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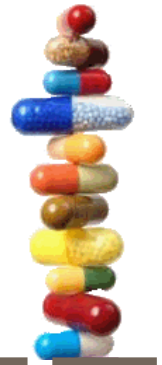

MEDICATION SAFETY

DIRECT COSTS OF MEDICATION ERRORS

BACKGROUND: MEDICATION SAFETY
«TOGETHER WE CARE»

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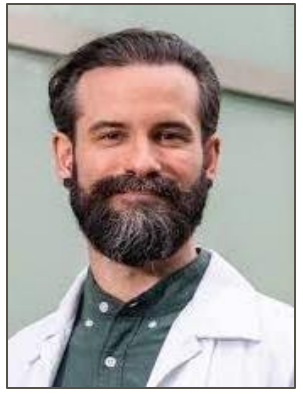

BACKGROUND: MEDICATION ERRORS
IMPACT

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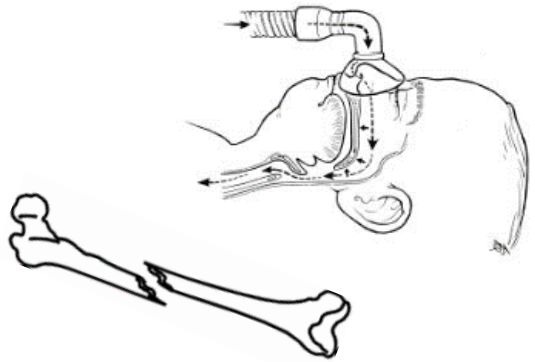

BACKGROUND: MEDICATION ERRORS
ASSOCIATED “RELEVANT” OUTCOMES

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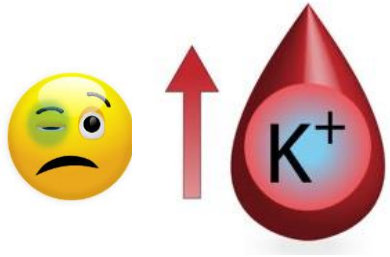

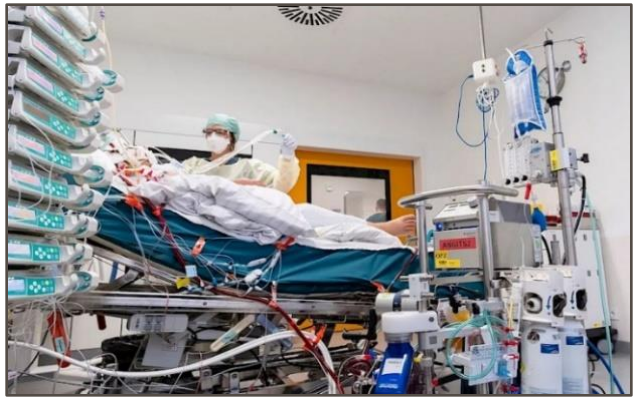

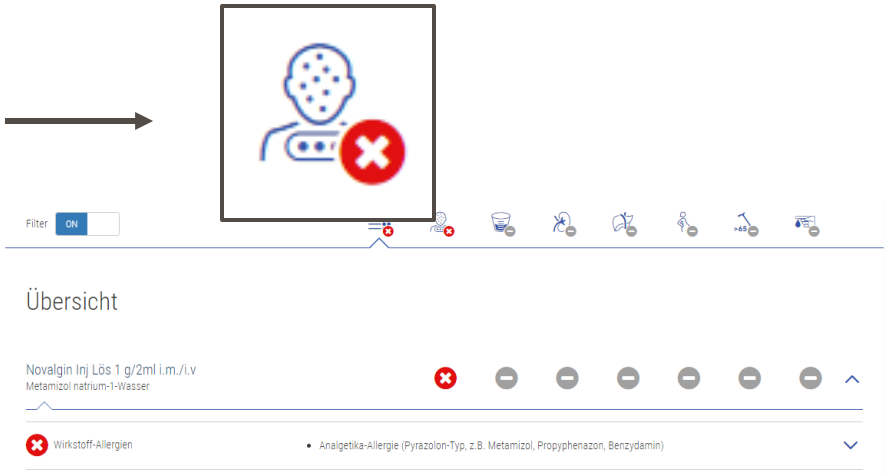

AIM: COSTS OF MEDICATION ERRORS?
DEFINITIONS, ESTIMATIONS, EXTRAPOLATIONS

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No standard methodology for reporting of costs of medication errors

- Definition / incidence of medication error and associated costs vary greatly
- Different perspectives: hospital, insurance, government
- Differences in healthcare systems across the world
- Dependence on statistical models & assumptions

$ 2'400.-

$ 8'500.-

€ 1'500.- to 4'100.-

$ 4'600.-

Study Aim: How much do medication errors cost us?

→ Identify cases of "relevant" medication errors
→ Match them with suitable controls
→ Compare costs transparently

METHODS: MEDICATION ERRORS
IDENTIFICATION OF CASES

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7 hospitals, 3 years (2021 - 2023), approx. 200’000 patients: 21 cases of medication errors

- Critical Incident Reporting System / pharmacovigilance cases
- Drug data (antidotes, drug-drug interactions, overdosing, etc.)
- Lab data (renal impairment, therapeutic drug monitoring, etc.)

