



ZheeChong Koh
Singapore



Data Analytics & Portfolio Management for Medical Insurance

ZheeChong Koh, FSA, MAAA
Medical Product Actuary, Asia
Swiss Reinsurance Company Limited

Waves of Reforms...Oceans of Opportunities

2013 AGFA & 15th Global Conference of Actuaries

17th – 19th Feb, 2013 | Mumbai,
India

Context

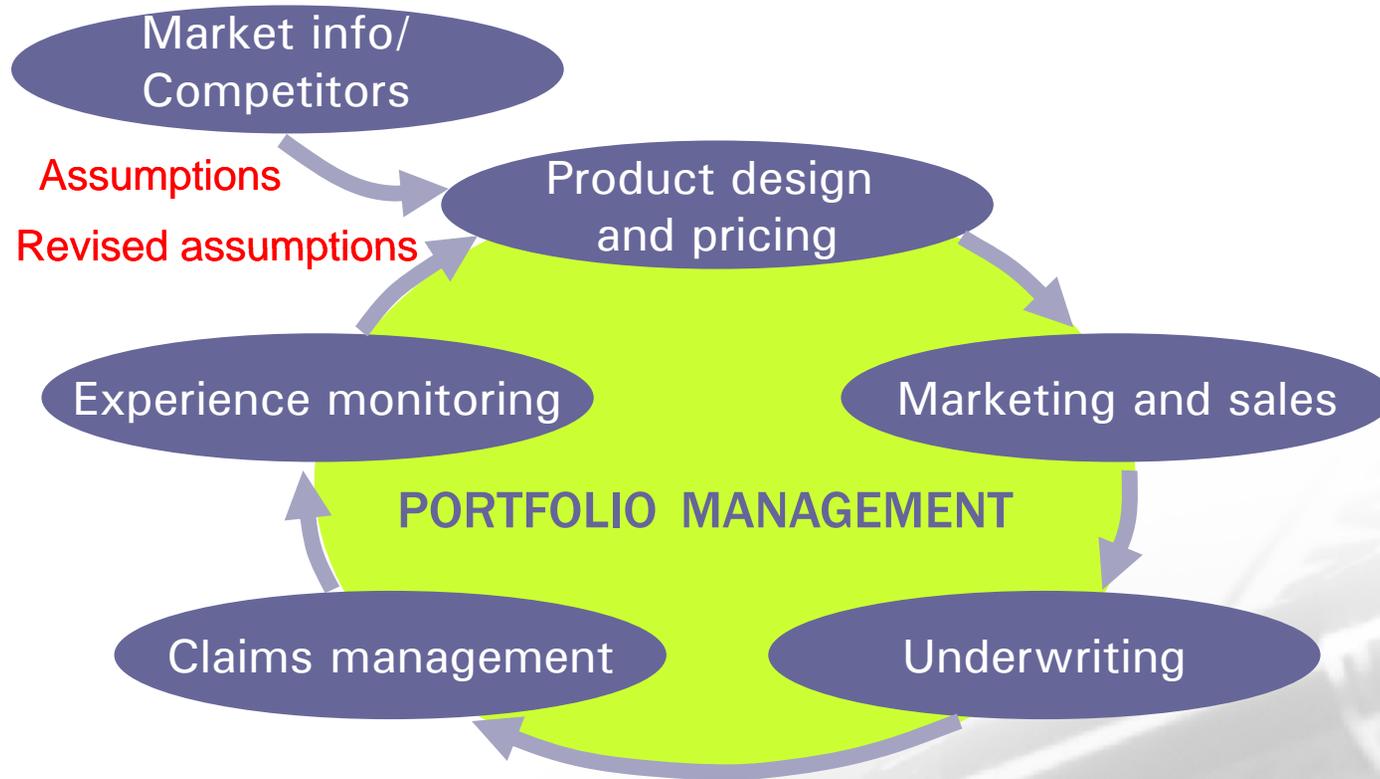
- "We have sold tons of medical insurance policies, and have built a sizable medical portfolio, now what?"
- Answer:
 - Monitor
 - Analyze
 - Investigate
 - Action
- Essentially portfolio management, through data reporting and analytics.
- Agenda for today:
 - Discuss key elements for each of the 4 steps above
 - Sample reports: Management, Claims, Actuarial
 - Market practice vs. best practice



