Healthcare Economics

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Contents

Lecture 3: Topics in the supply, regulation and financing of health care

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Resource Allocation

Supply, regulation and financing of health care

We need systems to pay healthcare providers, but there are multiple way's of doing this, for healthcare to try to improve the healthcare provided to patients.

How do we pay hospitals? Lecture 1

Can we use incentives for the care a doctor may provide - lecture 2

How is healthcare different?

- most health care is not paid for directly by the consumer
- instead, providers are reimbursed by a third party payer (or purchaser), which is government, private insurance companies or social insurance funds depending on country
- The supply of and market *for* healthcare is therefore highly regulated

As such, price competition is typically absent, and instead provider compete for patients in non price dimensions - quality, waiting times, complementary services (visiting times)

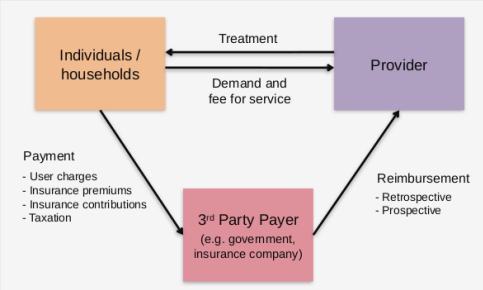

Figure 1: Simplified healthcare financing relationships

Healthcare is a fundamentally different from other types of good

- demand for healthcare is uncertain - the onset of ill health is difficult to predict, whilst healthcare is often a need and not a want
- Healthcare is an experience good, the quality of the good cannot be known until after consumption. Thus questioning the link between quality of care and demand
- there us a moral understanding that access to health care should be universal

Furthermore, there is *information asymmetry* (Arrow, 1963)

- between patient and provider - the patient is uncertain about the outcome of 'consuming health care'
- between payer and provider - the quality of care is often not verifiable to the payer (without expensive monitoring)

0.1 the role of reimbursement in health care

Financial incentives are common in most industries, payers can use reimbursement system to incentive provider behaviour, providing that health care providers are concerned with profits.

There are still financial incentives we need to think about

Challenges in health care reimbursement

there is a tradeoff between cost, access and quality

where other challenges are specific to health care

1. upcoming - relating to information asymmetry - want to measure activities hospital are doing as accurately as possible, but the doctors are the ones recording this. So the payer is relying on honesty here, but there are cases where hospital have overstated this to get more funding
2. supply induced demand - idea being that with information asymmetry, but between patient and provider, provider can over treat patient. Dentists get payer a lot based upon how many treatments they can provide, say a filling when not necessary → unintended incentives we may face.
3. cream-skimming and dumping patients - more profitable patients you keep, least profitable you get rid of

Role of health economics

One side of health economics is modelling to try to explain what will happen under certain assumptions, on the flip side there is the applied side, was switching from one thing to another the best thing in reality. Theoretical models have their limitations, assumptions may be too strict, and for applied it needs repercussions. Strike a fine line

Context in the UK How to pay hospitals whilst maintaining efficient and quality of care, think of picture.

0.2 Types of reimbursement systems

Characteristics of reimbursement systems Fixed vs Variable

- fixed - reimbursement doe not change as activity increases or decreases
- variable - reimbursement increases as activity increases (dentist). Where some systems can be more variable than others, but it depends on the level at which activity is reimbursed (per item or period)

Retrospective vs Prospective

- retrospective - payer reimburses all costs for treating patient
- prospective - agree price before hand, any extras hospital provides is not included in the reimbursement
- close ended - set budget, that is max revenue
- open ended - no limit on how much hospital can spend

Prospective systems can have variable and fixed aspects, but if retrospective then .

