Material	a)	a)	6.4	129.5	a)	5.8	a)	16.8	1.3
Operation (including wake-up room)									
- Anaesthetist / Surgeon	202.0	534.6	728.2	596.3	93.3	228.5	669.5	52.1	400.2
- Nursing	136.9	123.5	171.8	283.8	18.5	99.6	200.5	9.6	108.7
- Other Staff	42.5	0.0	44.8	133.2	a)	11.4	177.7	0.0	0.0
- Implant	a)	657.5	1852.2	963.5	481.8	3416.1	1825.0	978.4	1780.0
- Material	115.6	106.6	154.5	249.1	a)	22.3	a)	35.0	0.2
Drugs	59.6	571.3	61.0	178.9	72.5	74.3	104.1	175.1	46.2
Overhead	4599.1	1634.7	2211.6	1675.6	129.9	2629.6	1803.0	320.3	681.0
% overhead of total	77.53%	28.72%	36.25%	26.32%	10.04%	37.66%	32.17%	15.07%	18.92%
TOTAL COST	5932.2	5690.9	6101.1	6365.2	1293.8	6981.9	5604.9	2125.4	3599.0
Total cost (adjusted by PPP)	4401.1	5273.8	5679.7	6047.1	2147.0	6795.0	5328.4	3861.5	3965.0
Reimbursement	7840.0	6905.4	6622.1	6767.4	1794.9	8963.6	6842.0	1903.2	b)

Stargardt T (2008)

a) subsumed in overhead costs b) hospitals are receive budget. It only partly depends on the number of cases treated.

Results II

“Profit”-making plausible through comparatively low case complexity



Results III

Independent Variable	Coefficient	S.E.	t-value	p-value
<i>Fixed effects</i>				
Intercept	-1769.03	1330.26	-1.33	0.2253
Number of beds per hospital	-1.4131	0.6563	-2.15	0.0392*
PPP	7077.66	1324.62	5.34	<.0001*
% non cemented implants	1760.71	542.35	3.25	0.0028*
<i>Random effects</i>				
Intercept	519681	433679	1.20	0.1153
Residual	1034955	261157	3.96	<.0001

* significant <0.05

- Price differences (using PPP) explaining 79.4 % of cross-country variation
- Share of uncemented implants and number of beds explaining 12.1 and 1.6 % of within country variation

Stargardt T (2008)

Key findings

- Cost differences:
 - mainly due to different price and wage levels (PPP)
 - partly due to different level of technology (un/cemented)
 - slightly due to economies of scale and scope (hospital beds)
- Remaining cost variation might be due to:
 - health service organisation (e. g. rehab within or outside the hospital),
 - treatment patterns (e. g. surgical technique)
 - Existence of waiting lists (e. g. decreasing overhead costs due to capacity utilisation)

Drawbacks and difficulties

- Limited data sample (42 hospitals from 9 countries)
- Self assessed data
- Standardised severity and outcome due to case vignette approach
- Different cost accounting standards within and across countries
- Quality was beyond the scope of the study

Project EuroDRG

Diagnosis-Related Groups in Europe: Towards Efficiency and Quality

Phase I:

What are the differences between the DRG systems across Europe?