Case 6

Case 8

Case 18

Case 21

→ Associated with **serious / severe outcomes** according to HAMEC*

* Harm Associated with Medication Error Classification, Gates P, Standardising the classification of harm associated with medication errors HAMEC, Drug Saf 2019

METHODS: MATCHING CASES...

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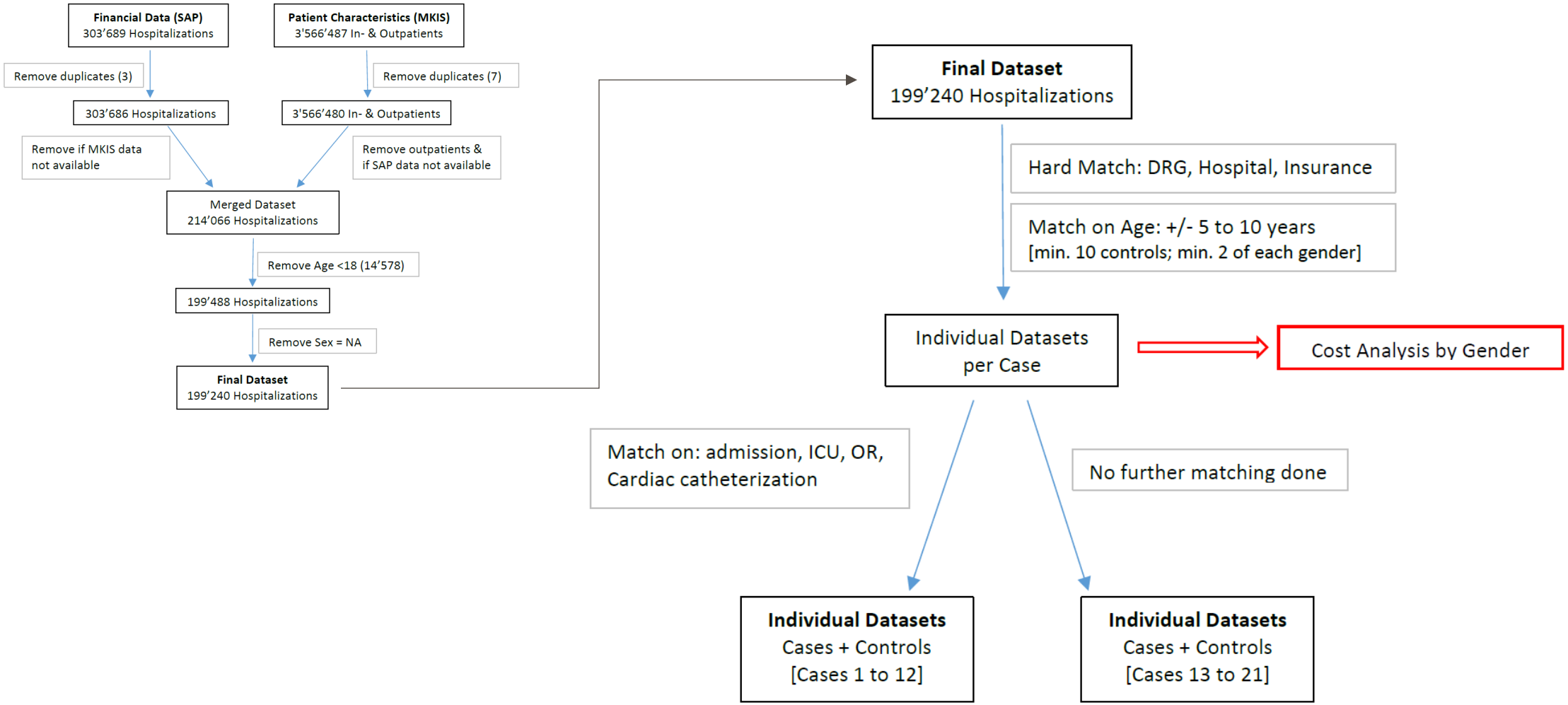

METHODS: MATCHING CASES… … TO CONTROLS

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ERROR	# CONTROLS	MATCHING CRITERIA
1	35	DRG, Hospital, Insurance, Age (+/-5), Admission Type, IPS*, OPS*, Heart catheter lab*
2	6	
3	12	
4	77	
5	152	
6	14	
7	48	
8	13	
9	21	
10	118	
11	2	
12	117	
13	6	DRG, Hospital, Insurance, Age (+/-10)
14	4	
15	3	
16	3	
17	3	
18	3	
19	2	
20	2	
21	2	




Easy DRG, plenty controls, closely matched, not expensive, expected Ø length of stay: 4.8 days[8]

Challenging DRG, few controls, basics matched, expensive, expected length Ø of stay: 22.3 days[8]

* Exclusion of cases without IPS / OPS / HCL

[8] https://www.swissdrg.org/application/files/6017/0005/6194/230928_SwissDRG_Broschuere_e.pdf (accessed 2024-05-28)

