CHAPTER VII

THAI MENTAL HEALTH CASEMIX CLASSIFITION (TMHCC)

This chapter illustrated the constructed classification model for using as an alternative budget allocation for psychiatric inpatient.

1. Background of casemix classification for psychiatric inpatient

According to previous studies, severity within diagnostic cluster (DC) affected psychiatric inpatient care costs (Buckingham et al., 2003; Lee et al, 1998; Pfeiffer & Hofdijk, 2002). The Thai Mental Health Casemix Classification (TMHCC) was developed to eliminate Thai Diagnosis Related Droup (TDRG) limitations by creating more equity to all related parties and enhancing mental health service quality. The TMHCC using clinical symptom from mental health measurement instate of using procedure and additional diagnosis as using in TDRG. The clinical symptom from mental health measurement which using in TMHCC composed of problems resulting from overactive/ aggressive/disruptive/agitated behavior, suicidal thoughts or behavior, detoxication, cognitive problems, depressed mood, other mental and behavioural problems, and problems making supportive social relationships (Phuaphanprasert et al., 2003).

The concept of this classification was to group inpatients with similar characteristic into the same group. This concept is believed that patients with similar characteristics are assumed to use the same amount of resources. Therefore, this study constructed mental health casemix classification model for inpatients that covers importance patient characteristics.

2. Method of classification

2.1 Design

Data available was an important part in designing the practical classification model. Therefore, data should be easy to collect. If otherwise, it would be costly and project would fail to use in routine practice.

TMHCC had 3 major criteria for construction the funding models as follows:

1. Use of inpatient related variables to explain service cost

2. Statistic concordance: Statistic concordance in this study was a variance reduction classification that using analysis statistical result. The subjects in each subclass must be given the statistic concordance that could consider from two major statistics as follows;

2.1 Decreasing variance in each subclass was illustrated by coefficients of variations (CVs) measure (Harper, 2005); (Harper, 2002); (Buckingham et al., 2003); (Benton, Evans, Light & et al., 1998); (Eagar, Gordon, Hodkinson, et al., 1997); (Remme, Habbema & Hermans, 1980. pp. 87-106).

2.2 Increasing variance in each variance between subclass was illustrated by percentage of reduction in variance (RIV) (Harper, 2005); (Harper, 2002); (Buckingham et al., 2003); (Benton et al, 1998); (Eagar et al, 1997); (Remme et al, 1980. pp. 87-106).

2.3 Number of subclasses: the more was the better.

3. Clinical concordance: Clinical concordance in this study means sensible clinical groups that patients in the same subclass had similar clinical symptom that concordance with experts' agreement. Most clinical concordance guideline was adopted from Australian Refined Diagnosis Related Groups (AR-DRG) version 5.1 (Commonwealth Department of Health and Ageing, 2004), Mental health classification and service costs project (MH-CASE) (Buckingham et al. (1998) and Thai Diagnosis Related Group (TDRG) version 3.0-3.5 (Ministry of Public Health, 2002). The classification had adapted clinical concordance for the Thai context by convent panel expert.

3. Subjects of the classification

This part presents the subjects' attributions or characteristics profile that presented inpatients' dataset from the two Thai adult public psychiatric hospitals. The dataset comprise of costing data and patient attributions data used for developing the mental health casemix classification model for funding.

This study was designed to cover maximum coverage of individual patients' data especially patient attributions. However, to date, little information had been available about the subject attributions of Thai's mental health services, so this study is based on only the two public psychiatric hospitals under the Thai Mental Health Department, Suan Prung psychiatric hospitals and Nakhon Ratchasrima psychiatric hospitals, from the total of 15 hospitals. The hospitals provided the most comprehensive dataset about receiving mental health services that represent popular in the North and the North-east region in Thailand.

Inclusions criteria for selecting inpatient data to using in classification that must have minimum data as shown in table 33. Subjects of TMHCC should be psychiatric inpatient from psychiatric hospitals. They were selected from all inpatient dataset from two co-research hospitals. In this step, auditing and re-correcting data were involved before data were used to explore major diagnostic category (MDC), disease cluster (DC), and Thai casemix classification subclass (TMHCCs).

Table 34 shows the number of the subjects in this study over the six-month from the sites. All subjects were 1,950 inpatients which comprises 79.0% from Suang Prung psychiatric hospitals and the rest (21.0%) from Nakhon Ratchasrima psychiatric hospitals. An average hospital stay was 30 days per case with 28 days per case at Suan Prung psychiatric hospitals and 32 days per case at Nakhon Ratchasrima psychiatric hospitals.

Table 33 Inclusions criteria for selecting subjects for TMHCC

1. Principal diagnosis (PDx) code for TMHCC (ICD-10)

  - All F code

    - G code: G470 Dis of initiating and maintaining sleep   G471 Dis of excessive somnolence

               G472 Dis of the sleep-wake schedule   G478 Other sleep disorders

               G479 Sleep disorder, unspecified

    - R code: R440 Auditory hallucination   R441 Visual hallucination

               R442 Other hallucination   R443 Hallucination, unspecified

               R448 Oth & unspec sympt/signs inv gen sensatn/percept

               R450 Nervousness   R451 Restlessness & agitation

               R454 Irritability and anger   R457 State of emotional shock & stress, unspec

               R480 Dyslexia and alexia   R481 Agnosia

               R482 Apraxia   R488 Other & unspec symbolic dysfunctions

   - Z code: Z032 Obeservtn for suspected mental and behave disorders

2. Age

3. Length of stay

4. Clinical symptom scores from the Thai Health of the Nation Outcome Scale (T-HoNOS)

    4.1 Overactive, aggressive, disruptive, agitated behaviour (T-HoNOS item 1)

    4.2 Suicidal thoughts or behaviour; non-accidental self-injury (T-HoNOS item 2)

    4.3 Problem drinking or drug taking (T-HoNOS item 3)

    4.4 Detoxification (T-HoNOS item 3)

    4.5 Cognitive problems with memory, orientation, understanding (T-HoNOS item 4)

    4.6 Physical illness (T-HoNOS item 5)

    4.7 Problems associated with hallucinations and delusions (T-HoNOS item 6)

    4.8 Depressed mood (T-HoNOS item 7)

    4.9 Melancholia (T-HoNOS item 7)

    4.10 Other mental and behavioural problems (T-HoNOS item 8)

    4.11 Problems making supportive social relationships (T-HoNOS item 9)

    4.12 Problems associated with daily living: Overall disability (T-HoNOS item 10)

Table 34 Overview of the subjects

	Nakchon Ratchasima psychiatric hospital	Suanprung psychiatric hospital	Total
Number of inpatient (cases)	409	1,541	1,950
	21.0 %	79.0 %	100.0 %
Number of length of stay (days)			
- Sum	8,716	39,411	48,127
- Mean	21.31	25.57	24.68
- SD	14.10	16.85	16.40
- Median	18	22	21

Patient attribution variables in this study were presented in three groups: socio-demographic, service attributions, and clinical attributes as describes below.

3.1 Socio-demographic variables

There were a number of socio-demographic variables involved in reflecting resource used as seen in chapter II such as age, sex, socio-economic status, marital status, clinician, ethnicity, aboriginality, number of dependent children under 5 years, usual accommodation, and stage of illness. However, data of this study had only three available variables: sex, age, and marital status as shown in Table 35.

Age: The subjects covered all adults in age range from 16 to 89 years with an average age was 39.27 years (SD =13.15). The average age of the male group was 38.22 years (SD = 12.47) while 41.89 years (SD = 14.40) for female.

Sex: Approximately 70% of all subjects were male and the remaining 30% were female.

Marital status: Almost half (49.6 %) of them were single, followed by marital status (35.1%), separated (5.2%), widowed (5.4%), and divorced (3.1%), respectively.

Table 35 Socio-demographic variables of the subjects

Variables	Suanprung psychiatric hospitals	Nakchon Ratchasima psychiatric hospitals	Total
1. Mean age, (SD), yrs	40.01 (13.29)	36.51 (12.23)	39.27 (13.15)
2. Sex (Male)	1,087 (70.5%)	303 (74.1%)	1,390 (71.28)
3. Marital status			
- Single	222 (54.30)	745 (48.30)	967 (49.59)
- Marital	117 (28.60)	568 (36.90)	685 (35.13)
- Separated	40 (9.80)	81 (5.30)	121 (6.21)
- Widowed	15 (3.70)	90 (5.80)	105 (5.38)
- Divorced	12 (2.90)	49 (3.20)	61 (3.13)
- Non identify	3 (0.70)	8 (0.50)	11 (0.56)

3.2 Service attribution variables

There was a number of service attribution variables involved with the subjects such as episode type, length of stay, first contact date, episode end date, reason for episode end, and pension status. However, this model had been developed on only two selected available and reasonable factors comprising pension status and length of stay.

Pension status: Most subjects used universal coverage scheme (UC) (54.5%), followed by others (e.g. low-income patient, student, disabled, monk and priest, elder, etc.) (27.3%), civil servant staff (9.1%), self supports (7.5%), and social security staff (1.6%).

Length of stay (LOS): Table 36 and Figure 20 show distribution of LOS in each subjects' disease cluster (DC). The total LOS was 48,764 days with an average LOS was 25 days (SD = 17.9), ranging from 1-182 days. Most of the subjects were classified in completed episode type which had LOS between 1 to 91 days, accounting for 98.8%. The rest were classified in ongoing episode type, accounting for 1.2%.