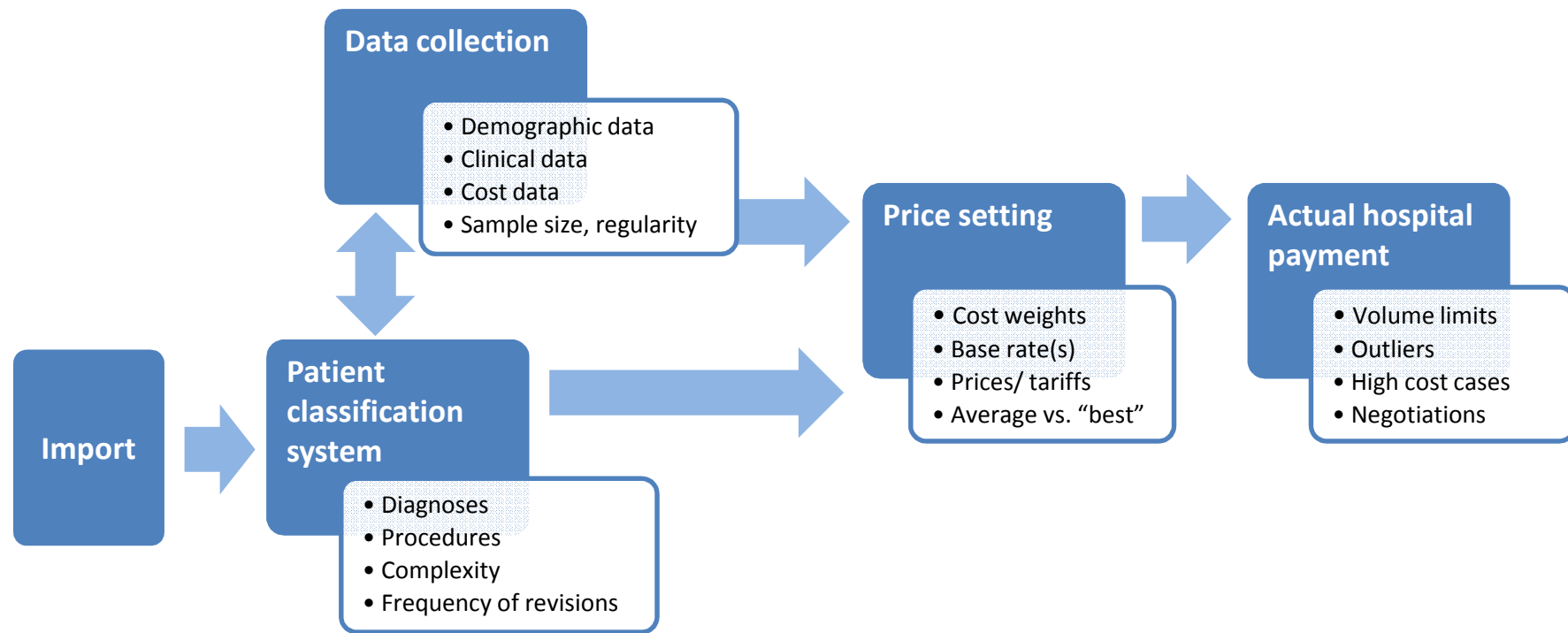
Phase II:

How are patients with specific diagnoses classified in these systems?

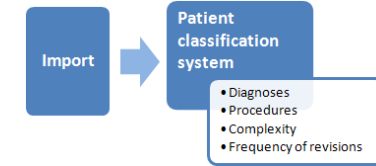
Phase III:

How DRG systems perform? Do they take up/reflect the severity, costs and the quality of hospital services?

