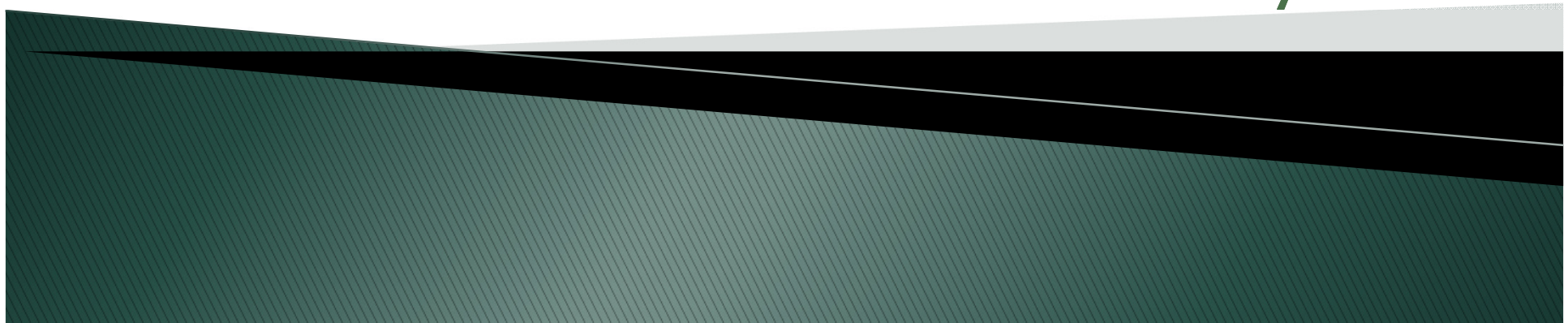


Introduction to the Price Setting Process

Royal College of Surgeons in Ireland
27th May 2015



The Aims

- The aims of this presentation are
 - to introduce the key concepts used in Activity Based Funding
 - to give an overview of the price setting process used by the HPO
 - Give insight into how **your** data is used in this process

Warning (for your good health)

- The presentation relies heavily on worked examples which are mainly in numeric tables
- Don't try to take in all of the detail – I will point out the important points in each example
- This presentation and an accompanying document will be made available so that you can go through each example at your own pace

Warning (for my good health)

- This talk only aims to cover the general price setting process
- It does not cover
 - Costing
 - ABF Funding Policy
 - Payments for quality/outcomes/clinical pathways
 - Cashing
 - Benchmarking
 - Target setting
 - Commissioning
 - Income collection

The Data Sources

- Patient Level Costing (PLC) Data
 - Used to generate **initial cost estimates (relativities)**
 - No longer relying on Australian cost weights
 - Used to validate specialty costing data
 - Available from participating hospitals (15)
- Specialty Costing Data
 - Is available for all ABF hospitals (38)
 - Used to determine **total hospital costs** for calibration process
 - Used to validate PLC data
 - Issues when hospitals don't return their specialty costing data
 - Validation of PLC is not possible
- HIPE Data
 - Used to determine current activity levels for all hospitals
 - Used to set baseline activity levels for ABF funding

Some Concepts

Average DRG Cost
Relative Value
Weighted Units
CMI
Base Cost
Base Price
Estimated Total Cost

Average DRG Cost

- The average cost per DRG is just the total cost associated with the cases falling into each DRG divided by the number of cases within that DRG.
 - Average costs are initially derived from the Patient Level Costing (PLC) data
 - We are concerned with setting a national price therefore we assess the cost by averaging across all PLC hospitals

	DRG 1	DRG 2	All Cases
Cases	20	40	60
Total Cost	€100,000	€800,000	€900,000
Average Cost	$€5,000 = \left(\frac{€100,000}{20}\right)$	$€20,000 = \left(\frac{€800,000}{40}\right)$	$€15,000 = \left(\frac{€900,000}{60}\right)$

The average **cost** across all inpatient cases in 2013 was €4,446 and across all day cases was €582

Relative Value (RV)

- The relative value of a DRG is the average cost per case for that DRG expressed as a proportion of the average cost per case across all DRGs
 - RVs give us an immediate measure of the relative costliness of a DRG
 - As cost is a proxy for complexity it is also an indication of the relative complexity of the cases in each DRG

	DRG 1	DRG 2	All Cases
Average Cost	€5,000	€20,000	€15,000
Relative Value (RV)	$.33 = \left(\frac{€5,000}{€15,000} \right)$	$1.33 = \left(\frac{€20,000}{€15,000} \right)$	$1 = \left(\frac{€15,000}{€15,000} \right)$

- DRG 1 costs 33% of the cost of the average case in the system
- DRG 2 costs 133% of the cost of the average case in the system

2013 Inpatient RV Examples

- Uncomplicated Appendectomy (G07B)
 - Average Cost=€4,243
 - $RV=.954$ ($=€4,243/€4,446$)
- Uncomplicated Hip Replacement (I04B)
 - Average Cost=€9,932
 - $RV=2.23$ ($=€9,932/€4,446$)
- Liver Transplant (A01Z)
 - Average Cost=€82,546
 - $RV=18.57$ ($=€82,546 / €4,446$)