Challenges to Medical Insurance in Asia

- Quantity & quality of data (limited, non credible)
- Cross-subsidization very common – young vs. old, life vs. health, individual vs. group, new business vs. in-force
- Inability to increase premiums as truly needed, due to competition
- Guaranteed premiums prevent the insurers from re-rating on demand
- Lack of "managed" care
- Large loss occurrences in small portfolio
- Low awareness and high anti-selection
- Moral hazards (frauds and abuses)
- Low disclosure rates
- Underwriting cycles occur and unpredictable underwriting gains/losses
- **Active portfolio monitoring of emerging trend not a practice norm**

Actuarial Control Cycle



Experience Monitoring

- Why monitor experience?
 - to measure actual results against expected
 - to act as an early warning mechanism
 - to highlight areas for concern and improvement
 - to assist in management reporting
 - to help in decision making
 - to determine profit by category (age/gender/occupation/benefit level)
 - to assess rate adequacy
 - to assist in future pricing and product design...refine best estimates



What to monitor?

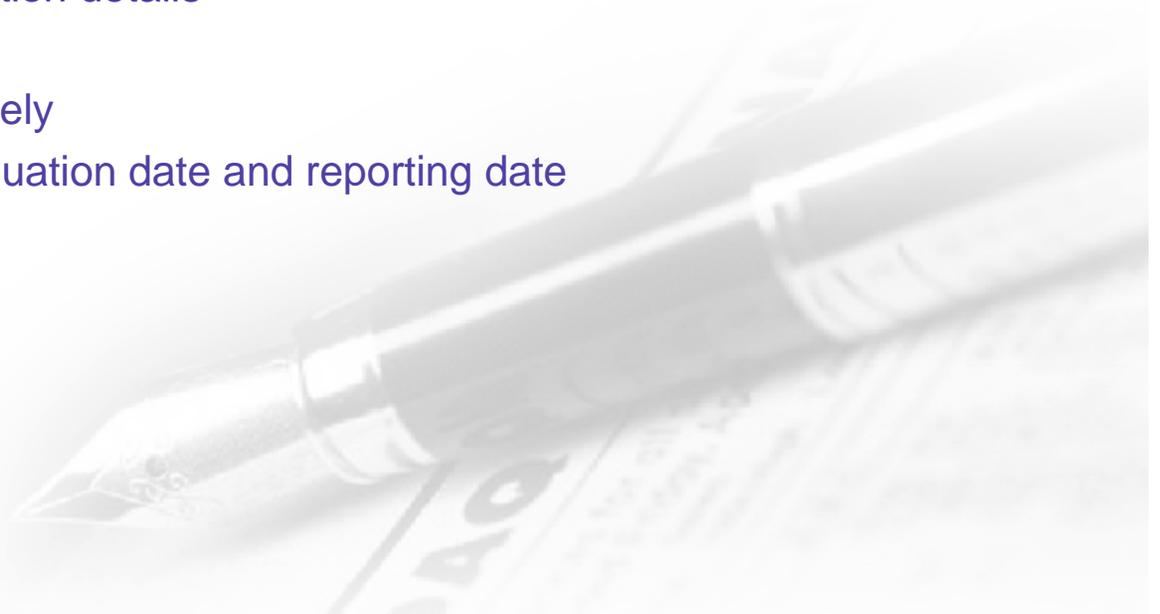
- Exposure (know your sales performance and customers!)
 - No. of lives
 - No. of live-years
 - No. of group
 - No. of policy
 - Distribution by demographics (age/gender)
 - Distribution by socioeconomic class
 - Distribution by geography
 - Distribution by group size
 - Renewal pattern by Month
 - by Calendar Year
 - by UW Year
- Premium (who pays you, how much, where?)
 - Written premium ("Sales")
 - Earned premium
 - Variance analysis vs Plan/Budget
 - Gross vs Net
 - by Product Type
 - by Plan Level
 - by Month
 - by Quarter
 - by Calendar year
 - by UW year

What to monitor?

