

3M Health Information Systems

## Quality of care: Benchmark (BM) between Swiss and German hospitals using Risk of Mortality (ROM)



Marc Berlinguet, MD, MPH, International Medical Manager

PCS Switzerland, November 22, 2007



# Why Risk adjustment of Mortality?

*„Since more specialized hospitals may treat more high-risk patients and some patients arrive at hospitals sicker than others, it is difficult to compare hospital mortality and utilization rates for patients with the same condition but a different health status. In order to compensate for this potential difference in hospital case mix, the international standard for risk adjustment, developed by 3M Corporation, was employed to risk-adjust the data.*

*This was done to ensure that a hospital's final score reflected the performance grading that the hospital would have received if it had provided services to patients with the average mix of medical complications.“*

The Fraser Institute / Hospital Report Card: Ontario, September 2006  
- [www.fraser.org](http://www.fraser.org)

# Typical Mortality Benchmarking (Helios Clinic Group in Germany)

Qualitätskennzahlen	Zaehler	Nenner	Indikator	Erwartungswert
QI-A 01.01 - Todesfälle bei Hauptdiagnose Herzinfarkt	146	1488	9.81%	8.97%
QI-A 01.02 - Todesfälle bei Hauptdiagnose Herzinfarkt, Alter kleiner 45 Jahre	4	80	5.00%	2.60%
QI-A 01.03 - Todesfälle bei Hauptdiagnose Herzinfarkt, Alter 45 bis 64 Jahre	27	550	4.91%	4.25%
QI-A 01.04 - Todesfälle bei Hauptdiagnose Herzinfarkt, Alter 65 bis 84 Jahre	95	781	12.16%	11.08%
QI-A 01.05 - Todesfälle bei Hauptdiagnose Herzinfarkt, Alter größer 84 Jahre	20	77	25.97%	27.99%

# 3M™ APR DRG and ROM

([http://www.3m.com/us/healthcare/his/products/coding/refined\\_drg.jhtml](http://www.3m.com/us/healthcare/his/products/coding/refined_drg.jhtml)),

## 3M™ APR DRG Definitions

### 3M™ APR DRGs:

An 18 step classification system to group codes into subclasses for Severity of Illness and Risk of Mortality