Table 36 Distribution of length of stay in each disease cluster

| Disease cluster	LOS	% LOS	Mean	SD	Median
1. Schizophrenia	26,442	54.90	29.28	18.19	26
2. Anxiety	63	0.10	10.50	5.58	12
3. Major affective	3,884	8.10	20.77	13.74	18
4. Other affective and somatoform	236	0.50	21.45	11.24	21
5. Eating and obsessive/compulsive	643	1.30	23.81	14.41	19
6. Personality disease and Acute reaction	2	0.00	2.00	.	2
7. Paranoid and Acute	1,520	3.20	17.08	10.46	16
8. Alcohol use disease and dependance	2,068	4.30	19.51	10.21	18
9. Alcohol intoxication and withdrawal	6,834	14.20	21.09	12.69	19
10. Drug intoxication and withdrawal	1,733	3.60	26.66	16.29	23
11. Opioid use disease and dependance	35	0.10	11.67	6.03	11
12. Other drug use disease and dependance	399	0.80	16.63	22.49	14
13. Dementia & other chronic disturbance	1,242	2.60	22.18	15.93	18
14. Delirium	2,365	4.90	19.55	13.32	17
15. Mental retardation	404	0.80	25.25	14.21	25
16. Infectious and parasitic disease	257	0.50	23.36	15.79	15
Total	48,127	100	24.68	16.40	21
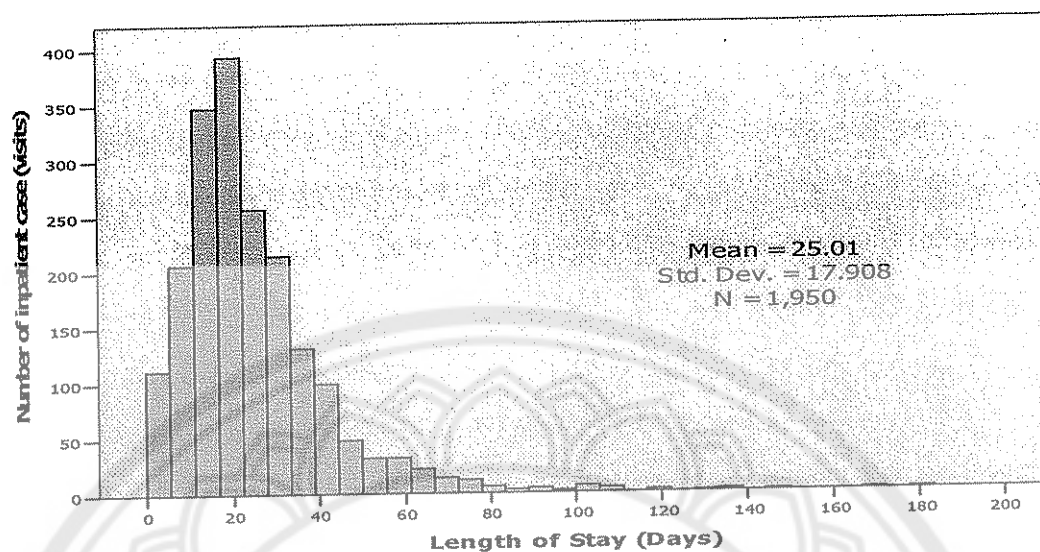
Figure 20 Distribution of the subjects' length of stay

3.3 Clinical attribute variables

Even-though there were many clinical attribute variables such as psychiatric service history, time since first psychiatric treatment, principle psychiatric diagnoses, additional psychiatric diagnoses, other diagnoses, ratings of clinical severity, level of functioning, focus of care, and legal status. The study selected only two reasonable and available factors to be counted that composed of principal diagnosis and clinical symptoms.

Disease cluster (DC): Nearly half (46.30%) were schizophrenia diseases, followed by alcohol intoxication and withdrawal diseases and disorders (16.60%), and major affective diseases (9.60%), respectively.

Clinical symptoms: The clinical symptoms of subjects were illustrated by nurses' scores given by Thai-HoNOS. The highest mean scores at admission are found in item 6: hallucinations/delusions (3.34), followed by item 1: aggression (3.22), item 8: other symptom (3.00), item 9: relationship problems (3.00), item 10: activities of daily living (3.00), respectively. The lowest mean scores were found in item 2: self-harm (1.47), and item 5: physical illness or handicap (1.66) as shown in Figure 6.2 and Table 6.2.

Table 37 and Figure 21 show T-HoNOS scores of the subjects. The highest T-HoNOS score was item 6: hallucinations or delusions (1.41), followed by item 8: other symptoms (1.22), item 1: aggression (0.76), and item 7: depression (0.57), respectively.

Table 37 Average scores of the Thai HoNOS of the subjects

(*p<0.05, **p<0.01)

T-HoNOS	Suang Prung psychiatric hospitals			Nakchon Ratchasema psychiatric hospitals			Total		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
Aggression	1.69	0.46	2	1.42	0.49	1	1.47	0.50	1
Self-harm	1.10	0.29	1	1.07	0.26	1	1.08	0.27	1
Alcohol&drug abuse	1.38	0.49	1	1.33	0.47	1	1.34	0.48	1
Cognitive problems	1.35	0.48	1	1.30	0.46	1	1.31	0.46	1
Physical illness	1.13	0.33	1	1.08	0.27	1	1.09	0.28	1
Hallucinations	1.63	0.48	2	1.51	0.50	2	1.54	0.50	2
Depression	1.07	0.26	1	1.11	0.31	1	1.10	0.30	1
Other symptom	1.75	0.43	2	1.44	0.50	1	1.51	0.50	2
Relationship problems	1.68	0.47	2	1.34	0.47	1	1.41	0.49	1
Activities daily living	1.34	0.47	1	1.22	0.41	1	1.25	0.43	1

Abbreviation:　　1 = no problem　　　　　　　　　　　2 = minor problem requiring no action

3 = mild problem but definitely present　　　4 = moderately severe problem
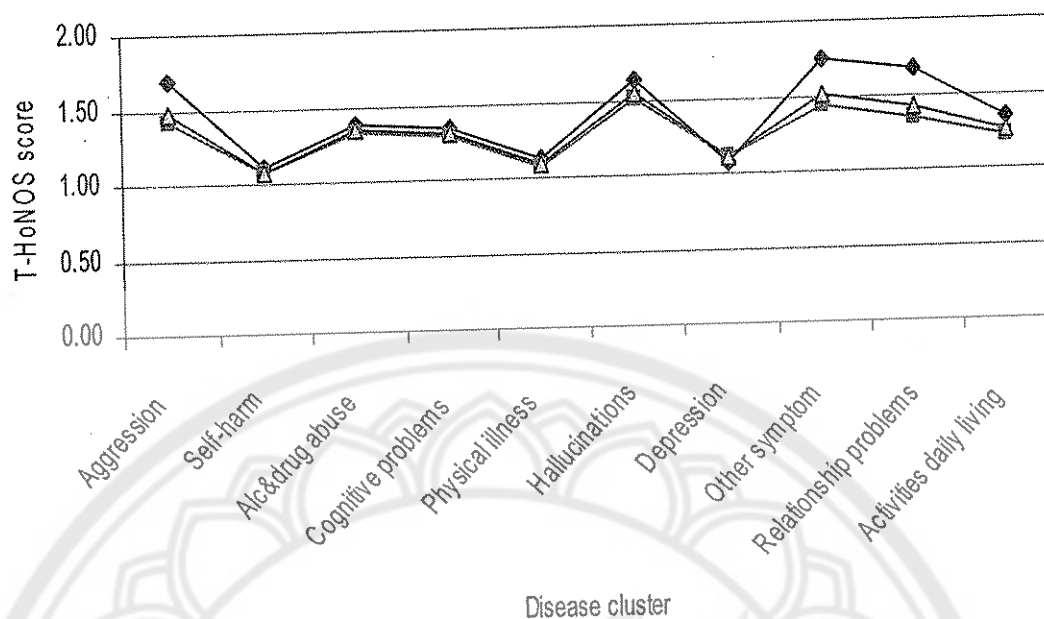
5 = severe to very severe problem

Figure 21 Average scores of the Thai HoNOS at admission of the subjects

4. Relation of subjects' attributions

4.1 Disease cluster (DC) and length of stay (LOS)

Table 38 and Figure 22 show distribution of the subjects in each DC by LOS. LOS was highest in patient with schizophrenia (29.28 days), followed by drug intoxication and withdrawal diseases and disorders (26.66 days), mental retardation (26.66 days), respectively. On the other hand, LOS was lowest in DC of personality disease and acute reaction disorders (2.00 days), followed by anxiety disorders (10.50 days), opioid use disease and dependence (11.67 days), respective.

Table 38 Distribution of length of stay in each disease cluster

| Disease cluster	LOS	% LOS	Mean	SD	Median
1. Schizophrenia	26,442	54.90	29.28	18.19	26
2. Anxiety	63	0.10	10.50	5.58	12
3. Major affective	3,884	8.10	20.77	13.74	18
4. Other affective and somatoform	236	0.50	21.45	11.24	21
5. Eating and obsessive/compulsive	643	1.30	23.81	14.41	19
6. Personality disease and Acute reaction	2	0.00	2.00	.	2
7. Paranoid and Acute	1,520	3.20	17.08	10.46	16
8. Alcohol use disease and dependance	2,068	4.30	19.51	10.21	18
9. Alcohol intoxication and withdrawal	6,834	14.20	21.09	12.69	19
10. Drug intoxication and withdrawal	1,733	3.60	26.66	16.29	23
11. Opioid use disease and dependance	35	0.10	11.67	6.03	11
12. Other drug use disease and dependence	399	0.80	16.63	22.49	14
13. Dementia & other chronic disturbance	1,242	2.60	22.18	15.93	18
14. Delirium	2,365	4.90	19.55	13.32	17
15. Mental retardation	404	0.80	25.25	14.21	25
16. Infectious and parasitic disease	257	0.50	23.36	15.79	15
Total	48,127	100	24.68	16.40	21
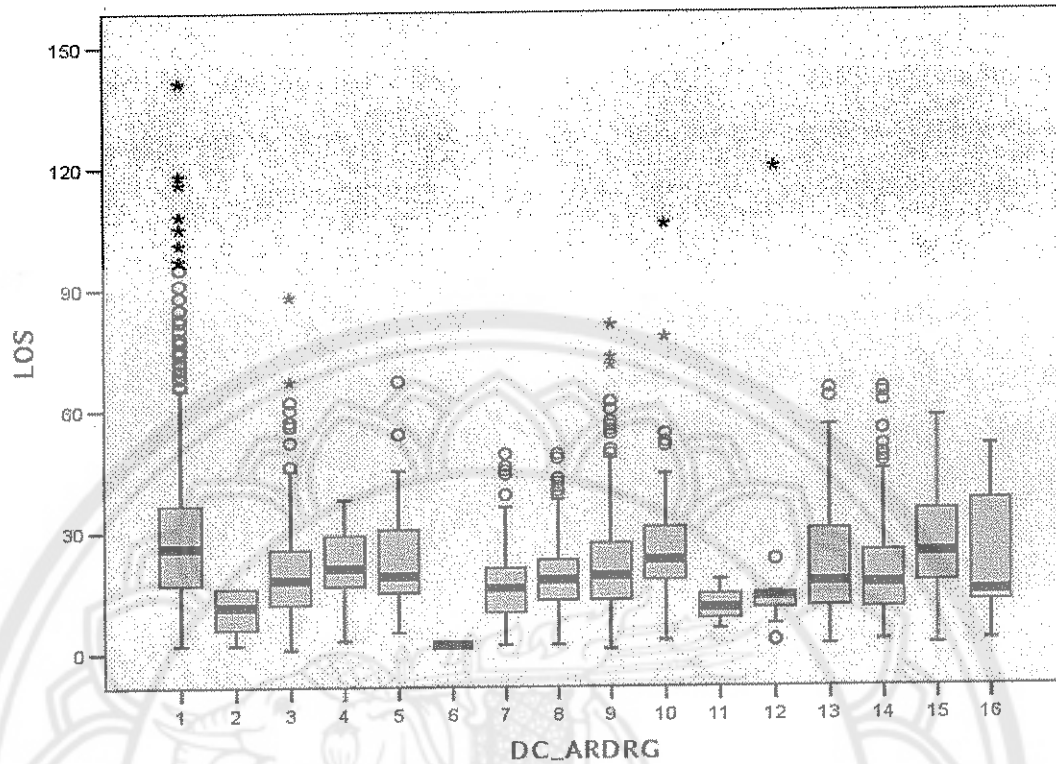
Figure 22 Distribution of subjects by length of stay

4.2 Disease cluster (DC) and Patient type

Table 39 shows distribution of the subjects in each DC by patient type that almost of them (98.82%) were classified in a complete type which had LOS between 1-91 days, while the rest had classified in an ongoing type that had LOS more than 91 days. By complete episode type, schizophrenia disorders was highest at 45.90%, followed by alcohol intoxication and withdrawal diseases and disorders (16.80%), major affective disorders (9.70%), while by ongoing episode type, schizophrenia diseases was the highest (78.30%), followed by drug intoxication and withdrawal diseases and disorders (8.70%), and alcohol intoxication and withdraw diseases and disorders and other drug use and dependence diseases and disorders and delirium diseases and disorders (4.30%), respectively.

