"Evaluation of DRG price calculation procedure in Estonia"

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Disclosures

- ✓ external audit of DRG price calculation process was initiated by Estonian Health Insurance Fund (EHIF)
- ✓ evaluation was performed by PricewaterhouseCoopers Advisors
- ✓ public presentation of the outcome apprised to PwC

- ✓ Presenter´s background is medical doctor, not a ***statistician***

Special thanks to my mentor Kristiina Kahur!

Why?

quotation by dr. Urmas Siigur, head of Tartu University Clinic
from NCC Conference in 2014 = identifies himself as „Estonian DRG skeptic“

- Small nation and small number of hospitals and cases
- Different levels of hospitals are handled the same way in financing aspects
- Poor cost information and FFS prices built on that
- „Estonian DRG system“ fails in majority of cases to classify patients in economically homogeneous groups but is still used for case payment
- Specific complicated high-cost services need different handling
- model for calculating upper and lower limits is applicable for less than half of the DRGs because of the extremely big STD even after second trimming

Questions the ultimate goal – is transparent, efficient and high quality health care being fairly paid?

DRG system in Estonia at glance

2001 – decision to implement case-mix system

2002 – full implementation of DRGs as a financing tool was seen to be too risky

2003 – DRGs as a grouping tool

2004 – DRGs as a financing tool....

.... but, DRGs are used in combination with FFS and per diem rates, i.e. only a proportion of each case is reimbursed on the basis of DRG price

2009 – reimbursement 70 % by DRG and 30 % by FFS …

... used only in acute in-patient cases, day surgery and outpatient cases involving surgical procedure(s)

