VINZENZ VONPAUL KLINIKEN gGMBH

MARIENHOSPITAL STUTTGART

Key figures und Benchmarking

Institut für Laboratoriumsmedizin

Matthias Orth

matthias.orth@vinzenz.de Tel. +49711 6489 2760

www.laborstuttgart.de


NOTARZT
NOTARZT
FEUERWEHR
112
FEUERWEHR
NOTARZT


BOSCH


30
ZONE
112
Deutsches
Rotes
Kreuz
NOTARZT

Hiatt HH. **Protecting the medical commons: who is responsible?** N Engl J Med. 1975;293:235-41

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Top 10 Management Tools

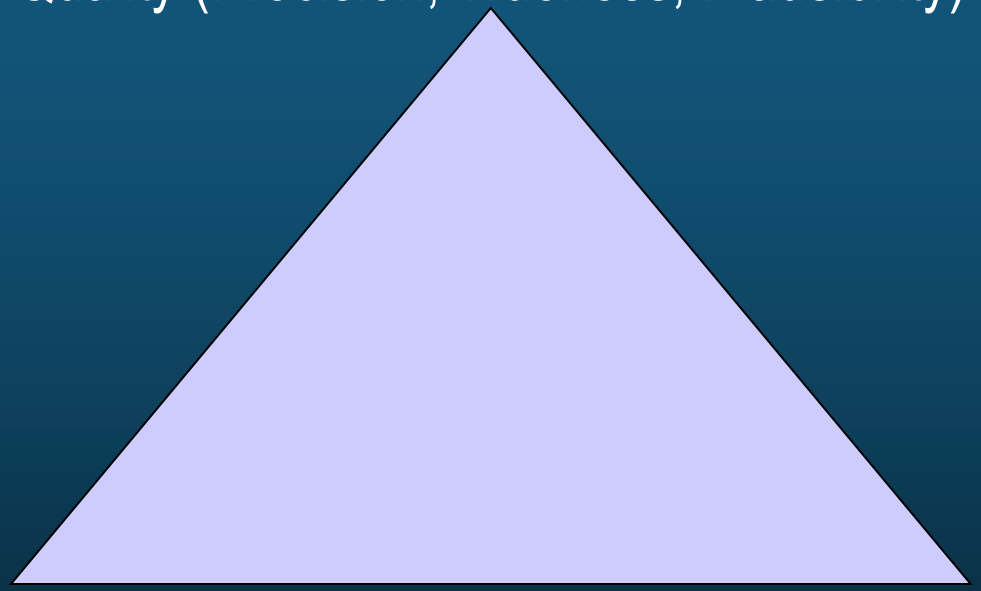
2000	2006	2008	2010	2012
1 Strategic Planning	1 Strategic Planning	1 Benchmarking	1 Benchmarking	1 Strategic Planning
2 Mission & Vision Statements	2 CRM	2 Strategic Planning	2 Strategic Planning	2 CRM
3 Benchmarking	3 Customer Segmentation	3 Mission and Vision Statements	3 Mission and Vision Statements	3 Employee Engagement Surveys
4 Outsourcing	4 Benchmarking	4 CRM	4 CRM	4 Benchmarking
5 Customer Satisfaction	5 Mission and Vision Statements	5 Outsourcing	5 Outsourcing	5 Balanced Scorecard
6 Growth Strategies	6 Core Competencies	6 Balanced Scorecard	6 Balanced Scorecard	6 Core Competencies
7 Strategic Alliances	7 Outsourcing	7 Customer Segmentation	7 Change Management Programs	7 Outsourcing
8 Pay-for-Performance	8 Business Process Reengineering	8 Business Process Reengineering	8 Core Competencies	8 Change Management
9 Customer Segmentation	9 Scenario & Contigency Planning	9 Core Competencies	9 Strategic Alliances	9 Supply Chain Management
10 Core Competencies	10 Knowledge Management	10 Mergers & Acquisitions	10 Customer Segmentation	10 Mission and Vision Statements

BAIN & COMPANY

Roll over to see tool ranking trends
Click to see usage vs. satisfaction

- Which key figures?
- Avoidance of unequal/unvalid data collection
- Controlling requests for testing – basic approaches of optimization

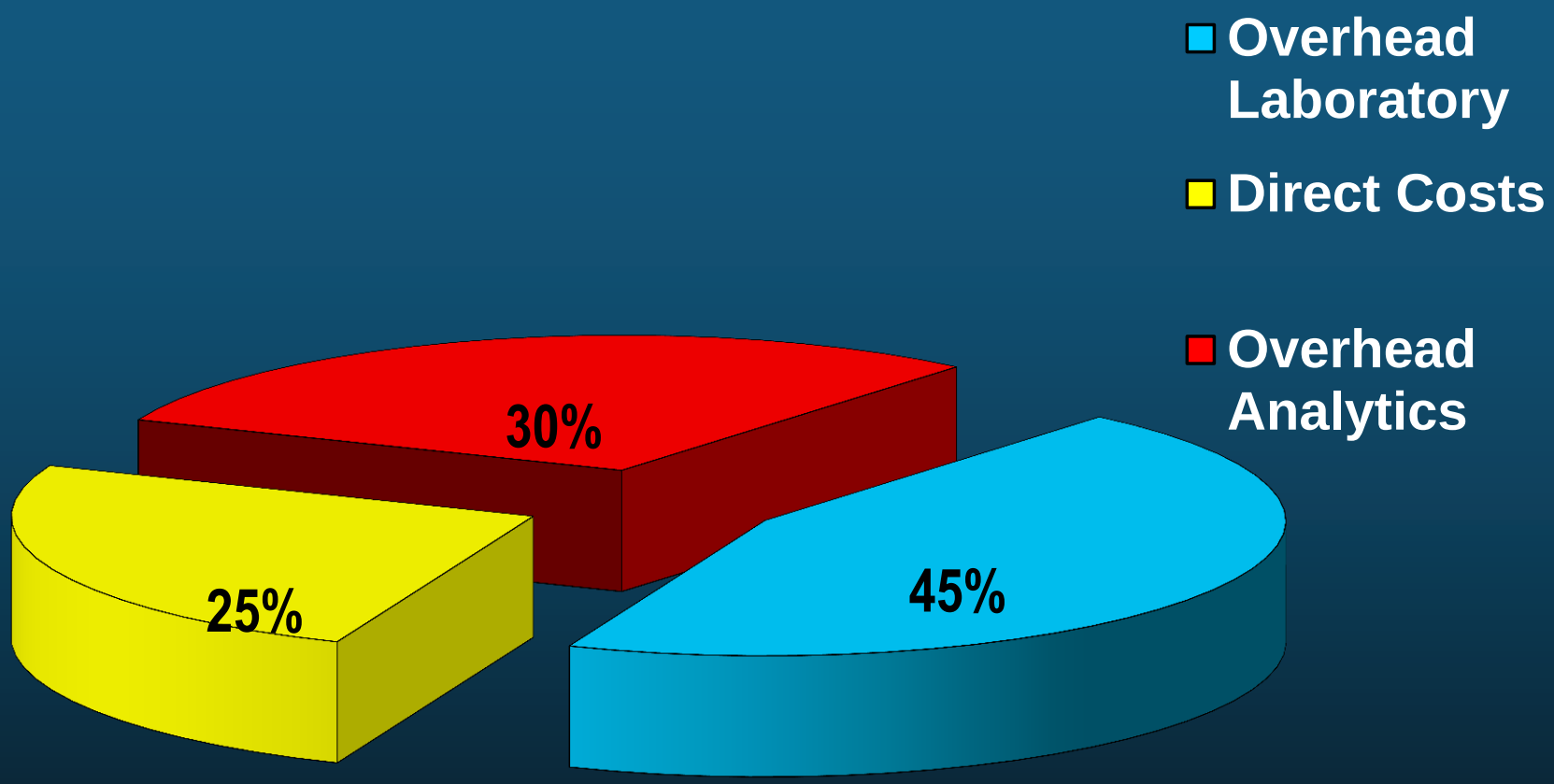
Trinity of Laboratory medicine



Laboratory Medicine involved in ~70% of all medical diagnoses

Bruce A. Jones, et al. (*2012*) Staffing Benchmarks for Clinical Laboratories: A College of American Pathologists Q-Probes Study of Laboratory Staffing at 98 Institutions. Archives of Pathology & Laboratory Medicine:136, 140

Cost structure in laboratory



Overhead costs: personal, IT, space, depreciation of instruments, service, QMS, other costs

Muda - the seven (six) wastes (in the laboratory)

Over-Production

Inventory

Defect
Not right first time
(expired, wrong storage)

Motion

Over-processing

Waiting

Transportation

改善

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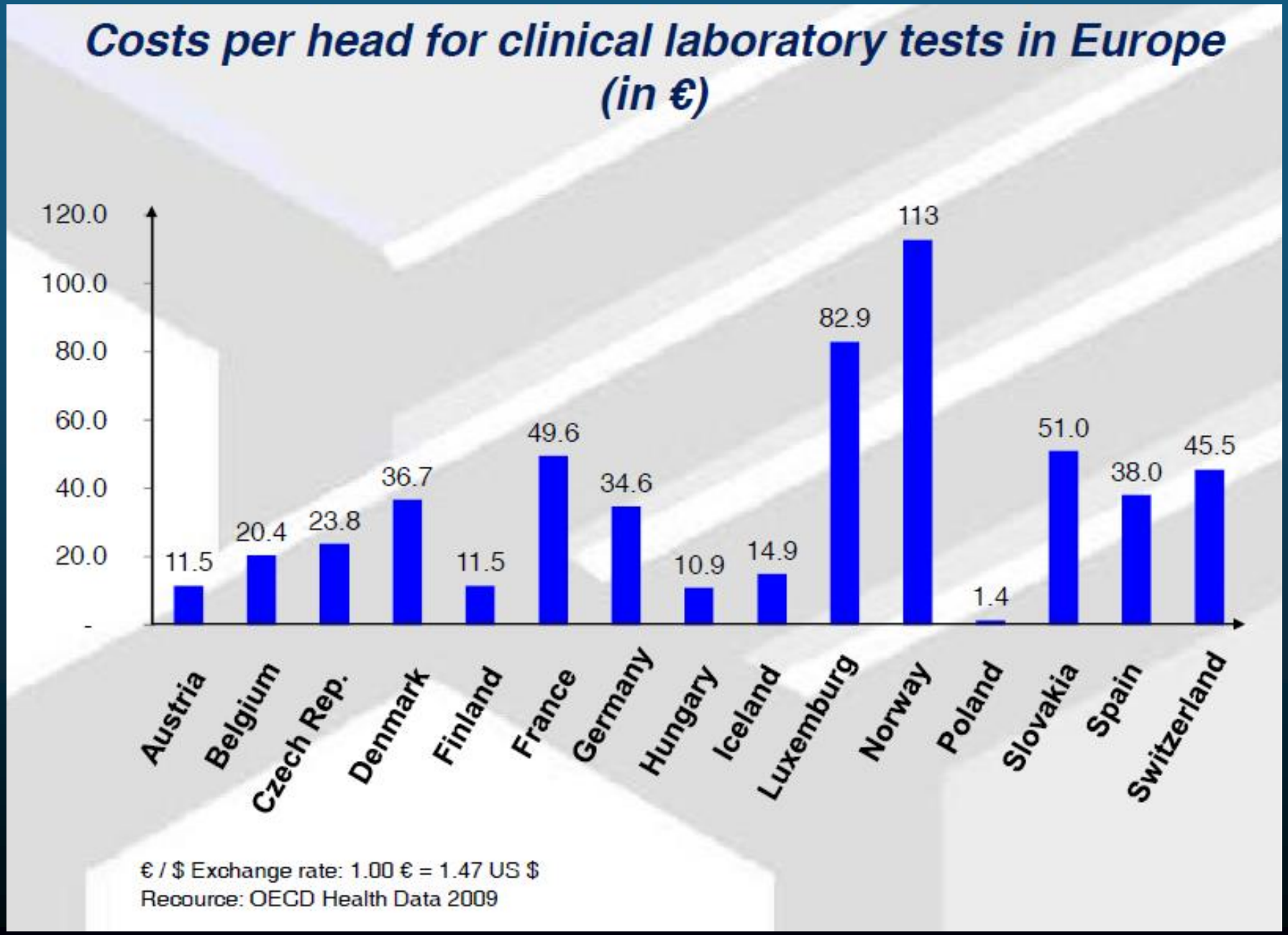
(Non)Transferability from experiences in other countries