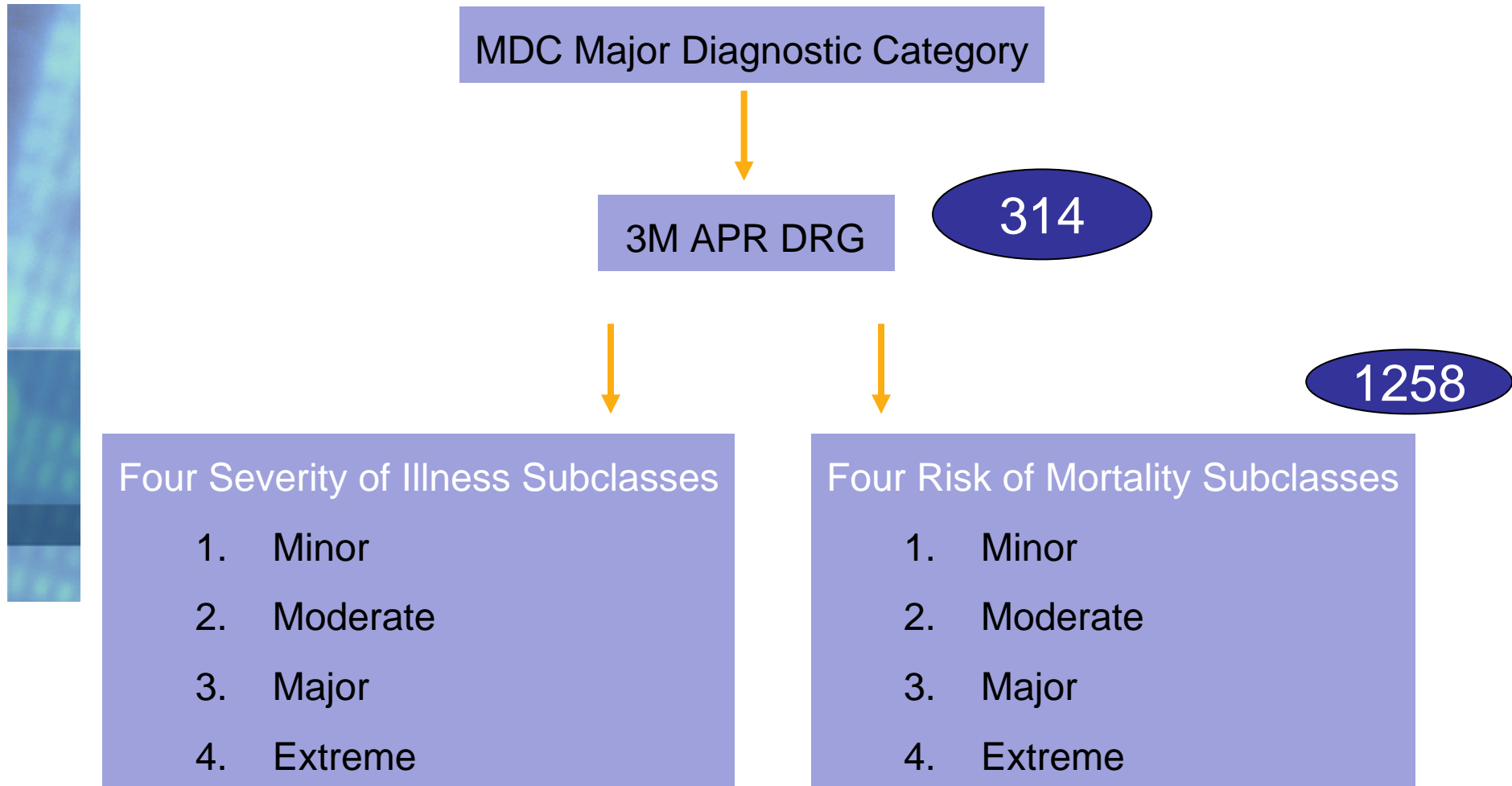
- ***Severity of Illness (SOI)***: The extent of physiologic decompensation or organ system loss of function. In order to calculate resource Intensity equivalent to PCCL level of G-DRGs
- ***Risk of Mortality (ROM)***: The likelihood of dying
- ***Resource Intensity***: The relative volume and types of diagnostic, therapeutic and bed services used in the management of a particular disease

## Underlying Principle of 3M™ APR DRGs

**Severity of illness and risk of mortality are dependent on the patient's underlying problem.**

**High Severity of Illness and Risk of Mortality are characterized by multiple serious diseases and the interaction among those diseases.**

# 3M™ APR DRG Classification Data Elements



**Pre-phase**

Assign APR-DRG



**Phase I**

ROM level of each 2<sup>ary</sup> Diagnosis



**Phase II**

Determine Base ROM Subclass



**Phase III**

Determine the Final Risk of Mortality Subclass

Modify Patient ROM Subclass based on the Presence of Specific Combinations of:

- Principal Diagnosis and APR-DRG
- Principal Diagnosis and Age
- APR DRG and non-OR Procedure
- APR DRG and OR Procedures
- Categories of Secondary Diagnoses