Since 2012 – DRGs as a benchmarking tool: publicly available reports

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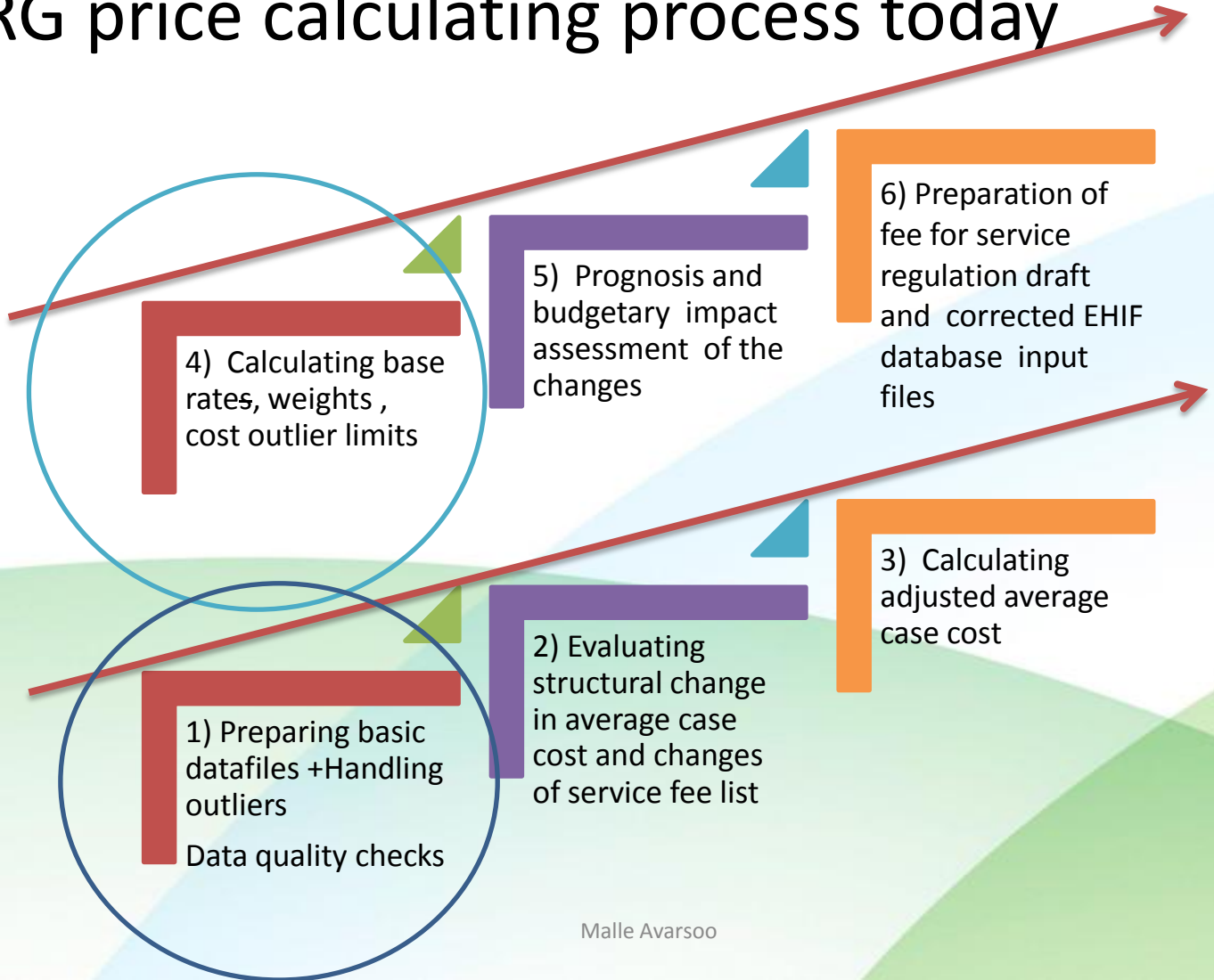
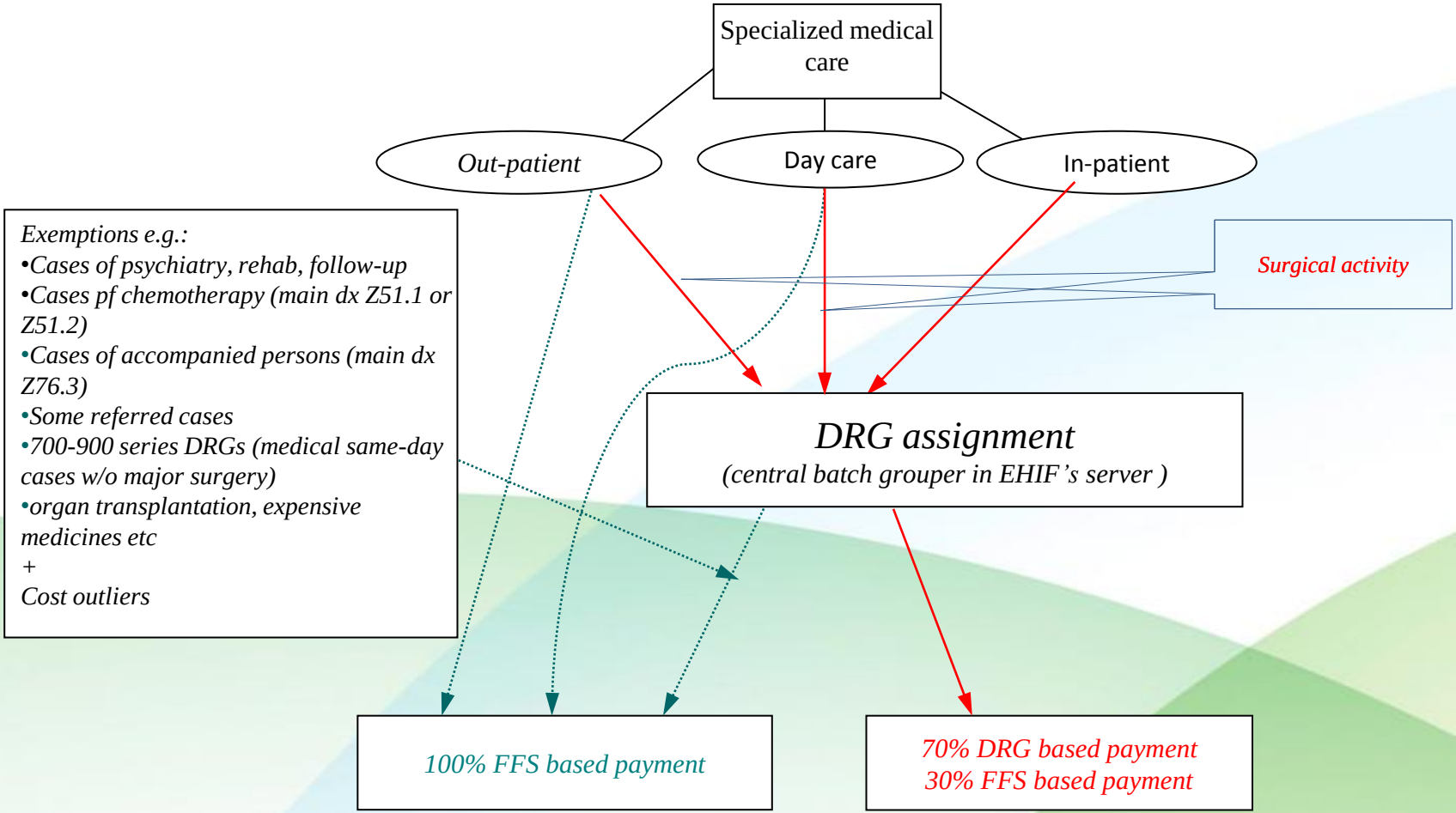
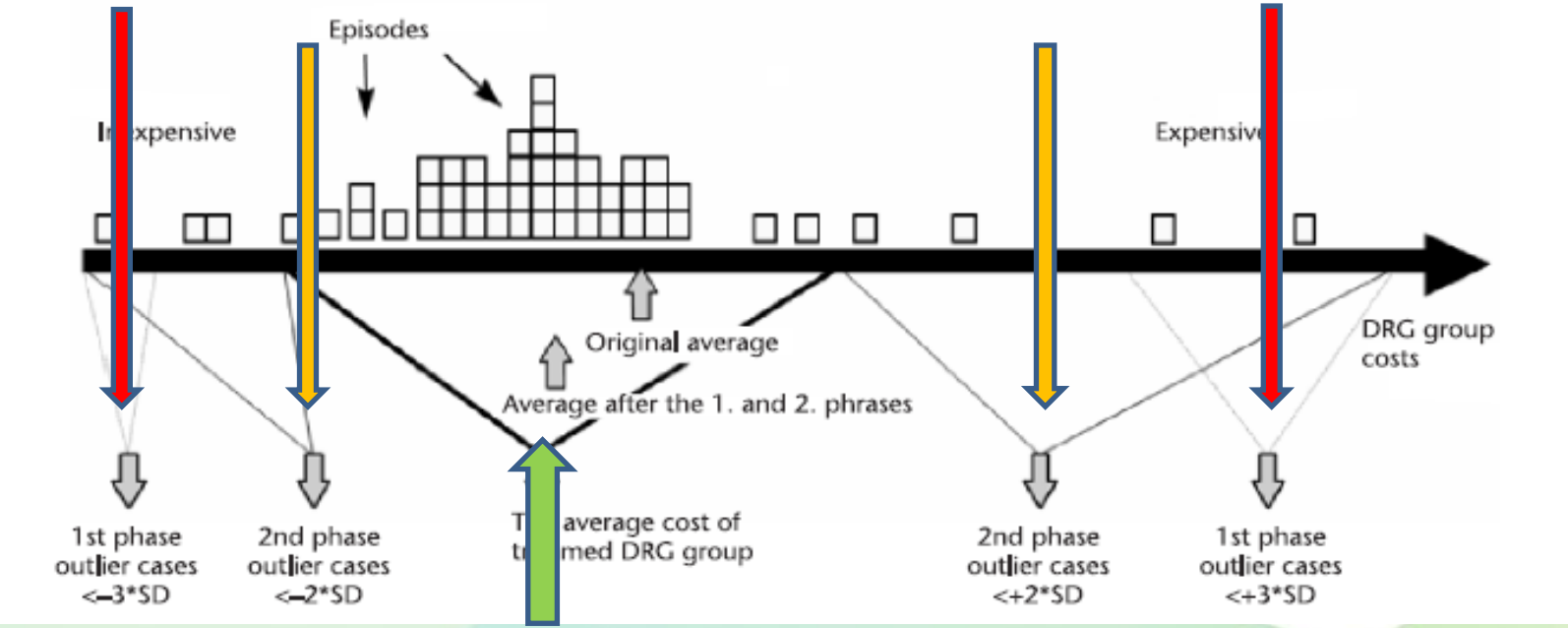
DRG price calculating process today



