

# Adverse hospitals events, their cost and DRG payments

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# Background



- Quality and safety of care in hospitals is an increasing concern in most European countries
- At the same time, governments are seeking to contain healthcare costs
- Adverse events (AE): unintended injuries caused by medical mismanagement rather than by the disease process
- Substantial rates of adverse events in hospital practice
  - USA: 100 000 die each year at hospital due to AE costing ~29 billion \$/year (IOM, *To Err is Human*, 1999)
  - Australia: AE were estimated to account for 8% of hospital bed-days, costs \$ ~5 billion/year (QAHCS, 1996)
  - UK: cost of preventable adverse events £ 1 billion per year (MoH, 2000)

## Background (2)

- AE are provoked by inadequate care process (diagnostic errors, lack of care protocol and/or communication between the HC professionals)
- They need to be tackled both at a system level as well as at individual provider level (hospitals, physicians, etc.)
- While ensuring that the incentives provided by the payment system do not reward bad quality and there is funding for improving hospital care quality

# DRG based payment

- **In principle:** pay hospitals on the basis of average observed cost of clinically homogeneous groups of patients (with similar resource use)
- **Issues:**
  - if the common practice (average cost) does not correspond to what is considered as “good quality”, payments encourage non-optimal (low quality) care which can be more expensive
  - in Europe, most DRG classifications are not able to discriminate between diagnoses that are present on admission (co-morbidities) and those occurring during hospital stay (complications)
  - hospitals can receive additional payments when care process, medical treatment or organisation are not optimal
  - the extent to which adverse events are covered by the DRG payment can vary across DRG systems and across treatments (some of the cost may be borne by the providers)



# Study objectives



- Compare the reporting of adverse events across countries in order to assess the value of routine hospital data for cross-country comparisons
- Estimate the impact of adverse events on resource use (costs and length of stay) for different care episodes
- Compare how different DRG systems deal with adverse events

# Study sample

*Appendectomy*: a simple benchmark operation (very young population)

*CABG*: a life saving complex procedure

*Childbirth*: the most common cause of hospitalisation for woman in Europe

*Cholecystectomy*: common procedure with clear guidelines

*Hip/Knee replacement*: common procedures for elderly population

	Appendectomy	CABG	Child birth	Cholecystectomy	Hip replacement	Knee replacement
<b>(No of cases)</b>						
Austria	13202	4152	74095	14887	19569	15392
England	33394	19522	553432	44300	86090	62828
Estonia	2113	204	15624	2734	1737	1422
Ireland	5813	1040	71742	3165	5231	1831
Finland	1480	646	18188	1854	1872	1247
France	9948	19444	100695	11201	17650	8929
Germany	2451	3165	11410	3320	5166	3535
Poland	31105	13029	395351	73545	45312	10732
Spain	1814	1169	18461	2341	2941	3637
Sweden	5609	4217	72946	4609	10242	4819

# Measurement of adverse events



- **Patient Safety Indicators:** focus on preventable adverse events using predefined algorithms combining secondary and primary diagnosis and DRGs
  - Foreign body left in during procedure (PSI 5), infections due to medical care (PSI 7), postoperative pulmonary embolism or deep vein thrombosis (PSI 12), postoperative sepsis (PSI 13) and accidental puncture or laceration (PSI 15)
  - Obstetric Trauma - Vaginal Delivery with/out Instrument, C-section, PSI 18, 19, 20)
- Urinary tract infections
- Wound infections

# Methods: estimations from equation 1

- Analysis of costs of individual patients
- Comparison of estimations 1) without and 2) with DRGs

$$\ln c_{ij} = \alpha + \beta' x_{ij} + Q' \gamma_{ij} + u_j + \varepsilon_{ij}$$

