Treatment of Brain Tumors in Thailand from 2005 to 2014: Data from the National Health Security Office

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Objective: *To evaluate the treatment of brain tumor in Thailand.*
Material and Method: *The data from the National Health Security Office (NHSO) concerning the principle diagnosis of brain tumors between 2005 and 2014 were retrieved and analyzed for their treatment.*
Results: *Between 2005 and 2014, there were a total of 93,810 hospital admissions in Thailand for brain tumor treatment. The number of brain tumors had increased each year (from 6,056 in 2005 to 12,098 in 2014) but the length of stay (LOS) had been shorter (from 13.28 in 2005 to 9.94 days in 2014). The adjusted relative weight had increased from 2.946 to 4.383, respectively. The number of poor outcomes had also decreased from 23.7% in 2005 to 18.1% in 2014. Above 80% of total admissions, the treatment was performed within the health region, namely region 1, 7, 12 and 13 which had very high treatment rates within the region.*
Conclusion: *The treatment of brain tumors in Thailand is developed throughout the country, with better outcomes, shorter lengths of stay. The health region 1, 7, 12 and 13 have a very high ability to treat brain tumors in their areas.*

Keywords: *Treatment, Brain tumor, National Health Security Office, Thailand*

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The treatment of brain tumors in Thailand first occurred more than 60 years. The payments was either made by the patient or the government if the patient or their family was the government employee, whilst the remainders were fully or partially supported by the hospital social welfare system.

Since 2002, healthcare in Thailand is provided to every Thai people. A total of 48.3 out of 65.1 million Thais (74.2%) are covered by the Universal health Coverage (UC) and received the financial support from the National Health Security Office (NHSO). The remaining are either covered by the Social Security Office (9.4 million) or the Civil Servant payment scheme (4.9 million)[1]. Every treatment from every hospital in Thailand would send the report to the NHSO for reimbursement.

In this report we gathered the data from the NHSO between 2005 and 2014 from every hospital that treats the brain tumors[2] (malignant brain tumors: ICD code C 700, 709, 710-19, 728-9, 751-3, 793, and benign tumors: code D 320, 329, 330-3, 337, 339, 352-4; tumor of uncertain behavior: ICD code D 420, 429, 430-4, 438-9, 443-5)[3]; reimbursement is received from the NHSO.

Statistical analysis: The statistical analysis was done using program SPSS 16 and excels.

The data retrieved from the NHSO were based on the principle diagnosis of brain tumor cases admitted to any hospital in Thailand and the expense claims made to the NHSO. Any treatment occurred at the outpatient services (such as OPD visits, follow-ups, some radiation treatment patients) was excluded. Every patient admission was counted, so the total numbers were not only new cases; the data were on a year by year basis.

The brain tumors in this report were grouped into seven (Table 2) because discussing the tumors in groups are likely to be more precise than each tumor codes, which were highly variable due to coder preferences.

Results

There were a total of 93,810 brain tumor patients were admitted between 2005 and 2014. The

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Table 1. Inclusion and exclusion criteria

Inclusion criteria	Inclusion	Exclusion
Nationality	Thais	Others
Age	Any	
Payment scheme	Universal coverage (UC)	Civil servant, Social security, Self-pay
Admission	Every admission count	
Hospital	Government hospitals	Private hospitals
Ward	In patients	Out patients
Procedure	Any: surgical, diagnostic, rehab, chemo, radiation, according to ICD 9 CM	
Surgery	The first 3 procedures	Accessory surgical procedure[4] 0201; Opening of cranial suture 0202; Elevation of skull fracture fragments 0203; Formation of cranial bone flap 0204; Bone graft to skull 0205; Insertion of skull plate 0206; Other; cranial osteoplasty 0207; Removal of skull plate 0211; Simple suture of dura mater of brain 0212; Other repair of cerebral meninges