Application of DRG system



Trimming



- In the 1st phase, the outlier cases with costs outside 3 standard deviation are excluded
- In the 2nd phase, outlier cases with costs outside 2 standard deviation are excluded

Purpose of the audit

- The goal was to get **an objective review** of the calculation methodology of DRG reference prices and pricelimits and to evaluate whether the used principles give a good statistical adaptation
- to put forward proposals for possible alternative or complementary methods for calculation the prices and pricelimits

Statistical tests performed

- Test 1: median and mean cost ratio
- Test 2: assessment of lower limit [*u*] and upper limit [*U*] of 0,95 confidence interval
- Test 3: skewness of distribution

Performed on following data sets:
I - raw data;
II – trimmed data;
III – outliers excluded ,
IV – complex fees excluded,
V - expensive drugs and devices (over 1000 €) excluded,
VI - intensive care bed-days excluded,
VII – bed-days (0,75 quintile) excluded

Test 1: median and mean cost ratio –

Chart 7 . sDRG median and mean cost ratio

Less than 10% **the rest**

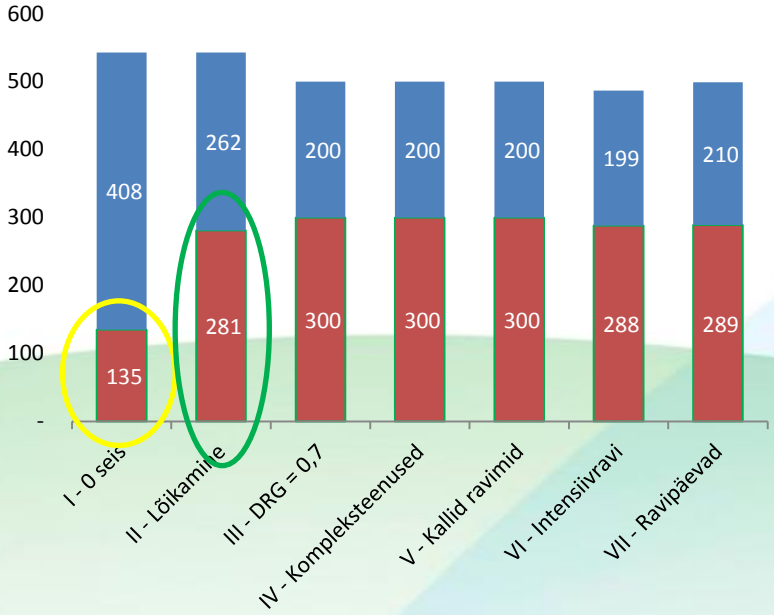


Chart 8 . vDRG median and mean cost ratio

Less than 10% **the rest**

population can be considered symmetric, if ratio between median and mean is under 10%

Test 2: assessment of lower limit [*u*] and upper limit [*U*] of 0,95 confidence interval

two methods

1. ***Theoretical method*** assumes that the distribution of medical bills in DRG-s corresponds to the normal distribution.

$$u = \bar{x} - 2s \quad \text{and} \quad U = \bar{x} + 2s$$ ($\bar{x}$ = mean ; s = standard deviation)