- Claim (Who are you paying, how much, why, where?)
 - No. of claim
 - No. of admission (hospitalization)
 - Length of stay
 - Amount of settled claim
 - Amount of pended claim
 - Quality of claim (TAT, payment accuracy)
 - by Product Type / Plan Level
 - by Month / Quarter / Calendar year / UW year
 - by Age & Gender, Geography (the common rating factors for medical insurance)
 - by MSP (hospital / clinic / physician)
 - by Diagnosis / Procedures (i.e. ICD-10 at different level, Schedule 13)
 - by Benefit item (at different hierarchy)

Considerations in Monitoring Framework

- Frequency of reports: monthly, quarterly, semi-annually, annually?
- Responsibilities: Actuarial, Claims, Underwriting, IT, Marketing?
- Target recipients of reports
- Implications on business decisions based on reports findings
- Challenges faced:
 - Limited IT system capabilities
 - Inconsistent diagnosis/procedures coding practice by providers
 - Missing pharmacy/medication details
 - Missing COB details
 - Metrics reported inaccurately
 - Long lag time between valuation date and reporting date



Data Analytics – General Principles

Five general rules to data analytics:

- Data driven decision making
- Go where the money is
- Start at the top and drill down
- Convert analytics into opportunities via a plan
- Take action, monitor impact and feed back into plan

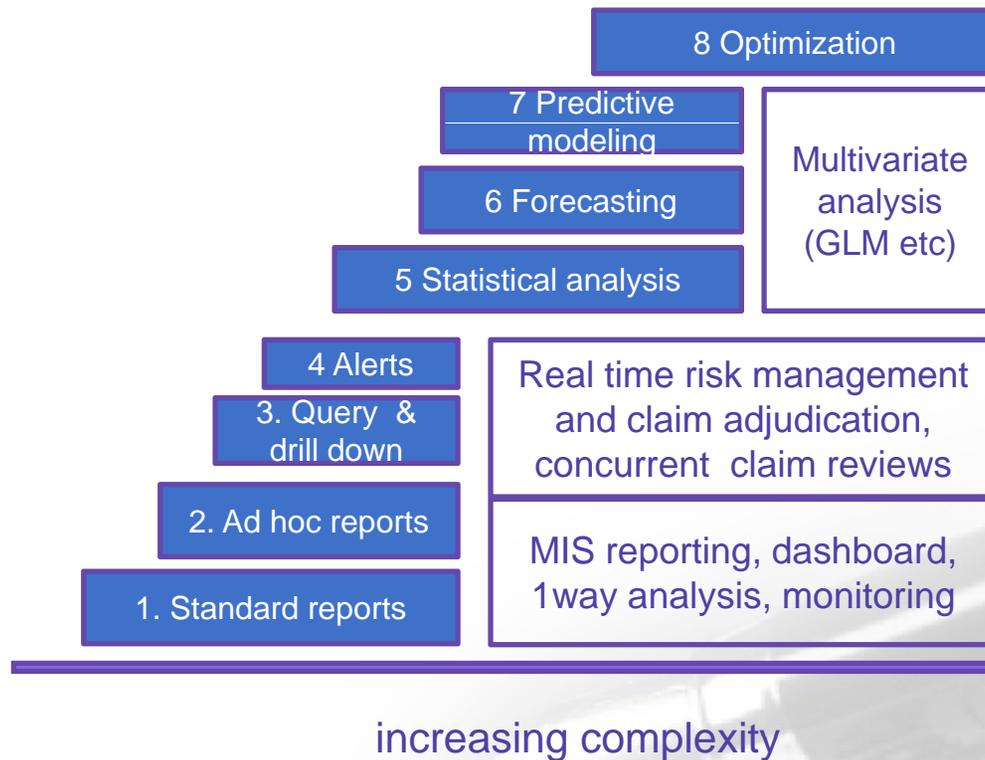
Three general tenets

- Parkinson's law: Most people spend way too much time on trivial things
- Pareto's 80/20 law: 80% of problems caused by 20% of insured lives
- 1st law of cybernetics: The more responses you have available in the system the more likely it will survive

Types of Analysis

"Eight levels" of analytics

increasing in value to a company



Reporting – Management, Claim, Actuarial

3 Broad Categories of Reports – Management, Claim, Actuarial

- Management reports

- High level, aggregate premium vs. claim amount
- By month/quarter
- Variance analysis against plan

- Claim reports:

- Chronic disease summary (DM opportunities assessment)
- Top 50 – 100 most expensive claimants (catastrophic cases, CM opportunities assessment)
- Length of Stays Summary (focus on very short and very long stays)
- Top providers/specialties (assess concentration of type of services, or specific doctor/hospital/clinic)
- Readmission Summary
- Fraud and abuse reports (e.g. procedures not aligning with diagnosis/condition, high medication cost without OP and/or IP visit, high admission/readmission rates, MSP consistently charging over UCR level, etc)
- Ancillary services analysis (by provider/location/condition)

Reporting – Management, Claim, Actuarial

3 Broad Categories of Reports – Management, Claim, Actuarial

•Actuarial reports

- Loss ratios by age/gender/plan level (to assess rate adequacy by rating cells, any cross subsidization)
- Claims PMPY/Loss Ratio by deductible/co-insurance/copay level
- Actuarial cost report (high level metrics by major service category (IP, OP, PH, Rx) and minor service category (surgical, medical, ER, etc.), compares against benchmark and historical experience if available)
- Duration study (to assess durational impact, indication of potential anti-selection or inadequate underwriting guidelines)
- Claims PMPY by benefit type (understand under/over utilization and assess adequacy of assumptions used during pricing)
- Loss ratios by group sizes/industry/location for group business (to assess renewal/manual rate quotation process)

Sample Reports

Inpatient Top Cost Drivers

ID(top 25)	Settled Amount	Total Settled Amount
	35839.98	548,267.06
	23453.27	% of Top 25
	23064.75	49.30%
	16345.91	Total Claimants
	15118.34	234
	15001.47	
	12814.73	
	10785.21	
	10623.90	
	10616.15	
	8929.70	
	8798.85	
	8376.53	
	8264.39	
	7202.96	
	6482.65	
	6277.88	
	6025.75	
	5922.26	
	5624.11	
	5477.04	
	5038.13	
	4894.33	
	4722.47	
	4609.33	
Total	270310.09	

Findings/Recommendations

The top 25 members account for almost 49.3% of total inpatient settled costs.

10 members cost in excess of 10,000 RMB. These 10 members in aggregate account for approximately 31.67% of the total inpatient spend.

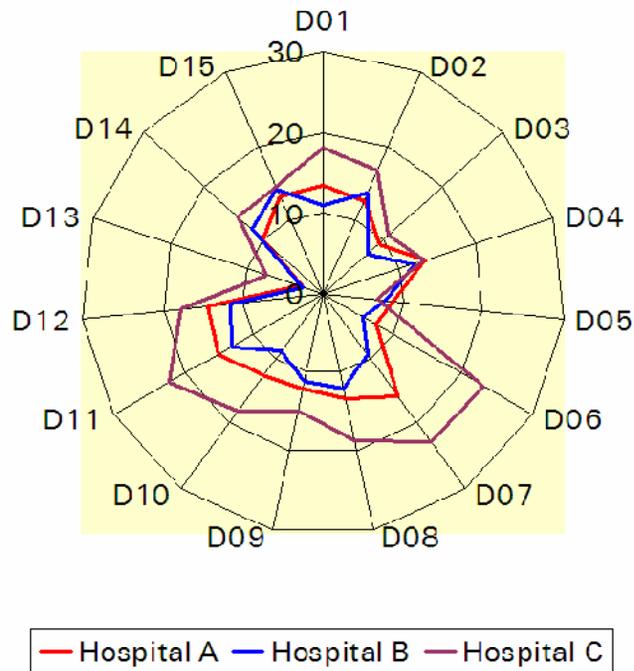
A small number of members account for a disproportionate amount of costs. Early identification of these members and potential case management may help reduce these costs.