METHODS: HOSPITAL ACCOUNTING*...
... AN INTRODUCTION

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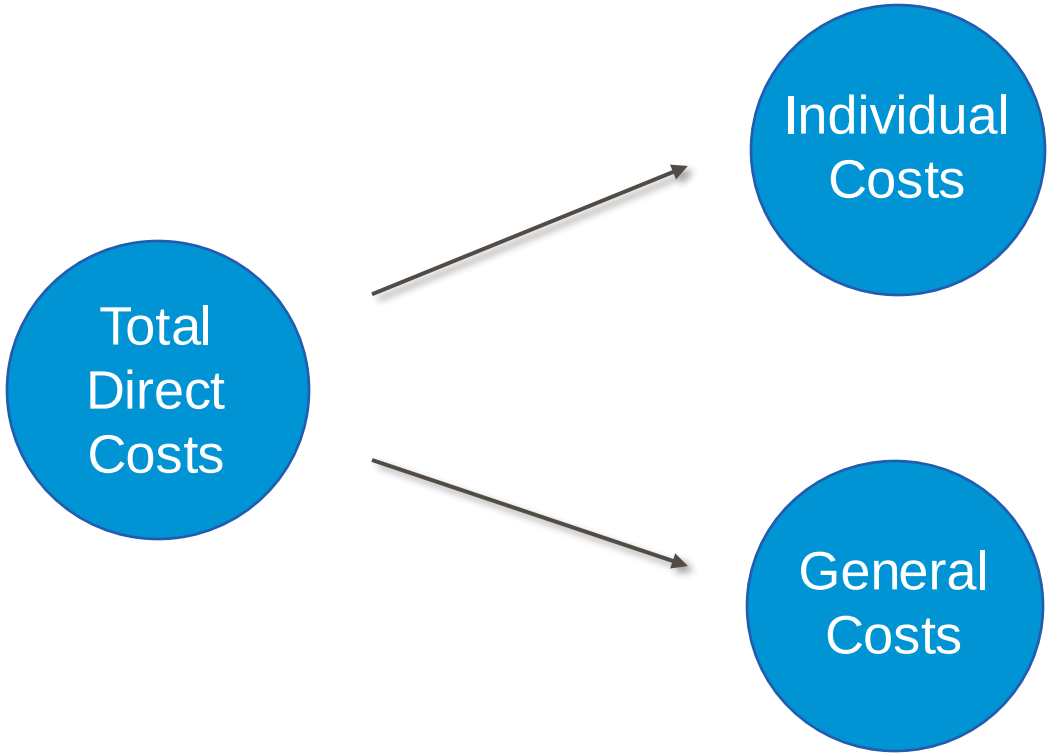

Available for each patient individually
- Drugs, blood products
- Implants, medical material
- External lab / diagnostics

Annual costs for service → time-based allocation
- Room costs / hospitality service
- Physicians, nurses, therapists
- Minutes spent on ICU

* Accounting according to REKOLE (Revision der Kostenrechnung und Leistungserfassung)