Weighted Unit

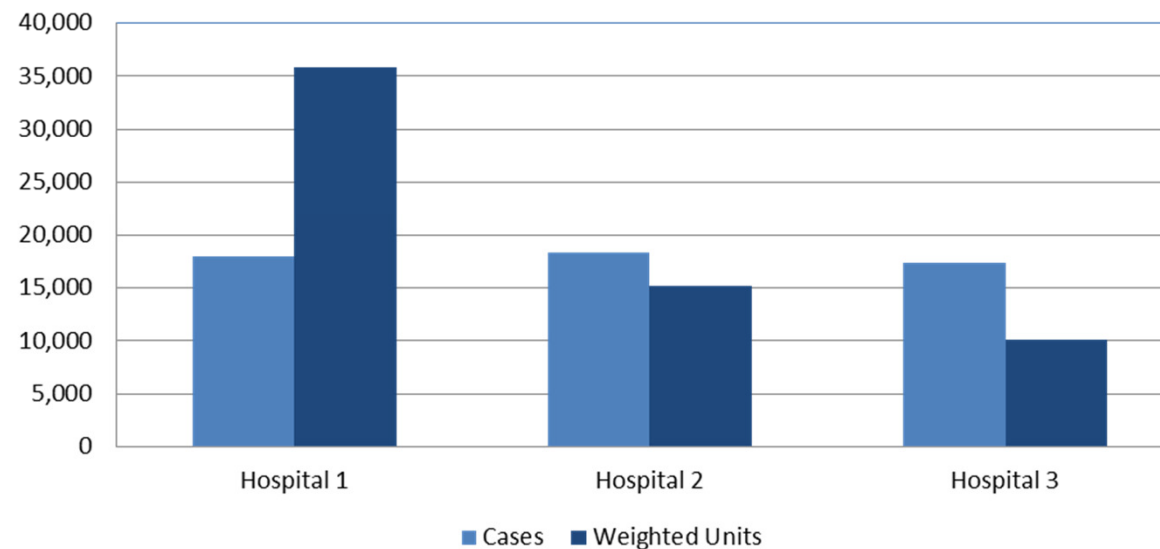
- The weighted units associated with a DRG is the sum of the relative values associated with the cases within that DRG
 - In its simplest form it is the RV times the number of cases

	DRG 1	DRG 2	All Cases
Cases	20	40	60
Relative Value (RV)	.33	1.33	1
Weighted Units	6.67 = $(20 * .33)$	53.33 = $(40 * 1.33)$	60 = $(60 * 1)$

- The weighted unit value takes into account the number of cases along with the complexity (through the RV) and so is a complexity weighted measure of activity
- Summed up to the hospital level the weighted unit value allows us to compare the complexity adjusted activity levels in hospitals without having to explicitly reference the different mix of cases in those hospitals

Inpatient Weighted Unit Example

Unweighted (cases) vs Weighted (WU) Activity Measures



- Three hospitals with very similar inpatient case numbers but with very different weighted activity levels
- The cases treated in Hospital 1 are more complex cases than in the other 2 hospitals

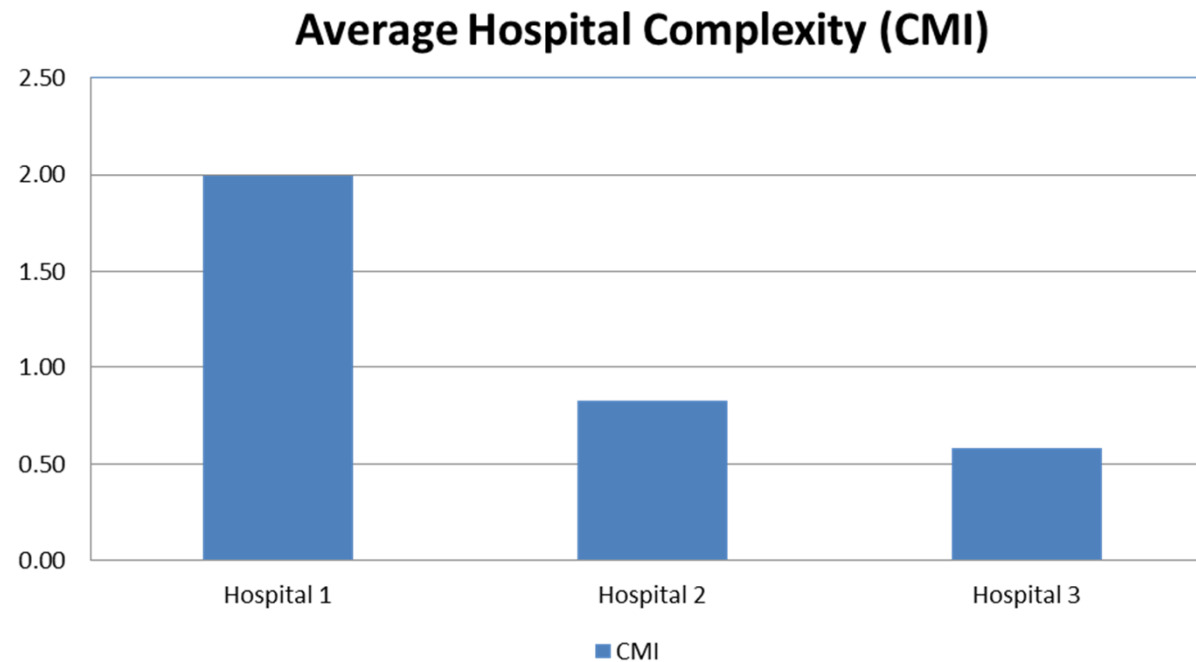
Casemix Index (CMI)