2. ***Empirical method*** is used if the medical bills do not meet the normal distribution or the sample size is small (less than 30 per DRG)

lower limit u value is 0.025-quintile and upper limit U value is 0.975 quintile

Presumtion: if relative difference of upper and lower limits by empirical and theoretical method is less than 20%, trimming method with 2 STD can be considered more or less effective

Test 2 results

Chart 9 . Big sDRG relative difference of empirical and theoretical limits

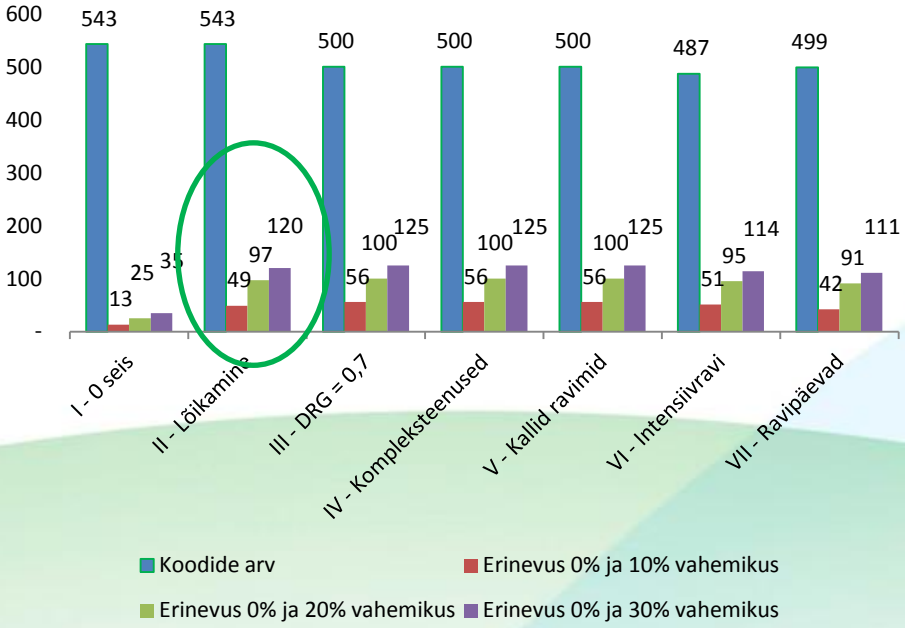
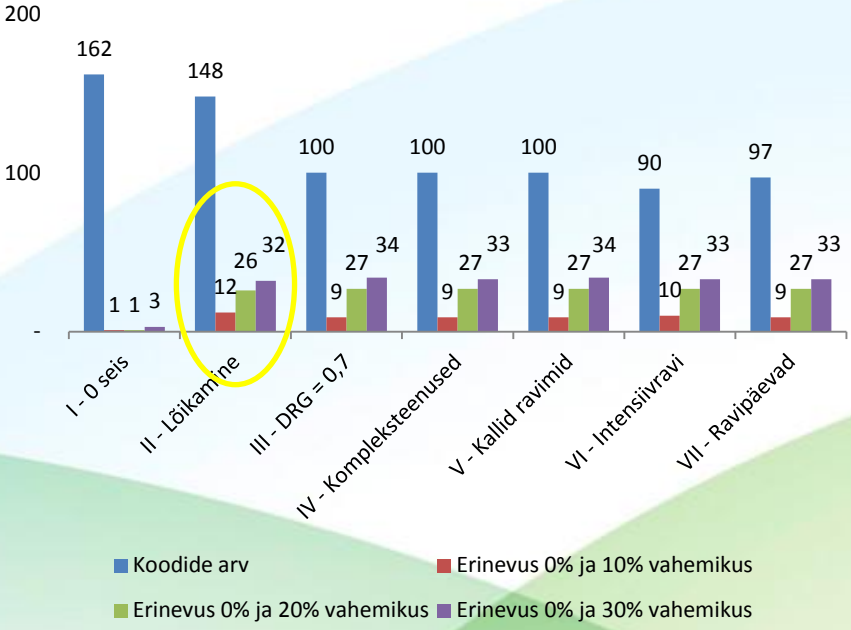