Cost based reimbursement

$$R^c = \sum_{i=1}^{N} [Q_i \cdot c_i] + Z^c$$

This is a relatively easy system to implement, Z is non-activity related revenue say maintenance costs. Unit cost c either set by payer or determined by natural price in market

Features Retrospective, variable, open ended. Varies depending on activity provided
Pros

- Clear incentives to provider to increase activity - good for access
- if c_i includes some profit, for every case treated get some profit on top of that, this creates further incentives
- incentives to improve quality
- common in US 60s/70s $\rightarrow$ but led to medical 'arms race' - competing to provide the best health care

Better quality, but costs could spiral
Cons

- Little incentives to reduce costs
- no control over global expenditure
- adverse incentives = supplier induced demand

Global budgets

lump sum amount of money, upto hospital if overspend

$$R^g = \sum_{s=1}^{S} B_S + Z^G = \sum_{s=1}^{S} [\overline{Q}_s \cdot p_s] + Z^G$$

Features Prospective, fixed, close-ended
Pros

- Incentives for provider to reduce costs and improve allocative efficiency
- payer has control over global expenditure (closed ended)

Cons

- potential adverse impact on quality
- weak incentives to increase activity
- providers may exceed target volume of activity
- adverse incentives - 'cream skimming' - selecting which patients to treat and services to offer

This was the main way of reimbursing for a while, then moved to cost based reimbursement systems after the medical arms race

Prospective Payment Systems

costs spiralling in US in 80s, but also wanted to increase activity, reduce waiting times. IN England, 'activity based financing'- per unit of care (item to period), tends to be per case now.

For every case treated, get this price. Grouping similar patients together based on diagnosis related groups (DRGs), and then set price pay hospital in say DRG1 equal to the historic how much it costs to treat that group of patients across the country

So take average costs and reimburse all hospitals this. DRG called HRH in England since the population and conditions faced very between England and America.

Normal delivery without CC - complications or co morbidities = £1496, but this may be unfair if paid all delivers one price, patient with CC would have less funding.

$$\text{Linear: } R^A = \sum_{j=1}^{J} [Q_j \cdot \hat{p}_j] \quad \text{Mixed: } R^A = \sum_{j=1}^{J} [Q_j \cdot \hat{p}_j] + \ldots \tag{1}$$

Marginal, mixed - weighting
can set $\alpha = 0$ so that it becomes closed system

0.3 Theory of yardstick competition

Model setup Payer (principal)

- an all knowing payer could directly contract incentives for cost reduction
- however, payers are often unable to monitor and contract cost reductions
- the payer has 2 instrumetns : price and a lump sum transfer

Provider (agent)

- providers are profit maximising
- providers have degree of monopoly power = downward-sloping demand curve
- each provider faces a constant marginal cost
- possible to reduce marginal cost through a costly fixed cost reduction effort

But how to incentivise cost reduction and increase activity?