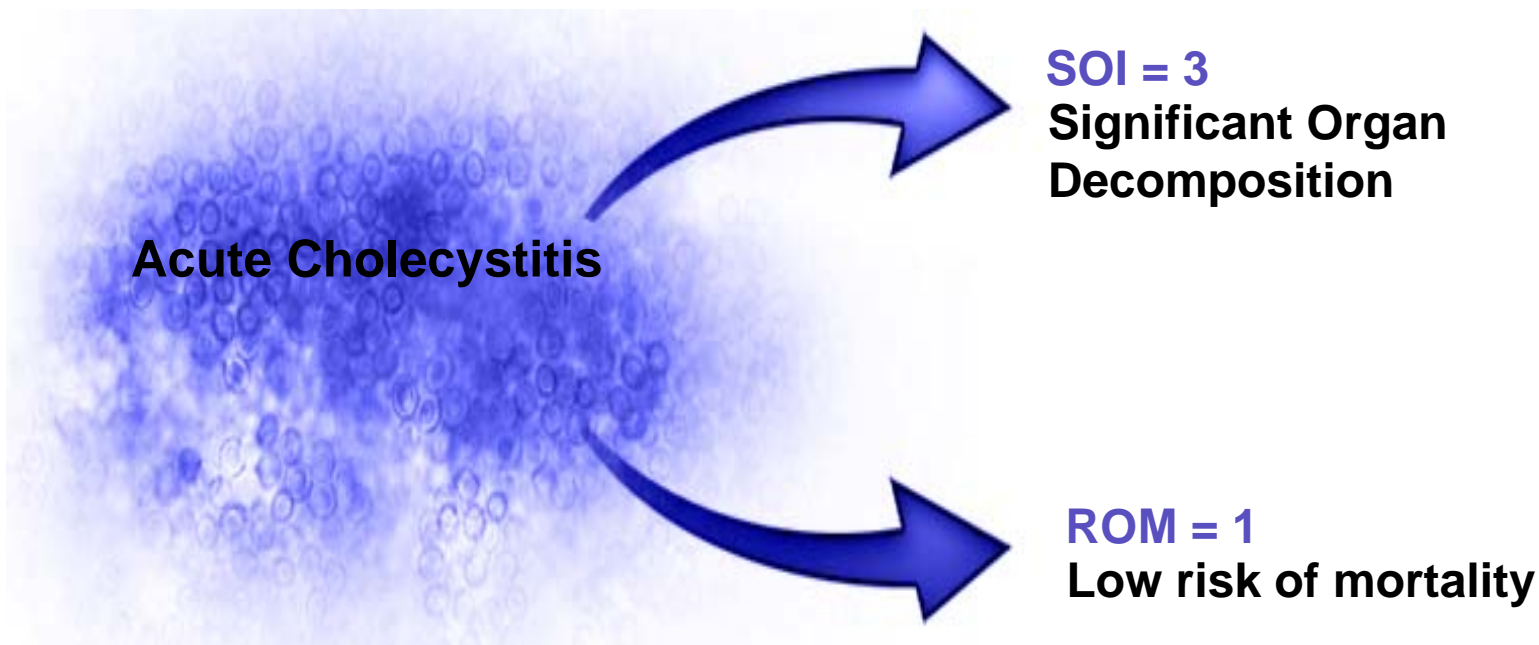
Compute the Final Patient ROM based on Phase II Base ROM Subclass and Phase III modifications of ROM Subclasses

# Examples of Standard Risk of Mortality (SMR) Progression of Subclasses


Risk of Mortality		Secondary diagnosis Cardiac dysrhythmia
1	Minor	Premature beats (427.60)
2	Moderate	Sinoatrial node Dysfunction (427.81)
3	Major	Paroxysmal ventricular Tachycardia (427.1)
4	Severe	Ventricular fibrillation (427.41)

## SOI and ROM are Independent

The severity of illness and risk of mortality subclass are calculated separately and may be different from each other.



## ROM Project Hypotheses

- 
- ROM is a valuable risk adjuster for mortality
  - Results can be obtained using administrative routine data
  - Problems in documentation and coding and/or potential quality problems can be identified
  - Academic hospitals treat more complex patients

# ROM Project in Switzerland

- Pooling of 2004 and 2005 year discharges in Swiss sample (and pooling of 2006 discharges in BM) and removing cases with Error APR DRGs 955 and 956
- 3M German Benchmark retained BM for current comparisons:
  - Benchmark = 3.177.206 inpatient discharges
  - Swiss sample = 65 855 inpatient discharges

## ROM Project Methods

- Evaluate sample results compared with Benchmark
- Evaluate the cases with death in ROM subclasses 1 and 2 and higher SMR :
  - Problem of documentation?
  - Problem of coding?
  - Potential quality problem?
  - Other reasons (e.g. special situations in treatment, palliative care etc.)
- Evaluate the cases with death in ROM subclasses 1 thru 4 using Indirect standardization (ROM Standardized Mortality Ratio)