Table 39 Distribution of patients' type in each disease cluster (DC) by patient type

Disease cluster	Complete type		Ongoing type	
	N	% N	N	% N
1. Schizophrenia	885	45.90	18	78.30
2. Anxiety	6	0.30	-	0
3. Major affective	187	9.70	-	0
4. Other affective and somatoform	11	0.60	-	0
5. Eating and obsessive/compulsive	27	1.40	-	0
6. Personality disease and Acute react	1	0.10	-	0
7. Paranoid and Acute	89	4.60	-	0
8. Alcohol use disease and depend	106	5.50	-	0
9. Alcohol intoxication and withdraw	323	16.80	1	4.30
10. Drug intoxication and withdraw	63	3.30	2	8.70
11. Opioid use disease and depend	3	0.20	-	0
12. Other drug use disease and depend	23	1.20	1	4.30
13. Dementia & other chronic disturbance	56	2.90	-	0
14. Delirium	120	6.20	1	4.30
15. Mental retardation	16	0.80	-	0
16. Infectious and parasitic disease	11	0.60	-	0
Total	1,927	100	23	100

4.3 Disease cluster (DC) and Age

Table 40 shows distribution of the subjects in each DC by age. An average mean age was highest at dementia and other chronic disturbance diseases and disorders (70.93 years), followed by personality disease and acute reaction diseases and disorders (46.00 years), infectious and parasitic diseases and disorders (45.09 years), alcohol use diseases and dependence disorders (43.01 years), and delirium disorders (42.95 years), respectively. In reverse, the lowest average mean age was other drug use disease and dependence diseases and disorders (23.38 years), followed by mental retardation (26.19 years), drug intoxication and withdrawal diseases and

disorders (28.85 years), schizophrenia diseases (36.64 years), opioid use diseases and dependence diseases and disorders (37.00 years), respectively.

Table 40 Distribution of subjects' age in each disease cluster (DC)

Disease cluster	N	% N	Age		
			Mean	SD	Median
1. Schizophrenia	903	46.30	36.64	11.36	34
2. Anxiety	6	0.30	38.33	10.15	43
3. Major affective	187	9.60	40.19	12.93	41
4. Other affective and somatoform	11	0.60	40.73	10.70	37
5. Eating and obsessive/compulsive	27	1.40	38.07	13.43	38
6. Personality disease and Acute react	1	0.10	46.00	.	46
7. Paranoid and Acute	89	4.60	37.04	13.80	35
8. Alcohol use disease and depend	106	5.40	43.01	9.33	45
9. Alcohol intoxication and withdraw	324	16.60	42.42	10.09	42
10. Drug intoxication and withdraw	65	3.30	28.85	9.64	26
11. Opioid use disease and depend	3	0.20	37.00	9.54	38
12. Other drug use disease and depend	24	1.20	23.38	7.80	21
13. Dementia & other chronic disturbance	56	2.90	70.93	12.09	73
14. Delirium	121	6.20	42.95	13.27	41
15. Mental retardation	16	0.80	26.19	7.27	25
16. Infectious and parasitic disease	11	0.60	45.09	11.79	46
Total	1950	100	39.27	13.15	38

4.4 Disease cluster (DC) and Sex

Table 41 and Figure 23 show distribution of the subjects' sex in each DC by sex. It found that males were predominant in drug intoxication and withdrawal diseases and disorders (6 times more than females), alcohol intoxication and withdrawal diseases and disorders (5 times more than female), other drug use diseases and dependence diseases and disorders (4 times more than females), alcohol use disease

and dependence diseases and disorders (3 times more than females), and delirium diseases and disorders (2 times more than females). Females were predominant in other affective or somatoform and dementia and other chronic disturbance diseases and disorders (4 times more than males), major affective and infectious and parasitic diseases diseases and disorders (3 times more than males), paranoid or acute and other diseases and disorders of nervous system (2 times more than male).

Table 41 Distribution of subjects in each disease cluster (DC) by sex

| Disease cluster	Male		Female		Total	
	N	% N	N	% N	N	% N
1. Schizophrenia	626	45.04	277	49.50	903	46.30
2. Anxiety	0	0.00	6	1.10	6	0.30
3. Major affective	79	5.68	108	19.30	187	9.60
4. Other affective and somatoform	4	0.29	7	1.30	11	0.60
5. Eating and obsessive/compulsive	18	1.29	9	1.60	27	1.40
6. Personality disease and Acute react	1	0.07	0	0.00	1	0.10
7. Paranoid and Acute	46	3.31	43	7.70	89	4.60
8. Alcohol use disease and depend	95	6.83	11	2.00	106	5.40
9. Alcohol intoxication and withdraw	299	21.51	25	4.50	324	16.60
10. Drug intoxication and withdraw	61	4.39	4	0.70	65	3.30
11. Opioid use disease and depend	2	0.14	1	0.20	3	0.20
12. Other drug use disease and depend	22	1.58	2	0.40	24	1.20
13. Dementia & other chronic disturbance	23	1.65	33	5.90	56	2.90
14. Delirium	100	7.19	21	3.80	121	6.20
15. Mental retardation	9	0.65	7	1.30	16	0.80
16. Infectious and parasitic disease	5	0.36	6	1.10	11	0.60
Total	1,390	100	560	100	1,950	100
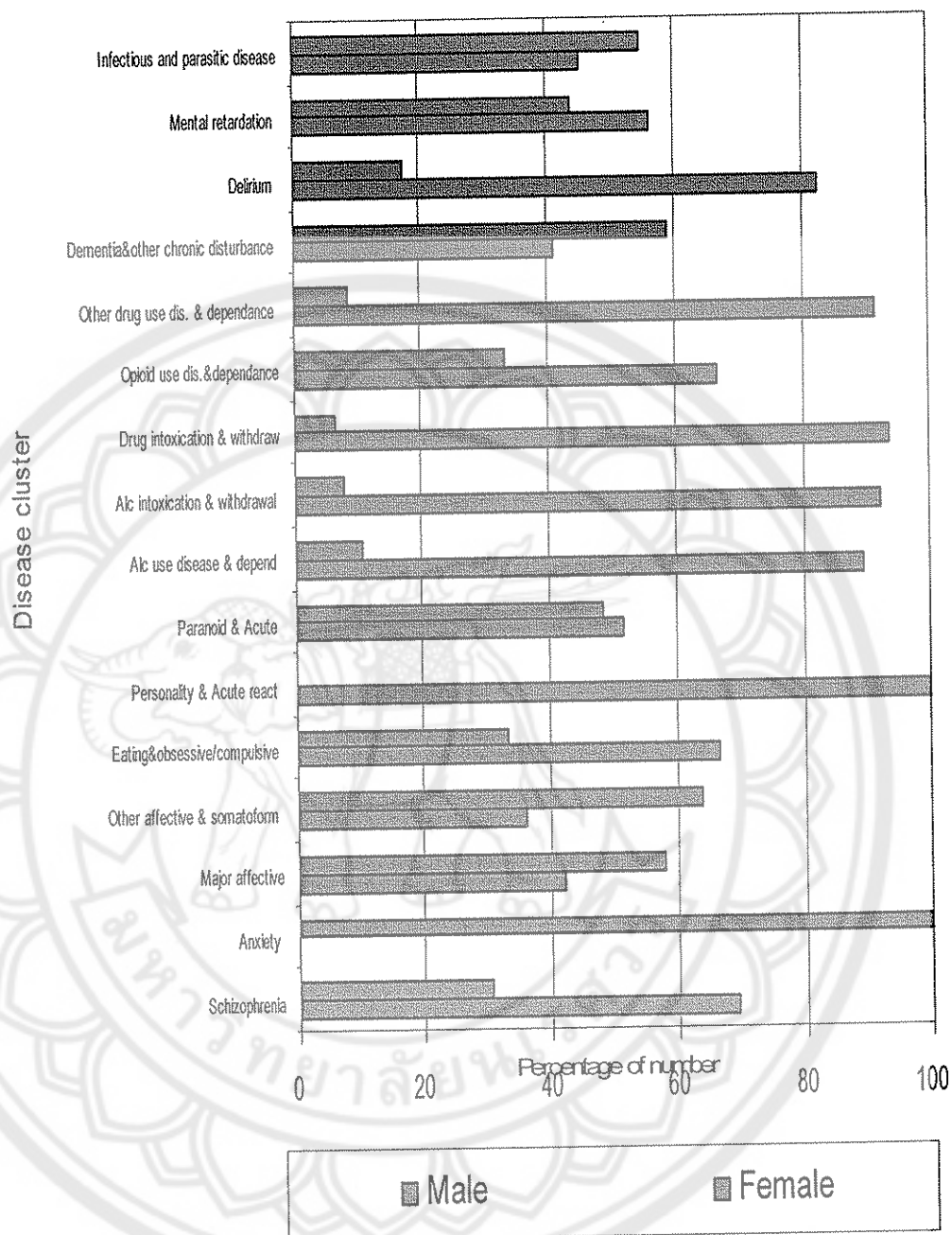
Figure 23 Distribution of subjects in each disease cluster (DC) by sex

5. Process of Thai Mental Health Casemix Class (TMHCC)

TMHCC process had 3 steps as follows:

1. Exploring of Major Diagnostic Category (MDC)

2. Exploring of Disease Cluster (DC)

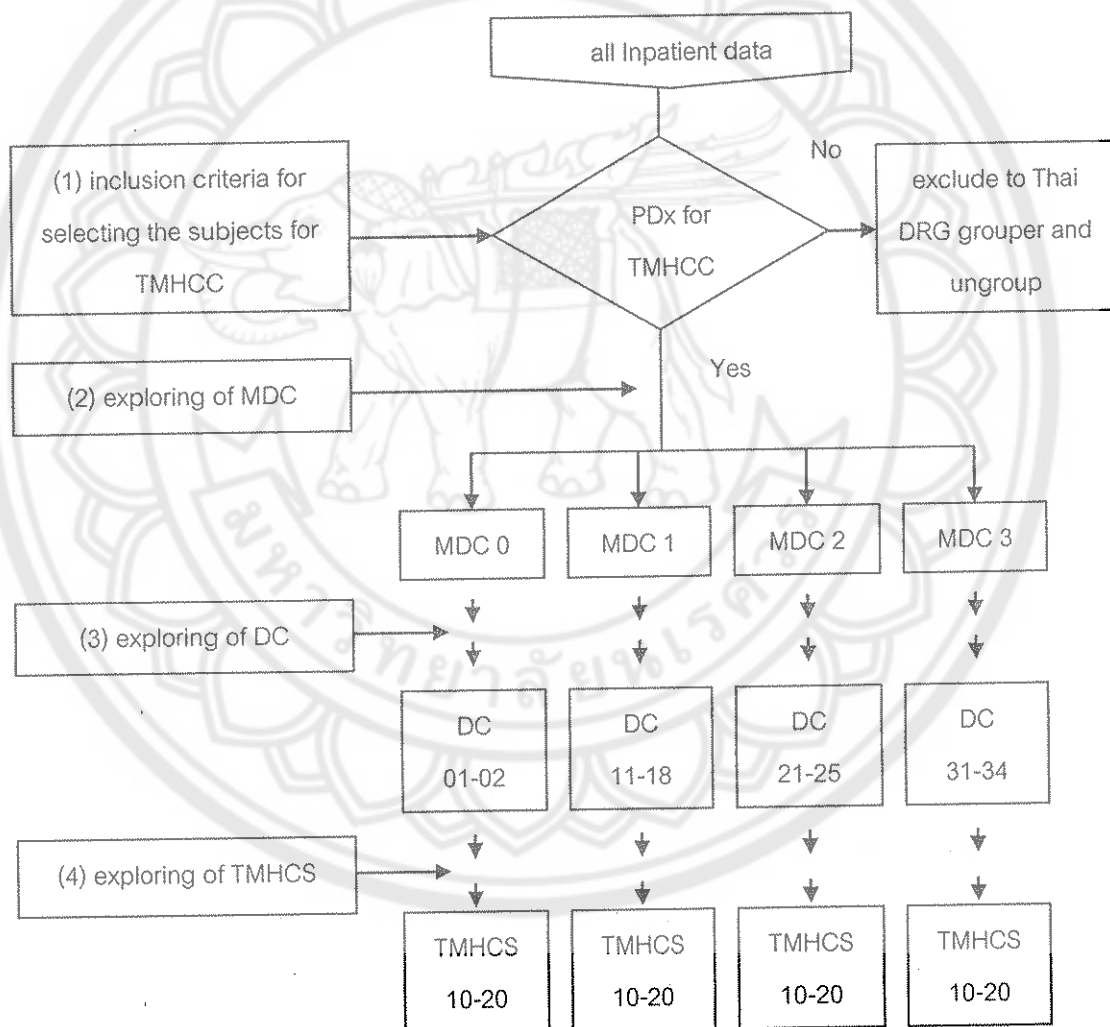3. Exploring of Thai-Mental Health Casemix Subclass (TMHCS) as shown

in Figure 24.

Figure 24 Diagram of TMHCC

5.1 Exploring of Major Diagnostic Category (MDC)

Figure 25 shows the diagram of TMHCC. Each inpatient data was classifed into MDC by its principle diagonis (PDx). The criteria for classify MDC in this study was the same as the Australian Refined Diagnosis Related Groups version 5.1 (AR-DRG v. 5.1).
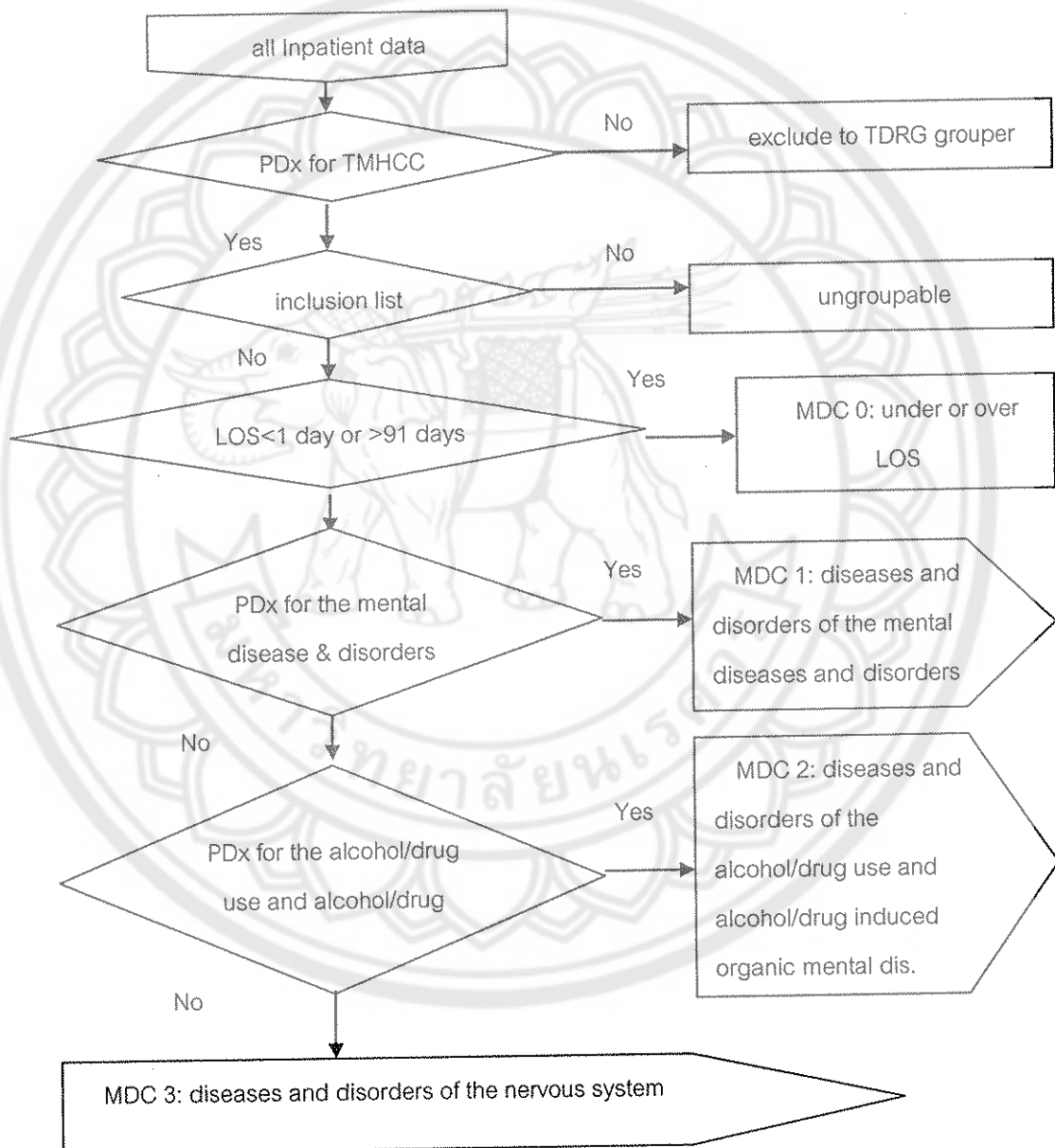

Figure 25 Classification step of TMHCC

Results from classification in this step gave 4 MDC as follows:

5.1.1 MDC 0: diseases and disorders of inpatients who have length of stay (LOS) less than 1 day or more than 91 days

5.1.2 MDC 1: diseases and disorders of the mental diseases and disorders

5.1.3 MDC 2: diseases and disorders of the alcohol/drug use and alcohol/drug induced organic mental disorders

5.1.4 MDC 3: diseases and disorders of the nervous system

For any not falling in MDC 0 – MDC 3, it will be in ungroup class.

5.2 Exploring of Disease Cluster (DC)

From all the subjects, 4 MDC can be classified into 19 major groups that called DC as follows;

MDC 0 (diseases and disorders of inpatients whose LOS less than 1 day or more than 91 days) can be classified into 2 DCs:

1. DC 01: length of stay less than 1 day
2. DC 02: length of stay more than 91 days

MDC 1 (diseases and disorders of the mental diseases and disorders) can be classified into 8 DCs:

1. DC 11: schizophrenia disorders
2. DC 12: paranoid and acute psychotic disorders
3. DC 13: major affective disorders
4. DC 14: other affective and somatoform disorders
5. DC 15: anxiety disorders
6. DC 16: eating and obsessive/compulsive disorders
7. DC 17: personality disorders and acute reactions
8. DC 18: childhood disorders

MDC 2 (diseases and disorders of the alcohol/drug use and alcohol/drug induced organic mental disorders) can be classified into 5 DCs:

1. DC 21: alcohol intoxication and withdrawal
2. DC 22: drug intoxication and withdrawal
3. DC 23: alcohol/drug use and alcohol/drug induced organic mental disorders
4. DC 24: opioid use disorders and dependence
5. DC 25: other drug use disorder and dependence

MDC 3 (diseases and disorders of the nervous system) can be classified into 4 DCs:

1. DC 31: dementia and other chronic disturbances of cerebral functioning
2. DC 32: delirium
3. DC 33: seizure
4. DC 34: other disorders of nervous system

Table 42, 43, 44 show details of disease cluster (DC) by length of stay (LOS), full cost (FC), and material cost (MC). Most of subjects were in DC 11 or schizophrenia disease DC (45.5%), followed by DC 21 (alcohol intoxication and withdrawal) (16.6%), and DC 13 (major affective disorders) (9.6%), respectively.

Table 42 shows details of LOS in each DC. The subjects had a median of 21 days and a mean of 25.0 days per case. The highest LOS per case was found in DC 02 (ongoing type) (115.9 days), followed by DC 11 (schizophrenia disease) (28.1 days), and DC 22 (drug intox and withdraw) (24.6 days), respectively, while the lowest LOS per case was found in DC 17 (organic group 3) (2.0 days), followed by DC 15 (anxiety mood) (10.3 days), and DC 24 (opioid use dis and depend) (11.7 days), respectively. Percentage of RIV by LOS was equal to 39.03 and it had no TMHCS with CV more than standard value (1.0).