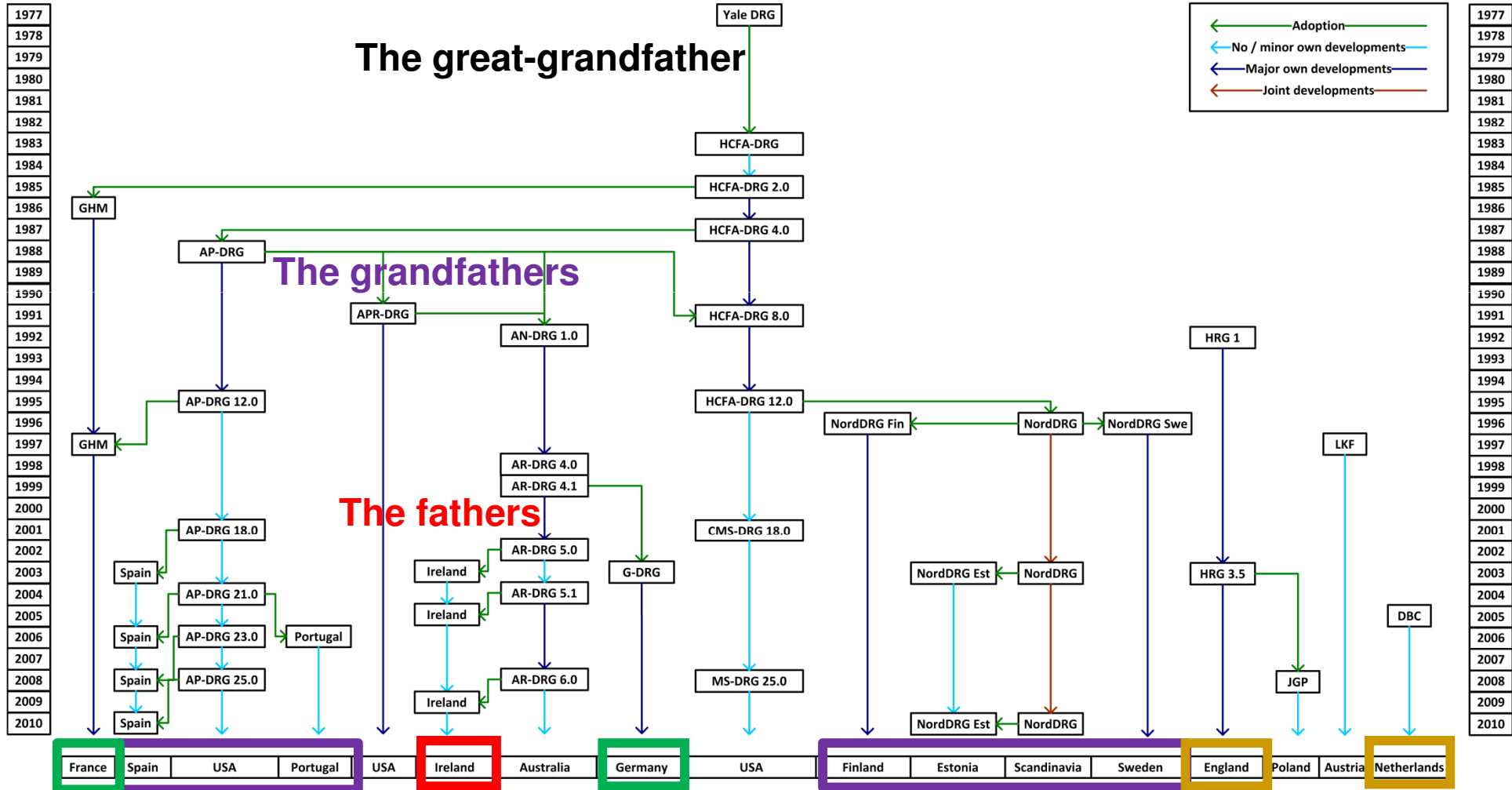
Building blocks of DRG systems

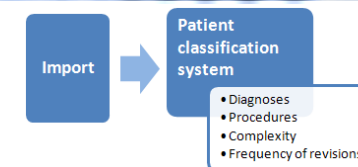


EuroDRG Phase I



France	Spain	USA	Portugal	USA	Ireland	Australia	Germany	USA	Finland	Estonia	Scandinavia	Sweden	England	Poland	Austria	Netherlands
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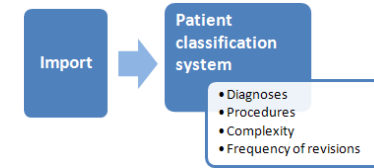
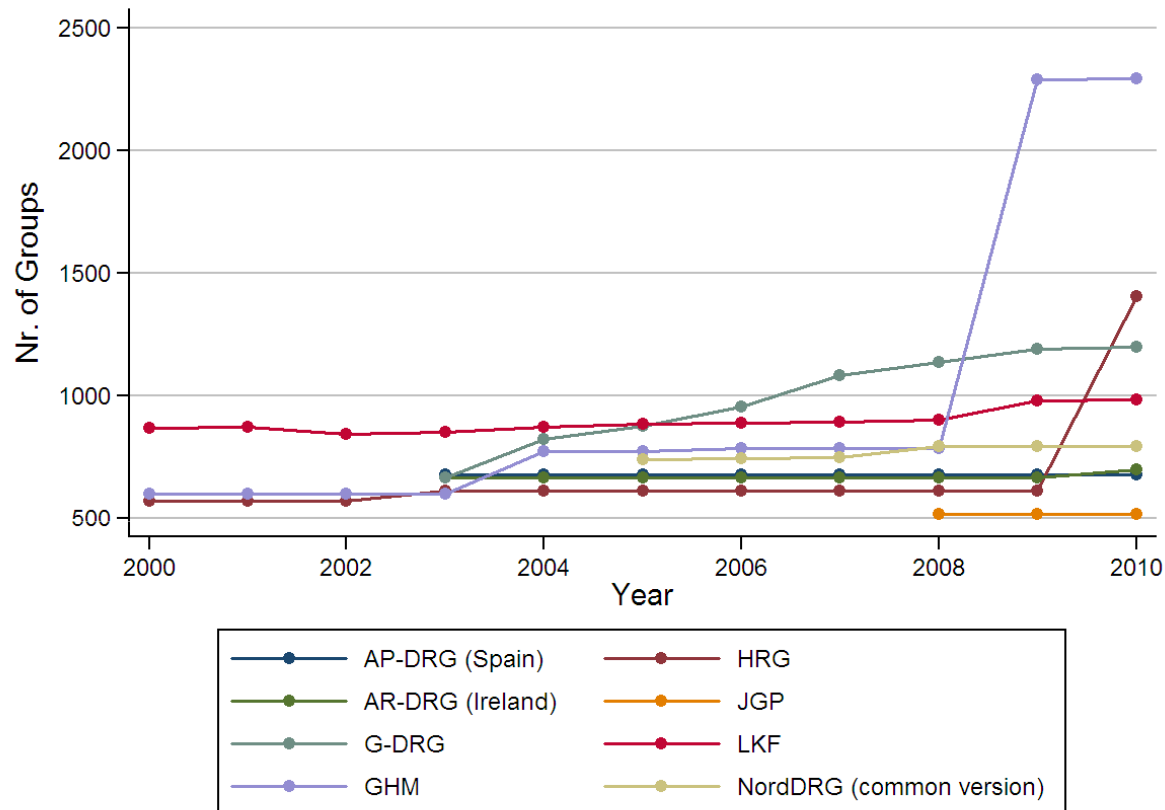
	AP-DRG	AR-DRG	G-DRG	GHM	NordDRG	HRG	JGP	LKF	DBC
Classification Variables									
<i>Patient characteristics</i>									
Age	X	X	X	X	X	X	X	X	-
Gender	-	-	-	-	X	-	-	-	-
Diagnoses	X	X	X	X	X	X	X	X	X
Neoplasms / Malignancy	X	X	X	-	-	-	-	-	-
Body Weight (Newborn)	X	X	X	X	-	-	-	-	-
Mental Health Legal Status	-	X	X	-	-	-	-	-	-
<i>Medical and management decision variables</i>									
Admission Type	-	-	-	-	-	X	X	-	-
Procedures	X	X	X	X	X	X	X	X	X
Mechanical Ventilation	-	-	X	X	-	-	-	-	-
Discharge Type	X	X	X	X	X	X	X	-	-
LOS / Same Day Status	-	X	X	X	X	X	X	-	-
<i>Structural characteristics</i>									