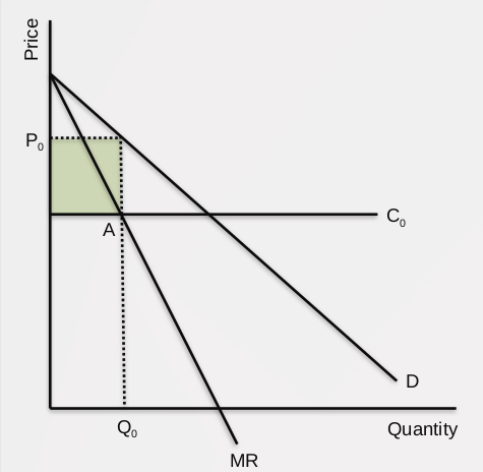

Figure 2: Retrospective Payment

Under PPS

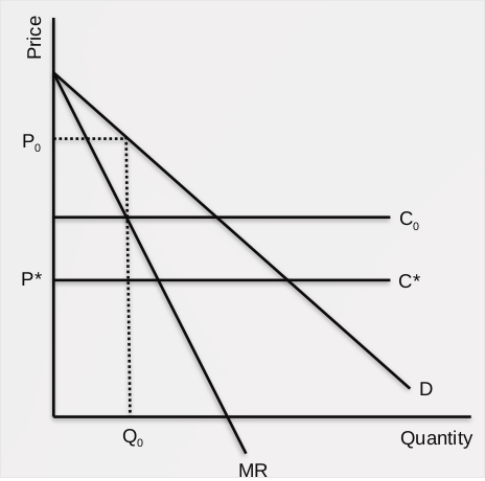

Figure 3

Scenario 1

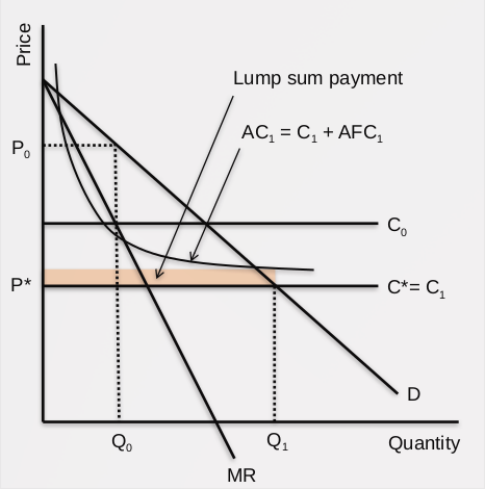

Figure 4

Produce at q p_1 but make loss of orange area since AC is higher than AR, but Schliefer : to incentivise reduction of MC, we can pay lump sum 'break even' payment. Make 0 profit but produce at Q_1

Reduced marginal cost to that of everybody else, if we keep investing in technology

Scenario 2

We can move marginal cost to C_2, they invest more to move marginal cost down.

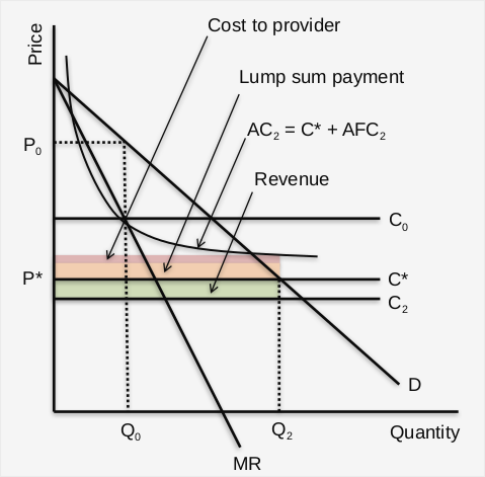

Figure 5

Trading off the size of the rectangles

Would the payer stop making profit, if didn't pay orange then hospital making loss of red plus orange, then overall loss since red and orange greater than green. But key is that since setting price equal to marginal cost of all firms in market, the BE payment 'differs' based upon hospitals starting point, if producing at c* already, get no BE sum, intuitively.

Even with break even payment, still incentivised to reduce costs.

Optimal solution involves lump sum transfer, but if this becomes tricky to do (in paper), we can set price based upon some sort of average cost pricing - making p* higher because we also compensate for lump sum transfer in price that set

That is average cost of treating DRG group in the past,

Extensions If lump sum transfer not possible Or, heterogeneous firms Or, in London or not (in the model)

Pros

- Stronger incentives to reduce costs and improve efficiency
- incentives to increase activity (depending on how we define this)

Cons

- Potential adverse impact on quality (or activity) say intensity (quality) of services - may negatively impact, if not paid to keep patient. may release prenatally if not keeping in after couple days
- open-ended - limited control over global spending
- Unintended consequences - information assymetry - hospital is one to decide whether CC

Payer is reliant on physician's judgement, this could have a knock-on effect for those not upcoding (since others have cheated the system). Patient reported CC vs hospital reported CC, comparing over time since noisy - patient reported remained flat whilst hospital reported increased over time, is there some reason for this? But really can argue due to upcoding, or that in the past patients with CC were undercoded

One hospital may be more efficient, prioritising different CC. But remember triangle between cost, access and quality

trade-offs between reimbursement systems All have advs and disadvs, there is so much variations since different systems require different things at different points in time

Differences between countries

There has been movement away from historical budget (global). Looking at DRG (prospective) based system, the amount of money reimbursed varies massively, comparing Austria $\sim 90\%$ with Estonia 39%.