- The casemix index is defined as the number of weighted units divided by the number of cases
 - It is a measure of the **average** complexity of cases
 - It is usually computed at the hospital level to compare the average complexity of cases being treated in those hospitals

	Hospital 1			Hospital 2		
	DRG 1	DRG 2	Total	DRG 1	DRG 2	Total
Cases	5	30	35	15	10	25
RV	.33	1.33	N/A	.33	1.33	N/A
Wtd. Units	1.67	40	41.67	5	13.33	18.33
CMI			1.19 = $\left(\frac{41.67}{35}\right)$			0.73 = $\left(\frac{18.33}{25}\right)$

- The average complexity of cases treated in hospital 1 is a lot higher than those treated in hospital 2.

Inpatient CMI Examples



- The cases treated in Hospital 1 are on average more than twice as resource intensive as those treated in Hospital 2 and almost 4 times as resource intensive as those in Hospital 3

Base Cost (1)

- The base cost (BC) is defined as the total cost across all hospitals divided by the total weighted units across all hospitals
 - It is the average cost of treating a patient across all DRGs and hospitals in the system
 - or alternatively the national average cost per weighted unit

	All Cases
Wtd. Units	60
Total Cost	€900,000
Base Cost	€15,000 = $\left(\frac{€900,000}{60} \right)$

Base Cost (2)

- A hospital level base cost can also be calculated
 - Comparing the hospital level base cost versus the overall base cost tells us whether the hospital is more or less efficient than the national average

	Hospital 1	Hospital 2	Total
Cases	35	25	60
Weighted Units	41.67	18.33	60
CMI	1.19	0.73	1
Total Cost	€567,500	€332,500	€900,000
Avg Cost / Case	€16,214= $\left(\frac{€567,500}{35}\right)$	€13,300= $\left(\frac{€332,500}{25}\right)$	€15,000= $\left(\frac{€900,000}{60}\right)$
Base Cost <small>(Avg Cost/ WU)</small>	€13,619= $\left(\frac{€567,500}{41.67}\right)$	€18,140= $\left(\frac{€332,500}{18.33}\right)$	€15,000= $\left(\frac{€900,000}{60}\right)$

- Here hospital 1 seems more expensive based on cost per case but when we take complexity into account (i.e. look at base cost) we see that in fact hospital 2 is more expensive.