Setting (inpatient, outpatient, ICU etc.)	-	-	-	X	-	-	-	-	X
Stay at Specialist Departments	-	-	-	-	-	-	-	X	-
Medical Specialty	-	-	-	-	-	-	-	-	X
Demands for Care	-	-	-	-	-	-	-	-	X
Severity / Complexity Levels									
Aggregate case complexity measure	3*	4	unlimited	5**	2	3	3	unlimited	-
	-	PCCL	PCCL	x	-	-	-	-	-

PCCL = Patient Clinical Complexity level

* not explicitly mentioned (Major CCs at MDC level plus 2 levels of severity at DRG level)

** 4 levels of severity plus one GHM for short stays or outpatient care

EuroDRG Phase I



	AP-DRG	AR-DRG	G-DRG	GHM	NordDRG	HRG	JGP	LKF	DBC
DRGs / DRG-like groups	679	665	1,200	2,297	794	1,389	518	979	≈30,000
MDCs / Chapters	25	24	26	28	28	23	16	-	-
Partitions	2	3	3	4	2	2*	2*	2*	-

Data collection

- Demographic data
- Clinical data
- Cost data
- Sample size, regularity

Data collection

Clinical data

- classification system for diagnoses AND procedures

Cost data

- imported (not best solution but easy) or
- collected within country (better but needs standardised cost accounting)