Table 42 Length of stay of all subjects in each DC

DC	TMHCS	%N	Median	Mean	SD	CV
01	sameday type	-	-	-	-	-
02	ongoing type	1.2	106	115.9	24.2	0.21
11	schizophrenia disease	45.4	26	28.1	16.0	0.57
12	paranoid and Acute	4.6	16	17.1	10.5	0.62
13	major affective	9.6	18	20.8	13.7	0.66
14	other affective and somatoform	0.6	21	21.5	11.2	0.52
15	Anxiety	0.3	11.5	10.3	5.9	0.57
16	eating and obsessive/compulsive	1.4	19	23.8	14.4	0.61
17	personality disoders & Acute reaction	0.1	2	2.0	.	-
18	childhood disorders	-	-	-	-	-
21	alcohol intoxication & withdrawal	16.6	19	20.9	12.3	0.59
22	drug intoxication & withdrawal	3.2	23	24.6	11.2	0.46
23	alcohol use disoders & dependence	5.4	18	19.5	10.2	0.52
24	opioid use disoders & dependence	0.2	11	11.7	6.0	0.52
25	other drug use disoders & dependence	1.2	14	12.1	4.7	0.39
31	dementia and other chronic disturbunce	3.4	16	22.3	15.8	0.71
32	Delirium	6.2	17	19.2	12.8	0.67
33	seizure	-	-	-	-	-
34	other disorders of nervous system	0.8	25	25.3	14.2	0.56
	Total	100.0	21	25.0	17.9	0.72
	% RIV	35.92				

Table 43 shows details of each DC by full cost (FC). The FC had a median of 8,451 Thai baht per case and a mean of 9,645 baht per case. Percentage of RIV by total cost was equal to 18.73 and it had no subclass CV more than standard (1.0). The highest FC per case was found in DC 02 (ongoing type) (27,592 baht), followed by DC 11 (schizophrenia disease) (10,669 baht), and DC 14 (other affective and somatoform) (9,371 baht), respectively, while the lowest FC per case was found in DC 17 (personality dis and acute react) (1,527 baht), followed by DC 24 (opioid use dis and depend) (5,215 baht), and DC 15 (anxiety) (5,492 baht), respectively.

Table 43 Full cost of all subjects in each DC

(unit: baht)

DC	TMHCS	Median	Mean	SD	CV
01	sameday type	-	-	-	-
02	ongoing type	28,210	27,592	7,287	0.26
11	schizophrenia disease	9,899	10,669	5,187	0.49
12	paranoid and Acute	7,614	7,804	3,605	0.46
13	major affective	8,017	8,738	5,117	0.59
14	other affective and somatoform	10,946	9,371	4,182	0.45
15	Anxiety	6,023	5,492	2,371	0.43
16	eating and obsessive/compulsive	8,490	9,101	4,935	0.54
17	personality disoders & Acute reaction	1,527	1,527	-	-
18	childhood disorders	-	-	-	-
21	alcohol intoxication & withdrawal	7,644	8,323	3,921	0.47
22	drug intoxication & withdrawal	9,052	9,214	3,796	0.41
23	alcohol use disoders & dependence	7,593	7,886	3,308	0.42
24	opioid use disoders & dependence	5,637	5,215	2,530	0.49
25	other drug use disoders & dependence	7,007	6,218	2,050	0.33
31	dementia and other chronic disturbunce	7,352	8,939	5,354	0.60
32	Delirium	7,593	8,434	4,823	0.57
33	seizure	-	-	-	-
34	other disorders of nervous system	9,212	9,027	3,935	0.44
	Total	8,451	9,645	5,274	0.55
	% RIV	18.73			

Table 44 shows detail of each DC by material cost. The MC had a median of 2,799 baht per case and a mean of 3,251 baht. The highest MC was found in DC 02 (Ongoing type) (10,246 baht), followed by DC 11 (schizophrenia disease) (3,625 baht), and DC 16 (eating and obsessive/compulsive) (3,335 baht), respectively, while the lowest MC per case was found in DC 17 (personality disorders and acute reaction) (380 baht), followed by DC 24 (opioid use disorders and dependance) (1,643 baht), and DC 25 (other drug use disorders and dependance) (1,765 baht), respectively. Percentage of RIV by MC was equal to 21.32 and it had no subclass CV more than standard (1.0).

Table 44 Material cost of all subjects in each DC

(Thai baht)

DC	TMHCS	Median	Mean	SD	CV
01	sameday type	-	-	-	-
02	ongoing type	10,409	10,246	2,632	0.26
11	schizophrenia disease	3,365	3,625	1,875	0.52
12	paranoid and Acute	2,286	2,529	1,271	0.50
13	major affective	2,722	2,946	1,796	0.61
14	other affective and somatoform	3,571	3,162	1,463	0.46
15	Anxiety	1,993	1,822	914	0.50
16	eating and obsessive/compulsive	3,069	3,335	1,989	0.60
17	personality disoders & Acute reaction	380	380	.	-
18	childhood disorders	-	-	-	-
21	alcohol intoxication & withdrawal	2,496	2,713	1,366	0.50
22	drug intoxication & withdrawal	3,067	3,035	1,322	0.44
23	alcohol use disoders & dependence	2,482	2,540	1,135	0.45
24	opioid use disoders & dependence	1,738	1,643	847	0.52
25	other drug use disoders & dependence	2,066	1,765	618	0.35
31	dementia and other chronic disturbunce	2,904	3,308	2,146	0.65
32	Delirium	2,457	2,747	1,645	0.60
33	seizure	-	-	-	-
34	other disorders of nervous system	3,027	3,122	1,505	0.48
	Total	2,799	3,251	1,925	0.59
	% RIV	21.32			

5.3 Exploring of Thai-Mental Health Casemix Subclass (TMHCS)

After step 5.3, each DC was classified into the latest classification, Thai Mental Health Casemix Subclass (TMHCS). Table 45 shows necessary factors for TMHCC. Necessary data to construct TMHCC model comprised service cost, length of stay, principle diagnosis, age, sex, and clinical symptom.

All variables in this study were classified into 2 types: (1) independent variables that were service cost and (2) dependent variables that were other variables apart from (1) such as length of stay, principle diagnosis, age, sex, and clinical symptoms.

Table 45 Necessary factors for Thai Mental Health Casemix Classification (TMHCC)

	Detail
Group 1: Length of stay (LOS)	
1	Same day (LOS < 1 day)
2	Complete type (LOS < 1- 91 days)
3	Incomplete type (LOS $\geq$ 91 days)
Group 2: Age	
1	Age > 17 years old
2	Age > 25 years old
3	Age > 50 years old
4	Age > 55 years old
5	Age > 70 years old
Group 3: Clinical symptom	
1	Problems resulting from overactive, aggressive, disruptive or agitated behaviour
2	Suicidal thoughts or behaviour; non-accidental self-injury
3	Problem drinking or drug taking
4	Cognitive problems involving memory, orientation, and understanding
5	Physical illness
6	Problems associated with hallucinations and delusions
7	Depressed moods
8	Other mental and behavioural problems
9	Problems making supportive social relationships
10	Problems associated with daily living: Overall disability

Group 1 Length of stay (LOS): LOS can be classified into 3 factors as follows:

1. Same-day type (LOS < 1 day)

   Same-day type patient was the one who stays in hospital less than 1 day.

2. Complete type (LOS < 1- 91 day)

   Complete type patient was the one who stays in hospital from 1- 91 days.

3. Incomplete type (LOS ≥ 91 day)

   Incomplete type patient was the one who stays in hospital more than 91 days.

Group 2: Age: Age can be classified into 3 factors as follows:

1. Age > 17 years old

   This factor related to the subjects whose age was more than 17 years old.

2. Age > 25 years old

   This factor related to the subjects whose age was more than 25 years old.

3. Age > 50 years old

   This factor related to the subjects whose age was more than 50 years old .

4. Age > 55 years old

   This factor related to the subjects whose age was more than 55 years old.

5. Age > 70 years old

   This factor related to the subjects whose age was more than 70 years old.

Group 3: Clinical symptoms: Clinical symptoms of the study were measured by the Thai HoNOS that comprise of 12 items but this study using 10 items (item 1-10) as follows:

1. Problems resulting from overactive, aggressive, disruptive or agitated behaviour

   This factor means whether the subjects have Problems resulting from overactive, aggressive, disruptive or agitated behaviour in a level that needs treatment or not. Rating from T-HoNOS scale 1 can be classified into two groups, as follows:

   - rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

2. Suicidal thoughts or behaviour; non-accidental self-injury

This factor means whether the subjects have suicidal thoughts or behavior in a level that needs treatment or not. Rating from T-HoNOS scale 2 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

3. Problem drinking or drug taking

This factor means whether the subjects have problem drinking or drug taking in a level that needs treatment or not. Rating from T-HoNOS scale 3 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

4. Detoxication

This factor means whether the subjects have detoxication in a level that needs treatment or not. Rating from T-HoNOS scale 3 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating = 4 equals treatment needed.

5. Cognitive problems involving memory, orientation, and understanding

This factor means whether the subjects have cognitive problems involving memory, orientation, and understanding in a level that needs treatment or not. Rating from T-HoNOS scale 4 can be classified into two groups, as follows:

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

6. Physical illness

This factor means whether the subjects have physical illness in a level that needs treatment or not. Rating from T-HoNOS scale 5 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

7. Problems associated with hallucinations and delusions

This factor means whether the subjects have problem associated with hallucinations and delusions in a level that needs treatment or not. Rating from T-HoNOS scale 3 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

8. Depressed moods

This factor means whether the subjects have depressed mood in a level that needs treatment or not. Rating from T-HoNOS scale 7 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

9. Other mental and behavioural problems

This factor means whether the subjects have other mental and behavioural problems in a level that needs treatment or not. Rating from T-HoNOS scale 8 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

10. Problems making supportive social relationships

This factor means whether the subjects have problems making supportive social relationships in a level that needs treatment or not. Rating from T-HoNOS scale 9 can be classified into two groups, as follows;

- rating < 3 equals no treatment needed   - rating > 3 equals treatment needed.

The Thai Mental Health Casemix Classification (TMHCC) Model composed of 3 MDC that were classified into 18 Disease Clusters (DCs) or 52 Thai Mental Halth Casemix Subclasses (TMHCS) by factors as shown in table 46.

Table 46 %RIV of all subjects by age and clinical symptom

Independent variables	Full cost per case		Material cost per case		Length of stay	
	Rank	%RIV	Rank	%RIV	Rank	%RIV
Age < 71 years old		0.35		0.14		0.41
Age < 56 years old		0.69		0.35		0.51
Age < 51 years old	3	1.08	5	0.79	3	0.89
Age < 46 years old	4	0.99		0.70	5	0.68
Age < 41 years old		0.80		0.56		0.51
Age < 36 years old		0.49		0.34		0.34
Age < 31 years old		0.28		0.20		0.20
Age < 26 years old		-0.04		-0.05		-0.05
Overactive, aggressive, disruptive, agitated behaviour	1	1.45	3	0.96		0.38
Suicidal thoughts or behaviour; non-accidental self-injury		-0.07		-0.06		-0.03
Problem drinking or drug taking	5	0.97	1	1.55	2	0.99
Detoxification		0.74	2	1.32	1	1.00
Cognitive problems with memory, orientation, understanding		0.72		0.68		0.63
Physical illness		0.57		0.72	4	0.74
Problems associated with hallucinations and delusions		0.44		0.32		0.31
Depressed mood		0.08		0.04		0.02
Melancholia		0.08		0.04		0.02
Other mental and behavioural problems		-0.02		-0.05		0.00
Problems making supportive social relationships	2	1.14	4	0.86		0.64
Problems associated with daily living: Overall disability		0.34		0.29		0.42

6. TMHCC results

6.1 MDC 0: diseases and disorders of inpatients whose length of stay < 1 or > 91 days

The classification in MDC 0 (under/over length of stay) was classified into 2 Thai Mental Health Casemix Subclasses (TMHCS) as shows in Figure 26.