Benchmarking with different methods and aims

Benchmarking-project: Benchmarking in Business Economics is a systematic and continuous process to compare products, services and processe within the institution as well with other institutions (in regard of qualitative and/or quantitative parameters)

Benchmarking in financial services: comparison of stocks (index)

Computer-benchmarking: comparison of power of computer-systems

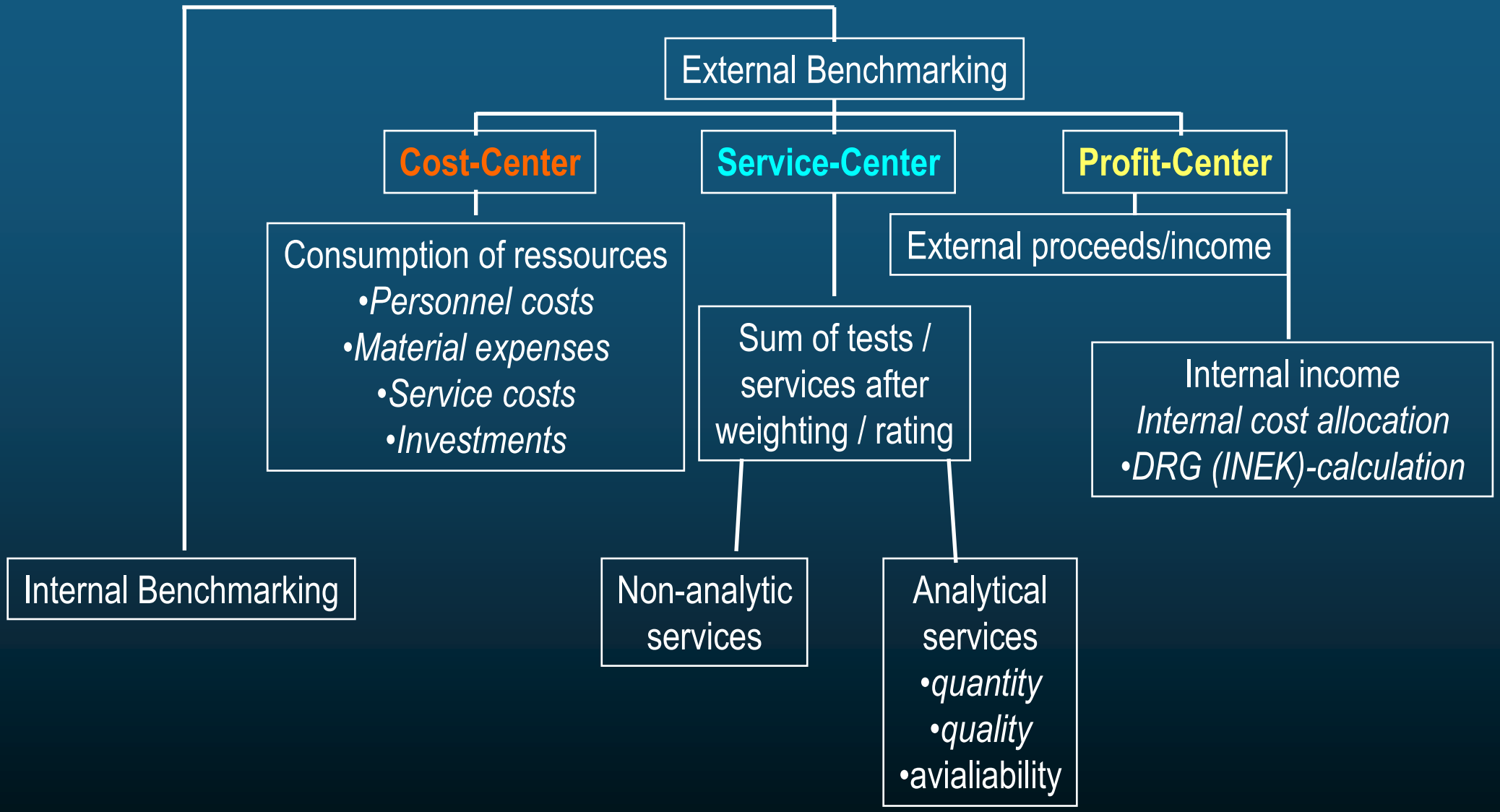
Process-benchmarking: compares prozesses in companies, analyzes and optimizes

Product-benchmarking: Focus on function, cost, unique selling points (for own and competitors‘ products)

Technology-benchmarking: compares technologies / processes, to identify most stable and most cost-effective processesfizieren („best in class“)

good practice / best practice EN/ISO norms accreditation

Benchmarking in hospital laboratory



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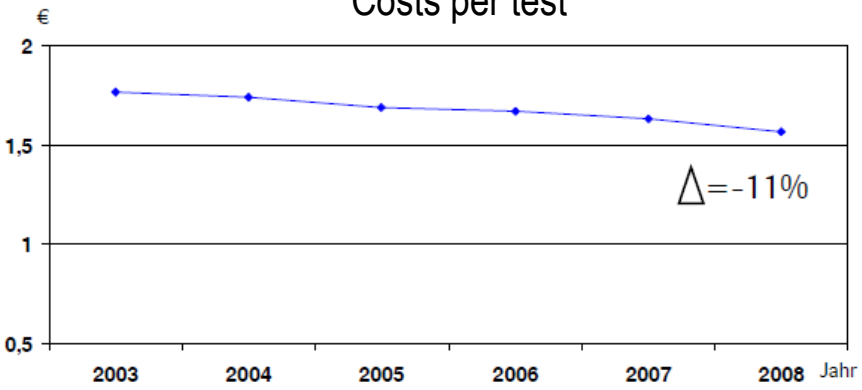
Orth M, Aufenanger J, Klosson R. Key figures and benchmarking in the hospital laboratory. J Lab Med 2012, **36:** 353-369

Example for (internal) benchmarking

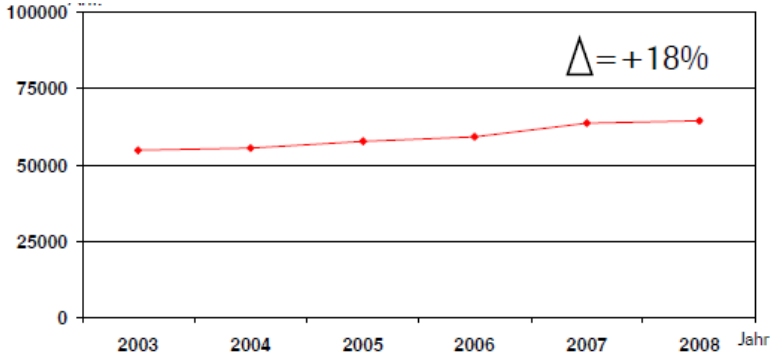
Benchmarks show improvements over time

Hospitals 100-600 beds

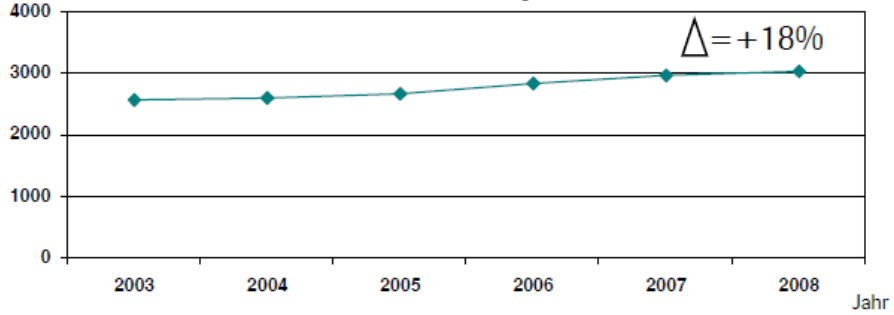
Costs per test



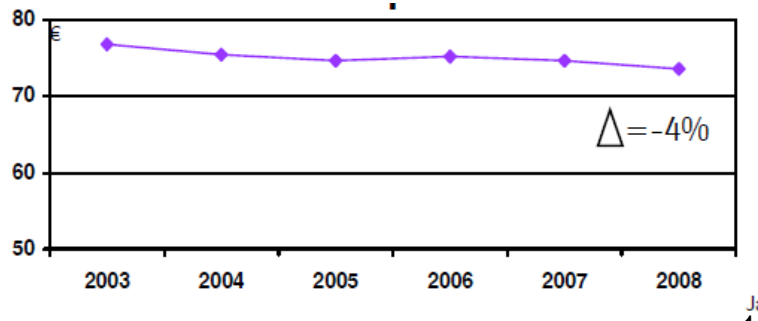
Tests per FTE per year



GOÄ-points per patient („case“)



Total costs per patient („case“)



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CONSULAB Beratungslösungen

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reasons for cost accounting/benchmarking

Outsourcing pressure (administration, owner of hospital, outsourcing)

Setup of offers for insourcing

Decision about expanding / limiting testing

Basis for negotiations with supplier

benchmarking with other laboratories / hospitals of the same owner

Basis for bonus-malus negotiation of employees

calculation of tarif system „EBM2008+“/“GOÄ neu“

In general: cost accounting must be an added value and may never produce more costs than it reduces costs (=cost savings, delivering information)

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Profit Center

Part of an organization with overall profit for the period

Profit will be calculated for each part of the organization. This profit is used for evaluation and management of this part of the organization

Profit evaluation is used to steer this part of the organization. Rentability is in the main focus

Costcenters can accumulate costs only – profit centers accumulate costs and income!