Chart 10. small vDRG relative difference od empirical and thereoretical limits



Green bar= relative difference 0-20% = trimming has positive effect

Test 3: skewness of distribution

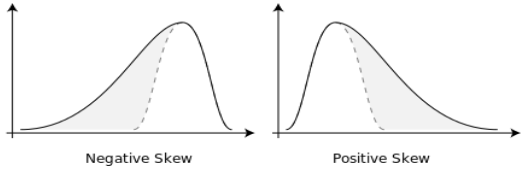


Chart 9. sDRG skweness changes

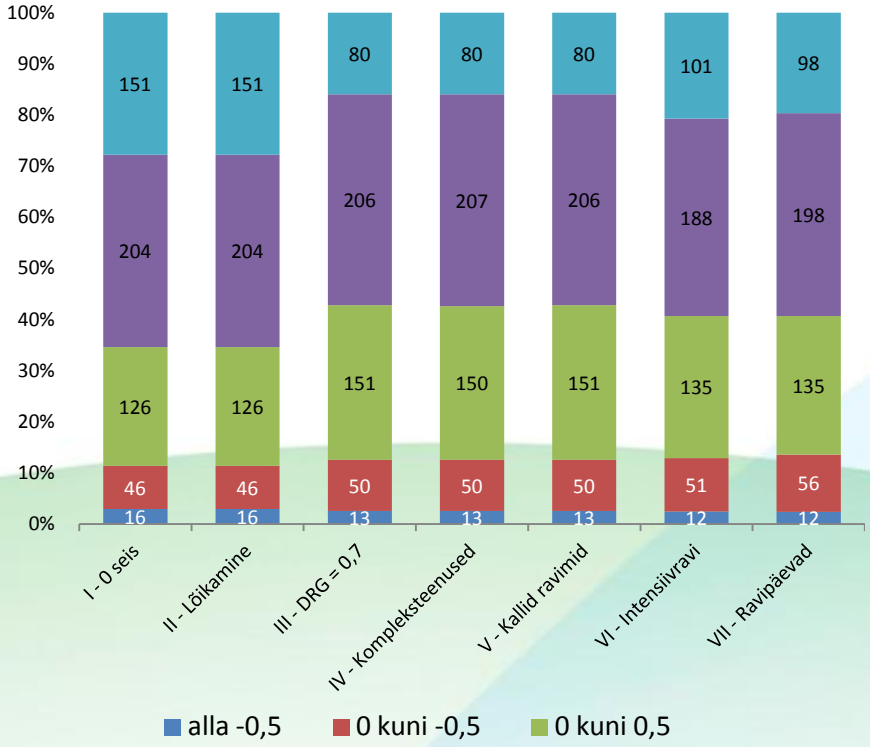
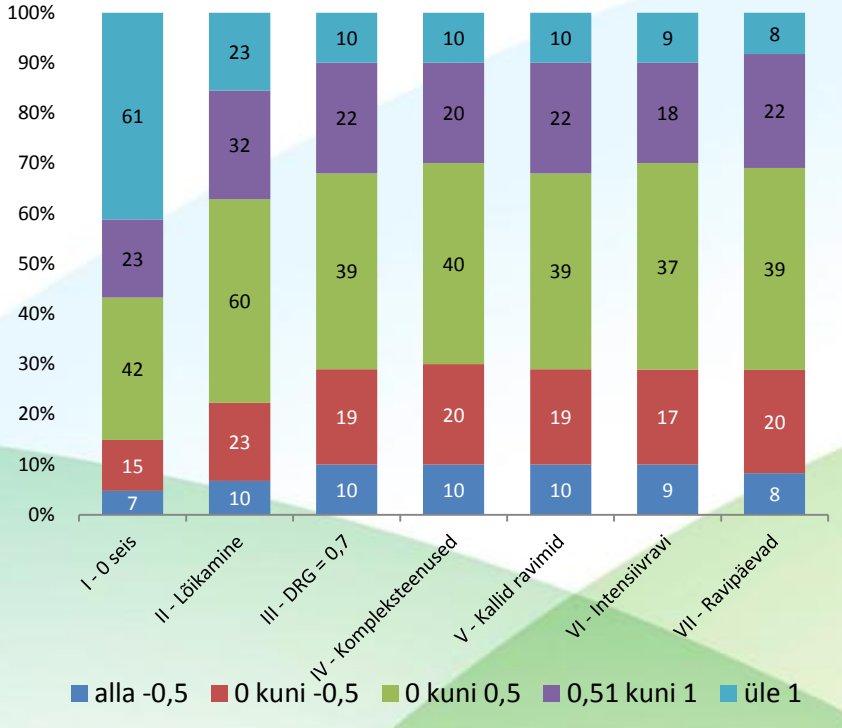