RESULTS
PATIENT CHARACTERISTICS

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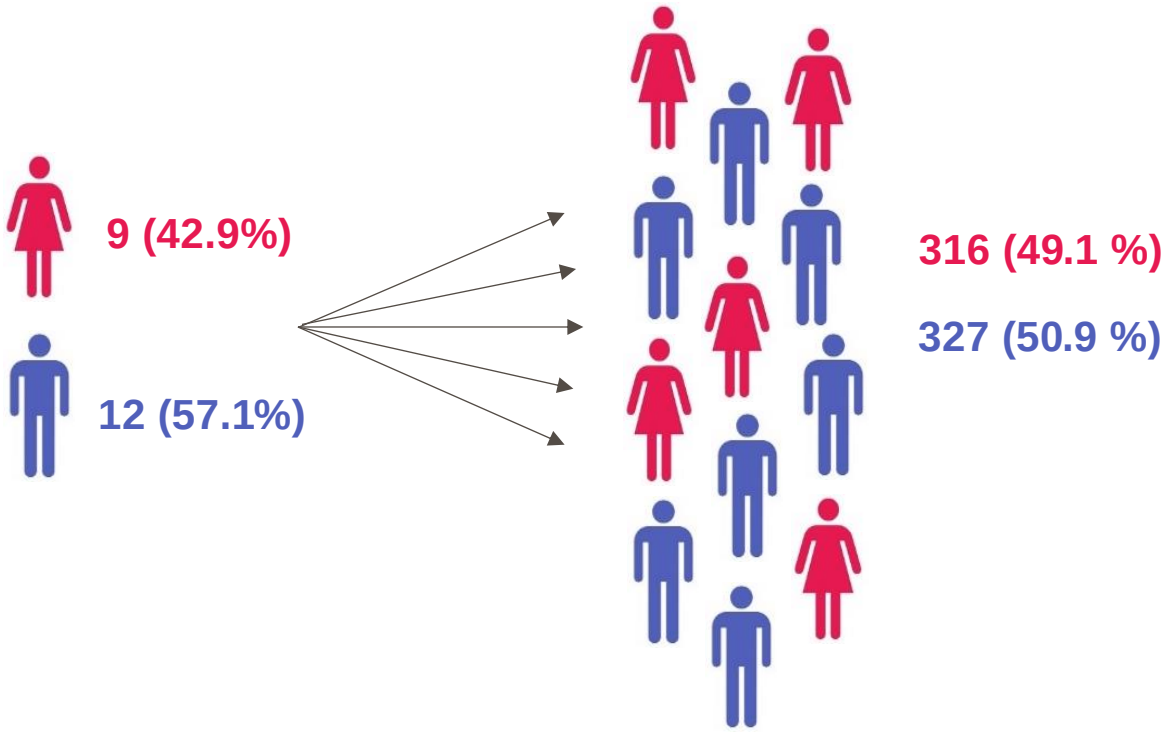
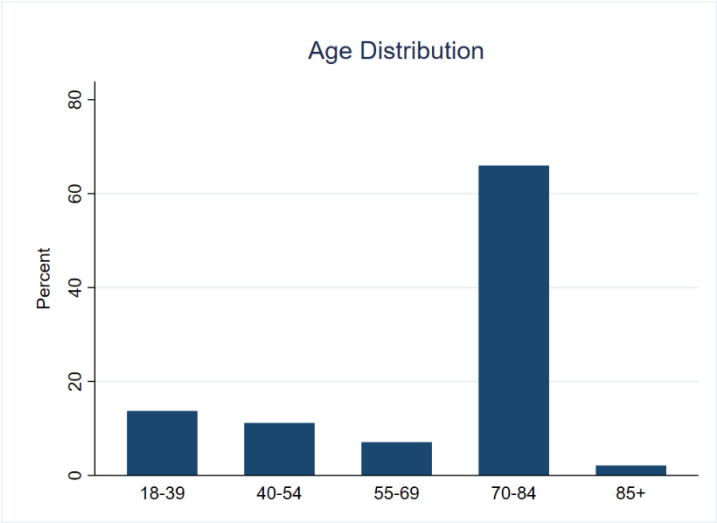
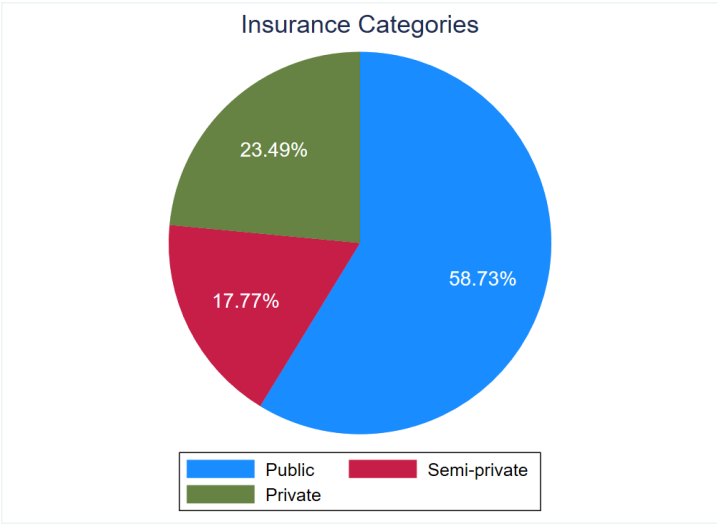
21 Cases