Core idea: profit center thinks and acts like a separate company

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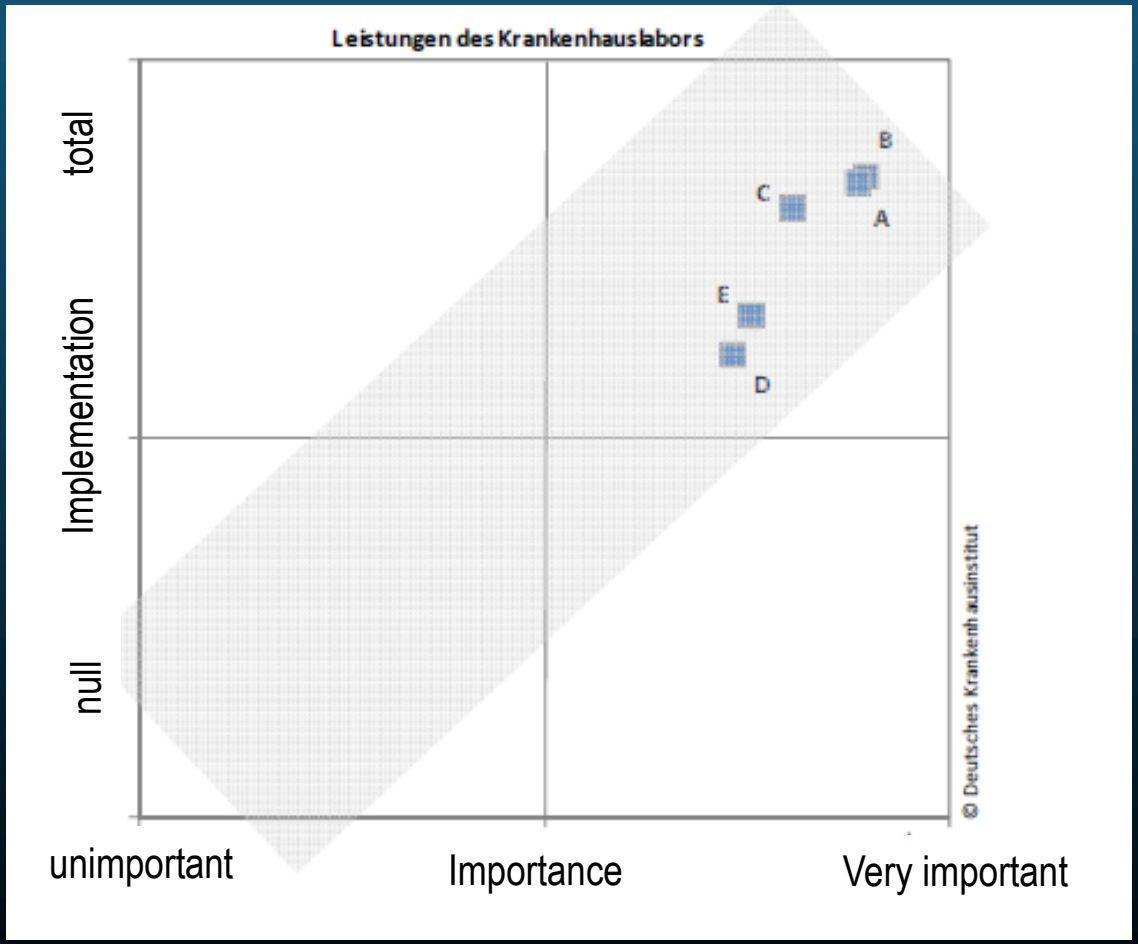
Importance-implementation-matrix: performance of hospital laboratory



A Laboratory is key element in medical diagnostics

B laboratory is a key element of emergency treatment

C Laboratory is a key element of adherence to therapy

D Laboratory is active in step-wise testing and in the the indication of esoteric testing

E Laboratory is in charge of organization and QC in POCT on the wards

DEUTSCHES KRANKENHAUS INSTITUT

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Physician Satisfaction With Clinical Laboratory Services

Table 1. Percentage and Aggregate Number of Ratings

Laboratory Service Category*	Excellent, % (No.)	Good, % (No.)	Average, % (No.)	Below Average, % (No.)	Poor, % (No.)
Quality/reliability of test results	45.6 (1939)	42.9 (1823)	9.8 (416)	1.3 (56)	0.4 (15)
Staff courtesy	50.4 (2069)	37.1 (1523)	9.7 (398)	2.2 (89)	0.6 (25)
Accessibility of pathologist	51.7 (1823)	34.1 (1201)	11.5 (406)	2.1 (74)	0.7 (23)
Accessibility of laboratory manager	46.5 (1524)	36.0 (1178)	13.7 (449)	2.7 (87)	1.2 (38)
Phlebotomy services	37.8 (1313)	43.7 (1515)	14.4 (501)	3.1 (106)	1.0 (35)
Test menu adequacy	36.7 (1427)	46.9 (1826)	14.0 (543)	1.7 (68)	0.7 (26)
Accessibility of laboratory staff	47.3 (1913)	36.5 (1475)	12.4 (500)	2.7 (111)	1.1 (44)
Courier services	38.0 (1039)	41.1 (1124)	15.6 (428)	3.2 (87)	2.1 (57)
Routine test TAT	33.5 (1389)	44.7 (1855)	17.0 (704)	3.4 (142)	1.4 (56)
Laboratory management responsiveness	40.4 (1380)	40.1 (1372)	14.4 (492)	3.6 (123)	1.5 (51)
Inpatient stat test TAT	36.7 (1177)	41.7 (1338)	15.0 (480)	4.4 (142)	2.2 (71)
Critical value notification	44.3 (1833)	39.3 (1624)	11.4 (470)	3.1 (128)	1.9 (79)
Clinical report format	33.7 (1396)	46.0 (1905)	15.5 (644)	3.1 (127)	1.7 (71)
Outpatient stat test TAT	33.6 (1170)	40.3 (1407)	17.4 (605)	6.2 (216)	2.6 (89)
Esoteric test TAT	17.1 (629)	38.0 (1398)	32.9 (1212)	8.9 (328)	3.1 (116)

* TAT indicates turnaround time.

4329 respondents

Responsibility of hospital laboratory for Prozesse outside its reach!

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Arch Pathol Lab Med. 2009;133:38–43

Pitfalls in data aquisition and interpretation of external benchmarking

Die Leistungserfassung zur statistischen Auswertung nach einem Bewertungsmaßstab ist nur bei vorheriger Zuordnung von Leistungsziffern möglich
Eine nachträgliche Änderung des Bewertungsmaßstabes bzw. eine Transcodierung einzelner Leistungen (z.B. aus der Mikrobiologie) ist nicht bei allen EDV-Systemen möglich bzw. ist sehr aufwendig
Es bestehen verschiedene Leistungsdefinitionen für die Erfassung von Leistungen (z.B. angeforderte/abgerechnete Leistungen, Netto-/Bruttoleistungen u.ä.)
Leistungen werden im Tages- und im Archivsystem nach unterschiedlichen Kriterien erfasst
Es können bei der Reaktivierung von Aufträgen aus dem Archiv, bei Wiederholungen von Messungen/wiederholter Messwertübertragung oder bei versehentlicher Mehrfachanforderung einer Leistung Doppelzählungen auftreten
Es bestehen Unterschiede in der zeitlichen Erfassung einer Leistung in den einzelnen EDV-Systemen (z.B. Zählung beim Materialeingang und/oder bei der Messwerterstellung)
Wenn der Patient im KIS (noch) nicht bekannt ist, kann die Erfassung einer Leistung je nach System unterbleiben
Nichtanalytische Leistungen oder seltene Spezialanalysen (Analogbewertung) werden nicht erfasst, wenn der eingesetzte Bewertungsmaßstab nicht entsprechend erweitert wurde

In fact, a reliable and fair comparison of different institutions is a methodological challenge, which requires huge statistical efforts and which cannot be performed with simple-minded comparisons of the mean

Wegscheider Z Ärztl Fortbild Qual Gesundheitswes 2004;98:647

Vergleich von Leistungsanzahlen ohne Berücksichtigung des Leistungswerts
Bezug von Leistungszahlen und Kosten auf Fallzahlen ohne Berücksichtigung der DRG-Erlöse
Fehlende Berücksichtigung/Bewertung von nichtanalytischen Leistungen und der Rahmenbedingungen der Leistungserbringung; Verwendung eines ungeeigneten Bewertungsschlüssels
Fehlende Berücksichtigung/Kenntnis von Erlösen außerhalb des DRG-Systems
Fehlende Berücksichtigung/Kenntnis von Umfang und Kosten der POCT bei den einzelnen Teilnehmern
Fehlende Ausgliederung von „laborfremden“ Kosten, die nicht im direkten Zusammenhang mit der Laboranalytik im Krankenhauslabor stehen (z.B. Kosten für Blutkonserven, Pathologie, Stationsbedarf u.ä.)
Unterschiedliche Praxis der Berechnung/Berücksichtigung von auf das Labor entfallender Umlagen, Raummieten, Abschreibungen u.ä.
Bisher übliche Kennzahlen berücksichtigen nicht die Versorgungsqualität oder erfassen nur Teilbereiche des diagnostischen Prozesses

