Costing the Cancer Care Pathway: Association Between Cancer Type and Costs of Hospital Care in England

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Partnership between…

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NCIN national cancer intelligence network

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Motivations

- The cost of cancer care is soaring:
  - Ageing population
  - Improving cancer survival
  - Increasing costs of care

- Population based data on care pathways and costs are keys:
  - To monitor present costs
    - What are the main drivers? Ageing, Survival, or new Treatments?
  - To plan future expenditure
    - What are the estimated costs in the next 20 years?
  - To design effective health policies
    - How to reduce costs without affecting health outcomes? Or how to improve outcomes without increasing costs?
    - How to allocate the health budget across different health programmes?

Lessons from the US

- Linkage of population based data from cancer registries to data on costs from insurance claims -> SEER-Medicare dataset (1999)
  - **1.6 million** patients hospital care and costs linked from 1996
  - SEER-Medicare dataset used in **844** peer reviewed studies in 1999-2013, including *Lancet Oncol (1), J Clin Oncol (80), JAMA (17), N Engl J Med (5), Ann Inter Med (8), Med Care (58)*
  - No equivalent data linkage in England (so far):
    - Most of the evidence on pathways and costs from clinical trials

Data on Patient Care Pathway for England

National Cancer Data Repository (NCDR)

Cancer registrations:

- Patient level records collected by the Cancer Registries
- Data on cancer diagnoses
- And demographic information about cancer patients e.g ethnicity, age, sex, postcodes

Cancer registrations data are linked to other patient level datasets:

Currently:

- Hospital Episodes Statistics (HES) 1990-2010: Data on inpatient hospital admission of NHS patients. Outpatient visits will be added soon

Longer term:

- National Radiotherapy Dataset - RTDS
- Systemic Anti-Cancer Therapy Dataset (Chemotherapy)
- Clinical Practice Research Datalink (CPRD)
- Clinical audits

Data on Health Care Costs

- NHS hospitals are mandated to submit data on the cost of the service produced at end of the year (National Schedules of Reference Cost)

  - Health Related Groups > 1,100
  - Distinct costs by type of admission
  - Extra costs are reported for length of stay outlier
  - Extra costs reported for expensive additional services:
    - Chemotherapy; Radiotherapy; Critical Care; Specialist Palliative Care; Diagnostic Imaging; High Cost Drugs; Rehabilitation; Renal Dialysis

Achieved Outcomes:

- A new national dataset

  Reference Costs (100K) are matched to HES-NCDR records (4.5 millions per year)
  - Use costs for inpatient activity reported in 2010 only
    - Minimise artificial variation from change in costing rules over time
  - Match costs to activity reported in 2006-2010
    - 2006 first year with OPCS codes compatible with HRG v4
  - Construct patient level pathways of inpatient care
    - Only few HES records are unmatched (1.7%)

- Descriptive analysis on selected cohorts of patients
  - *Only preliminary results at this stage – not to be published!*
  - Patients with a cancer diagnosis in 2006 followed up to 2010
    - lung (ICD-10: *C33-C34*)
    - breast (*C50*)
    - bowel (*C18-C20*)
    - skin (*C44*)