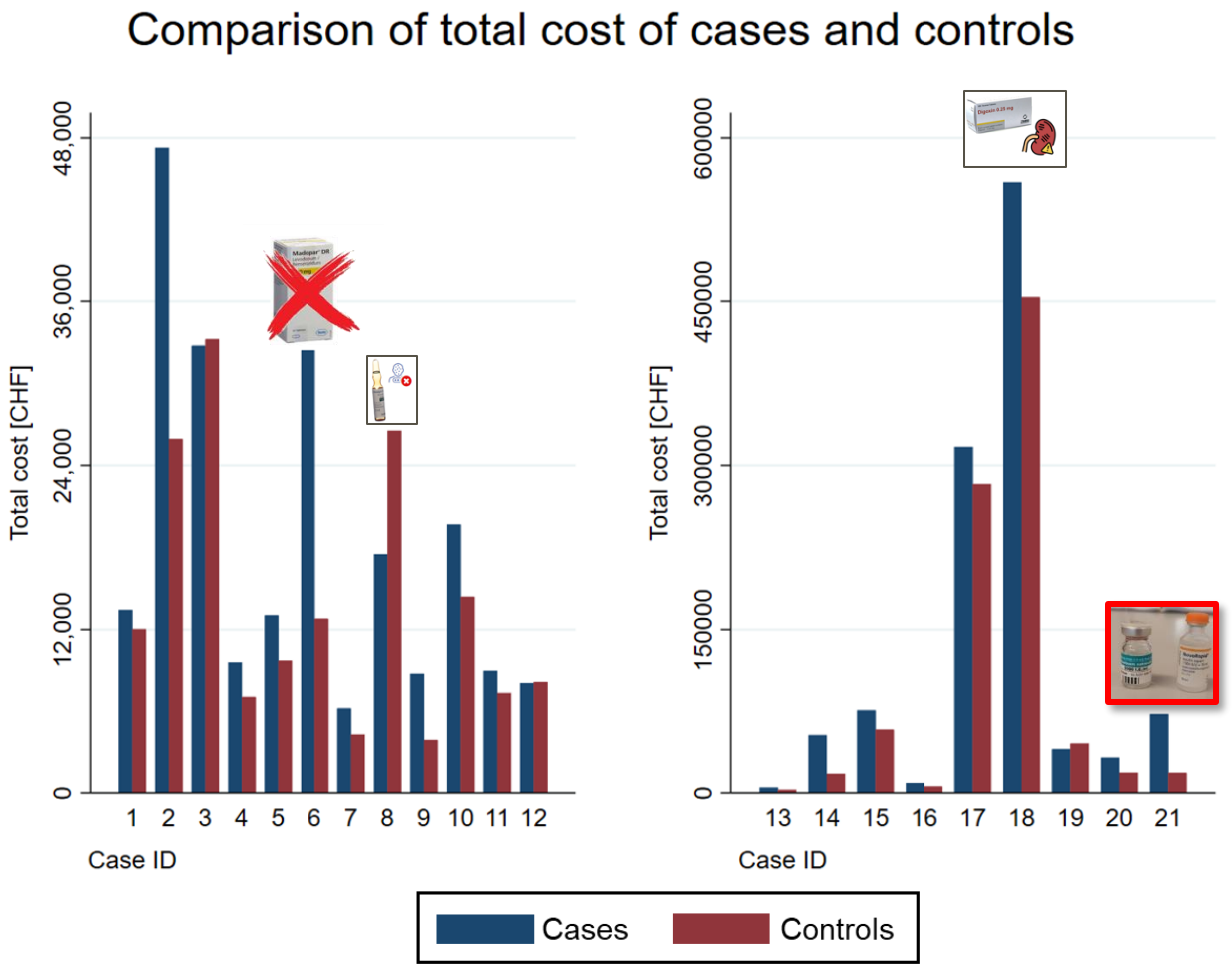
643 Controls







RESULTS
TOTAL COSTS



Ø Cases 1-12: CHF +4’400.- (32%)

Ø Cases 13-21: CHF +30’100.- (29%)

Ø Total: CHF +15’000 (30%)

Ø Length of stay for cases: +4.3 days

RESULTS
TOTAL COSTS

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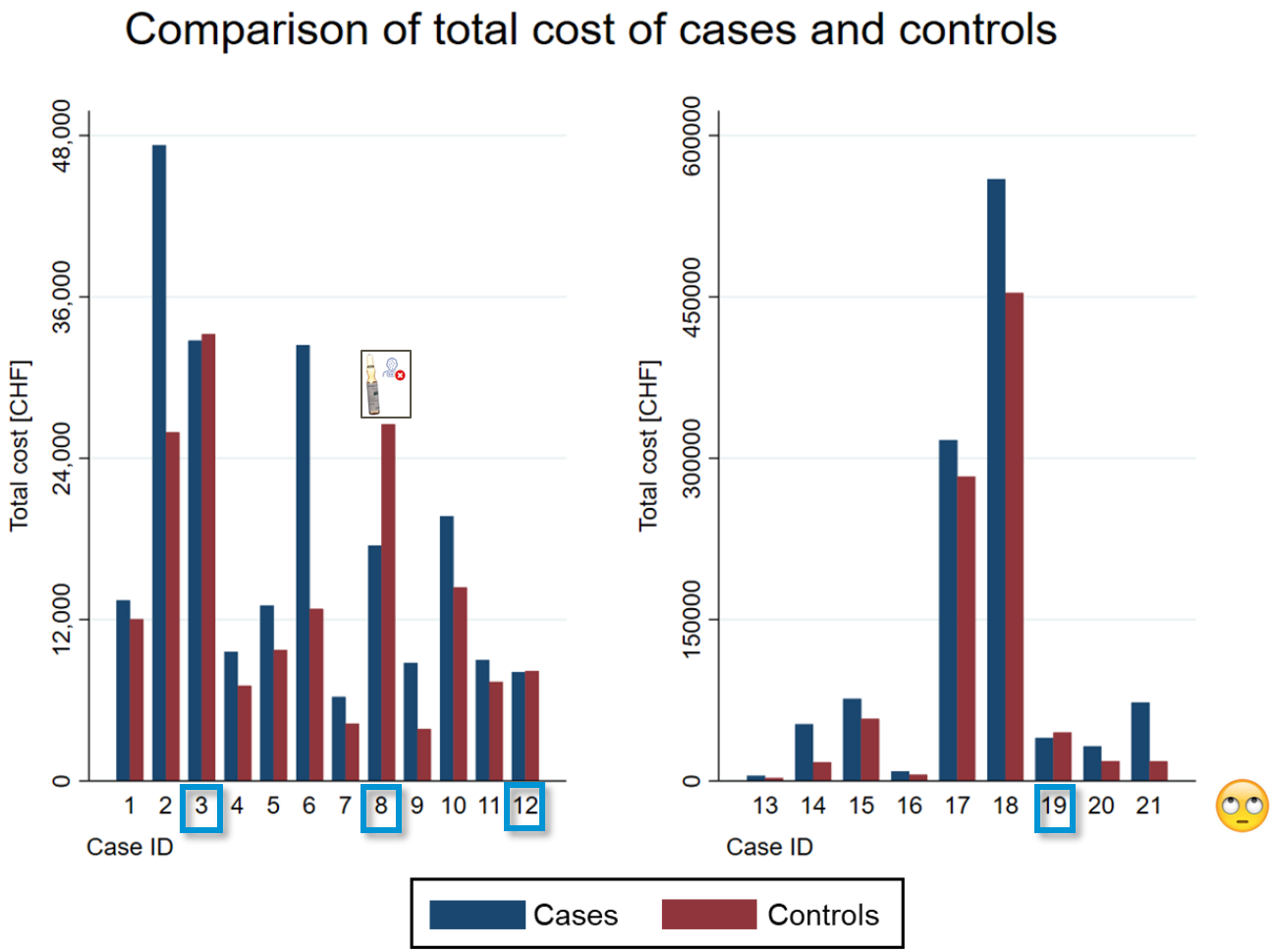