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Leistungen 2007/2008	GOÄ-Punkte	Einfachsatz GOÄ in €	Sachkosten			Personalkosten			Fremdversand		Fälle	Leistungen	Kosten gesamt
			Kosten	%-Anteil zum Einfachsatz GOÄ	je GOÄ-Punkt	Kosten	%-Anteil zum Einfachsatz GOÄ	je GOÄ-Punkt	Kosten	je GOÄ-Punkt	Anzahl	je Fall	je Fall
353.542	24.610.702	1.434.491 €	442.333 €	30,84%	0,0180 €	206.459 €	14,39%	0,0084 €	24.147 €		14.876	23,77	45,24 €
417.056	31.736.265	1.851.570 €									10.248	40,70	46,00 €
1.118.969	85.123.280	4.961.606 €	632.064 €	12,74%	0,0074 €	572.233 €	11,53%	0,0067 €	51.636 €		27.131	41,24	46,29 €
169.682	15.499.525	903.425 €							208.503 €	0,0135 €	4.151	40,88	50,23 €
730.780	51.221.923	2.985.588 €	400.000 €	13,40%	0,0078 €	479.192 €	16,05%	0,0094 €	83.306 €	0,0170 €	18.610	39,27	51,72 €
184.509	15.850.756	923.898 €									5.286	34,91	52,59 €
237.753	17.292.797	1.007.950 €									5.541	42,91	54,50 €
144.300	8.815.880	513.854 €	47.912 €	9,32%	0,0054 €	142.380 €	27,71%	0,0162 €	146.247 €	0,0166 €	6.169	23,39	54,55 €
870.685	49.919.540	2.909.675 €	316.094 €	10,86%	0,0063 €	566.686 €	19,48%	0,0114 €	252.144 €	0,0051 €	20.229	43,04	56,10 €
729.049	63.523.501	3.702.613 €									24.431	29,84	56,32 €
947.818	74.913.995	4.366.535 €	482.318 €	11,05%	0,0064 €	791.562 €	18,13%	0,0106 €	140.000 €		24.138	39,27	58,57 €
995.499	73.899.892	4.307.425 €	665.880 €	15,46%	0,0090 €	696.932 €	16,18%	0,0094 €	45.478 €	0,0162 €	23.732	41,95	59,34 €
378.714	30.098.560	1.754.364 €	334.778 €	13,78%	0,0111 €	390.262 €	22,80%	0,0130 €	88.619 €	0,0146 €	13.649	27,75	59,61 €
1.294.271	106.292.730	6.195.516 €									38.911	33,26	59,88 €
565.222	42.759.229	2.492.903 €									14.480	39,03	65,88 €
285.816	19.890.070	1.159.338 €	270.425 €	23,33%	0,0136 €	311.806 €	26,90%	0,0157 €	11.905 €	0,0169 €	9.006	31,74	65,97 €
805.542	56.075.245	3.268.475 €	373.399 €	11,42%	0,0067 €	861.998 €	26,37%	0,0154 €	232.291 €		21.496	37,47	68,28 €
455.059	29.845.380	1.739.607 €	289.087 €	16,62%	0,0097 €	426.068 €	24,49%	0,0143 €	55.786 €		11.048	41,19	69,78 €
180.712	11.478.590	669.056 €	139.575 €	20,86%	0,0122 €	232.036 €	34,68%	0,0202 €	36.506 €		5.792	31,20	70,46 €
616.285	49.939.855	2.910.859 €	514.897 €	17,69%	0,0103 €	687.828 €	23,63%	0,0138 €	20.037 €		16.736	36,82	73,06 €
867.294	62.580.625	3.647.656 €	441.304 €	12,10%	0,0071 €	556.192 €	15,25%	0,0089 €	241.398 €		16.747	51,79	73,98 €
343.078	23.800.460	1.387.265 €	489.740 €	35,30%	0,0206 €	462.381 €	33,33%	0,0194 €			12.587	27,26	75,64 €
439.111	27.630.780	1.613.438 €	278.190 €	17,24%	0,0100 €	462.056 €	28,64%	0,0167 €	140.139 €		11.536	38,06	76,32 €
895.771	59.356.150	3.459.710 €	838.461 €	24,24%	0,0141 €	991.072 €	28,65%	0,0167 €			23.851	37,56	76,71 €
58.722	3.976.510	231.780 €	77.521 €	33,45%	0,0195 €	88.311 €	38,10%	0,0222 €	5.923 €		2.219	26,46	77,40 €
242.330	15.649.360	912.159 €	348.721 €	38,23%	0,0223 €	528.691 €	57,96%	0,0338 €			11.264	21,51	77,90 €
153.243	19.182.455	1.118.094 €	210.681 €	18,84%	0,0110 €	129.028 €	11,54%	0,0067 €	32.956 €	0,0017 €	4.039	37,94	92,27 €
469.328	32.006.018	1.865.544 €	367.533 €	19,70%	0,0115 €	404.365 €	21,68%	0,0126 €	137.340 €		9.510	49,35	95,61 €
142.960	9.625.676	561.055 €									3.653	39,13	102,38 €
2.747.979	259.656.122	15.134.654 €	2.727.230 €	18,02%	0,0105 €	3.565.142 €	23,56%	0,0137 €	412.233 €		58.849	46,70	113,93 €
295.690	20.533.519	1.199.758 €	193.334 €	16,11%	0,0094 €	352.809 €	29,41%	0,0171 €	310.284 €		5.975	49,49	143,34 €
92.467	8.938.885	521.023 €	206.138 €	39,56%	0,0231 €	125.900,27	24,16%	0,0141 €	14.979 €	0,0153 €	2.347	39,40	147,86 €
18.229.236 €	1.401.864.276	81.710.884 €	11.087.616 €	13,57%	0,0118 €	14.031.391 €	17,17%	0,0144 €	2.691.858 €	0,0130 €	478.237	37,01	70,88 €
58.722,00 €	3.976.510	231.780,00 €	47.912,03 €	9,32%	0,0054 €	88.311 €	11,53%	0,0067 €	5.923 €	0,0017 €	2.219	21,51	45,24 €
2.747.979,00 €	259.656.122	15.134.654,30 €	2.727.230,29 €	39,56%	0,0231 €	3.565.142 €	57,96%	0,0338 €	412.233 €	0,0170 €	58.849	51,79	147,86 €

Mittelwert	0,0118	0,0144	0,0130	37,01	70,88
min	0,0054	0,0067	0,0017	21,51	45,24
max	0,0231	0,0338	0,0170	51,79	147,86
Faktor	4,3	5,0	10,0	2,4	3,2

Material cost per point Personnel costs per point sendout total €

Tests per case

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Percentage of laboratory costs per DRG

Prozentuale Laborkostenanteile für ausgewählte DRG		
A05B	Herztransplantation ohne Beatmung > 179 Stunden	9,8 %
A01A	Liver transplantation with ventilation >179 h	12,6 %
B09B	Andere Eingriffe am Schädel ohne äußerst schwere CC	2,9 %
F17Z	Change of heart pacer	2,1 %
G02Z	Eingriff an Dünn- und Dickdarm mit komplexem Eingriff oder komplizierter Diagnose	5,7 %
I44B	Implantation einer bikondylären Endoprothese oder andere Endoprothesenimplantation / -revision am Kniegelenk	2,1 %
O60D	Vaginal delivery without complications	1,9 %

Reimbursement (in €)

88.697, laboratory 11.175

2.604, laboratory 55

3.156, laboratory 59

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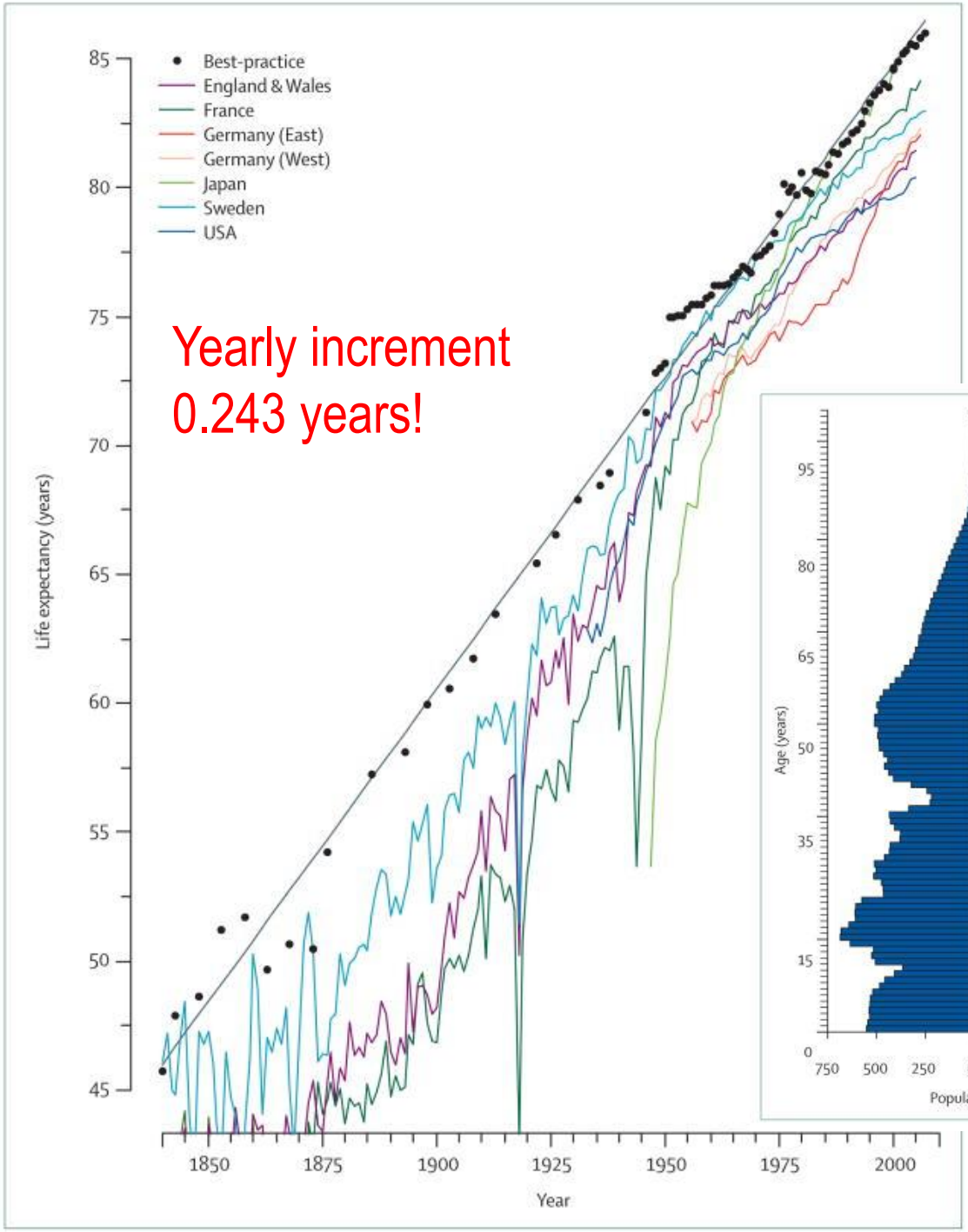
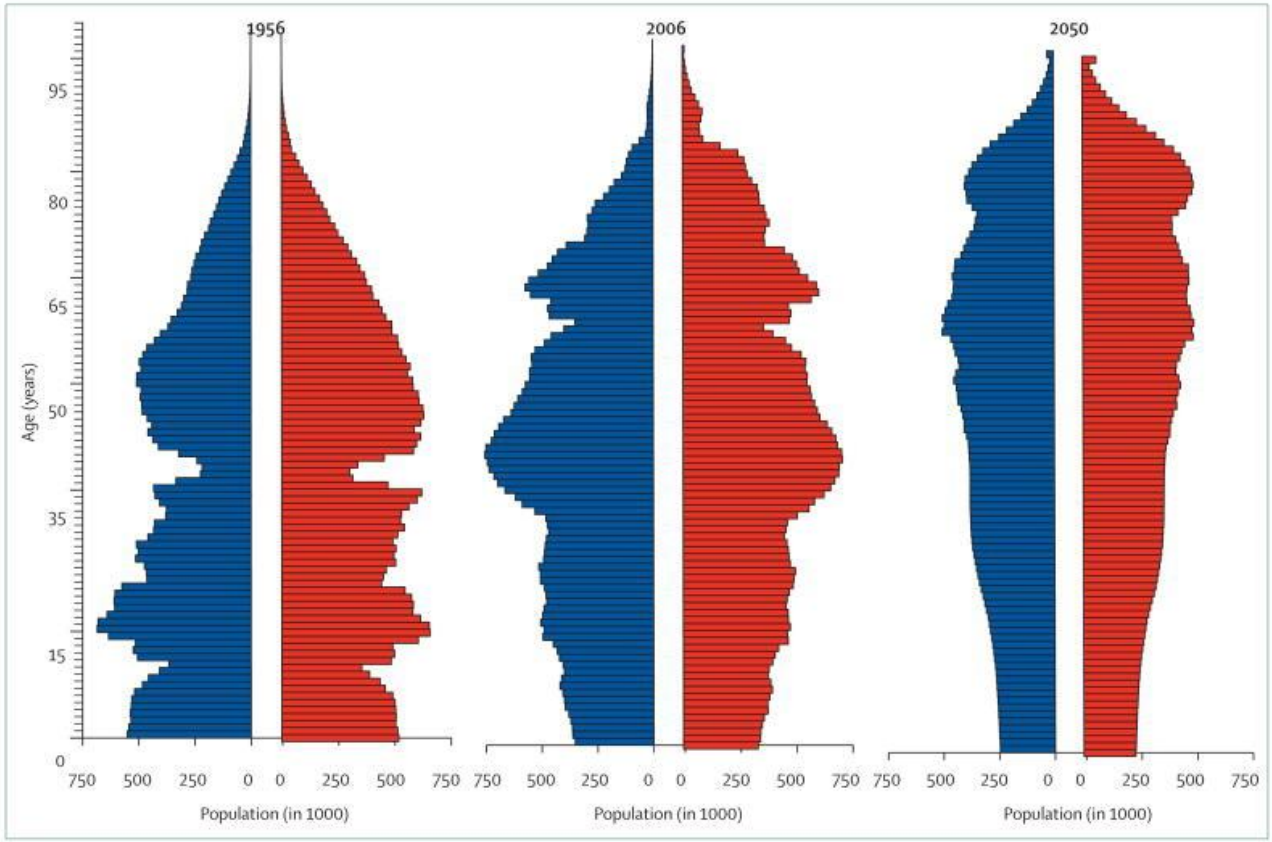
Demographics