Sample Reports

Pharmacy Spend By Individual Physician Hospital X

Department	Dr's Name	Number of Bill	Total Amount	Avg per Bill	STD	CV
ENT	Dr.Zhao	503	40,547.73	80.61	152.40	1.89
Obstetrics and Gynecology Department	Dr.Li	323	20,219.91	62.60	69.27	1.11
Stomatology Department	Dr.Zhang	75	1,218.43	16.25	12.50	0.77
	Dr.Zhu	135	2,039.07	15.10	14.61	0.97
	Dr.Wang	14	400.06	28.58	17.54	0.61
OPD of Physical Therapy	Dr.Jin	183	20,097.69	109.82	99.16	0.90
OPD of Internal Medicine	Dr.Dai	763	38,805.59	50.86	65.47	1.29
	Dr.Huang	1617	243,805.69	150.78	156.45	1.04
	Dr.Liu	2874	269,406.66	93.74	112.37	1.20
	Dr.Ren	2794	251,508.96	90.02	112.04	1.24
	Dr.Yu	3355	343,839.82	102.49	133.08	1.30
Dermatology Department	Dr.Hua	2002	169,194.62	84.51	108.40	1.28
	Dr.Dong	512	22,413.91	43.78	65.71	1.50
Community Service Department	Dr.Zhen	712	124,528.46	174.90	233.02	1.33
	Dr.Su	7	571.79	81.68	68.46	0.84
	Dr.Qiao	442	73,831.16	167.04	212.71	1.27
OPD of Surgery	Dr.Ma	1239	101,997.28	82.32	92.39	1.12
OPD of Psychology Service	Dr.Yang	6	683.50	113.92	96.39	0.85
Traditional Chinese Department	Dr.Kui	4126	451,540.52	109.44	108.25	0.99
	Dr.Xian	3097	343,231.56	110.83	100.44	0.91

Sample Reports



Example: Inpatient only product

Status Quo
1500 admits/year

Hospital A	500 *	10,000/stay	= 5,000,000
Hospital B	500 *	8,500/stay	= 4,250,000
Hospital C	500 *	12,500/stay	= 6,250,000
Total inpatient costs:			15,500,000

Assuming 50% redirection:

Hospital A	250 *	10,000/stay	= 2,500,000
Hospital B	1000 *	8,500/stay	= 8,500,000
Hospital C	250 *	12,500/stay	= 3,125,000
Total inpatient costs:			14,125,000

Sample Reports

Inpatient Cost – Drill Down

ICD Code ICD 代码	ICD Description ICD 描述	Count of claims 理赔案件数	% of Count 百分比	Value of Claims('000) 医疗费用金额	% of Value 百分比	Avg Value / Claims('000) 平均案件金额
I25	Chronic ischemic heart disease 慢性缺血性心脏病	85	11.52	1,822.19	11.91	21.44
Z98	Other post surgical states 其他手术后状态	46	6.23	1,102.34	7.20	23.96
C34	Malignant neoplasm of bronchus and lung 支气管和肺恶性肿瘤	29	3.93	975.66	6.37	33.64
N18	Chronic renal failure 未特指的肾衰竭	15	2.03	615.95	4.02	41.06
C83	Diffuse non-Hodgkin's lymphoma 弥漫性非霍奇金淋巴瘤	2	0.27	554.53	3.62	277.27
I63	Cerebral infarction 脑梗死	40	5.42	547.12	3.57	13.68
C18	Malignant neoplasm of colon 结肠恶性肿瘤	13	1.76	534.97	3.50	41.15
I71	Aortic aneurysm and dissection 主动脉瘤和主动脉壁夹层形成	4	0.54	389.00	2.54	97.25
I61	Intracerebral haemorrhage 脑内出血	6	0.81	386.22	2.52	64.37
C84	Peripheral T-cell lymphoma 周围和皮的T细胞淋巴瘤	2	0.27	265.76	1.74	132.88
J18	Pneumonia, organism unspecified 肺炎, 病原体未特指	11	1.49	231.59	1.51	21.05
C15	Malignant neoplasm of oesophagus 食管恶性肿瘤	5	0.68	221.26	1.45	44.25
C50	Malignant neoplasm of breast 乳房恶性肿瘤	11	1.49	220.12	1.44	20.01
J96	Respiratory failure, not elsewhere classified 呼吸衰竭, 不可归类在他处者	3	0.41	214.09	1.40	71.36
H25	Senile cataract 老年性白内障	26	3.52	193.33	1.26	7.44
Others 其他		440	59.62	7,031.22	45.94	15.98
Total: 总和		738	100.00%	15,305.36	100.00%	20.74

What does this tell us?

- Chronic heart disease should be an area of focus
- High cost claims may not contribute significantly to PMPM costs
- Cataracts are an OP procedure in many markets; opportunity?