# ROM Swiss sample and BM distribution of cases and mortality

BM = German cases,  
Hos= Swiss cases

<b>CntBM</b>	<b>CntHos</b>	<b>diedBM</b>	<b>diedHos</b>	<b>sumExpt</b>	<b>pctDiedBM</b>	<b>pctDiedHos</b>	<b>ratio raw</b>	<b>SMR</b>
3 177 206	65 855	71 143	1 673	1 700	2,2%	2,5%	1,135	0,984
<b>CntBM</b>	<b>CntHos</b>	<b>diedBM</b>	<b>diedHos</b>	<b>sumExpt</b>	<b>pctDiedBM</b>	<b>pctDiedHos</b>	<b>ratio raw</b>	<b>SMR</b>
2 000 905	37 274	54 338	1 237	1 200	2,7%	3,3%	1,222	1,031
1 176 301	28 581	16 805	436	500	1,4%	1,5%	1,068	0,873

# ROM Distribution and Mortality ratios (Note: not SMR but adjusted mortality ratio by ROM subclass here) Medical (M)/Surgical (S) partitions. Swiss and BM data

part	ROM	CntBM	CntHos	diedBM	diedHos	sumExpt	pctDiedBM	pctDiedHos	ratio raw	SMR
M	1	1,314,665	25,109	3,304	133	64	0.3%	0.5%	2.108	2.080
M	2	454,619	7,473	14,775	322	258	3.2%	4.3%	1.326	1.248
M	3	198,082	3,536	22,388	422	421	11.3%	11.9%	1.056	1.003
M	4	33,539	1,156	13,871	360	458	41.4%	31.1%	0.753	0.786
part	ROM	CntBM	CntHos	diedBM	diedHos	sumExpt	pctDiedBM	pctDiedHos	ratio raw	SMR
S	1	921,852	22,027	633	41	28	0.1%	0.2%	2.711	1.440
S	2	170,255	4,168	2,535	90	63	1.5%	2.2%	1.450	1.420
S	3	64,041	1,656	6,088	129	138	9.5%	7.8%	0.819	0.932
S	4	20,153	730	7,549	176	269	37.5%	24.1%	0.644	0.654

## ROM Standardized Mortality Ratios of Swiss sample using German hospitals reference, 2004-2005

SMR	Medical DRGs	Surgical DRGs
More than 2,0	36	13
More than 1,5	47 (28 with more than 5 deaths)	23 (10 with more than 3 deaths)
More than 1,0	78	35
<i>Number of DRGs with 25 deaths or more</i>	16	

# 13 Surgical DRGs in Swiss sample with ROM SMR >2,00

CntBM	CntHos	diedBM	diedHos	sumExpt	pctDiedBM	pctDiedHos	ratio raw	SMR
21 566	204	25	2	0	0,1%	1,0%	8,457	14,580
8 656	109	8	2	0	0,1%	1,8%	19,853	12,465
38	23	1	3	0	2,6%	13,0%	4,957	9,500
30 669	368	62	4	1	0,2%	1,1%	5,377	4,768
743	50	6	1	0	0,8%	2,0%	2,477	3,871
128	13	10	2	1	7,8%	15,4%	1,969	3,176
6 783	126	44	3	1	0,6%	2,4%	3,670	3,079
592	44	80	10	3	13,5%	22,7%	1,682	3,049
19 556	573	28	1	0	0,1%	0,2%	1,219	2,832
464	102	1	1	0	0,2%	1,0%	4,549	2,500
28 877	458	43	1	0	0,1%	0,2%	1,466	2,439
3 409	92	30	2	1	0,9%	2,2%	2,470	2,160
17 401	98	225	4	2	1,3%	4,1%	3,157	2,056

## Example of ROM results for APR DRG 911 Extensive abdominal procedures, All Discharges, Swiss sample vs German Benchmark

pctCntBM	pcdCntHos	ROM	CntBM	CntHos	diedBM	diedHos	pctDiedBM	pctDiedHos	ratio died
9.1%	43.2%	1	54	19	4	6	7.4%	31.6%	4.26
23.5%	29.5%	2	139	13	2	0	1.4%	0.0%	0.00
34.8%	20.5%	3	206	9	19	2	9.2%	22.2%	2.41
32.6%	6.8%	4	193	3	55	2	28.5%	66.7%	2.34
100.0%	100.0%	subtotal	592	44	80	10	13.5%	22.7%	1.68
32.6%	72.7%	un1_2	193	32	6	6	3.1%	18.8%	6.03