Germany

„life expectancy in 2050 reaching 83.5 years for men and 88.0 years for women“



Yearly increment
0.243 years!



Christensen et al. Lancet. 2009; 374: 1196–208

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	1850–1900	1900–25	1925–50	1950–75	1975–90	1990–2007
0–14 years	62·13%	54·75%	30·99%	29·72%	11·20%	5·93%
15–49 years	29·09%	31·55%	37·64%	17·70%	6·47%	4·67%
50–64 years	5·34%	9·32%	18·67%	16·27%	24·29%	10·67%
65–79 years	3·17%	4·44%	12·72%	28·24%	40·57%	37·22%
>80 years	0·27%	−0·06%	−0·03%	8·07%	17·47%	41·51%

Data derived from reference 12 and the Human Mortality Database.

Table 2: **Age-specific contributions to the increase in record life expectancy in women from 1850 to 2007**

Reduction in disease free life expectancy (DFLE) in the elder

Christensen et al. Lancet. 2009; 374: 1196–208

THEMEN DER ZEIT

Das deutsche DRG-System: Grundsätzliche Konstruktionsfehler

Dtsch Arztebl 2013; 110(39): A-1782 / B-1572 / C-1548

Simon, Michael

Downstairs effect (~-2- -3% p.a.)

According to the health insurances, there were economical reserves in the hospitals. With this estimation, average costs were **above** the cost of economic services

According to the hospitals, since the 1990s years, there was a lack of finances in the hospitals. Average costs were **lower** than the costs thought to be economical.

When costs are defined to be the average costs of all hospitals, hospitals with costs above the average are forced to reduce costs, stop offering these services or to close. ... If costs are reduced to average costs, the new average costs will be calculated. Because of these new average costs, there is again cost pressure on all hospitals. This logic of cost calculation leads to this downstairs effect.

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1. Conclusion: Benchmarking is unsuited for comparison of different hospital laboratories

Effects of different patients (diseases, severity), temporal ordering, STAT testing

Structural/architectural infrastructure, **POCT**, non-analytic services, send-out testing

Structure of labservices (central laboratory, satellites, different institutes)
Allocation of personnell

in laboratory: architectural infrastructure, automatization, claim of service, kind of technologies needed

Rating/valuation of tests for outpatients

Orth M, Aufenanger J, Klosson R. Key figures and benchmarking in the hospital laboratory. J Lab Med 2012, **36:** 353-369

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*Valenstein P et al. Arch Pathol Lab Med. 2001;***125***:153*

2. Conclusion: Costbenchmarks are unsuited to optimize logistics (Riverside Medical Center in Kankanee Illinois (12 points))

3. Warehouse for reagents and consumables was implemented

4. SOPs were implemented

5. Benchmarks for the quality of workprocesses were implemented

7. Arrangement of instruments was changed

8. Laboratory inventory was replenished only once per day from the central warehouse. No interruption of the analytical work of the technicians during the day

10. Personnel was used according to qualification and reimbursement: experienced technicians with high salaries were no longer used for warehouse or cleaning services

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Graban M. Lean manufacturing. Soc Man Engin Lean Manufact 2007:53

Benchmarking of „value“ of laboratory services

1. Targeted Diagnostics
2. Short stay in the hospital (shot hole vs. step-wise diagnostics)
3. Avoidance of pricy in vivo additional diagnostics (specificity)
4. Improved (+cost efficient) use of drugs
5. Improved reimbursement in DRG (Rightcoding)
6. Avoidance of medical catastrophies („MRSA, ESBL, 4MRGN“)
7. Cost efficiencies (insurance fee, litigance)
8. Patient satisfaction, (hospital) employee satisfaction

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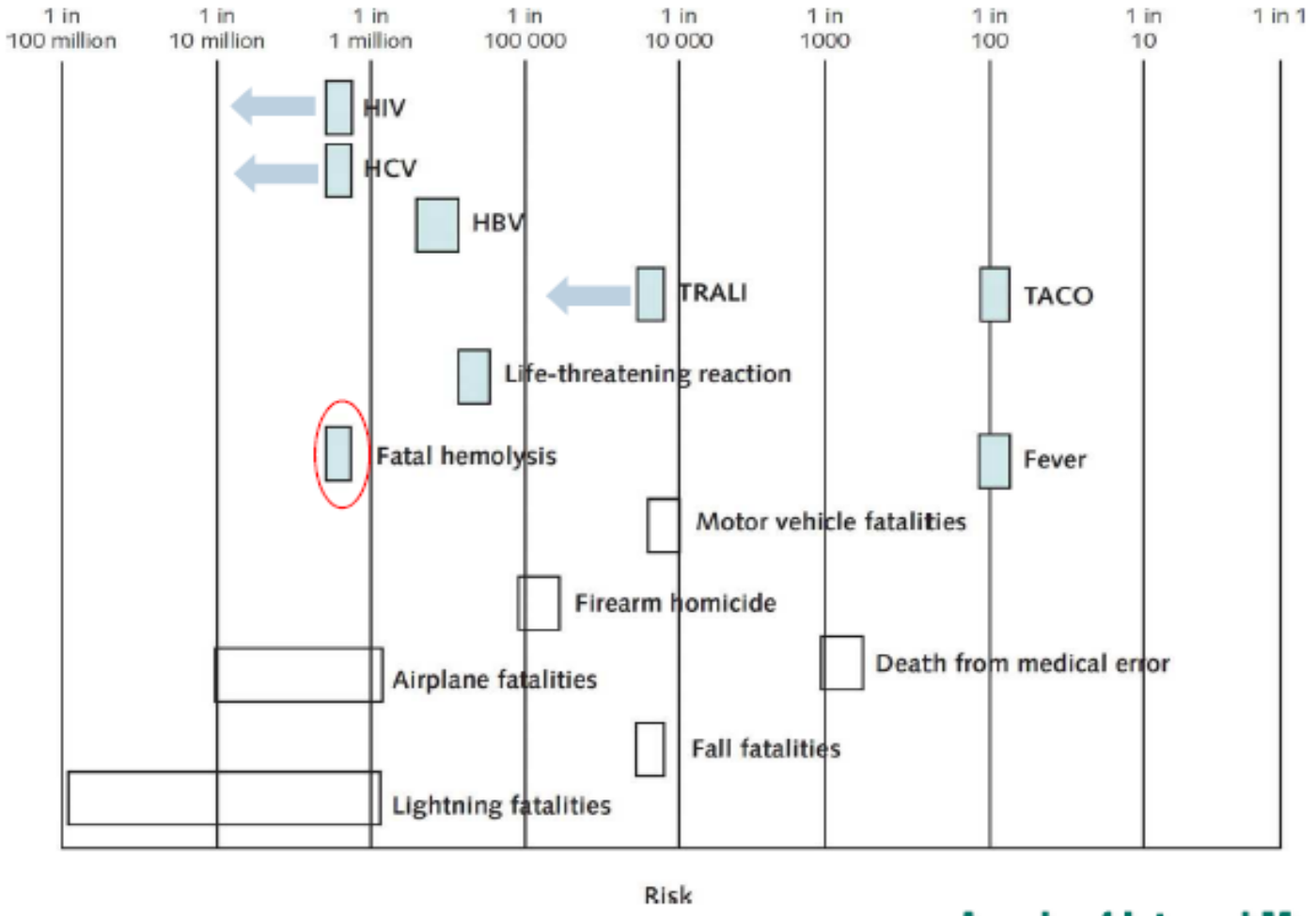
Are we aiming on the real problems?