Table 2. Grouping of brain tumors by ICD 10 codes

Tumors	Codes
Meningioma	D320, D329, D420, D429, C700, C709
Brain and others CNS tumors	D330, D331, D332, D337, D339, D430, D431, D432, D438, D439, C710, C711, C712, C713, C714, C715, C716, C717, C718, C719, C728, C729
Cranial nerve tumors	D333, D433, C722, C723, C724, C725
Tumors of the pituitary gland	D352, D443, C751
Tumors of the pineal gland	D354, D445, C753
Craniopharyngioma	D353, D444, C752
Metastatic tumors	C793

average age of the patients had been increased each year, correlating well with life expectancy of Thais and predominately females in the latest year could be explained with the same reason. The results of the treatment showed either being dead or not improved, describing poor outcomes of the treatment. However, this numbers had gradually declined, respectively. Moreover, the number of transferals in the past 5 years had also slightly decreased which showed the improvement of treatment facilities. Total number of admissions had increased markedly but the average length of stay was shorter. The adjusted relative weight (RW) reflected the complicated treatment and also the quality of medical records which had been rising each year (Table 3).

Of note, the total admissions represented not only new cases, so the mean age, sex, marital status may be different from the new case data.

Cost in the brain tumor treatment

The cost of brain tumor treatment had increased every year and also the number of admissions which almost doubled in this ten-year interval. In 2014, the NHSO received more than 617 million baht claims compared to only 233 million baht in 2005. The average cost was 38,565.20 baht in 2005 and increased to 51,063.40 baht in 2014, representing a rise of 32.41% in 10 years.

Training centers as a treating hospital for brain tumors

Neurosurgical training centers are expected

Table 3. Demographic data

	2005	2010	2014
Age	44.19	46.20	47.60
% males	49	47.6	44.9
Married	60.9	59.7	58.7
D/C status: not improved/death	17.1/6.6	15.1/7.0	12.0/6.1
D/C types: by transferals	13.4	14.5	12.2
LOS mean: days (SD)	13.28 (18.03)	11.39 (19.47)	9.94 (15.84)
adj RW (SD)	2.946 (2.158)	4.383 (5.340)	4.104 (4.177)
Total admissions	6,056	9,796	12,097
Total cases	4,102	6,166	7,748
Average admission/patient	1.48	1.60	1.58

D/C = discharge, LOS = length of stay, adj RW = adjusted Relative Weight

to have the best facilities for treating brain tumors. In Thailand, there are eight training centers in neurosurgery which have been launched for more than ten years and there are another three centers which started training recently. The data showed that the patients were admitted in the training centers for neurosurgery up to 22.74% in 2005 but the number has declined to only 17.69% in 2014. The total number of the patients admitted to the training centers has been rising every year until the year 2014 despite the decreased percentage of the total number.

The strategy for treating the patients in the health region has been implemented in 2014. This policy strengthens the health system in the area where the patients stay and reduce workload for the training centers resulting in a sharp decline in numbers between the years 2013 and 2014 (Table 5).

The procedures recorded in the database (ICD 9-CM 2010) include the surgical procedures, diagnostic procedures, or any other procedures. As the first top three procedures being analyzed, the total number of neurosurgical procedures had increased remarkably (from 2,650 in 2005 to 4,353 in 2014); however, the percentage of the patients admitted for surgery decreased from 43.76% in 2005 to 35.98% in 2014. The number of the patients admitted for diagnostic procedures such as CT, MRI had obviously increased, from 1,728 in 2005 to 7,073 in 2014. A lot more patients were admitted for rehabilitation in the year 2014. The ratio of the patients received radiation therapy or chemotherapy had not changed, but the number had

Table 4. The treatment cost of brain tumors, claimed by the hospital

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total cost (million baht)	233.55	292.3	345.6	415.34	420.63	484.21	501.63	547.02	576.65	617.77
Average (baht)	38,565.20	42,627.5	45,945.5	47,527.60	44,905.40	49,424.00	47,516.10	49,161.40	48,922.40	51,063.40
Number of admissions	6,056	6,857	7,522	8,738	9,276	9,796	10,556	11,126	11,786	12,097