DC 01: mental health disease, same-day type

TMHCS 01000: same-day type

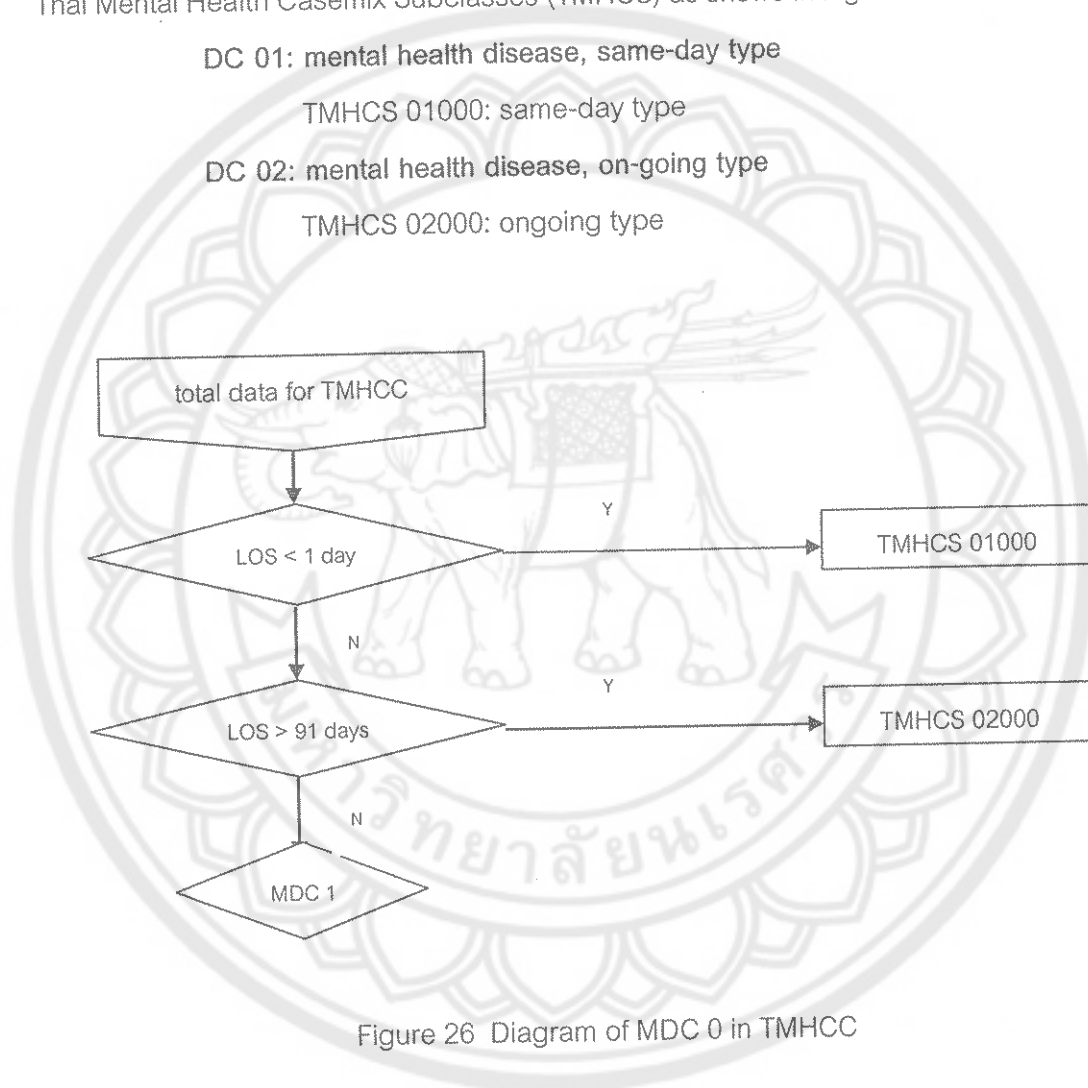DC 02: mental health disease, on-going type

TMHCS 02000: ongoing type

Figure 26 Diagram of MDC 0 in TMHCC

6.2 MDC 1: diseases and disorders of the mental diseases and disorders

The classification in MDC 1 (mental health diseases and disorders) was classified into 9 DC and then reclassified into 23 TMHCS as shown in Table 47 and Figure 27.

Table 47 TMHCC subclass in MDC 1: mental health diseases and disorders

	TMHCS	Definition
DC 11: schizophrenia disorders		
1	11111	schiz, age < 51, wo cognitive prob, wo prob from overactive/aggressive/agitated behavior
2	11112	schiz, age < 51, wo cognitive prob, w prob from overactive/aggressive/agitated behavior
3	11121	schiz, age < 51, w cognitive prob, wo prob from overactive/aggressive/agitated behavior
4	11122	schiz, age < 51, w cognitive prob, w prob from overactive/aggressive/agitated behavior
5	11211	schiz, age >50, wo cognitive prob, wo prob from overactive/aggressive/agitated behavior
6	11212	schiz, age >50, wo cognitive prob, w prob from overactive/aggressive/agitated behavior
7	11221	schiz, age >50, w cognitive prob, wo prob from overactive/aggressive/agitated behavior
8	11222	schiz, age >50, w cognitive prob, w prob from overactive/aggressive/agitated behavior
DC 12: paranoid & acute psychotic disorders		
9	12110	paranoid & acute psychotic dis, wo prob overactive/aggressive/disruptive or agitated behavior, wo other mental & behavioural prob

Table 47 (Cont.)

|	TMHCS	Definition
10	12120	paranoid & acute psychotic dis, wo prob overactive/aggressive/disruptive or agitated behavior, w other mental & behavioural prob
11	12210	paranoid & acute psychotic dis, w prob overactive/aggressive/disruptive or agitated behavior, wo other mental & behavioural prob
12	12220	paranoid & acute psychotic dis, w prob overactive/ aggressive/ disruptive or agitated behavior, w other mental & behavioural prob
DC 13: major affective disorders		
13	13110	major affective dis, wo suicidal thoudhts or behaviour, wo depressed mood, wo prob making supportive social relationships / melancholia
14	13120	major affective dis, wo suicidal thoudhts or behaviour, wo depressed mood, w prob making supportive social relationships / melancholia
15	13210	major affective dis, wo suicidal thoudhts or behaviour, w depressed mood
16	13220	major affective dis, w suicidal thoudhts or behaviour, wo depressed mood
DC 14: other affective and somatoform disorders		
17	14000	other affective & somatoform disorders
		DC 15: anxiety disorders
18	15000	anxiety disorders
		DC 16: eating and obscessive-compulsive disorders
19	16000	eating and obscessive-compulsive disorders
		DC 17: personality disorders and acute reactions
20	17000	personality disorders and acute reactions
		DC 18: childhood and adolescent disorders
21	18000	childhood and adolescent disorders
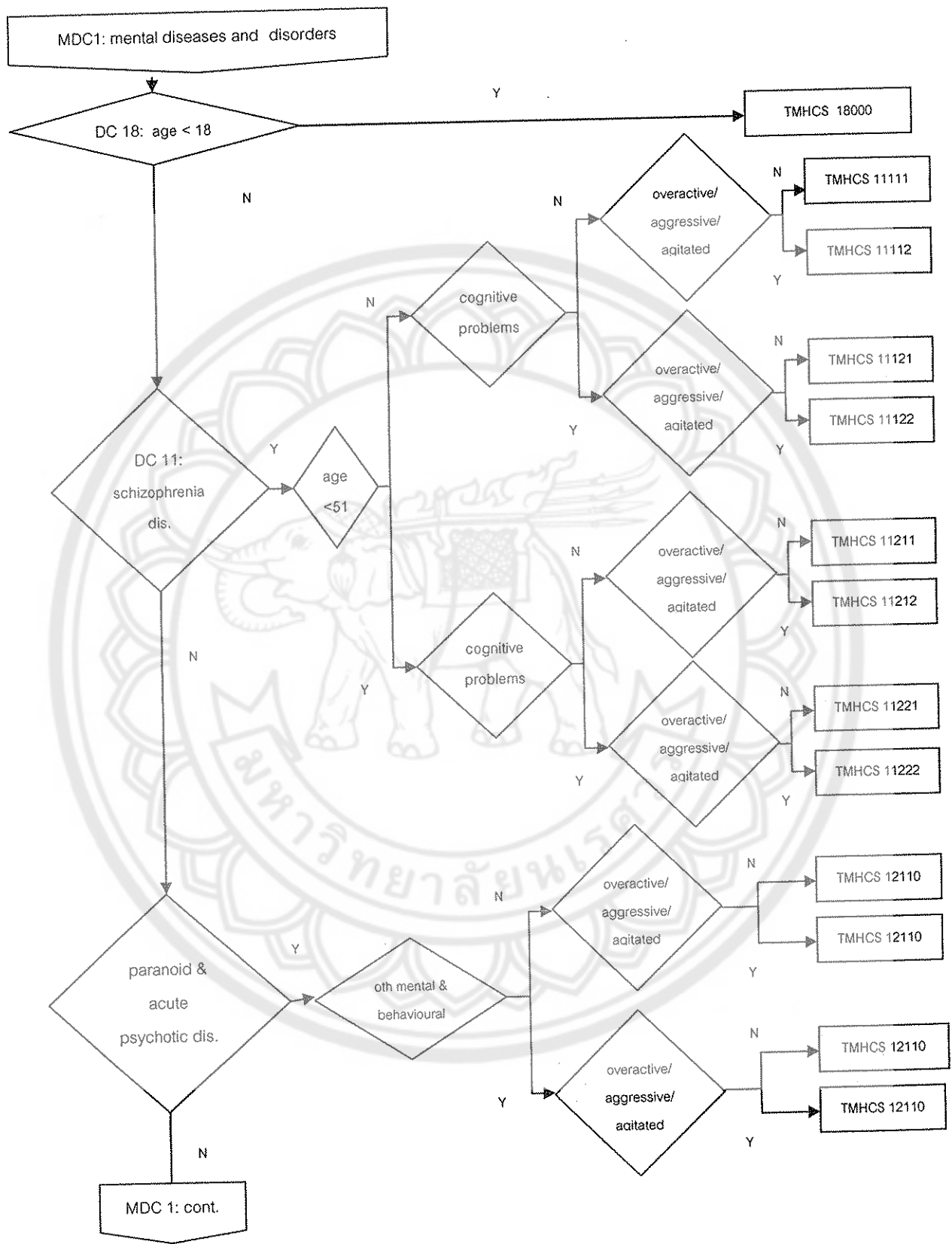
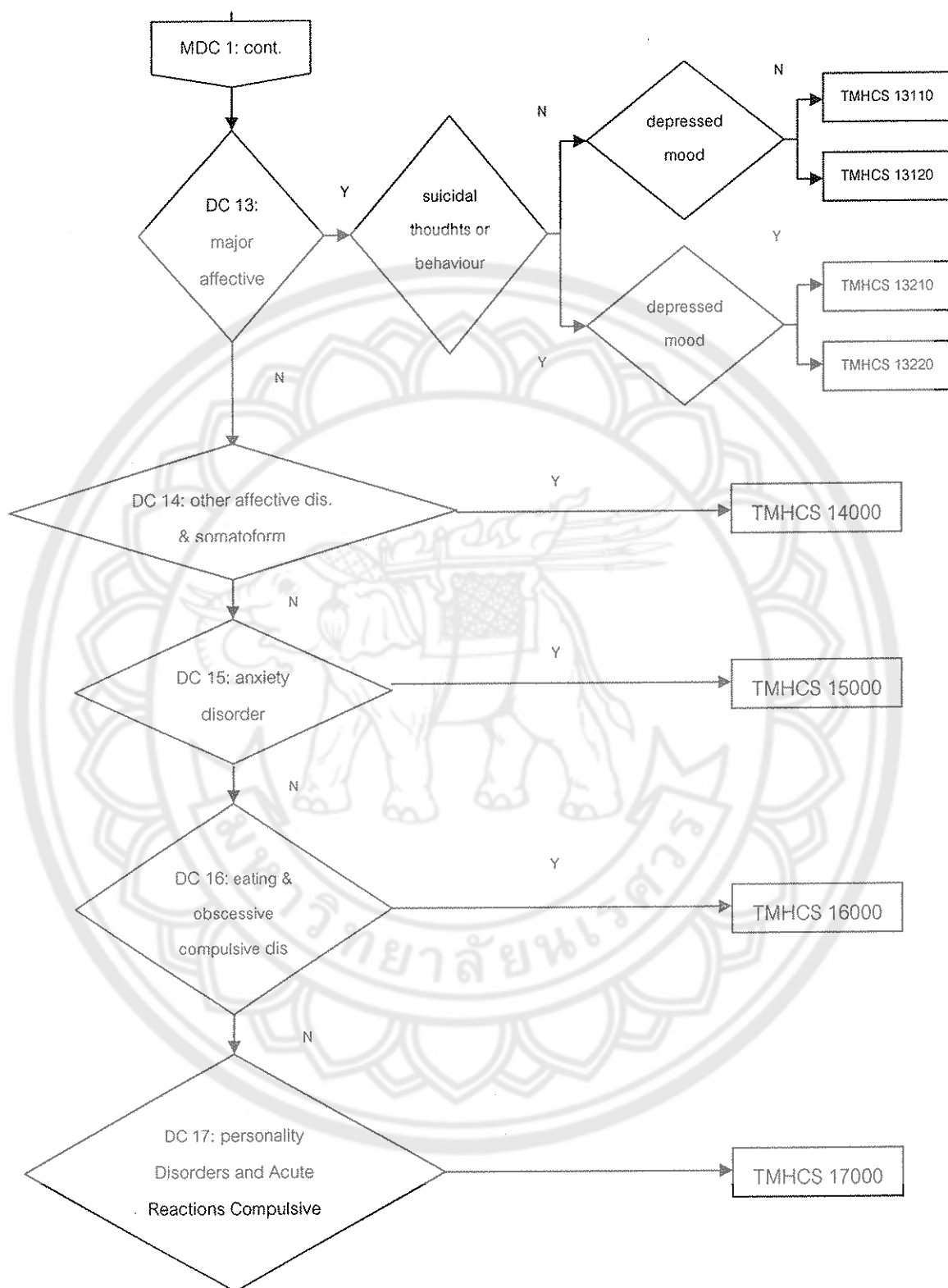Figure 27 Diagram of MDC 1 in TMHCC