Adverse effects of RBC transfusion contrasted with other risks

Risk is depicted on a logarithmic scale



Carson J L et al. Ann Intern Med doi:10.1059/0003-4819-156-12-201206190-00429

Annals of Internal Medicine

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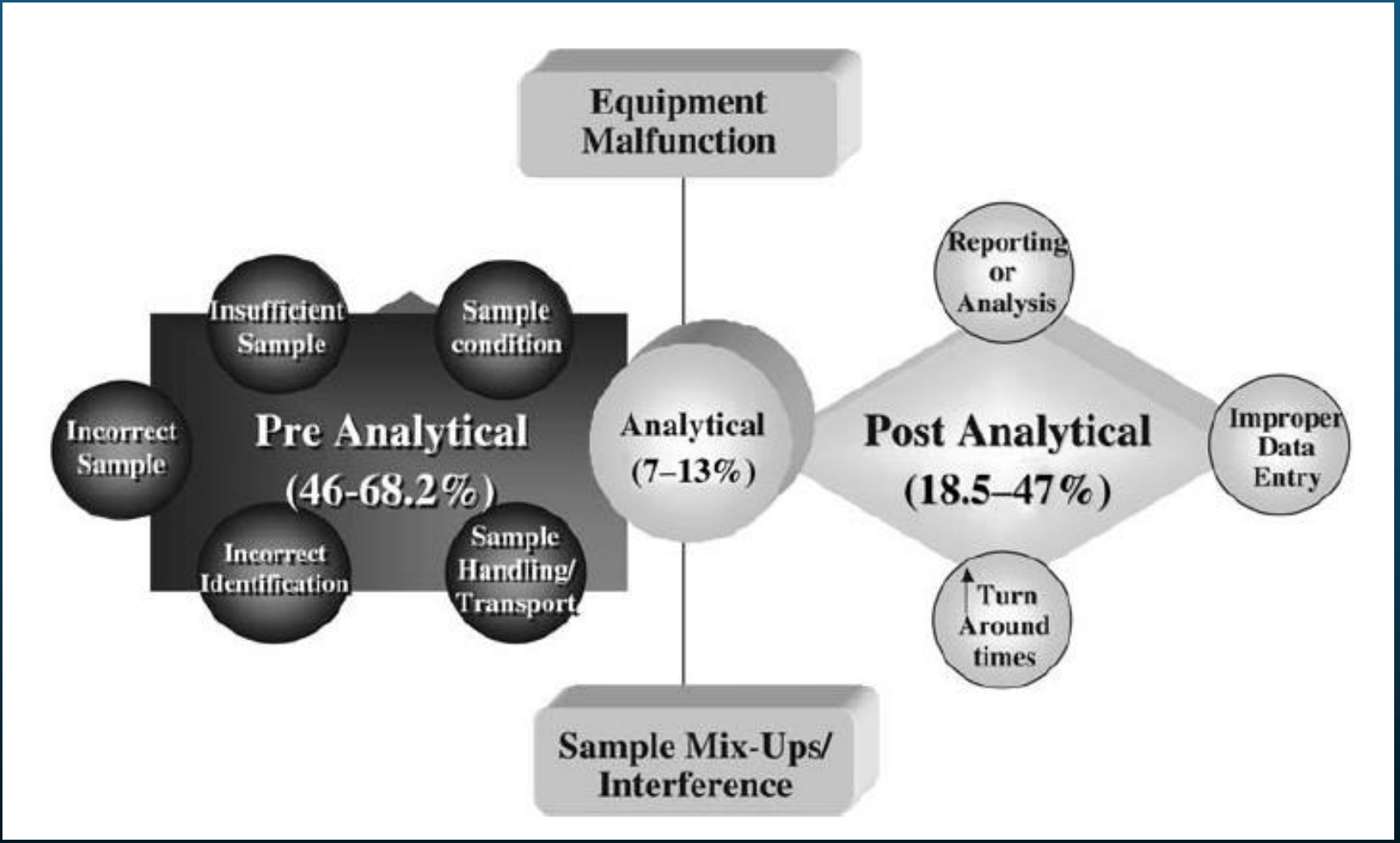
Is focus on analytics correct?



Logistics, insurance fees, satisfaction ....

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Plebani M. Clin Chem Lab Med 2006;44:750

Qualification of benchmarking: % of analytics on „brain to brain time“

		TAT (Total, h)	Intra laboratory TAT	Contribution of analytical phase in TAT (approx, %)	Contribution of pre- and post-analytical phase in TAT (approx, %)
WARD	Electrolytes	4.5–5.5	1–1.5 h	30	70
	Prothrombin time	4.5–5.5	30 min	15	85
	Routine chemistries	4.5–5.5	1.5–2 h	35	65
OPD	Prothrombin time	1	30 min	50	50
	Rest of the chemistries	24	2.5–3 h	15	85
EMERGEN.	All parameters	1–1.5	45 min	50	50

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Goswami B et al. Indian J Clin Biochem. 2010;25:376, Ervasti M et al. Clin Chem Lab Med. 2008;46:1030

Exponential error reduction in pretransfusion testing with automation

Susan F South, Tony S. Casina, and Lily Li

TABLE 3. FMEA summary of the seven routine G&S test procedures

Method	Number of process steps	Total RPN	Defect opportunities	Reduction in defect opportunities (%)
Tile and tube	39	9,245	637	
Tile, tube, and CAT	37	7,633	513	19.5
Tube	25	10,976	296	53.5
Manual CAT	22	5,304	166	73.9
Galileo	8	436	62	90.3
ID-GelStation/ProVue	7	225	13	97.9
AutoVue Innova	6	129	10	98.4

TRANSFUSION 2012;52:81S-87S.

Useful Benchmarks for demonstration of use of laboratory medicine

Benchmarks for preanalytics

Benchmarks for postanalytics

Benchmarks for process quality*

Qualification of benchmarks

*Differences between real laboratory and POCT:
Lenters-Westra E, Slingerland RJ. Three of 7 hemoglobin A1c point-of-care instruments do not meet generally accepted analytical performance criteria. Clin Chem 2014;60:1062-72.

Bingisser R, Cairns C, Christ M, Hausfater P, Lindahl B, Mair J, Panteghini M, Price C, Venge P. **Cardiac troponin: a critical review of the case for point-of-care testing in the ED** Am J Emerg Med. 2012 30:1639-49. **...** in general, many point-of-care cardiac troponin tests are less sensitive than cardiac troponin tests developed for central laboratory-automated analyzers ... most randomized evaluations of POCT technology having demonstrated little or no (benefit) in outcome

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	Performance level			
	Optimum	Desirable	Minimum	Unacceptable
Pre-analytical Quality Specifications				
% requests with clinical question from general practitioners/total number of requests from general practitioners	>87	58-87	29-57	<29
% appropriate requests, with respect of clinical question from general practitioners /number of requests that reports clinical question from general practitioners	>97	65-97	32-64	<32
% requests without physician identification/total number of requests	<5	5.0-6.0	6.1-8.0	>8.0
% unintelligible requests/total number of requests	<0.2	0.20-0.25	0.26-0.30	>0.30
% requests with errors concerning patient identification/total number of requests	<0.4	0.40-0.50	0.51-0.60	>0.60
% requests with errors concerning physician identification/total number of requests		<0.1		
% requests with errors concerning input of tests (missing)/total number of requests	<0.3	0.30-0.40	0.41-0.50	>0.50
% requests with errors concerning input of tests (added)/total number of requests		<0.1		
% ts (misinterpreted)/total number of requests	<0.2	0.20-0.25	0.26-0.30	>0.30
% amples	<0.2	0.20-0.40	0.41-0.60	>0.60
% r/total number of samples	<0.07	0.07-1.13	1.14-0.20	>0.20
% er of samples	<1	1.0-1.5	1.6-2.0	>2.0
% of samples with anticoagulant	<0.5	0.50-1.0	1.1-2.0	>2.1
% tal number of samples	<0.4	0.40-0.80	0.81-1.20	>1.20

Sciacovelli, L. et al. Clin Chem Lab Med. 2011;49:835

IFCC Working Group: Laboratory Errors and Patient Safety

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Pay for performance: data compilation and sufficient case numbers ?

Community aquired pneumonia

	QI-ID	Bezeichnung des Indikators	2012 Ergebnis	2013 Ergebnis	2013 Fälle (Patienten) Zähler (O | E)*	2013 Fälle (Patienten) Nenner	Tendenz
Indikatorengruppe		Erste Blutgasanalyse oder Pulsoxymetrie					
	2005	Erste Blutgasanalyse oder Pulsoxymetrie innerhalb von 8 Stunden nach Aufnahme	96,8 %	97,2 %	252.566	259.737	↗
	2006	Erste Blutgasanalyse oder Pulsoxymetrie innerhalb von 8 Stunden nach Aufnahme (nicht aus anderem Krankenhaus)	96,9 %	97,4 %	242.827	249.433	↗
	2007	Erste Blutgasanalyse oder Pulsoxymetrie innerhalb von 8 Stunden nach Aufnahme (aus anderem Krankenhaus)	93,6 %	94,5 %	9.739	10.304	→
	2009	Antimikrobielle Therapie innerhalb von 8 Stunden nach Aufnahme (nicht aus anderem Krankenhaus)	94,3 %	94,6 %	210.044	222.050	↗
Indikatorengruppe		Frühmobilisation innerhalb von 24 Stunden nach Aufnahme					
	2012	Frühmobilisation innerhalb von 24 Stunden nach Aufnahme bei Risikoklasse 1 (CRB-65-SCORE = 0)	95,6 %	95,9 %	34.176	35.620	→
	2013	Frühmobilisation innerhalb von 24 Stunden nach Aufnahme bei Risikoklasse 2 (CRB-65-SCORE = 1 oder 2)	91,2 %	90,9 %	115.627	127.158	→
	2015	Verlaufskontrolle des CRP oder PCT innerhalb der ersten 5 Tage nach Aufnahme	97,9 %	98,2 %	206.305	210.170	↗
Indikatorengruppe		Überprüfung des diagnostischen oder therapeutischen Vorgehens					
	2018	Überprüfung des diagnostischen oder therapeutischen Vorgehens bei Risikoklasse 2 (CRB-65-SCORE = 1 oder 2)	96,7 %	97,5 %	19.436	19.928	↗
	2019	Keine Überprüfung des diagnostischen oder therapeutischen Vorgehens bei Risikoklasse 3 (CRB-65-SCORE = 3 oder 4)	1,97 %	2,02 %	35	1.730	→

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Quality report 2013, G-BA

Sigma Metric	Defects per million
1.0	698,000
2.0	308,000
2.5	159,000
3.0	66,800
3.5	22,750
4.0	6,210
4.5	1,350
5.0	233
5.5	32
6.5	3.4