Additional payments provide incentives

At the top we have DRG system developed in America, in England we have healthcare resource groups, highlighting PPS are different across systems.

It is common and often case that PPS aren't fully prospective, we see variations in what we see in hospitals depending on primary diagnosis, secondary diagnosis, CC, treatment intensity and lengths of stay and decisions hospitals make, that can influence revenue.

Essentially, there is a prospective component and a cost reimbursement component, finding they are much less prospective than is assumed.

Reimbursement systems in England

2003 - Payment by results tariff system first introduced

- prospective payment system to reimburse hospital care
- system in which autonomous provides competed to deliver care

2020 - COVID-19 led to the suspension of PbR system entirely

- the NHS reconfigured services to deal with the pandemic
- faced significant new costs that were hard to precisely anticipate

Now, there is a movement towards blended system (fixed, variable and quality payments)

- NHS is increasingly emphasises collaboration over competition
- there is a mismatch between policy intentions and payment incentives

0.4 Evidence on reimbursement systems

limitations of previous theoretical model Theory of yardstick competition is useful to illustrate rational behind PPS, but it doesn't consider quality of care, just quantity and costs. Assumed profit maximising

Ellis & McGuire (1986)

- developed a theoretical model to derive optimal reimbursement system
- when physiciajns also care about the benefit to the patient (benevolent)
- using a cost-sharing perspsctive

Model setup

- Single Patient (principal) - Assume patient is fully insured (no out of pocket costs), they will accept the level of treatment prescribed.
- Essentially that there is optimal level of benefit for the patient q* Hospital (principal) - Hospital profit maximise (think of manager, profitable, don't shut down (profit function of revenue and cost))

- Physician (agent) - decision maker - decided quantity of services, derive utility from hospital profit. Compensation is independent from treatment costs

Physician indifference curves - an inverse flip of patient benefit curve, as provide more quantity, provide more treatments but profits drop. There exists best possible care at q*

The shape of ID curve is MRS = rate at which physician willing to trade 1$ of hospital profit for 1$ of patient benefit. We assume MRS is constamt, that ID curves are parallel.

2 types of Physicians Perfect agency
Imperfect agency

Findings Investigates optimal solution under reimbursement systems

Scenario 1 : under pure cost based reimbursement

- hospital revenue = cost, profits always 0
- quantity of services therefore does not affect hospital profits
- Implications for physicians behaviour

Scenario 2 : under imperfect cost-based reimbursement

- not always the case that revenue = cost
  - providers have some degree of monopoly power to influence price
  - payer has imperfect information about true cost of services
  - payer builds in profit margins into payments

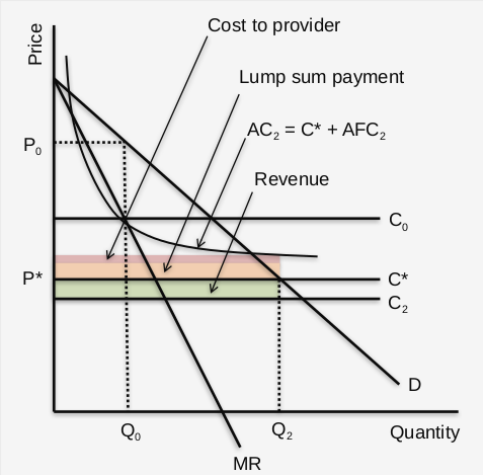

Figure 6

- profits greater than 0
- slope of profit line is equal to difference between marginal revenue and marginal cost
- physician chooses quantity of services q_2 to maximise utility

scenario 3 : Under PPS (perfect agency)

- set q = 0, profit = expected payment (single patient)