Actions to consider

- Costs by hospital
- Disease management programs
- Case management
- Obtain benchmark information

Sample Reports

Item wise Breakup of Claim Expenses-OP and SOP

Account Head 单项	Incurred Amount 发生金额	% Value 占比	SHI Paid Amount 社保赔付	% Value 占比	Outside SHI Scope 社保范围外	% Value 占比	Policy Disallowance 保障范围外	% Value 占比
Aggregate 分割单	900,663.21	4.30%	610,267.48	17.10%	22,162.34	2.53%	3,900.00	0.41%
Ambulance 救护车	10,034.00	0.05%	.00	0.00%	5,714.00	0.65%	4,175.00	0.44%
Consumables 材料费	71,753.42	0.34%	18,720.13	0.52%	4,531.84	0.52%	4,411.59	0.46%
Doctors 医师费	302,052.74	1.44%	18,760.08	0.53%	78,871.20	9.00%	640.70	0.07%
Drugs 药费	16,027,122.84	76.48%						
ICU 重症监护费	396.40	0.00%	.00	0.00%	20.00	0.00%	.00	0.00%
Key Investigations 检查费	307,786.06	1.47%	12,387.27	0.35%	20,090.65	2.29%	12,985.81	1.35%
Lab Tests 实验室检查	762,521.93	3.64%	61,098.08	1.71%	27,139.19	3.10%	60,823.29	6.34%
Nursing 护理费	634.33	0.00%	16.20	0.00%	32.20	0.00%	14.50	0.00%
Other Costs 其他费用	143,147.05	0.68%	5,788.98	0.16%	74,374.03	8.48%	9,072.89	0.95%
Other Radiology Investigations 放射检查费	623,475.79	2.98%	28,526.98	0.80%	81,554.54	9.30%	47,258.96	4.93%
Package Costs 手术套餐费	3,522.80	0.02%	799.02	0.02%	.00	0.00%	.00	0.00%
Physiotherapy 理疗费	126.00	0.00%	.00	0.00%	.00	0.00%	.00	0.00%
Prostheses 假体费	943.86	0.00%	.00	0.00%	46.76	0.01%	198.25	0.02%
Room and Board 床位费	24,136.65	0.12%	86.40	0.00%	233.48	0.03%	1,646.50	0.17%
Surgeons Costs 手术费	118,156.40	0.56%	.00	0.00%	3,259.70	0.37%	5,267.47	0.55%
Therapeutic or Diagnostic Procedures 诊疗费	1,644,304.04	7.85%	487,854.04	13.67%	102,320.94	11.67%	82,546.88	8.61%
Theatre Costs 手术室费	16,207.60	0.08%	371.45	0.01%	1,153.00	0.13%	3,247.50	0.34%
Total: 总和	20,956,985.12	100.00%	3,569,125.04	100.00%	876,630.36	100.00%	958,658.83	100.00%

Outpatient Cost – Drill Down

52% is national comparison.

What are the Actions?

- Revise pricing assumptions
- Redesign product/benefit
- Tighten policy wording
- Tighten UW practices
- Recognize "good" policyholders - Reward them to enhance loyalty (persistency ratio), e.g. premium holiday
- Recognize "bad" policyholders - Necessitate proper rating, introduce case/disease management
- Improve claims management (see next few slides)



Action: Managing Medical Expense



		Pre-authorization Pre-certification	
		Case Management	
		MSP network and network management	
		MSP profiling	
		Claim adjudication system and protocols	
	Disease management		
Prevention and Wellness programs			
		On-site clinics/gatekeeper	
		Medical advise/Nursing hotline	
		Second Opinion Programs	
	Predictive modelling		
		Pharmacy benefit management	
		Contracting/Pricing methodologies	
Underwriting			
Product Design			
Data Analytics			

Action: Demand, Utilization Management

- **Demand Management**
 - To influence future demand of medical care
 - Provide access to preventive services
 - Operate at convenient hours
 - Disseminate advice manuals for home use
 - 24/7 nurse advice lines

- **Utilization Management**
 - Prospective utilization review (PUR)
 - Concurrent utilization review (CUR)
 - Retrospective utilization review (RUR)
 - Drug utilization review (DUR)