Figure 27 (Cont.)

6.3 MDC 2: diseases and disorders of the alcohol/drug use and alcohol/drug induced organic mental disorders

Table 48 and Figure 28 illustrated the classification of MDC 2: alcohol/drug use and alcohol/drug induced organic mental disorders. The classification in MDC 2 was classified into 5 DCs and then classified into 18 TMHCSs.

Table 48 TMHCC subclass in MDC 2 of TMHCC

	TMHCS	Definition
DC 21: alcohol Intoxication and Withdrawal		
1	21111	alc intox & withdrawal, wo problems making supportive social relationships, wo prob from overactive/aggressive/agitated behavior, wo Detoxication
2	21112	alc intox & withdrawal, wo problems making supportive social relationships, wo prob from overactive/aggressive/agitated behavior, w Detoxication
3	21121	alc intox & withdrawal, wo problems making supportive social relationships, w prob from overactive/aggressive/agitated behavior, wo Detoxication
4	21122	alc intox & withdrawal, wo problems making supportive social relationships, w prob from overactive/aggressive/agitated behavior, w Detoxication
5	21211	alc intox & withdrawal, w problems making supportive social relationships, wo prob from overactive/aggressive/agitated behavior, wo Detoxication
6	21212	alc intox & withdrawal, w problems making supportive social relationships, wo prob from overactive/aggressive/agitated behavior, w Detoxication
7	21221	alc intox & withdrawal, w problems making supportive social relationships, w prob from overactive/aggressive/agitated behavior, wo Detoxication
8	21222	alc intox & withdrawal, w problems making supportive social relationships, w prob from overactive/aggressive/agitated behavior, w Detoxication
DC 22: drug Intoxication and Withdrawal		
9	22111	drug Intox & withdrawal , wo problems with physical illness/disability, wo suicidal thoughts or behavior, wo depressed mood
10	22112	drug Intox & withdrawal , wo problems with physical illness/disability, wo suicidal thoudhts or behavior, w depressed mood
11	22120	drug Intox & withdrawal , wo problems with physical illness/disability, w suicidal thoudhts or behavior

Table 48 (Cont.)

|	TMHCS	Definition
11	22120	drug Intox & withdrawal , wo problems with physical illness/disability, w suicidal thoudhts or behavior
12	22200	drug Intox & withdrawal , w problems with physical illness/disability
DC 23: alcohol/drug use and alcohol/drug induced organic mental disorders		
13	23110	alc/drug use & alc/drug induced organic mental dis., wo cognitive problems, age < 56
14	23120	alc/drug use & alc/drug induced organic mental dis., wo cognitive problems, age < 56
15	23210	alc/drug use & alc/drug induced organic mental dis., w cognitive problems, age > 55
16	23220	alc/drug use & alc/drug induced organic mental dis., w cognitive problems, age > 55
DC 24: opioid use disorders and dependence		
17	24000	opioid use disorders and dependence
DC 25: other drug use disorder and dependence		
18	25000	other drug use disorder and dependence
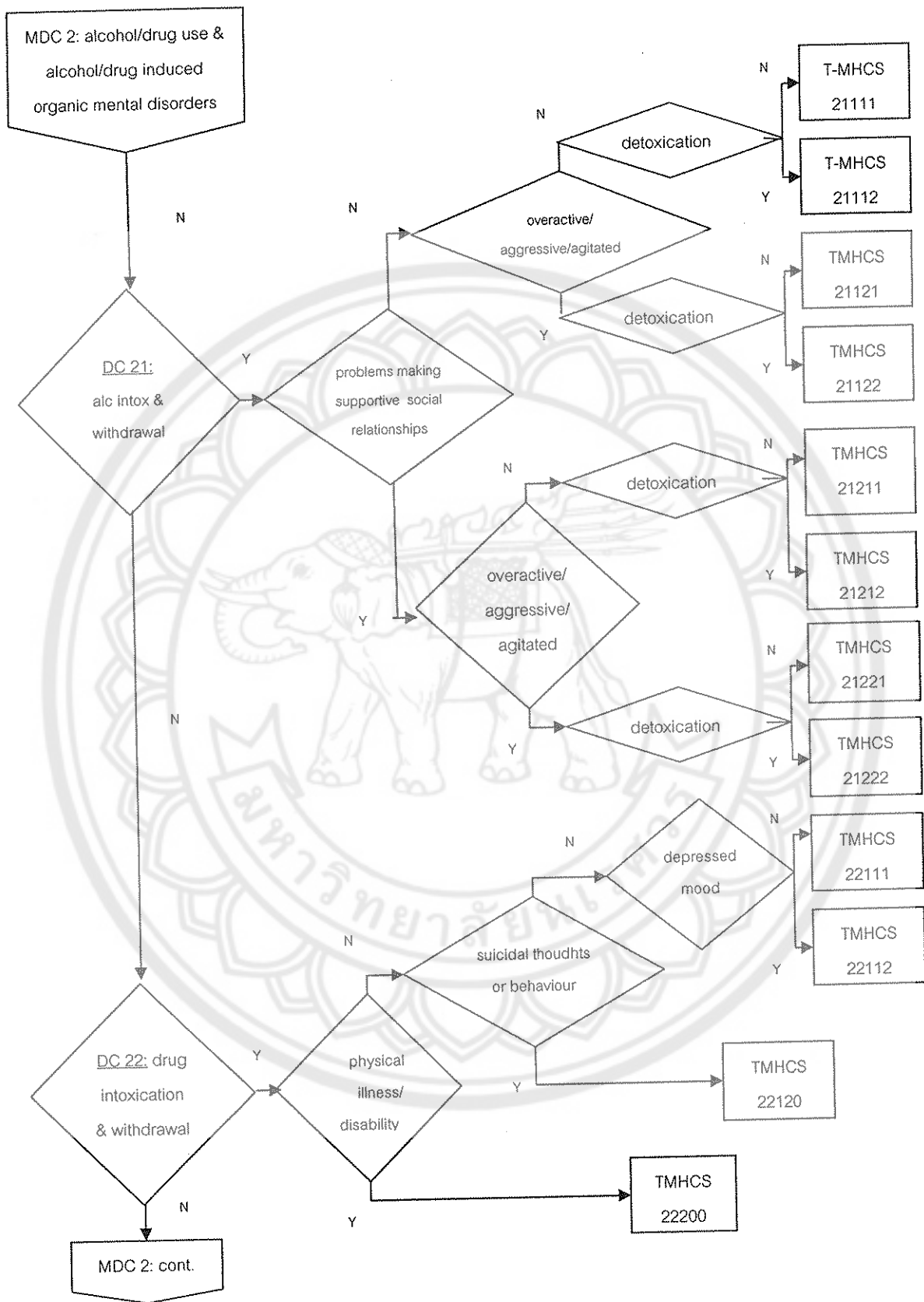
Figure 28 Diagram of MDC 2 in TMHCC
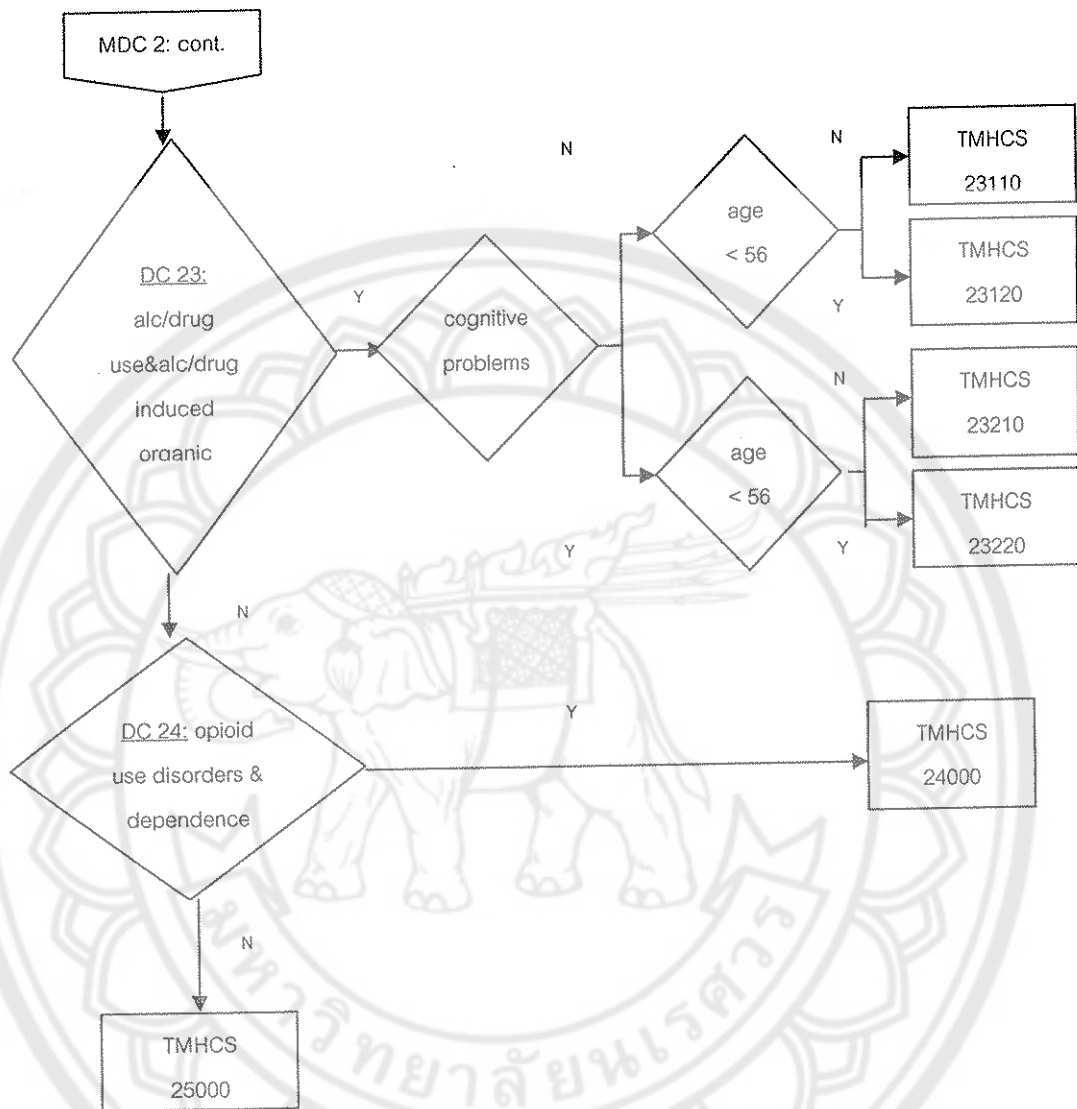
Figure 28 (Cont.)