RESULTS
INDIVIDUAL AND GENERAL COSTS

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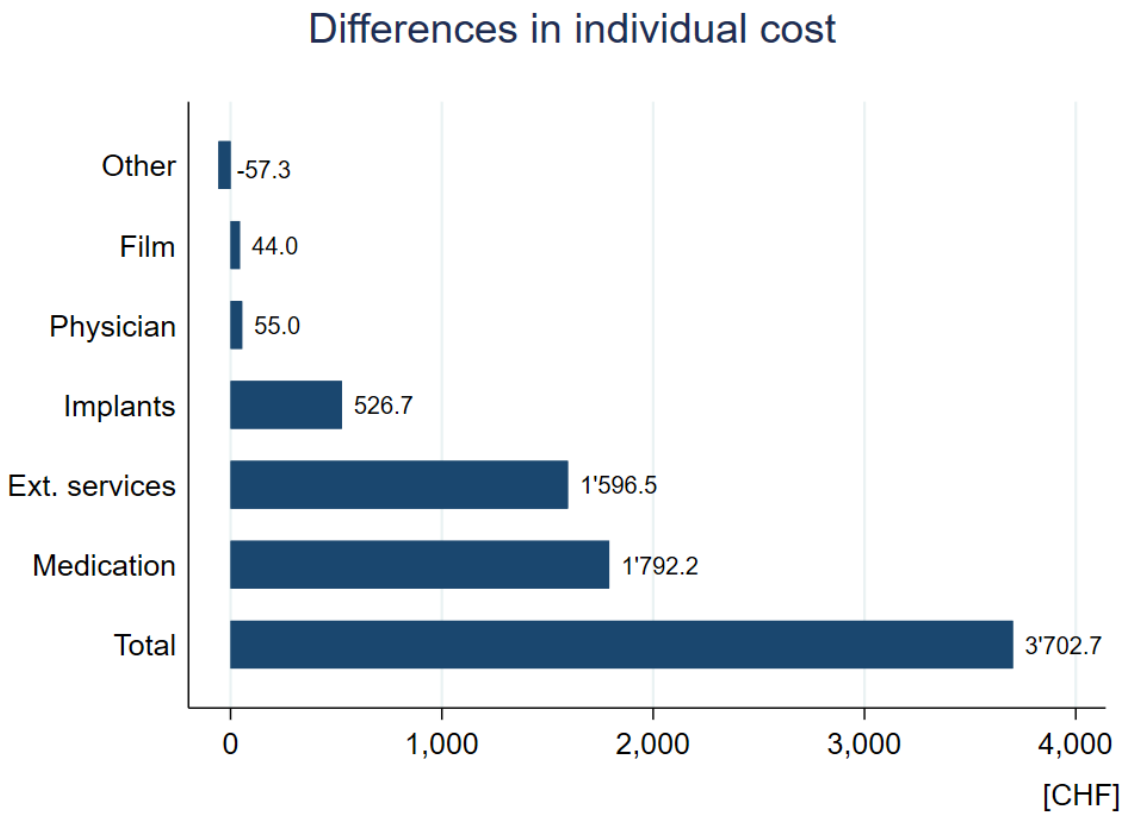