Action: Case Management

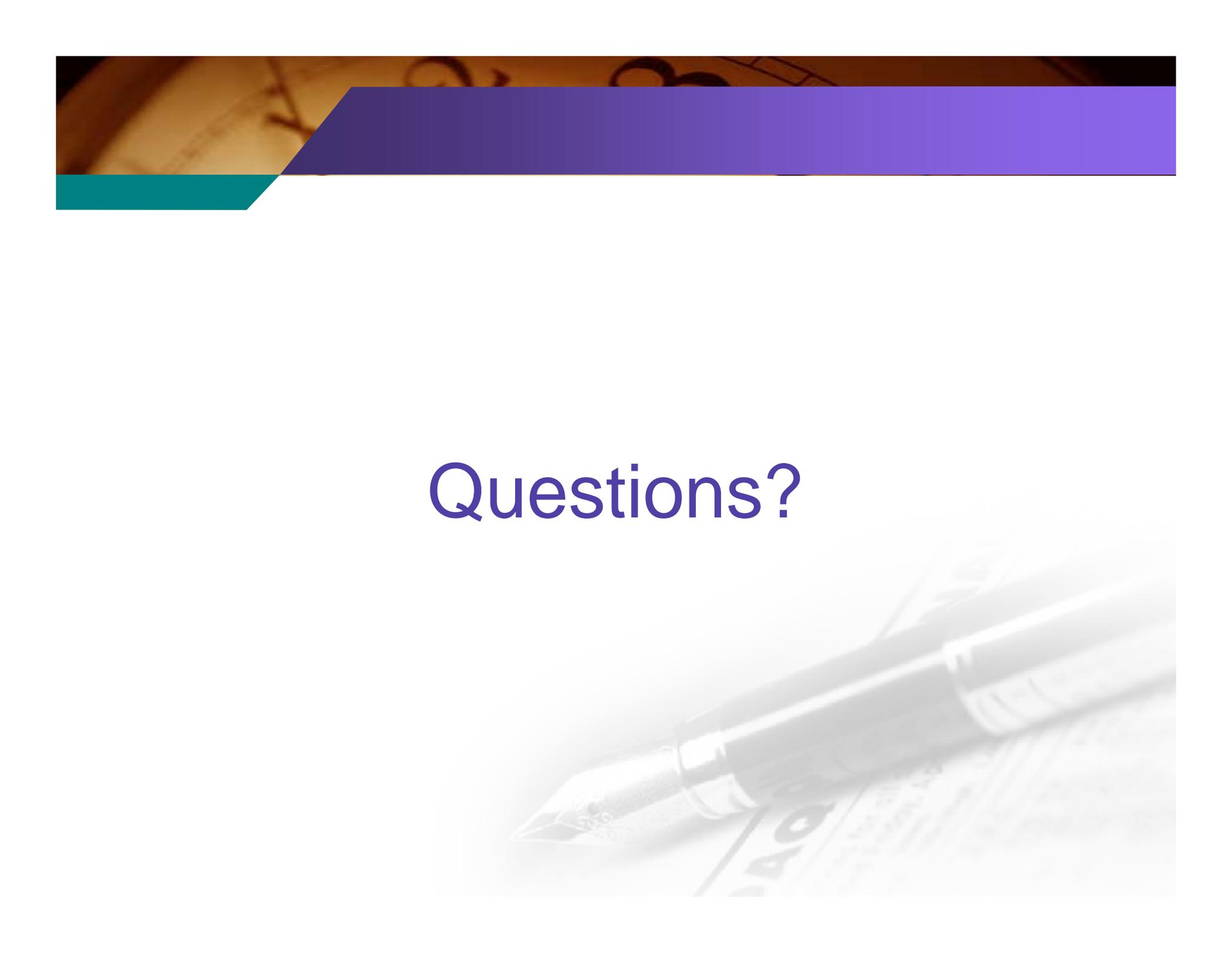
- Case Management
 - Employ RN as case managers
 - Deliver "personalized" service to individual to improve his health; help navigate choices of care; coordinate components of care; emotional support to family
 - 4 steps
 - Screening for target population for case management
 - Plan & deliver care per standard guidelines
 - Evaluate plan's effectiveness
 - Evaluate program's effectiveness
 - Common case management programs
 - Catastrophic
 - Transitional
 - Maternity



Action: Disease Management

- Disease Management
 - Chronic illnesses targeted (e.g. diabetes, asthma, heart diseases)
 - Behavior coaching by DM manager to ensure adherence to
 - medication
 - diet
 - exercise
 - risk prevention/avoidance (e.g. smoking)
 - Collaborative, multi-disciplinary approach among patient, physician, support-services
 - Patient self-management education
 - Extensive use of IT capabilities for tracking, monitoring, reporting
 - Delivered through phone calls, SMS, visits, education materials/talks





Questions?