Example of ROM results  
for APR DRG 911 Extensive abdominal procedures,  
All discharges, Swiss sample vs German Benchmark

ROM	ntMaleB	ntMaleHos	FemaleB	FemaleHos	avgAgeBM	avgAgeHos	avgAgeMBM	avgAgeMHos	vgAgeFBM	vgAgeFHo
1	40	17	14	2	34.0	32.8	33.1	33.1	36.7	30.5
2	102	10	37	3	39.7	29.7	37.9	27.7	44.6	36.3
3	136	6	70	3	42.2	43.2	42.2	50.0	42.1	29.7
4	139	2	54	1	46.4	78.3	45.1	82.5	49.7	70.0
subtotal	417	35	175	9	42.2	37.1	41.2	37.3	44.6	36.6
un1_2	142	27	51	5	38.1	31.5	36.5	31.1	42.5	34.0

Example of ROM results  
for APR DRG 911 Extensive abdominal procedures,  
Deaths , Swiss sample vs German Benchmark,

ROM	ntDMaleEnt	ntDMaleH	DFemale	Fema	avgAgeDBM	avgAgeDhos	avgAgeDMBM	avgAgeDMhos	avgAgeDFBM	avgAgeDFhd
1	3	6	1	0	38.0	38.3	27.7	38.3	69.0	
2	1	0	1	0	71.5		58.0		85.0	
3	14	1	5	1	42.4	61.0	45.1	83.0	34.8	39.0
4	38	2	17	0	51.1	82.5	51.2	82.5	50.9	
subtotal	56	9	24	1	48.9	51.7	48.5	53.1	49.7	39.0
un1_2	4	6	2	0	49.2	38.3	35.3	38.3	77.0	

Example of ROM results  
for APR DRG 911 Extensive abdominal procedures,  
Swiss sample vs German Benchmark (Cont'd)

ROM	LOS <sub>BM</sub>	LOS <sub>Hos</sub>	avgSDx <sub>BM</sub>	avgSDx <sub>Hos</sub>	avgPr <sub>BM</sub>	avgPr <sub>Hos</sub>	CMI_ <sub>APRBM</sub>	CMI_ <sub>APRhos</sub>
1	19.74	15.32	9.5	9.5	12.5	6.5	4.696	2.679
2	21.32	30.85	11.0	12.5	15.4	7.5	6.452	4.674
3	35.18	34.33	16.9	14.2	22.6	10.0	8.111	7.271
4	27.64	31.00	20.7	16.7	22.9	13.0	8.416	8.416
subtotal	28.06	24.86	16.1	11.8	20.1	8.0	7.509	4.599
un1_2	20.88	21.63	10.6	10.7	14.6	6.9	5.961	3.489


# ROM Project Strategy of Recoding and Chart Review

## Step 1:

- Cases with death in ROM subclasses 1 and 2
- Exclusions:
  - Age > 85 years
  - Cases in trauma DRG groups
  - Medical DRG groups with cancer and immuno-suppression
  - Surgical patients with principal diagnosis of malignant neoplasm
  - Patients without specific treatment in the final stage of their disease (Equivalent for DNR – Do not resuscitate)


# ROM Project with Swiss sample

## Conclusion (1)

- 
- ROM is applicable in Switzerland and can be used based on the Swiss classifications ICD-10 and CHOP
  - Results can be obtained using administrative routine data
  - Some crude mortality rates and ROM Standardized mortality rates (SMR) in Swiss sample are significantly different than in the Benchmark with German hosp.

# ROM Project

## Conclusion (2)

- 
- Problems in documentation and coding and/or potential quality problems can be further identified
  - After more in depth validation, ROM may become a valuable and valid indicator for risk adjustment of mortality
  - Results are immediately available for internal quality management

## Outlook of ROM Project in Switzerland

### Multi-center Evaluation of 3M ROM-adjusted Mortality :

- A more specific Benchmark with **more** data from Swiss hospitals
  - Creation of a Swiss **Quality** Benchmark
  - Recoding and chart review of sample from high SMR DRGs and all ROM 1 and 2 with deaths
  - Focussed Quality of care review



**Thank you for your attention!**

Danke!

Merci!