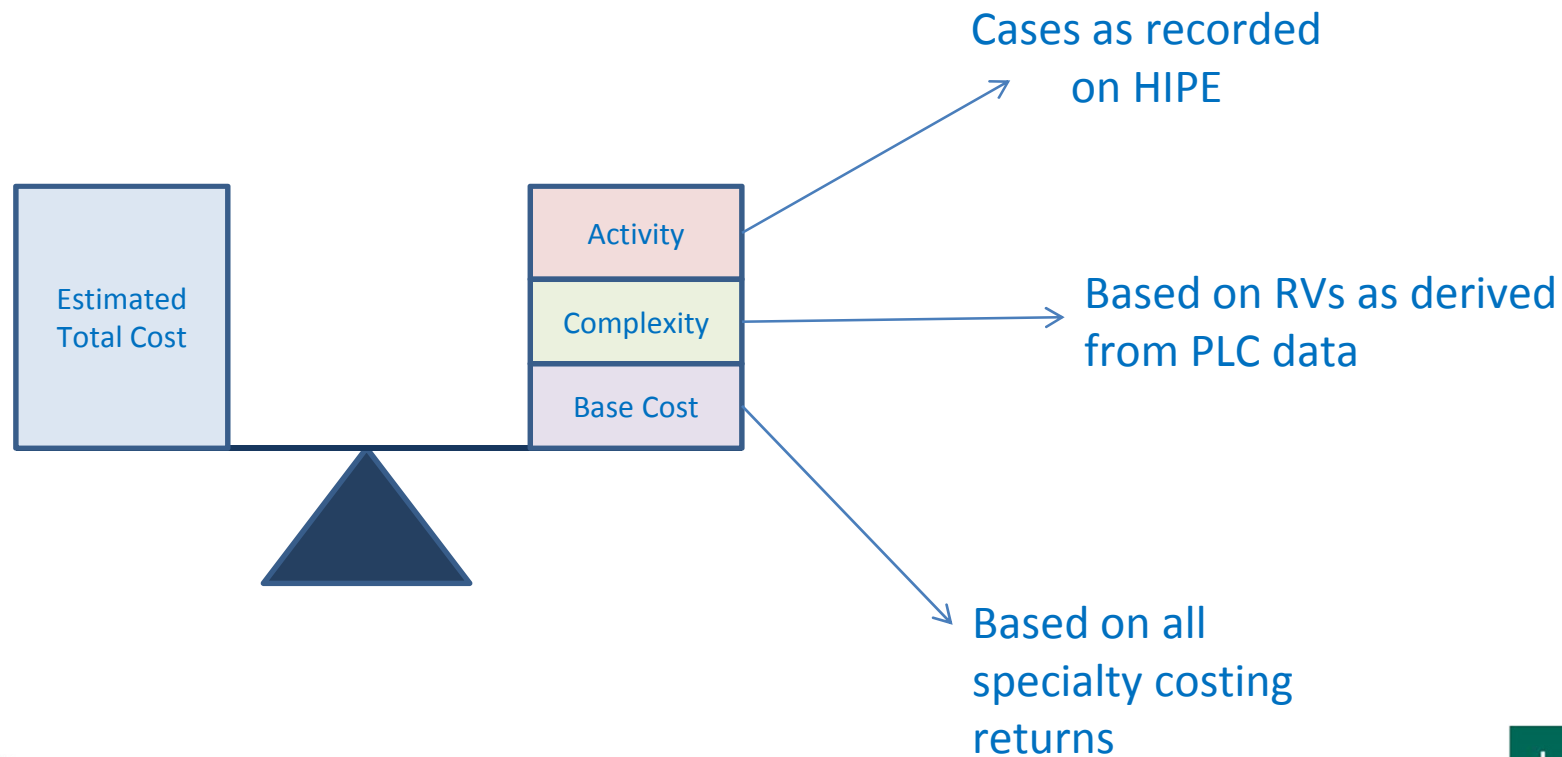
Estimated Total Cost

- The estimated total cost is the total cost estimate we get by applying the RVs and base cost to our data
 - Comparing our estimated total cost to our actual total cost gives us a test of our derivation process
 - If the two aren't equal then we have either added or removed cost in the derivation process

	DRG 1	DRG 2	Total
Cases	20	40	60
Wtd. Units	6.67	53.33	60
Base Cost			€15,000
Est. Total Cost	€100,000 $=(6.67 * €15,000)$	€800,000 $=(53.33 * €15,000)$	€900,000 $=(90 * €15,000)$
Total Cost	€100,000	€800,000	€900,000

Key Concept (1)

- Estimated Total Cost = Activity * Complexity * Base Cost

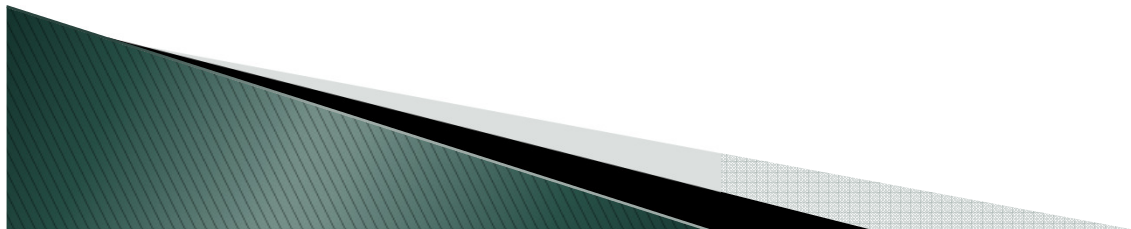


Key Concept (2)



- If any one of these 4 components changes then at least one of the others must be adjusted to balance the equation
- This is key to the cost estimation and price setting process and to ABF funding

The Derivation Process in Action



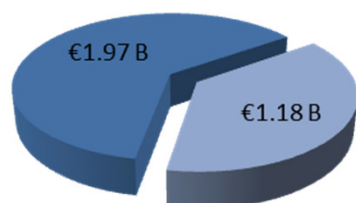
The Starting Point – Total Cost

- The starting point in the derivation of an average cost per DRG is the **total cost** associated with the treatment of inpatient and day cases in all 38 hospitals to be funded through ABF
 - This figure comes from the annual specialty costing returns submitted by hospitals
- In 2013 this figure was approximately **€3.15bn**
- This figure represents a **fixed point** in the price setting process
 - This means that when we generate our cost estimates and apply them to the activity of all 38 hospitals the **estimated total cost** must equal the **actual total cost**.
 - This ensures that no money is added or removed from the system as a result of the derivation process