Chart 10. vDRG skewness changes



Ideal symmetry = skweness = 0, **green column = close to symmetric distribution 0 up to 0,5**

DRG-s with negative STD limit

Chart 12. Number of DRGs with negative limits (big sDRGs), red part of the bar

Chart 11. Number of DRGs with negative limits, (small vDRG-s), red part of the bar

In raw data 79 % of big DRG-s and 50% of small DRG-s are with negative STD limits !

Test impacts to DRG-s with negative STD limits

proceedings	Test 1		Test 2		Test 3		Toal cost (mln EUR)	Change in cost (mln EUR)
	DRG	cost	DRG	cost	DRG	cost		
0 – raw data	4%	6%	1%	4%	2%	3%	222	-
I – outliers by specialty (700,800, 900 series DRG-s)	5%	6%	1%	4%	2%	3%	210	-12
II – trimming	37%	43%	8%	19%	18%	24%	161	-61
III - DRG = 0,7* (price outliers)	52%	63%	9%	24%	32%	40%	129	-33*
IV – complex services	37%	43%	8%	19%	17%	24%	161	0*
V – expensive drugs*	37%	47%	8%	19%	18%	24%	157	-4*
VI – Intensive care*	42%	49%	8%	12%	20%	21%	94	-67*
VII – LOS*	42%	48%	9%	23%	14%	14%	115	-46*

Share of positive test results (more than 5%) of all DRG-s and total cost in green , * change after trimming

Test impacts to DRG-s with positive STD limits

proceeding	Test 1		Test 2		Test 3		Total sum (mln EUR)	Change in cost (mln EUR)
	DRG	cost	DRG	cost	DRG	cost		
0 – raw data	100%	100%	19%	29%	22%	21%	86	-
I – specialty exclusions (700,800, 900 series)	93%	100%	19%	34%	20%	20%	69	-17
II – trimming	94%	100%	54%	69%	67%	51%	62	-24
III - DRG = 0,7* (price outliers)	90%	99%	60%	76%	72%	54%	60	-2*
IV – complex services	94%	100%	54%	69%	67%	51%	60	0*
V – expensive drugs*	94%	100%	54%	69%	67%	51%	60	0*
VI – Intensive care*	88%	97%	50%	66%	64%	48%	42	-20*
VII – LOS*	90%	98%	53%	73%	65%	37%	52	-10*

Share of positive test results (more than 5%)of all DRG-s and total cost in green colour , * change after trimming

Summary

- Current DRG pricing methodical approach and principles ensure **a reasonable statistical adaptation** to the cost of medical services provided by healthcare providers
- Trimming method has positive impact on cost data statistical adaptation
- Existing outliers have positive impact, no need for additional outliers

Everyone satisfied?

Solution for price limits calulation ?

Approach to small DRG-s?

Solution for DRG-s with negative STD limits?

More outliers?

Less outliers?

Sequence of outliers?

Further steps

- ✓ Analyze the impact of current outliers one by one (were analyzed as a set)
- ✓ Perform an overlap analyse of current outliers
- ✓ Evaluate the impact of each outlier and role of their sequence
- ✓ Find appropriate method to calculate price limits
- ✓ Evaluate solutions for small DRG-s (coding practise?)

… audit will be continued……

Thank you!


REYKJAVIK