↑  
Log cost patient i  
in hospital j

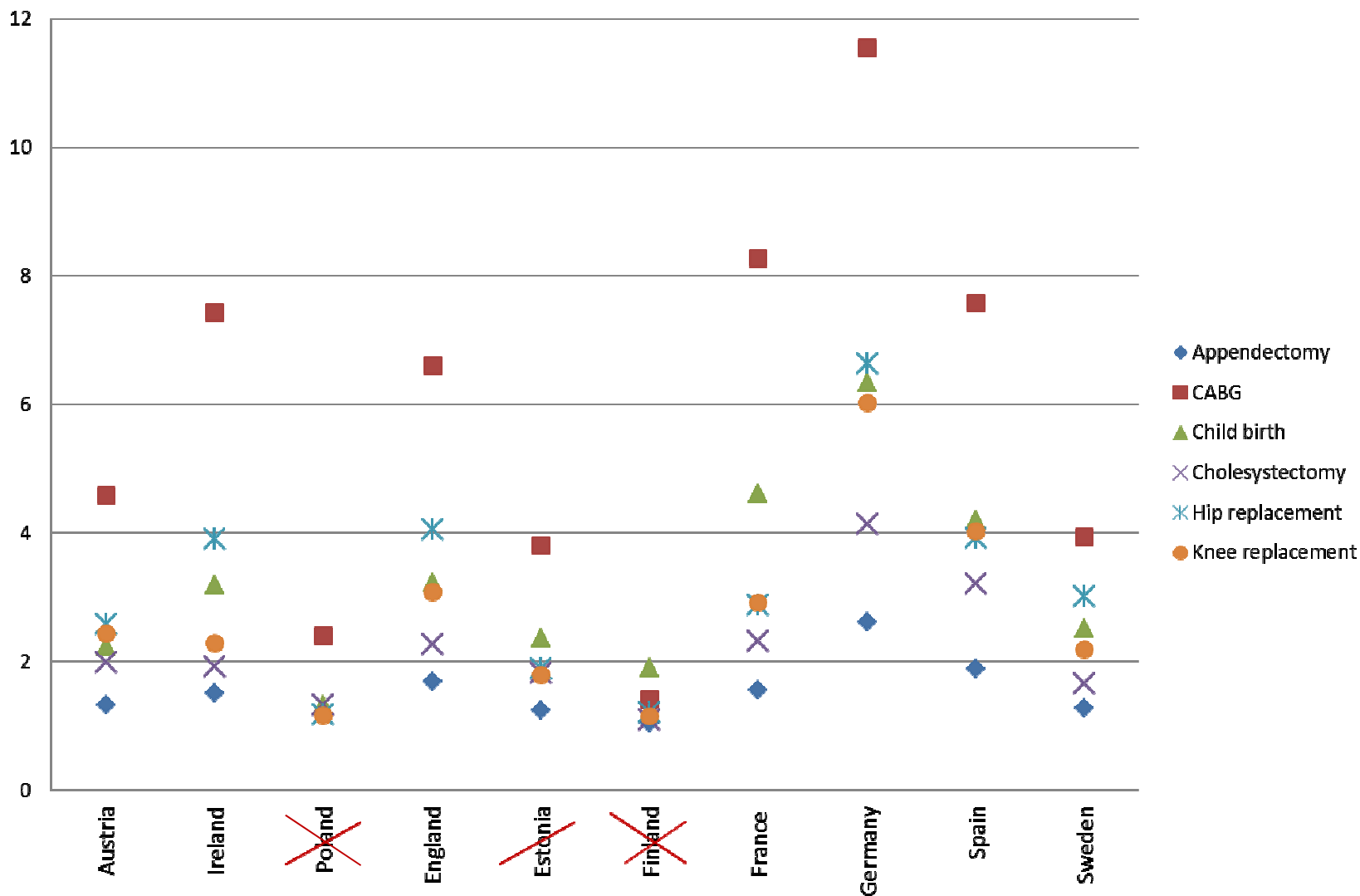
↑  
patient  
characteristics

↑  
treatment quality  
(AE, 0/1)