Sample size

- entire patient population OR a smaller sample

Common practice in many countries:

clinical data = from all patients;

cost data = from hospital sample with standardised cost accounting system

Data collection

- Demographic data
- Clinical data
- Cost data
- Sample size, regularity

Country	Diagnosis Coding	Procedure Coding
Austria	ICD-10-AT	Leistungskatalog
England	ICD-10	OPCS - Office of Population Censuses and Surveys
Estonia	ICD-10	NCSP - Nomesco Classification of Surgical Procedures
Finland	ICD-10	NCSP - Nomesco Classification of Surgical Procedures
France	ICD-10	CCAM - Classification Commune des Actes Médicaux
Germany	ICD-10-GM	OPS - Operationen- und Prozedurenschlüssel
Ireland	ICD-10-AM	ACHI - Australian Classification of Health Interventions
The Netherlands	ICD-10	Elektronische DBC Typeringslijst
Poland	ICD-10	ICD-9-CM
Portugal	ICD-9-CM	ICD-9-CM
Spain	ICD-9-CM	ICD-9-CM
Sweden	ICD-10	NCSP - Nomesco Classification of Surgical Procedures

**(almost)
standardised**

no uniform standard available

Price setting

- Cost weights
- Base rate(s)
- Prices/tariffs
- Average vs. "best"

Data base and payment calculation

	England	France	Germany	Netherlands
Cost data collection methodology to determine payment rate				
Sample size (% of all hospitals)	All NHS hospitals	99 hospitals (5%)	253 hospitals (13%)	Resource use: all hospitals; unit costs: 15-25 hospitals (24%)
Cost accounting methodology	Top down	Mix of top-down and bottom-up	Mainly bottom-up	Mainly bottom-up
Calculation of hospital payment				
Payment calculation	Direct (price)	Indirect (cost-weight)	Indirect (cost-weight)	Direct (price)
Applicability	Nationwide (but adjusted for market- forces-factor)	Nationwide (with adjustments and separate for public and private hospitals)	Cost-weights nationwide; monetary conversion state-wide	List A: nationwide List B: hospital specific
Volume/ expenditure limits	No (plans exist for volume cap)	Yes	Yes	List A: Yes List B: Yes/No

Actual hospital payment

- Volume limits
- Outliers
- High cost cases
- Negotiations

Hospital payments rates

	England	France	Germany	Netherlands
Payments per hospital stay	One	One	One	Several possible
Payments for specific high-cost services	Unbundled HRGs for e.g.: <ul style="list-style-type: none"> • Chemotherapy • Radiotherapy • Renal dialysis • Diagnostic imaging • High-cost drugs 	Séances GHM for e.g.: <ul style="list-style-type: none"> • Chemotherapy • Radiotherapy • Renal dialysis Additional payments: <ul style="list-style-type: none"> • ICU • Emergency care • High-cost drugs 	Supplementary payments for e.g.: <ul style="list-style-type: none"> • Chemotherapy • Radiotherapy • Renal dialysis • Diagnostic imaging • High-cost drugs 	No
Innovation-related add'l payments	Yes	Yes	Yes	Yes (for drugs)

Results

European countries have developed – and are continuously modifying – their own DRG systems, which:

- classify patients into increasing number of groups,
- give a higher weight to procedures and to setting,
- base payment rates on actual average (or best-practice) costs,
- pay separately for high-cost and innovative technologies,
- are implemented in a step-wise manner, and
- thus reduce, or even avoid, the potential of risk selection and under-provision of services.

How are patients with specific diagnoses classified in European DRG systems?

- Episode of care approach with 10 EoCs (Appendectomy, Cholecystectomy, Stroke, CABG, Inguinal hernia, AMI, Hip replacement, Knee replacement, Breast cancer, Childbirth)
 - EoCs are defined by diagnoses or procedures
 - Administrative data from each country
 - Preparation for empirical work in Phase III
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EoC hip replacement: definition

Defined by	Procedure
ICD 9-CM (procedures)	00.7: Revision of hip replacement, both acetabular and femoral components 00.85: Resurfacing hip, total, acetabulum and femoral head 00.86: Resurfacing hip, partial, femoral head 00.87: Resurfacing hip, partial, acetabulum 81.51: Total hip replacement 81.52: Partial hip replacement 81.53: Revision of hip replacement, not otherwise specified
Diagnosis	all
Exclude	Age <1, outpatients (but include day cases)

EoC hip replacement: data sample

	Hospitals	Cases	ALOS	AAge	Male [%]
Austria	105	19 569	13.8	69	41
England	150	61 020	8.6	70	38
Estonia	11	1 737	8.6	69	37
Finland	5	1 872	4.7	71	37
France	830	140 313	10.1	72	40
Germany	1201	228 384	15.3	70	48
Ireland	22	5 231	12.8	71	45
Netherlands	32	23 650	4.6	68	32
Spain (Cat.)	56	7 566	12.6	73	39
Sweden	32	10 244	7.7	73	38