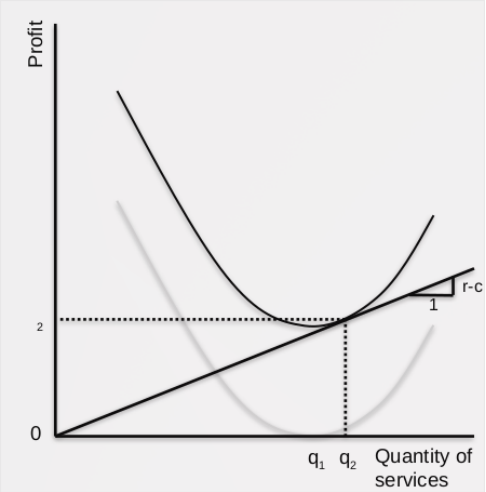

Figure 7

Quantity of services q_1 pure cost based system, we see a drop in quantity of services from here and an increase in profit, optimal solution is worse

Prospective payment price P is based on historical, across everyone in market. Over time price is calibrated and lowered to reflect lower costs hospitals now providing. Profit line intersects IC. But notably because indifference curves are vertically parallel q_3 stays the same

scenario 4 : (imperfect agent) indifference curve is a lot shallower, relative to perfect agent curve p_3, provide lower quantity, intensity of services q_4. But in doing so, benefit of q_4 is worse than benefit q_3

Essentially,

Mixed payment system still fixed prospective payment for treating payment but also cost-based payment that is fraction of cost, reimburse some of cost. Fixed prospective

Set prospective payment

Physician has lower utility, but at q_5

Even if doctors do care bit more about profit, can still devise system where they produce as if they equally valued patient benefit and profits.

This has some real world values, looking at spain only 20% of hospital fee reimbursed but also have FFS. May be more private hospitals for example, reducing the amount of prospective payments

In summary, **Ellis & McGuire (1986)** formalise how different payment systems can yield different results.

Models give idea of what may to expect in real life - but are these assumptions realistic?

Ellis and McGuire better in this respect, incorporating patient benefit, but still need to look at empirical evidence - evaluating adoption of other health care systems.

4 hour A&E target - target setting, can we translate this into salary?

Recap

- Ellis and McGuire - best scenario with imperfect agent is mixed situation
- theoretical models are good but not the be all and end all since we make a lot of assumptions → empirics are needed

Empirical Evidence on Reimbursement systems

Numerous empirical papers assessing the impact of reimbursement on

- activity measures
- health care costs and expenditure
- quality measures (proxies)
- adverse impacts (upcoding, shifting of patients)

Different approaches to do so

- most studies exploit introduction of new reimbursement system. Say a before and after comparison, and comparing changes with a control group
- others exploit changes within payment systems - say the extent to which payments become more or less prospective

Exercise 1. Moreno-Serra & Wagstaff (2010) Relating back to the grey figure Using country level data from 1990 to 2004, comparing budgets for healthcare systems → Say Estonia from global budget to cost based reimbursement system from 2002, compare this to Turkey for example Look at the switch from global budget to prospective payment system too Setting is that these countries were moving away from communism, looking at multiple outcome measures (hospital activity - admissions, length of stay, bed, bed occupancy. Public private hospital spending)

Fundamentally, we cannot observe say Estonia in 1992 that can say what would have happened has the system not been introduced As a second best we use the countries that didn't change as a control group, for those that switched systems. **Simple DiD**

$$y_{it} = \alpha + \sigma \ \text{treat}_i \ + \delta \ \text{post}_t \ + c\beta D_{it} + X_{it}\gamma + e_{it}$$

where y_{it} is any measure of hospital performance (say admissions), i is country, t is time

$$D_{it} = \ \text{treat}_i \cdot \ \text{post}_t$$
$$X_{it} = \ \text{observable time varying factors}$$

where we condition on time varying factors $y|X_{it}$ pre : post $= 0$, $D_{it} = 0$ here we have just α counterfactual if no change in post $\delta post_i = 0$ - in this case didn't need counterfactual in pre $post = 0$ so β still switched off, but treat is $\alpha + \sigma$, then in post the difference difference is β