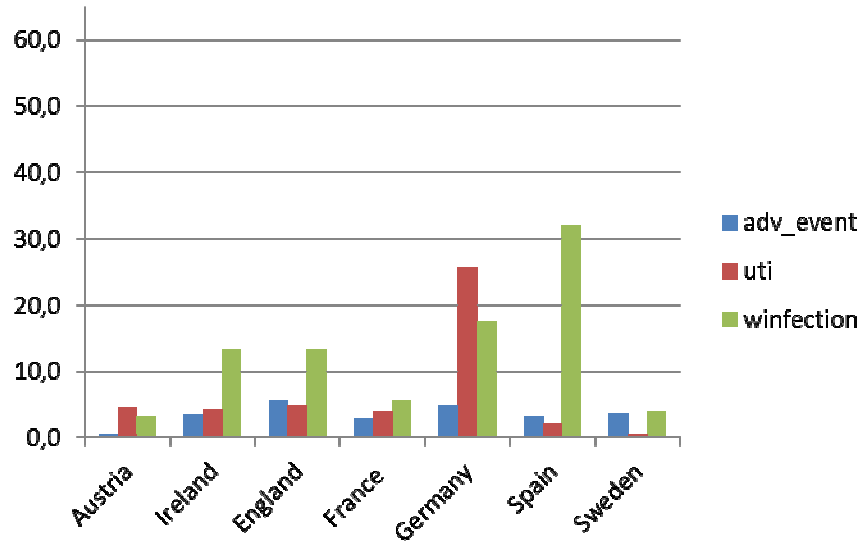
↑  
Hospital/patient  
effects



# Mean number of secondary diagnosis by country/episode



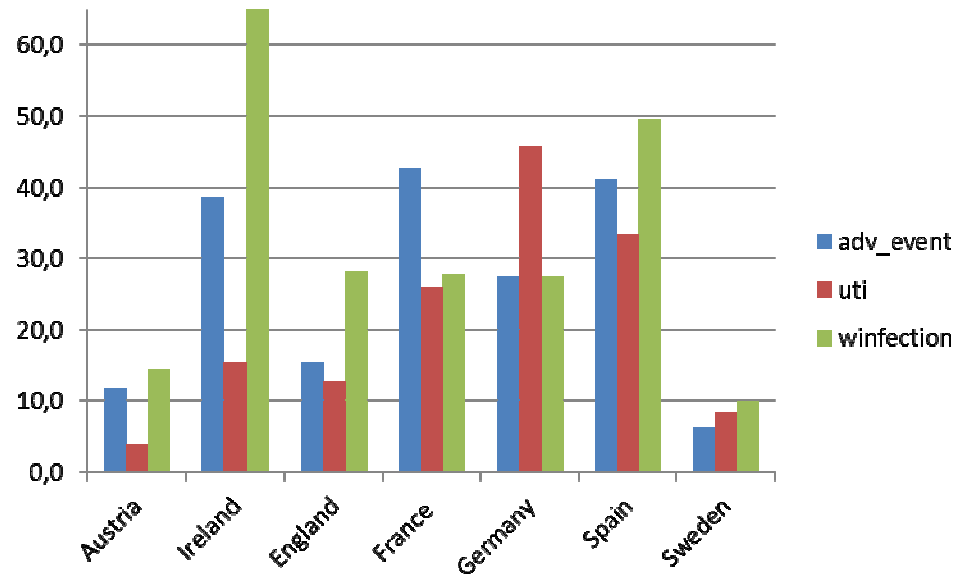
# No of adverse events



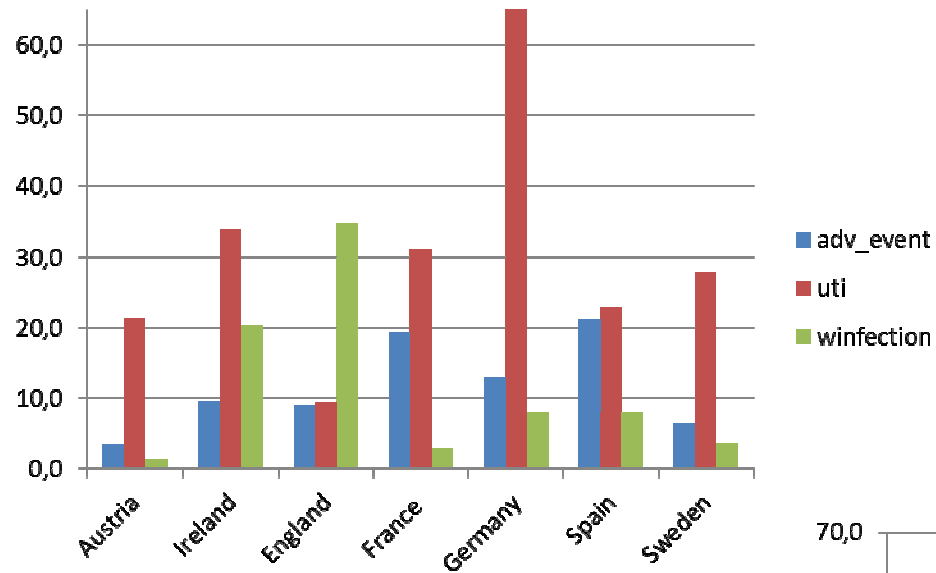