Sigma value of defects per million products or tests

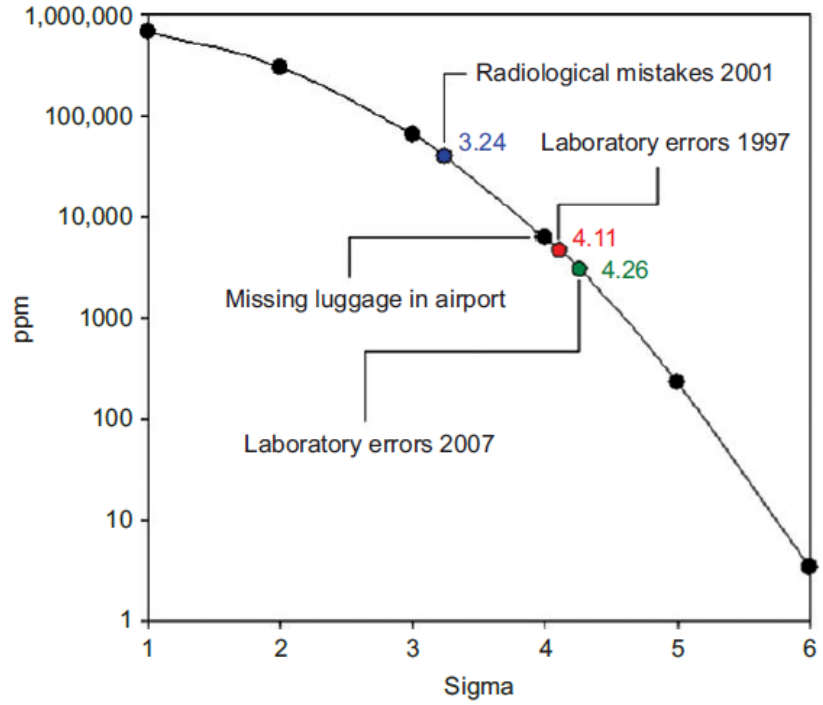

Figure 1 Six sigma metrics of laboratory errors.

Table 2. Percent Variance Normalized to Parts per Million for Published Q-Probes Laboratory Quality Indicators That Represent a Cross Section of the Total Testing Process*

Quality Indicator	Sample Size	Percent Variance (at Median [50th] Percentile)	Parts per Million
Six Sigma Quality	1 000 000	0.00034	3.4
Preanalytic			
Order accuracy: tests ordered and not ordered	224 431	1.8	18 000
Duplicate test orders	221 476	1.52	15 200
Wristband errors: patients not banded	451 436	6.5	6500
Therapeutic drug monitoring timing	18 679	24.4	244 000
Hematology specimen acceptability	35 325	0.38	3800
Chemistry specimen acceptability	10 709 701	0.30	3000
Surgical pathology specimen accessioning	1 004 115	3.4	34 000
Cervicovaginal cytology specimen adequacy	626 400	7.32	73 200
Analytic			
Laboratory proficiency testing	616 467	0.9	9000
Surgical pathology frozen section discordant diagnosis rate	79 647	1.7	17 000
Papanicolaou smear rescreening false-negative rate	1 741 515	2.4	24 000
Postanalytic			
Reporting error	487 804	0.0477	477

* Excerpted from Schifman et al[6] and Howanitz et al.[7]

Arch Pathol Lab Med 2000; 124:516-9
Clin Chem Lab Med 2013; 51: 229–41

Do we know what inappropriate laboratory utilization is? A systematic review of laboratory clinical audits

84 eligible studies were identified. ... There were large variations in the estimates of inappropriate laboratory use (4.5%-95%). Evidence supporting the explicit criteria was frequently weak by the standards suggested for therapeutic maneuvers, but was nonetheless compelling based on principles of physiology, pharmacology, and probability.

CONCLUSIONS:

Many studies identify inappropriate laboratory use based on implicit or explicit criteria that do not meet methodological standards suggested for audits of therapeutic maneuvers. Researchers should develop alternative evidentiary standards for measuring inappropriateness of laboratory test use.

van Walraven, C; Naylor, C. D.JAMA 1998;280:550

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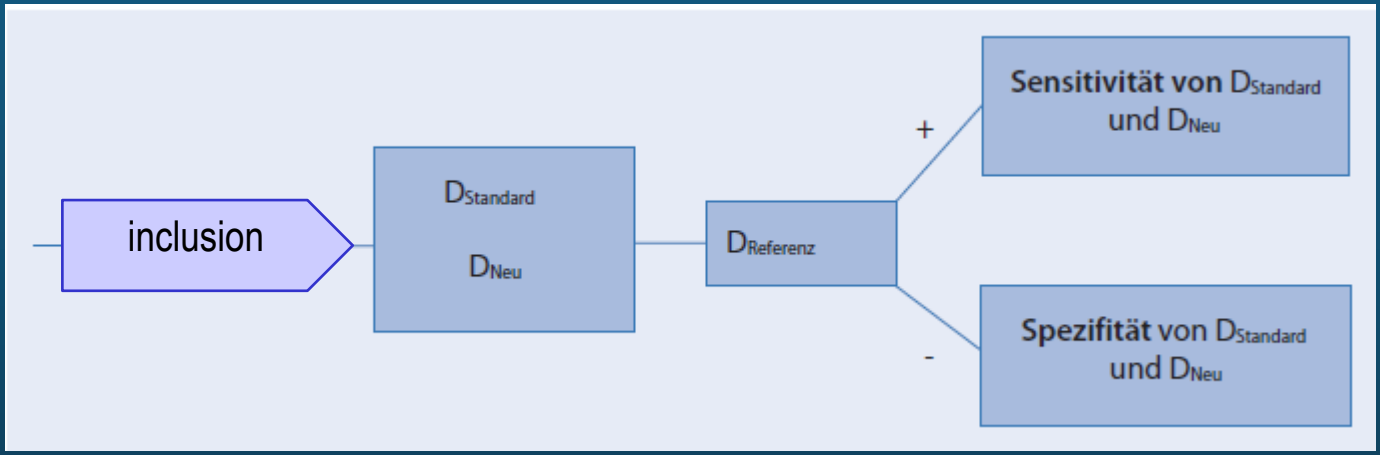
Table 1 Key questions for evaluating the evidence base for clinical use

Has this marker been measured with an appropriate method and been shown to be additive to or replace a contemporary test?
Have there been independent studies?
Has there been a multicentre study?
Is there meta-analysis of evidence?
Has there been an RCT?
Can I measure it in the routine lab without additional equipment and staff?

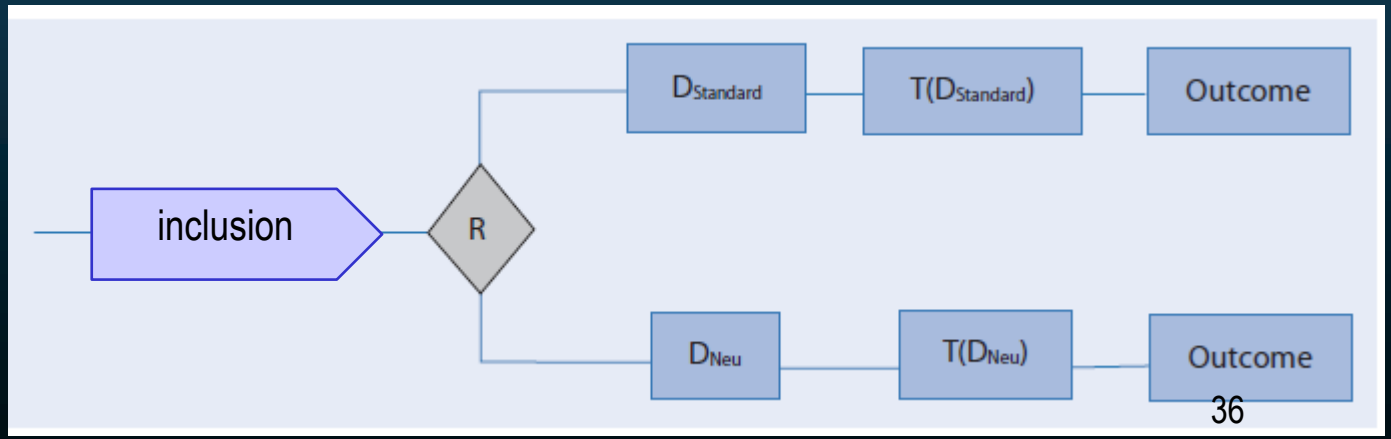
Table 2 Cost effectiveness categories

Type	Measurement and valuation of consequences
Cost minimisation analysis	No measurement. Consequences assumed or shown to be equivalent.
Cost effectiveness analysis	Natural units (Life years gained)
Cost utility analysis	Health state preference values (quality adjusted life years gained)
Cost benefit analysis	Monetary gains

Flowchart to compare test acuity. Each patient is tested with an established and a novel test. Gold standard is obtained via a reference test (calculation of sensitivity and specificity). Alternatively, randomization to one of both tests only