EuroDRG Phase II

	Major Diagnostic Category	Partition	Main diagnosis	Procedure	Main/second. Diagnosis	Type of Admission	Age	Complications/ Comorbidities	DRG	Cases in EoC [%]	Price [€]			
Austria (LKF 2008) 99% of cases	Relevant procedure			Partial hip replacement					MEL14.07A	2	7,712			
									MEL14.07B	14	7,559			
									MEL14.07C	1	6,673			
				Total hip replacement								MEL14.08A	2	7,865
												MEL14.08B	74	7,507
												MEL14.08C	2	5,865
				Change of inlay with /without prosthesis								MEL14.12A	2	6,705
												MEL14.26A	1	19,854
Finland (NordDRG.Fin V2008 97,6% of cases) Sweden (NordDRG.Swe V2008 98,6% of cases)	Musculoskeletal system and connective tissue diseases	Surgery		Hip replacement					209A	86	9,679			
									209O	87	7,970			
									209B	0.2	13,255			
										11	6,227			
										11	11,857			
Spain (Catalonia) (AP-DRG version 23) 98.4% of cases	Diagnosis of musculoskeletal system and connective tissue diseases	OR procedure		Major musc.scel. Procedure*					558	5.7	14,081			
									471	< 1	16,122			
									817	11	10,487			
									818	82	8,471			

* except bilateral or multiple major joint

EuroDRG Phase II

	Major Diagnostic Category	Partition	Main diagnosis	Procedure	Main/second. Diagnosis	Type of Admission	Age	Complications/ Comorbidities	DRG	Cases in EoC [%]	Price [€]																																												
Germany (G-DRG V2008) 99% of cases	Disease and disorders of the mus. scl. System and connective tissue	Surgery		Replacement of hip replacement	Transplantation of bone tissue			PCCL > 3	I46A	2	9,199																																												
									Neoplasm or infection of LE bones	Multiple and/or bilat. procedures	PCCL ≤ 3	I46B	4	7,501																																									
												Osteotomy or transplantation of bone/ cartilage tissue	PCCL ≤ 3	I03B	3	8,137																																							
														Revision and Removal of hip replacement	PCCL > 3	I03A	3	12,395																																					
																PCCL ≤ 3	I47A	1	7,529																																				
																	PCCL > 3	I05Z	12	7,952																																			
																		PCCL ≤ 3	I47B	68	6,638																																		
																			Partial/total hip replacement	Surgical intervention on upper extremity and spinal column	PCCL > 3	I08A	<1	10,401																															
																						PCCL ≤ 3	I08B	2	9,724																														
																							Multiple or bilat. procedures	Complicating diagnoses or procedures ¹	PCCL > 3	PCCL ≤ 3	I08C	<1	6,515																										
																														Other surgery on hip and femur*	Complicating diagnoses or procedures ¹	PCCL > 3	PCCL ≤ 3	I08D	<1	4,964																			
																																					Complex geriatric early rehabilitation	Certain OR procedure ²	PCCL ≤ 3	I34Z	2	10,665													
																																											Infantile cerebral palsy	Complicating diagnoses or procedures ¹	PCCL > 3	PCCL ≤ 3	I10017010223	84	8,852						
																																																		Arthrosis	Surgical with prosthesis	inpatient	I110030190223	13	3,348

² incl. hip replacement, revision, removal and replacement of hip replacement,
¹ incl. diagnoses of arthritis or soft tissue injury or complex procedures on blood vessels, nerves and muscles
 * incl. removal/replacement of certain partial hip replacement

Results

- Number of DRGs varies from 2 (Netherlands) to 12 (Germany)
 - Number and utilisation of classification variables differs widely
 - Type of treatment (e. g. total vs. partial replacement) not incorporated by each system
 - Complexities/Comorbidities not recognized by most systems
 - Reimbursement for standard case is lower in countries with more DRGs
 - DRG system harmonisation on European level is far from being achieved
-

Current work

- Regression models with costs and/or length of stay as dependent variable
 - Uncover determinants of hospital costs and quality for 10 episodes of care
 - Discover the performance of DRG systems
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Thank you very much for
your time and attention!

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