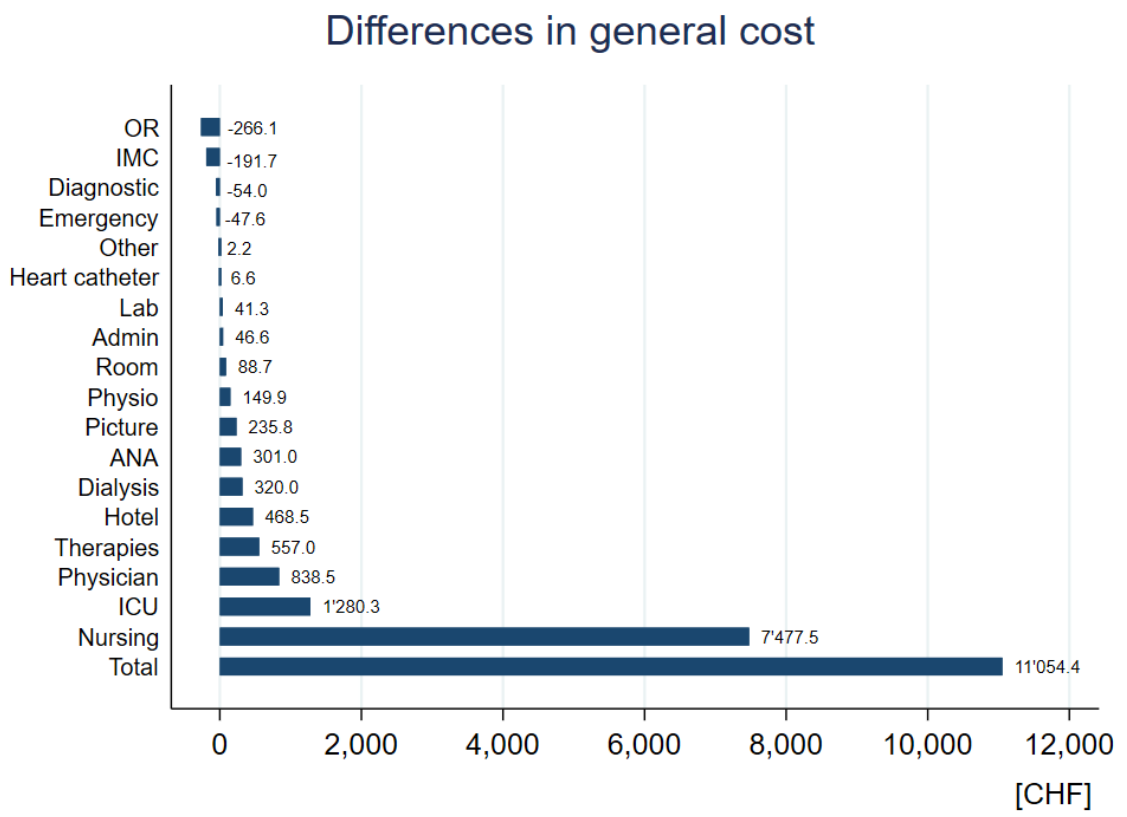

DISCUSSION
LIMITATIONS

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- Overlooking / underreporting of medication errors, what about medium & low harm cases? 🤔

- Association of medication errors with outcome ≠ causality → multifactorial confounding… 😅

- Number of controls varies from 2 to 152 → “real life” limitations 🤦

CONCLUSION / TAKE HOME MESSAGE

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- Identified 21 relevant medication errors in 7 Swiss hospitals 🏥
- Matched them with best possible controls to reduce confounding 🤓
- Average additional lengths of stay associated with medication errors: +4 days 😕
- Costs associated with studied medication errors: +30 % of total costs, mean +CHF 15’000.- 

Not spending enough to prevent medication errors is expensive!

MEDICATION SAFETY AT HIRSLANDEN
«TOGETHER WE CARE»

HIRSLANDEN
SWISS HOSPITAL GROUP














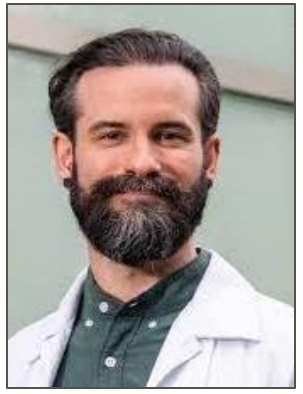

Die Hirslanden-Gruppe:

Hirslanden Klinik Aarau – Klinik Beau-Site, Bern – Klinik Permanence, Bern – Salem-Spital, Bern – Hirslanden Klinik Linde, Biel – AndreasKlinik Cham Zug – Klinik Am Rosenberg, Heiden – Clinique des Grangettes, Genf – Clinique La Colline, Genf – Clinique Bois-Cerf, Lausanne – Clinique Cecil, Lausanne – Klinik St. Anna, Luzern – Hirslanden St. Anna in Meggen, Luzern – St. Anna im Bahnhof, Luzern – Klinik Birshof, Münchenstein Basel – Klinik Stephanshorn, St.Gallen – OPERA, Bern – OPERA, St.Gallen – OPERA, Zumikon – Klinik Hirslanden, Zürich – Klinik Im Park, Zürich – Operationszentrum Bellaria, Zürich