Pathways of inpatient care

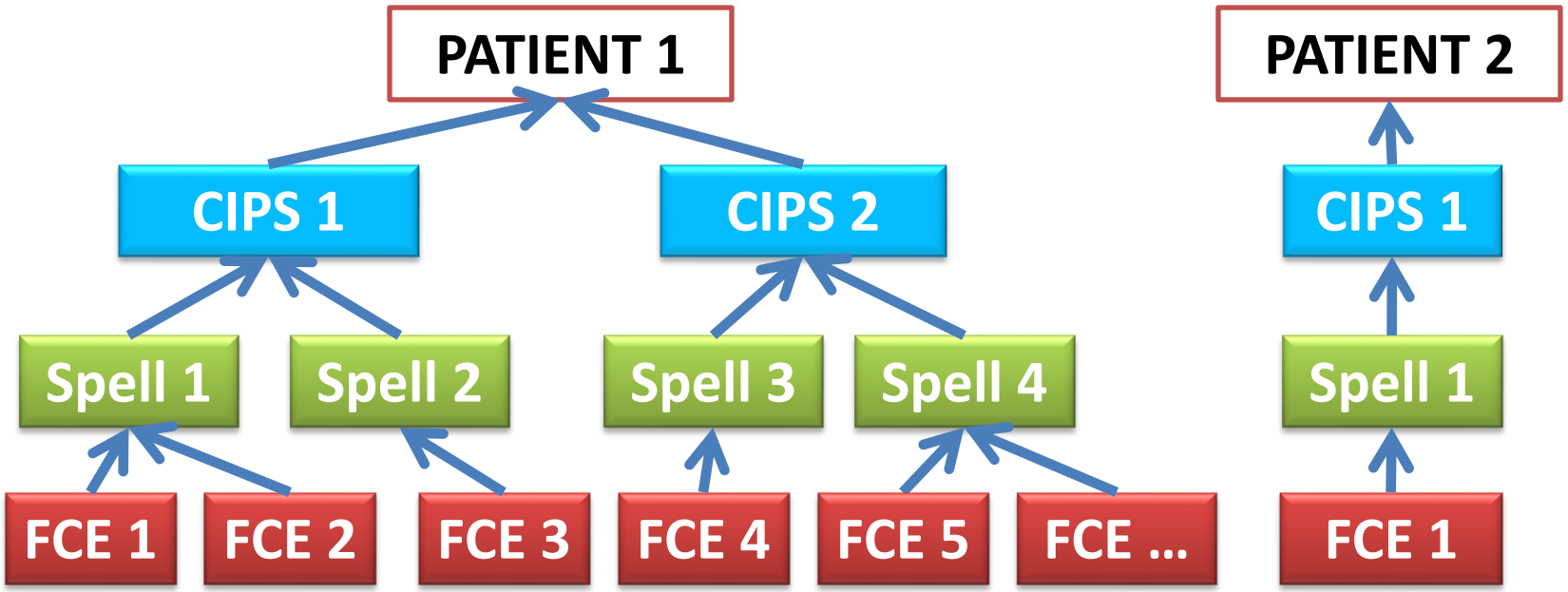

Table 1. Descriptive statistics. Patients diagnosed with cancer in 2006 and followed from 2006 to 2010

	Skin	Breast	Bowel	Lung
mean length of life (days)*	1,495	1,421	997	322
mean age (years)	70.9	63.8	72.1	72.7
share female	0.451	0.993	0.468	0.414
share with at least 1 hospital admission	0.582	0.875	0.916	0.866
mean hospital admissions	4.91	7.75	9.58	5.28
mean cost of hospital care (£)	10,296	14,836	22,117	13,390
mean cost per day of life (£/day)*	11.57	29.83	142.87	247.25
total patients	20,426	7,726	6,064	5,319

*Truncated at 5 years (1,825 days)

Table 2. Cost per day of life in patients diagnosed in 2006; Patients are followed from 2006 to 2010; Linear regression

Baseline: Skin cancer, female patients, age 18-40

	Coefficients (£/day)	Z	[95% Conf.	Interval]
sex				
male	9.88	1.27	-5.42	25.18
age				
40-60	-9.87	-2.43	-17.74	-1.90
60-80	14.98	2.9	4.87	25.09
80+	85.42	10.6	69.62	101.22
Cancer cohort				
Breast cancer	32.10	5.58	20.82	43.38
Bowel cancer	134.30	12.09	112.54	156.07
Lung cancer	239.97	22.09	218.68	261.26
constant	-27.32	-4.34	-39.65	-14.99
Tot observations:	27,715			

Note: the sample include patients having at least one hospital admission!

Current Limitations

- Only inpatient admissions at this stage
  - Care services such as chemo and radiotherapy are supplied under outpatient settings
- Critical Care and (in part) Rehabilitation services are excluded
  - Critical Care can be added at a later stage by data application to the HCSIC
- No GP visits
- Costs are fixed at 2010
  - Potential technological change within HRG is lost
  - But cost allocation within HRG is consistent over time
- Before 2006 activity is difficult to match
  - Different OPCS code system

Potentials in informing the cost of cancer

- Estimating geographical variation in the cost of cancer by cancer type and phase of disease (initial, continuation, terminal)
  - Also, variation by PCTs and GPs
- Estimating future cost of cancer
- Identifying characteristics of the care pathway with higher impact on costs
  - Number of outpatient and inpatient visits
  - Chemotherapy sessions
- Measuring contribution of different level of care to lifetime cost, e.g. GP quality of care

Plans for future research

- Add Outpatient visits and costs
- Add Critical Care visits and costs (?)
- Publish method
- Add other datasets e.g. treatment

- **Start answering some research questions!**

Thanks!

Project sponsors:

Table 2. Probability of an hospital admission in patients diagnosed with cancer in 2006; Patients are followed from 2006 to 2010; Logistic regression
Baseline: Skin cancer, male patients, age 18-40 and alive in year 1

	Odds Ratio	Z	[95% Conf.	Interval]
sex				
female	0.858	-5.87	0.815	0.903
age				
40-60	1.128	1.54	0.967	1.315
60-80	1.504	5.35	1.295	1.746
80+	1.356	3.86	1.162	1.583
Cancer cohort				
Breast cancer	5.958	43.37	5.496	6.458
Bowel cancer	9.225	44	8.356	10.18
Lung cancer	6.988	32.37	6.212	7.861
Survival				
alive in year 2	2.387	11.85	2.067	2.757
alive in year 3	2.680	12.45	2.294	3.129
alive in year 4	2.863	12.42	2.425	3.380
alive in year 5	1.782	11.12	1.610	1.973
Tot observations:	39,535			