The Break Down - PLC vs non PLC

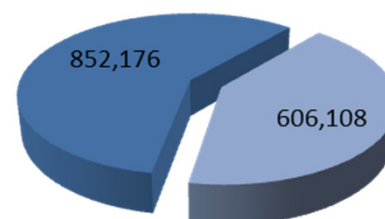
Cost Breakdown 2013

■ PLC Hospitals ■ Non PLC Hospitals



Case Breakdown 2013

■ PLC Hospitals ■ Non PLC Hospitals



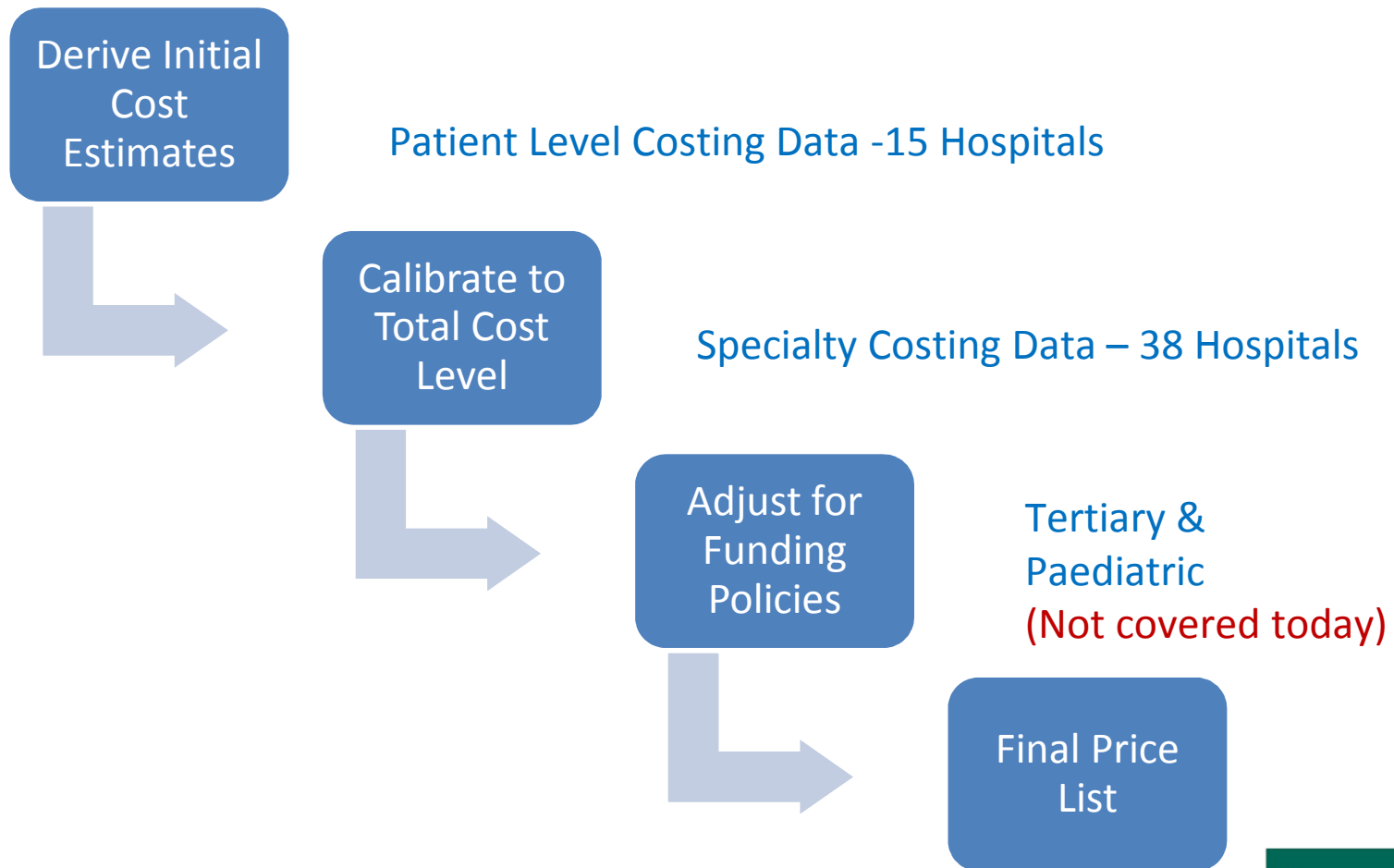
Hospital Breakdown Breakdown 2013

■ PLC Hospitals ■ Non PLC Hospitals



Note: Figures presented reflect the total inpatient and day case costs only.