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RESULTS
INDIVIDUAL COSTS

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Case ID	Total LOS	Total IC	Medication	Implants	Film	Ext. Services	Physician	Other
1	3	1396.6	-0.7	-60.3	-1	1845.7	-2.4	-0.1
2	5.5	4340.9	1042.9	1629.9	78.5	2022.3	165.9	-301.4
3	-1	-230.9	1180.4	-1113.4	46	-45.9	-31.5	2
4	0	479.7	50.2	473.5	5.2	0.2	0	0.5
5	0	3486.3	43.4	2871.4	-5	0.9	23.4	545.1
6	-2.5	1467.6	568.3	402.4	155.4	50.4	292.9	307.7
7	0	632.2	-9.3	495	0.1	-7.4	200	0.2
8	-3	-5330.1	3949.9	-7919.6	25	-49.2	0	-5.7
9	3	1242.7	82.3	1118.8	3.3	163.2	19.8	1.6
10	1	-143.4	196.5	-301.7	17.8	88.1	62.4	0.4
11	2.5	-27.6	100.4	-213.8	2.6	82.4	0	1
12	0	152.8	95.7	40.6	-2.6	78.8	4.2	-0.9
13	0	485.2	43.9	927.2	-2.2	-48.7	-3.9	42.8
14	7.5	1750.8	320.6	748.1	28.7	1347.6	8	-3.8
15	3	3631.3	3443.7	280.7	69.6	-1168.7	208.4	691.9
16	7	49.4	43.9	31.3	156.7	-83.3	164.3	-0.3
17	21	-254.1	748.9	-10286.6	136.9	9561.9	-2.3	-218.9
18	6	64662.6	29945.8	18450.4	74.4	17502	-409.8	-900.4
19	7.5	-5222.2	-4457.1	228.2	40.6	-29.4	-105.5	-899.1
20	13.5	1704.5	309.1	-858.7	11.4	1609.1	631.9	1.7
21	15.5	3483.1	-62.2	4117.4	83.6	607.3	-70.3	-468
Mean	4.3	3702.7	1792.2	526.7	44.0	1596.5	55.0	-57.3

RESULTS
GENERAL COSTS

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Case ID	Total GC	Admin	OR	Heart Lab	ANA	ICU	ER	Scans	Lab	Dialysis	Physici -ans	Physio	Therapies	Diagnostic	IMC	Nursing	Room	Hotel
1	-99.6	128.6	-258.4	0	-43.7	0	0	0	-2.8	0	-1.8	0	0	0	0	387.9	18.8	206.6
2	17151.7	47.2	-269.3	0	2357.5	12549	75.3	246	70.5	0	5873.7	466.2	413.9	0	0	-5015	73	746.1
3	-147.3	-0.9	392.2	0	167.8	1034.3	0	-26.7	-1.9	0	787.9	0	0	0	0	-1117.5	-14.1	-82.5
4	2079.2	34.2	438.4	0	536.2	0	0	0	0	0	-0.1	376	558.3	0	0	252.9	17.9	21.7
5	25.3	0	0	141.9	0	0	0	0	-1	0	0	0	0	0	0	-10.6	-24.9	-83
6	17830.4	0	0	0	0	0	-33.1	107.9	60.6	0	-206.5	-85.6	0	0	0	18529.7	-90.2	-229.8
7	1488.7	6.7	460.4	0	728.8	0	0	0	0	0	81.1	0	0	0	0	85.1	9.6	53.9
8	-6344.3	9.8	-3298.6	0	494.2	0	0	-4.8	0	0	0	-101.7	0	0	0	-1937.4	-66.4	-776.8
9	3542.8	5.6	1701.7	0	858.3	0	0	33.2	0	0	0	0	0	0	0	747.5	53.8	278.5
10	5649.1	-11.2	656.6	0	421.2	2596.3	0	121.9	3.09	0	1529.8	75.3	0	0	0	48.5	0	132.8
11	1656.2	-6.9	93.9	0	380.4	0	0	0	4.1	0	24.8	-138.4	0	0	0	1275.9	19.3	3.3
12	-388.1	0	-95.5	0	101.7	0	0	0	2.9	0	3	207.8	327.1	0	0	-617.9	-8.7	3.8
13	1333.9	-28.3	689.2	0	961.4	0	-133.4	-48.6	0	0	-252.1	0	0	0	0	697	-7.8	-6
14	34263.7	1171.9	0	0	0	2600.6	-188.5	836.2	-37.8	0	7289.8	-146.6	0	0	0	20356.2	350.6	1481.4
15	14791.7	128.6	-258.4	0	104.9	758.4	320.1	334.9	14.3	0	7712.7	-65	739.3	0	0	947	-0.7	396
16	3107.3	4.1	0	0	0	0	-13	109.6	233.2	0	-14.4	0	0	0	0	4804.9	217.4	585.7
17	34135.4	0	-11548	-671.4	-6143.8	6524	0	1449	0	6719.5	1473	2853.2	2358.8	-1134	0	29130.9	552.5	2515.6
18	39954.9	-139.9	5779.5	668.6	4209.8	-11647.4	-912.4	-47.3	519.3	0	-8782.7	329.1	5759.3	0	0	44415.5	109.9	822
19	125.5	0	0	0	295.7	7920.1	364.6	244.4	-21.9	0	1193.2	0	0	0	0	-10778.7	178.6	684.6
20	12206.1	-354.3	-293.7	0	186.9	2820.1	0	1967.3	0.4	0	1723.7	48.6	783.5	0	0	2869.8	270.8	1853
21	49779.3	-17.1	221.6	0	704.6	1730.1	-479.6	-371.1	25.3	0	-826.5	-670.1	756.5	0	-4026	51956	204.2	1232.1
Mean	11054.4	46.6	-266.1	6.6	301.0	1280.3	-47.6	235.8	41.3	320.0	838.5	149.9	557.0	-54.0	-191.7	7477.5	88.7	468.5