Their Model :

$$y_{it} = \beta_1 FFS_{it} + \beta_2 PPS_{it} + X_{it}\gamma + \alpha_i + \theta_t + e_{it}$$

This model allows for s different starting point along y axis for every different country 3 country Example, 1 global budget, 1 switches to FFS, 1 prospective

$\alpha_{gb} < \alpha_{FFS} < \alpha_{PPS}$ - on X axis. Global budgets to begin with country fixed effects α_i control for 'base level differences' year level FF control for time level differences (say shocks) across time. Together = TWFE

Model Assumptions

Parallel trends

' in the absence of treatment, the trends in the outcome for treated units (conditional on observable time varying factors) would have followed the same trends as observed for the control units'

Potential violations (may fail if non-parallel trends)

- Non-parallel trends, when
    1. unobservable tie varying factors differ between treatment and control group
    2. treatment and control group affected by different exogenous shocks over time
    3. Natural ceiling / floor effects affect treatment and control group differently
- Selecting into treatment (reverse causality) - countries switching systems may be switching into a system based on outcome (global budgets not working in first place)
    - units may self select into treatment based on outcome
- Spillover effects between treatment and control group - if looking at treated and not within hospitals, there may be some effect here we need to think about
    - learning or substitution effects, or joint production or migration

Comparing Estonia with turkey, something could change in turkey that doesn't in Estonia after 1992 that could have an effect on mortality and hence invalidate the control group for the analysis.

This paper runs a DiD model, requiring the parallel trends assumption, if we try to relax this potential violation by allowing trends to differ.

2nd model : random trend model or trend adjusted DID now allows for different underlying trends between countries to begin with and factor in these trends when devising the counterfactual, running time variable allows for linear trends in one country.

Extends base model to control for assumption that all countries face same trend over time, but relying on extrapolation of linear trend - assuming linearity

Differential trends model - for all countries that switched to PPS and all they switched to FFS - allow for unique - control for non linear time trends across countries that switched. Random trends relaxes parallel trends assumption.

Importantly, they test parallel trends in pre-policy periods and check whether statistically parallel to each other

Concerns about reverse causality - countries that switch into might be fundamentally different from those that don't. Test this with model

Including lead dummies is almost like a placebo test - for whether they observe a difference in the data before the change happened - thus suggesting reverse causality may be an issue.

Hypothesis - positive effect on admissions activity, but even larger effect for PPS - under cost based - billed for item of service so treat more intensively but PPS may be encouraged to (DRG at admission level) treat less intensively to decrease cost

Results - find significant increase note since country level analysis, we require country-level data

Testing assumptions

- chi squared - if significant use model

- tests are looking to see whether trends in pre policy period are different from each other
- at least in pre period, can argue trends are parallel
- Find increase in STR in diabetes - may have been some selection for treatment - but only one specific outcome (diabetes) so could be that controls included in the model are controlling for decision to switch systems

Countries implement changes at different times - differential time as a treatment - simple model may be biased under differential treatment timings

External Validity - only looks at global budget to FFS or PPS, so doesn't consider blended systems, thus questioning the nuance.

Lecture 4: Topics in the supply, regulation and financing of healthcare

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0.5 Rationale for incntivising wuality of healthcare

Patient demand does not always reflect quality

- information assymetry between patient and providor - patient is uncertain about the outcome of 'consuming healthcare' or may not be aware if all relevant aspects of quality
- Helath care is an experience good - the quality of the good cannot be known until after consumtpion, thus questioning the link between quality of care and demand

Though, there may be limited inventives to competet for patients, this may be due to

- Few hospitals/practices in an area (a degree of monopoly power)
- Not all payers allow free choice of provider

Bariers to quality Practitioners may base