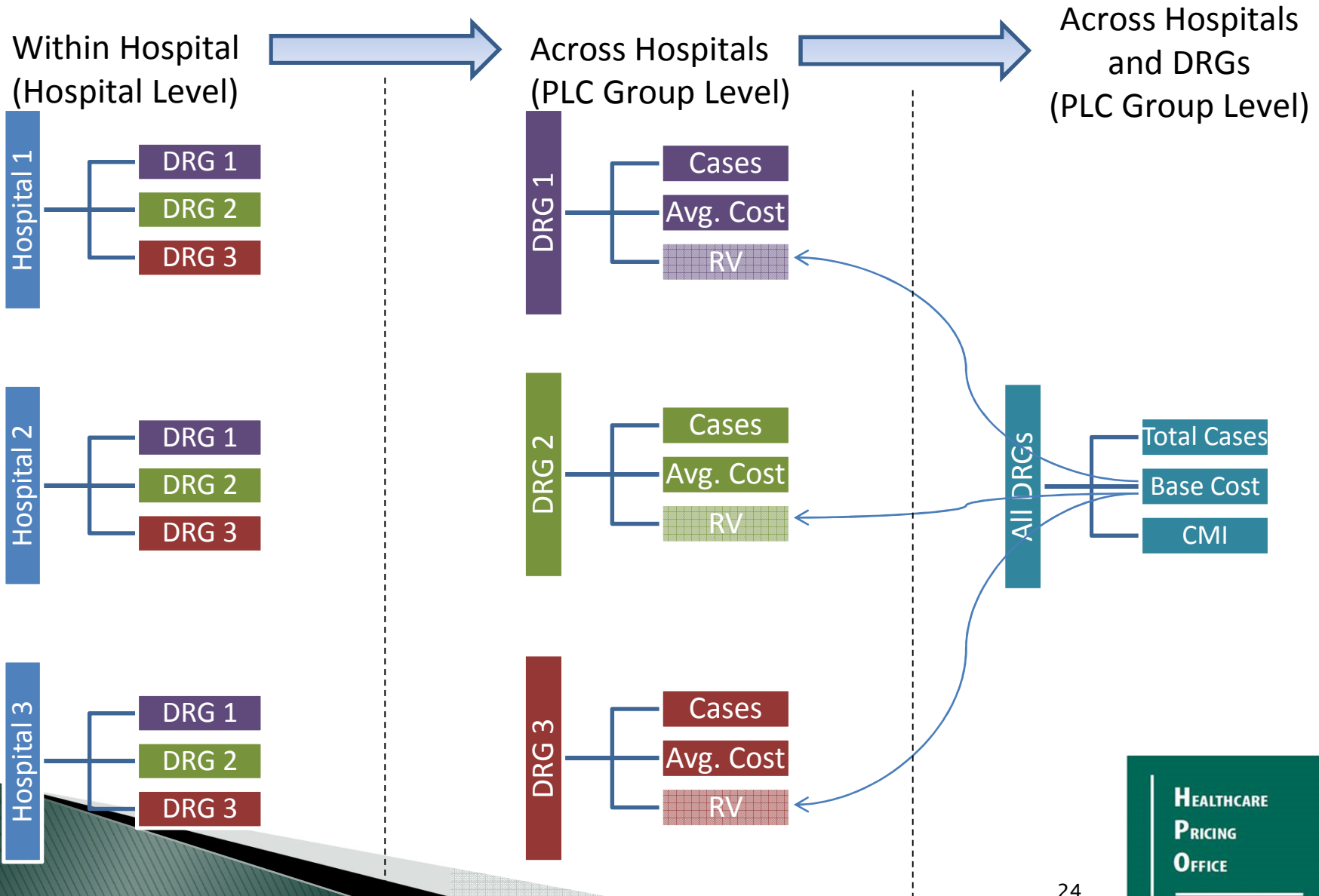
The General Approach



Step 1 - Derive the Initial Estimates

- The initial estimates of average DRG costs are derived directly from the data provided by the 15 hospitals participating in the PLC studies
- In its simplest form we pool the cases within each DRG across hospitals and use this to calculate the average costs
 - There are technical issues involved in this process which can be discussed later

Step 1 Basic Process (PLC Hospitals Only)



Step 1: Derive initial Estimates from PLC Data Pooled Across Hospitals

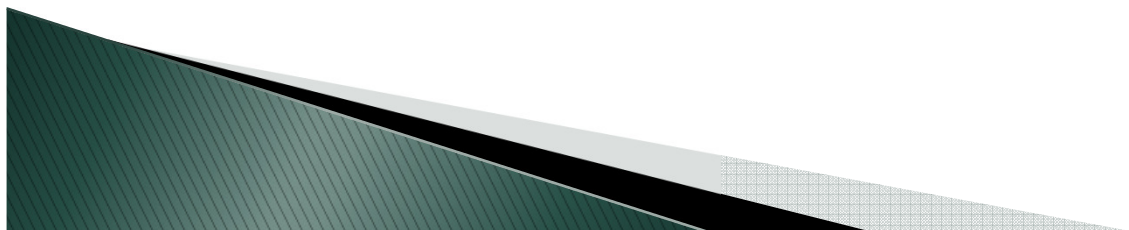
	DRG 1	DRG 2	Total	
Cases	20	40	60	
Total Cost	€100,000	€800,000	€900,000	
Cost per Case	€5,000	€20,000	€15,000 ^(BC)	1
Relative Value (RV)	0.33	1.33	1 ^(CMI)	2
Wtd. Units	6.67	53.33	60	
Total Value	€100,000	€800,000	€900,000	3

1. Base Cost (BC) = Cost per case across all DRGs = Cost per weighted unit across all Cases
2. CMI =1 and Total Cases = Total weighted units
3. Total Value = Total Cost

These features can be used as a checklist for a correctly calibrated funding system

Lets Take Stock

- At this point we have generated a set of RVs and a base price which we can use to describe costs in the PLC hospital sample
- We know that the estimated total cost = the actual cost for the PLC sample so by using our estimates we neither add anything or take anything away
- Lets see what happens when we apply them to the full ABF set of hospitals



The ABF Dataset

	Hospital 1 (PLC)			Hospital 2 (PLC)			Total (PLC)		
	DRG 1	DRG 2	Total	DRG 1	DRG 2	Total	DRG 1	DRG 2	Total
Cases	5	30	35	15	10	25	20	40	60
Total Cost	€27,500	540,000	€567,500	€72,500	€260,000	€332,500	€100,000	€800,000	€900,000