## Appendectomy

*Numbers per 1000  
appendectomy/ CABG  
patient*

## CABG



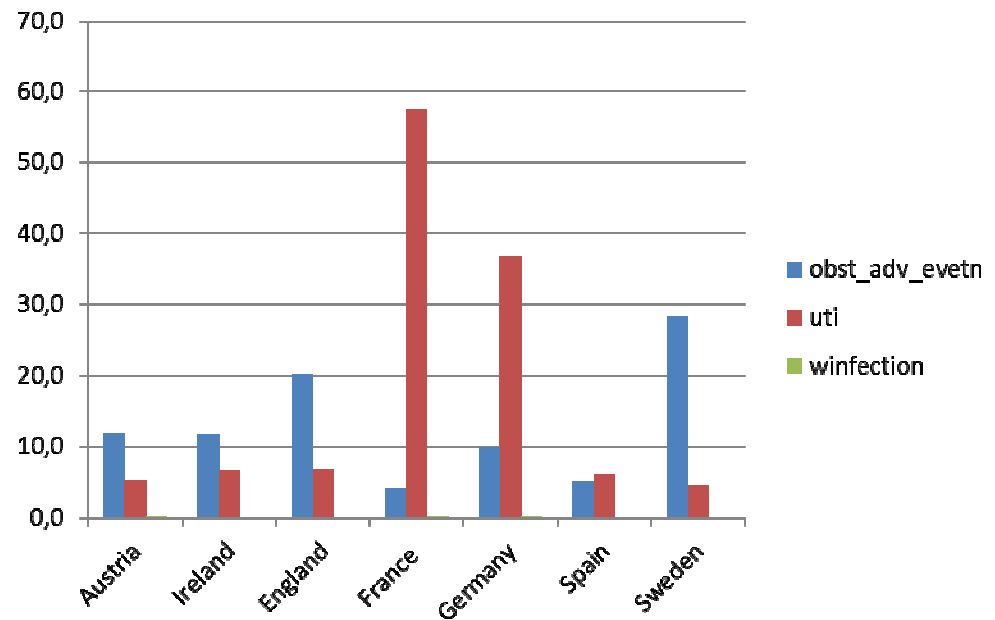
# No of adverse events



## Hip replacement

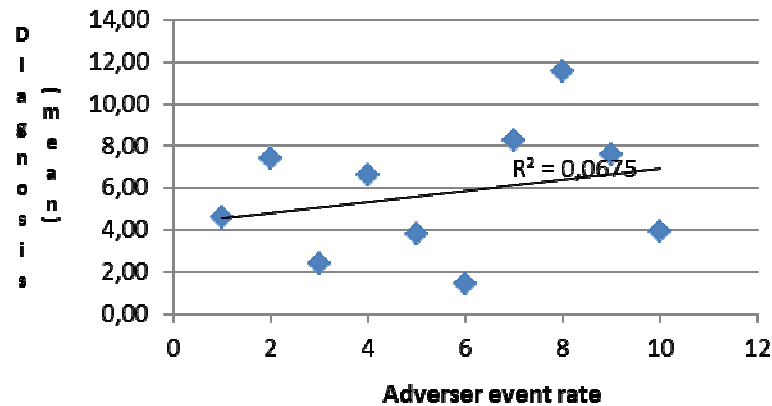
*Numbers per 1000 hip replacement/ child delivery cases*