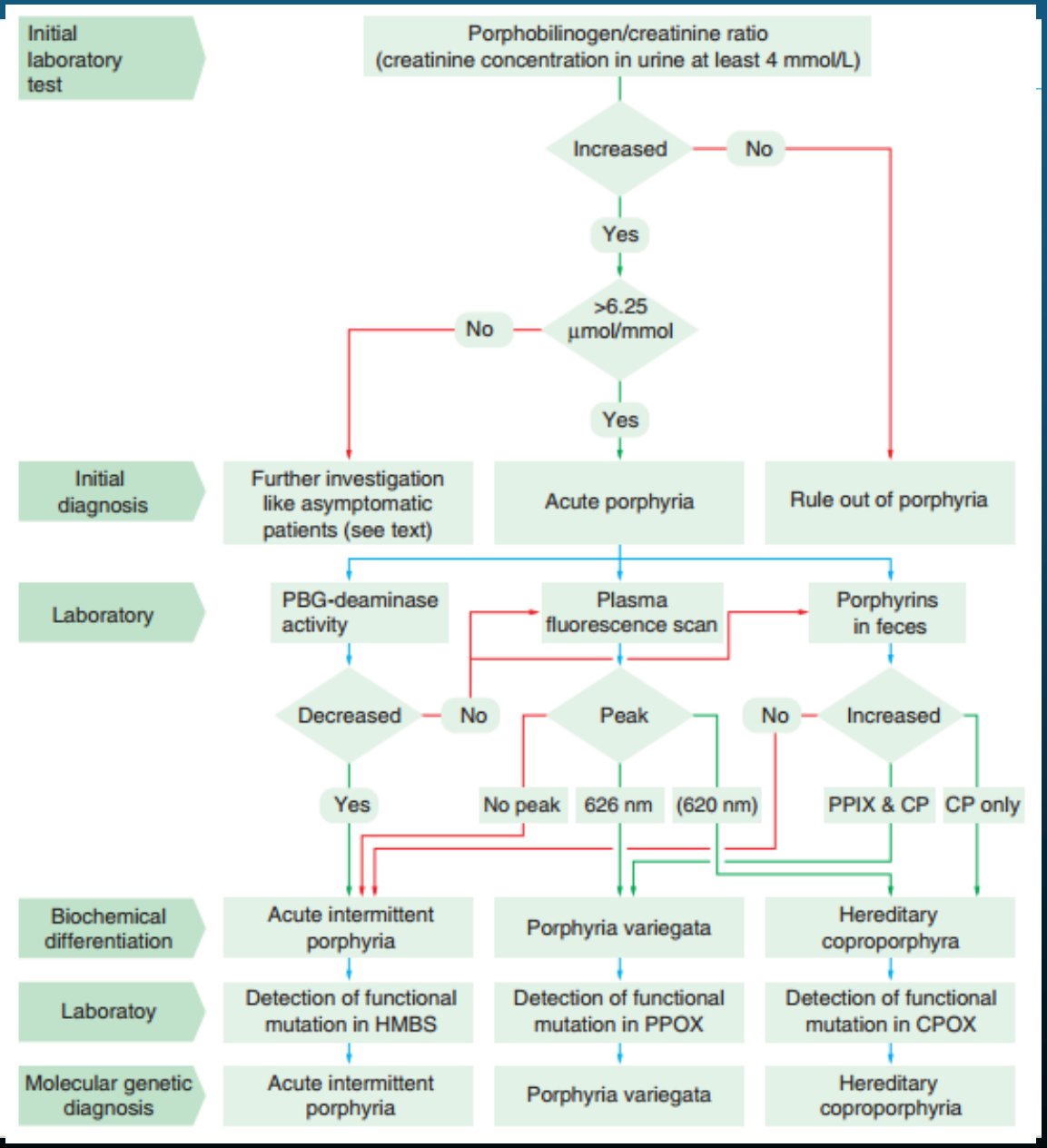


Flowchart of a randomized diagnostic study. After inclusion, randomization to testing by standard ($D_{standard}$) or new (D_{Neu}) procedure. Treatment (T) depends on result of diagnostic procedure. Outcome is measured.



Bundesgesundheitsbl 2015 · 58:256–262 DOI 10.1007/s00103-014-2111-4

Tailored diagnostics with diagnostic pathways and Standards (?)



Diagnosis 2014; 1(4): 269–276

1. Hepatitis basic diagnostics

ASAT, ALAT, GGT, AP, Bilirubin, Differential, IgG, IgM, IgA , Quick, PTT, Elektrophoresesis, Albumin, Cholinesterase

2. Differential diagnostics

Virus-Hepatitis

Hepatitis A: Anti-HAV-IgG /-IgM - if positive: Anti-HAV-IgM

Hepatitis B: 1. step: HBs-Ag, Anti-HBc, Anti-HBs
2. step: Anti-HBc-IgM, HBe-Ag, anti-HBe, HBV-DNA

Hepatitis C: Anti-HCV (if negative HCV-RNA)

Hepatitis D: if Hbs-Ag positive - Anti-HDV

Hepatitis E: Anti-HEV

Secondary Hepatitis e.g.

EBV-AK, CMV-Ak, Entero-Virus-Ak, HSV 1/2-Ak, Adeno-Virus-Ak, Mumps virus-Ak, Leptospirosis-Ak, Toxoplasma-Ak, Brucella-Ak

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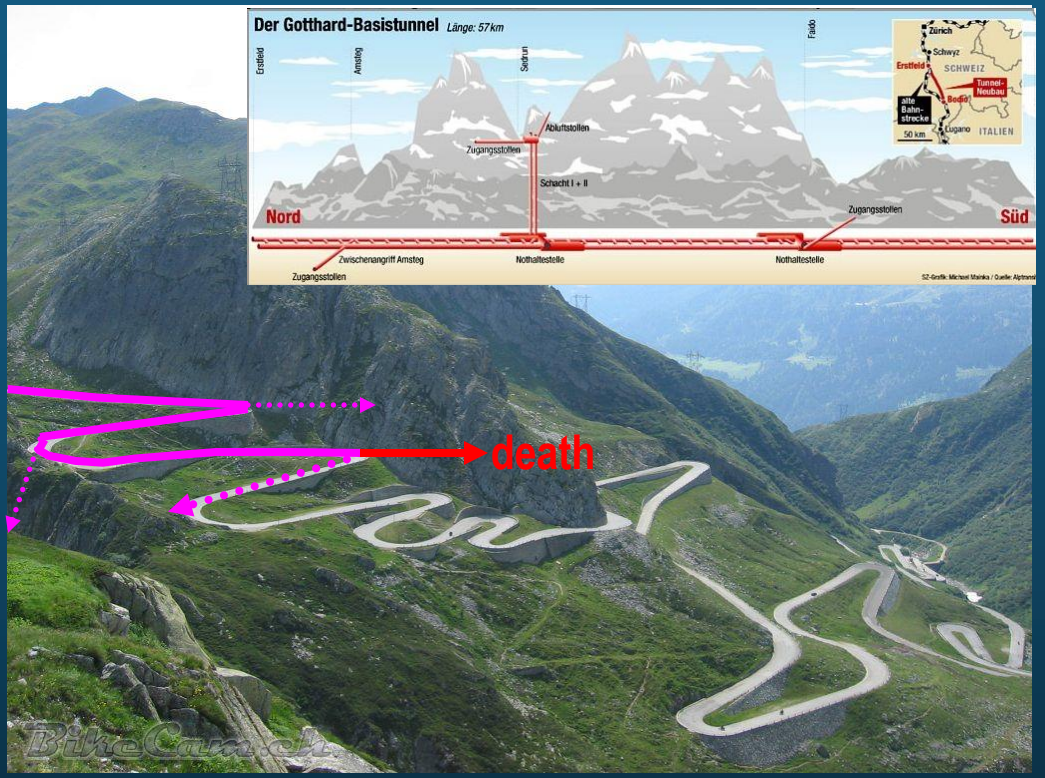
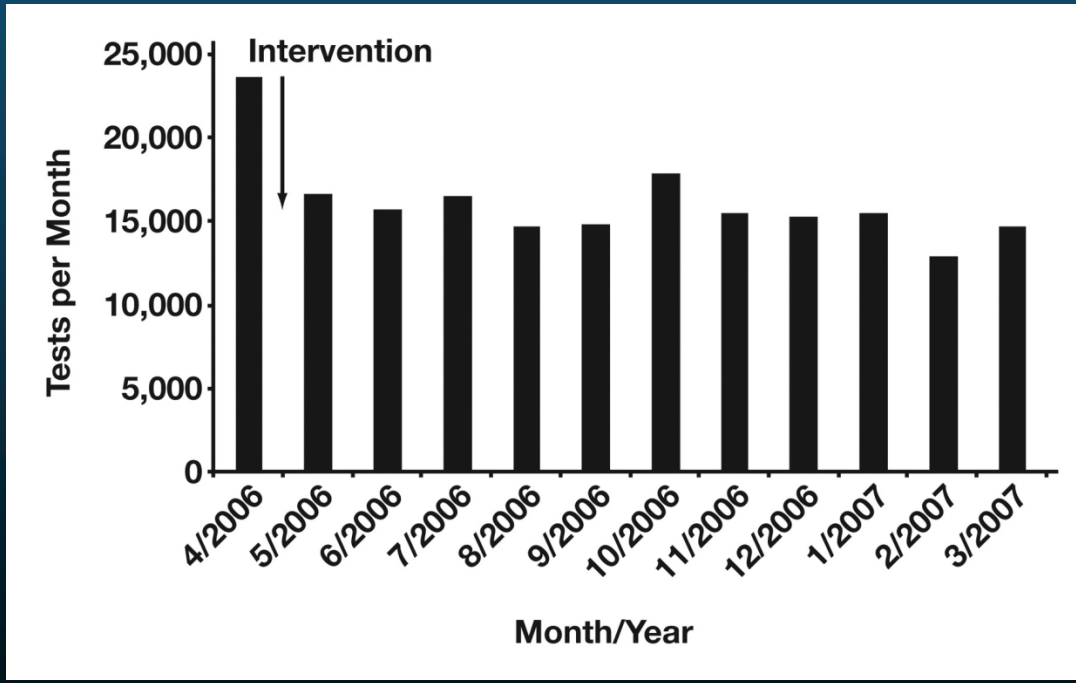
Diagnostic pathway vs. special qualification of sophisticated tests



Harvard Medical School: Limitation of tests for certain „customers“, special qualification of customer, orders only with check back (in case of genetic testing)



requirement: competent and accepted partner in medical laboratory on eye level!

No automatic annullation – Beware of ***e-latrogenesis***

Am J Clin Pathol 2011;135:108-118

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Recommended time intervals for repeat testing

HbA1C 3 months in patients with diabetes mellitus with insulin therapy, 6 months in patients with diabetes mellitus w/o insulin therapy, no specifications for diagnostic of diabetes mellitus, changed Intervals in patients under transfusion or in hemolysis and in pregnancy

Ferritin 2 months

ANA 4 weeks

PSA 12 weeks, for estimation of residual tumor tissue after extirpation 1 week

Urin Albumin/g creatinine 3 times on 3 non-consecutive days (to exclude renal impairment in Diabetes mellitus)

Creatinine 1 day (after application of X-ray radiopaque material)

Infection serology (dependent on immune status of patient or disease stage)

	Seropositive Patients	Seronegative
HBs-Ag	180 d	7 d
HCV-RNA	60 d	7 d
HIV-Ak	--	28 d

Orth, M., et al. (2014). "Recommendations for the frequency of ordering laboratory testing." LaboratoriumsMedizin **38(5): 231-8.**

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Key figures and benchmarking in the medical laboratory

- Laboratory diagnostics uses only marginal financial ressources, but is indispensable for most diagnoses
- Benchmarking in the laboratory is **NOT** suited to compare different hospital laboratories
- Cost saving in the hospital laboratory after benchmarking processes cannot save a loss-making hospital --- unreflected reorganisations in the laboratory **can ruin** a hospital (medically and economically)
- Improvements of processes have to be tailored for each single house/structure
- Many divisions of laboratory diagnostics are already very effective and efficient
- Optimization/benchmarking in the areas of pre- and postanalytics/logistics are generally more meaningful than a further optimization of analytics
- **Benchmarks of the value of laboratory services have to be developed**