6.4 MDC 3: diseases and disorders of the nervous system

Table 49 and Figure 29 illustrated the classification of MDC 3: diseases and disorders of the nervous system. The classification in MDC 3 was classified into 4 DC and then classified into 10 TMHCS by using physical illness/disability, cognitive problems, cognitive problems, detoxification, and age.

Table 49 TMHCC subclass in MDC 3

|	TMHCS	Definition
DC 31: dementia and other chronic disturbances of cerebral function		
1	31110	dementia and other chronic disturbances of cerebral function, wo physical illness/disability, wo cognitive problems
2	31120	dementia and other chronic disturbances of cerebral function, wo physical illness/disability, w cognitive problems
3	31210	dementia and other chronic disturbances of cerebral function, w physical illness/disability, wo cognitive problems
4	31220	dementia and other chronic disturbances of cerebral function, w physical illness/disability, w cognitive problems
DC 32: delirium		
5	32110	delirium, age <71, wo detoxification
6	32120	delirium, age <71, w detoxification
7	32210	delirium, age > 70, wo detoxification
8	32220.	delirium, age > 70, w detoxification
DC 33: seizure		
9	33000	seizure
		DC 34: other disorders of nervous system
10	34000	Other disorders of nervous system
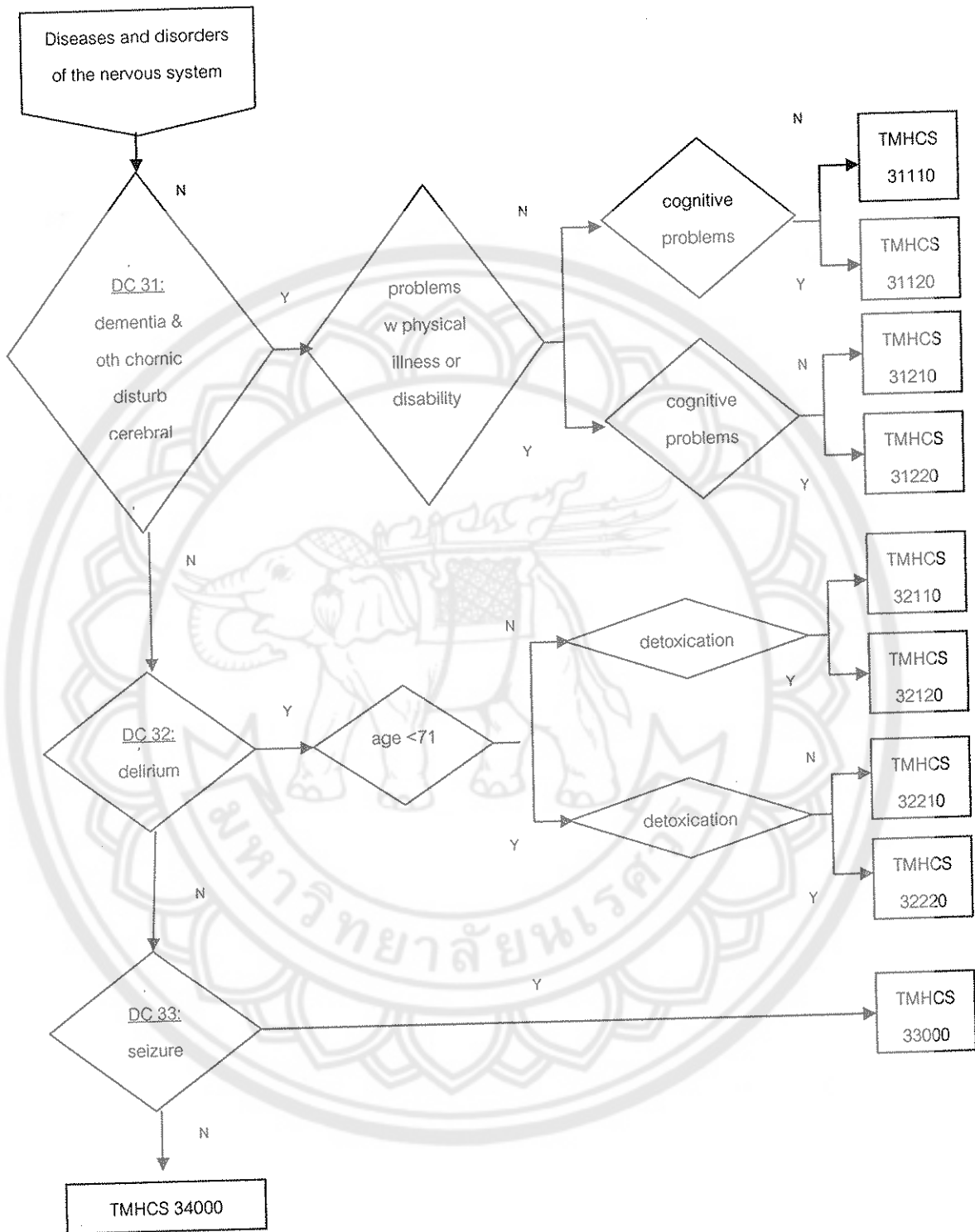
Figure 29 Diagram of MDC 3 in TMHCC

7. Discussion and conclusions

This chapter gives us a clear understanding of the subjects' profile in term of their attributions. Subjects' attributions here comprise of socio-demographic variables (age, sex, and marital status), service attributions variables (insurance class and length of stay), and clinical attributes variables (diagnosis cluster and clinical symptoms). It provides a more completed picture of the patients being 'classified'; describing their range of clinical characteristics and varied patterns of service use. It illustrates that the same/difference characteristics and their relation among variables. It gives a basis for evaluating the clinical reference for future study for chapter VII.

The concept of this classification was to group inpatients with similar characteristics into the same group. This concept suggests that patients with similar characteristics presumably use the same amount of resources. Patient characteristics used in TMHCC model must cover all cost-effect factors. My two major criteria of TMHCC were selected from (1) literature reviews from both abroad and local and (2) analysis results of the subjects. From literature reviews involving mental health casemix, I found three important papers: (a) Mental Health Classification and Service Costs (MH-CASC) (b) Thai-Diagnosis Related Grouping version 3.0-3.5 (c) Australian Refined Diagnosis Related Groups Version 5.1 (AR-DRG v. 5.1).

From a statistical view, the TMHCC model focuses on cost performance with the following main principles.

1. The highest cover necessary patient attribute (characteristic) factors of TMHCC and lowest number of equity factors for every party. Both lead to decreased conflict of service reimbursement

2. Use service care costing factors instead of hospital charge for dependent variable

3. Patient characteristic from mental health assessments from medical record and use factors in TMHCS for maximizing response costing.