## Child delivery

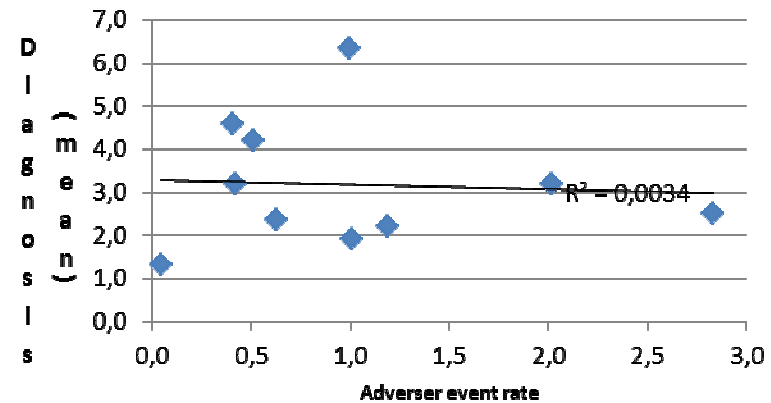


# Correlation between adverse events and coded diagnosis

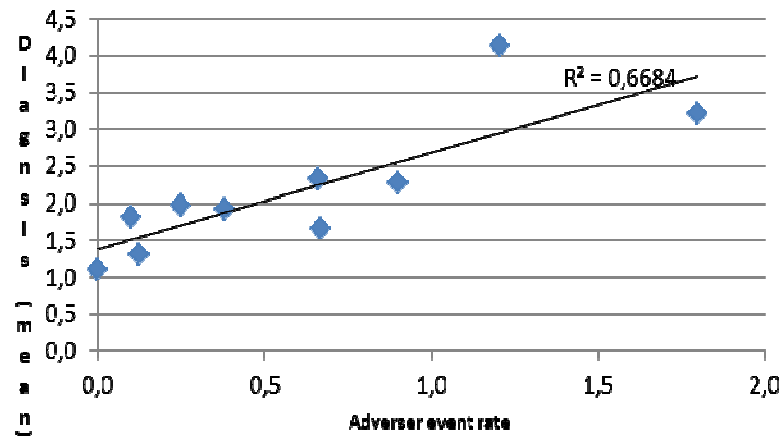
## CABG



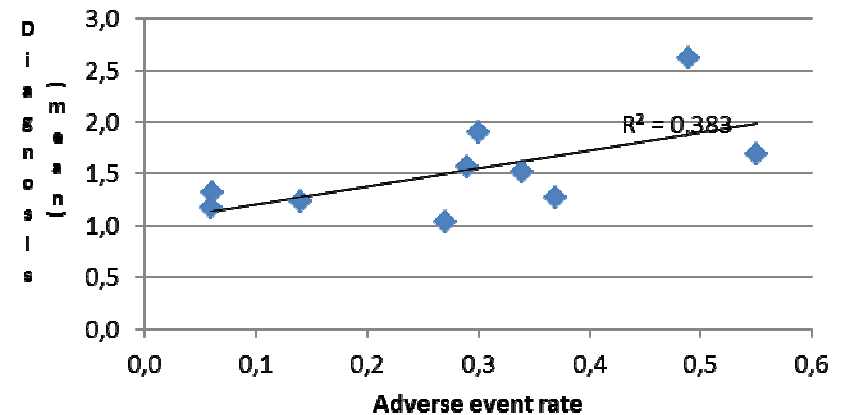
## Child birth



## Cholesystectomy



## Appendectomy



# Regression results

		Appendectomy		CABG	
		M1	M2	M1	M2
<b>England</b>	Adverse events	0.146***	0.075*	0.043*	0.044*
	Urinary tract infection	-0,025	0,02	0,003	0,001
	Wound infection	0.258***	0.125***	0.100***	0.101***
<b>France</b>	Adverse events	0.131*	-0,023	0.057	0.005
	Urinary tract infection	-0.108**	-0.115**	0.001	-0.019
	Wound infection	0.407***	0.154**	0.178***	0.117**
<b>Germany</b>	Adverse events	0,026	0,018	0,017	0,013
	Urinary tract infection	0,026	-0,013	0,038	0,033
	Wound infection	0.262***	0.158**	0.284***	0.300***
<b>Spain</b>	Adverse events	0,092	0,041	1.225*	1.213*
	Urinary tract infection	-0,168	-0.290***	1.218*	1.258*
	Wound infection	0.450***	0.241***	1.712***	1.733***
<b>Sweden</b>	Adverse events	0.343***	0.209*	0.243**	0.240**
	Urinary tract infection	-0,022	-0.169***	0,022	0,035
	Wound infection	0.369***	0.284***	0.241**	0.261***

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# Conclusions

- In countries where DRGs are used directly for payment, routine hospital data has been improving and could be useful for tracking quality
- Coding practices might improve in those countries with a young DRG system
- Despite strong heterogeneity in coding practices, high rates of coded adverse events for certain episodes in some countries may deserve attention
- The impact of AE on cost/LOS could be significant both for healthcare providers and for public payers

# Conclusions

- In some DRG systems the cost of low quality (adverse events) is compensated by the DRG payments since complications can be part of severity adjustment
- Separating diagnoses that are present on admission from those arrived during hospital stay (complications linked to care process) is necessary if payers want to give clear incentives for improving care quality
- DRG systems can (and need to be) designed for encouraging quality improvement (US Medicare, UK Quality accounts, etc.)
- Requires understanding the incentives provided by the DRG system in order to promote care quality while also improving cost-efficiency of providers