	Hospital 3 (Non PLC)			Hospital 4 (Non PLC)			Total (Non PLC)		
	DRG 1	DRG 2	Total	DRG 1	DRG 2	Total	DRG 1	DRG 2	Total
Cases	40	5	45	20	15	35	60	20	80
Total Cost	unknown	unknown	€275,000	unknown	unknown	€375,000	unknown	unknown	€650,000

	ABF Total		
	DRG 1	DRG 2	Total
Cases	80	60	140
Total Cost	unknown	unknown	€1,550,000

Apply PLC Values To All ABF Hospitals

	DRG 1	DRG 2	Total
Cases	80	60	140
Actual Total Cost	Unknown	Unknown	€1,550,000
Base Cost			€15,000 1
Relative Value (RV)	0.33	1.33	$0.76 = \left(\frac{106.67}{140} \right)$ 2
Wtd. Units	$26.67 = (0.33 * 80)$	$80 = (1.33 * 60)$	$106.67 = (26.67 + 80)$
Estimated Total Cost	€400,000 $= (26.67 * €15,000)$	€1,200,000 $= (80 * €15,000)$	€1,600,000 3 $= (106.67 * €15,000)$

1. Base Cost (BC) \neq Cost per case across all DRGs (€11,071) \neq Cost per weighted unit across all Cases (€14,531)
2. CMI \neq 1. In fact this CMI indicates that cases in the ABF sample are on average less complex than those in the PLC sample alone.
3. Total estimated cost is greater than total cost (our fixed point) therefore using the values from PLC sample to fund all hospitals would result in overfunding

Step 2 Calibrate Base Cost so That Estimated Total Cost = Actual Total Cost

	DRG 1	DRG 2	Total
Cases	80	60	140
Actual Total Cost	Unknown	Unknown	€1,550,000
Base Cost	€4,844=(0.33*€14,531)	€19,375=(1.33*€14,531)	€14,531=(€15,000*1.32)
Relative Value	0.33	1.33	0.76
Wtd. Units	26.67	80	106.67
Estimated Total Cost	€387,500 =(26.67*€14,531)	€1,162,500 =(80*14531)	€1,550,000 =(106.67*€14,531)

$$\text{Ratio of estimated to actual total cost} = \frac{€1,600,000}{€1,550,000} = 1.032$$

Our PLC based estimates overfund the system by 3.2% therefore reduce the base cost by this amount (This was around 2.7% for the actual 2013 data)

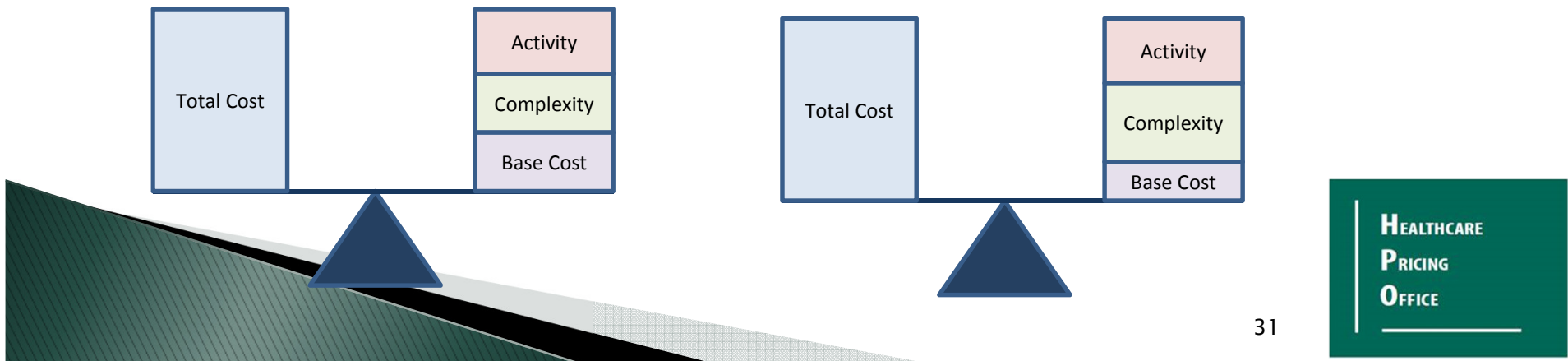
This gives us an estimated total cost that matches the actual cost and also an estimate of the cost per weighted units within each DRG. These will be our prices.

Lets Take Stock Again (1)

- At this point we have a set of RVs and a base cost which can be used to describe the total cost of the full ABF sample
- This relationship will no longer hold for the PLC sample **but our ultimate aim is to fund the full ABF sample** so that is where we need the relationship to hold.
- Our base cost is now a deflated version of the PLC base cost and our **RVs and CMI are still relative to the average across the PLC sample**

Lets Take Stock Again (2)

- It would be more sensible for our base cost to be the average across all cases in our full ABF sample and the CMI to be 1 for the ABF sample
- Luckily we can do this due to the flexibility between complexity and base cost.
 - i.e. We can alter the relative magnitudes of CMI and base cost while still maintaining the average cost per DRG and the estimated total cost



Adjust RVs and Base Cost so that CMI=1

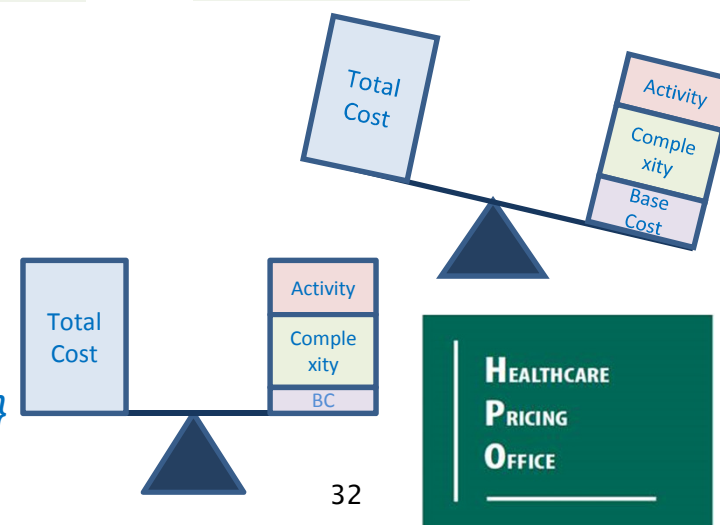
	DRG 1	DRG 2	Total	
Cases	80	60	140	
Actual Total Cost	Unknown	Unknown	€1,550,000	
Est. Cost per Case	€4,844	€19,375	€11,071	1 ✓
Relative Value	0.44 ↓	1.75 ↓	1 ↑	2 ✓
Wtd. Units	35	105	140	
Est. Total Cost	€387,500	€1,162,500	€1,550,000	3 ✓

0.76 * 1.32 = 1 so first multiply
all RVs by 1.32 and

But Est. Total Cost = Wtd Units * Base Cost

Therefore we need to divide the base
cost by 1.32 at the same time

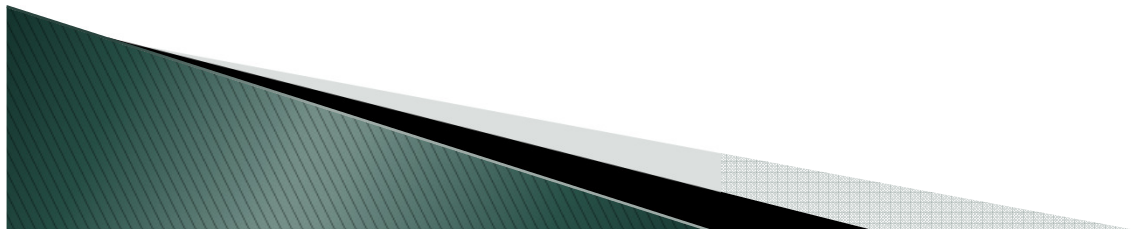
{Remember the key concept from earlier!}



Lets Take Stock One Last Time

- At this point we have a set of RVs and a base cost which are fully calibrated to the full ABF hospital sample
- Note that in the final step the overall CMI was changed but the relative complexity/costliness of the DRGs remained unchanged
- Similarly the relative efficiency of the hospitals will not have been altered
- Lets see what things would look like if the hospitals had to carry out their activity at these average cost levels (i.e. if we used them as a price)

What Are The Results?



The Price List

- For simplicity let's assume that our price is going to be set at the average cost
- Then we have a base price of €11,071 and a price list that looks like this.

DRG	RV	Price
DRG 1	0.44	€4,844
DRG 2	1.75	€19,375

The Hospital Outlook

- To see the implication of ABF using this price list for our 4 hospitals we can calculate the estimated value of their activity and compare it with the actual cost of carrying out that activity.

Estimated Value = Weighted Units * Base Price

- Only PLC hospitals will be able to assess their relative costliness at the DRG level.

Hospital	DRG 1 Expected Surplus/Deficit	DRG 2 Expected Surplus/Deficit	Expected Surplus/Deficit
Hospital 1 (PLC)	(€3,281)	€41,250	€37,969
Hospital 2 (PLC)	€156	(€66,250)	(€66,094)
Hospital 3 (Non-PLC)	Unknown	Unknown	€15,625
Hospital 4 (Non-PLC)	Unknown	Unknown	€12,500
Total	Unknown	Unknown	€0 (when decimals are included)

Just in case you thought that was it.....

- Some simplifying assumptions were made for the purposes of this presentation to avoid complicating things.
- Some of the main ones are:
 - We assumed that all cases within a DRG cost the same and receive the same payment. In fact there are 5 different RVs per inpatient DRG.
 - We assumed that there are no outlier cases in terms of length of stay or cost. In fact there are usually both which need to be removed to avoid distorting the prices.
 - The concepts of inlier boundaries and equivalencing which are used to handle the points above were not discussed.
 - We didn't mention the requirement the prices remain reasonably stable year on year
- Don't despair though - these topics are covered in the accompanying document which is just being finalised

Any Questions?