Table 5. Ratio of brain tumor treated in the training center

Hospital	2005	2010	2011	2012	2013	2014
A	46	70	61	51	67	73
B	22	30	39	30	40	70
PNI	148	256	266	288	210	193
D	135	268	314	282	337	313
E	175	208	211	216	222	236
F	393	454	470	494	408	399
G	203	373	388	443	466	425
H	255	408	445	407	519	431
Sum	1,377	2,067	2,194	2,211	2,269	2,140
Total admission	6,056	9,796	10,556	11,126	11,786	12,097
% treatment	22.74	21.10	20.78	19.87	19.25	17.69

increased.

The first top three procedures were analyzed and found that most of the patients had undergone more than one procedure and sometimes the procedures were performed in a single admission but the records were more than once such as 0159-excision of tumor of the brain, 0212-other repair of cerebral meninges, 0234-ventriculo-peritoneal shunt (VP shunt). In this report, these were analyzed as two surgical procedures.

The procedure codes 0201-0212 were added as resection procedures and the author decide to exclude them from analyzes (Table 1).

The patients had higher chance to receive chemotherapy, radiation therapy and surgical procedures in the training centers. Prasat Neurological institute (PNI) is one of the training centers for neurosurgery, however, as a specialist center; we do not have radiation treatment in the institute. In addition, the number of patients underwent rehabilitation in the training centers was quite small.

The data analyzed in the present report were from the NHSO inpatient claims, so some procedures such as radiation therapy (procedure code 99.20-99.29, 92.3, 92.4) which may have been performed in the outpatient basis and then were not counted in this report.

The 10-year changes

The treatments of each group of brain tumors showed the same direction. There were shorter length of hospital stays and higher adjusted RW in the 10-year interval. The treatments (surgery, chemotherapy and radiation therapy) were higher in numbers but a decrease in percentage of total admissions (Table 7).

Craniopharyngioma was the tumor that had the highest LOS, followed by the cranial nerve tumors and pineal tumors (14.46, 13.92 and 12.19 days, respectively), whilst tumors of the cranial nerve had the highest adjusted RW, followed by craniopharyngioma and meningioma (6.52, 6.275 and 5.999, respectively).

Treatment in the health regions

The health regions that had the academic training center had higher percentage of treatments in their own area. The health region 1 covered Chiang Mai University, the health region 7 involved Khon Kaen University, the health region 12 covered the Prince of Songkhla University and the health region 13 referred to Bangkok, which had six out of eight training centers. The trend showed more and more patients having the treatments within their regions.

Discussion

Treatments for brain tumors consist of investigation, surgery, rehabilitation, radiation and chemotherapy, in which varied depending on type of tumors[6-10]. In this present study, the diagnosis was based on ICD 10 which did not consider specific tumors pathology but divided the codes into group of benign tumors of the brain, malignant tumors of the brain and uncertain behavior tumors of the brain. These preferences limited comparing the data of each diagnosis based on the pathology such as high grade glioma to other studies[8-10]. The percentage of radiation treatment for brain and other CNS tumors was 5.3% in 2005 decreasing to 3.6% in 2014. But again, this was the prevalence data not only from the new cases. A study by Noipitak and Veerasarn[11] reported the results of high grade glioma treatment in Prasat

Table 6. The first top three procedures claimed by all eight training centers for neurosurgery in 2014

Procedures (ICD 9 CM 2010)	2005	2014	2014							
			A	B	PNI	D	E	F	G	H
012 craniotomy-craniectomy	766	310	0	1	1	3	11	14	11	17
013 incision of brain/meninges	171	268	3	0	0	5	3	3	2	2
015 excision of lesion	1,171	2,704	41	23	96	114	95	88	99	185
022-024 ventriculostomy & shunt	336	655	8	8	14	35	22	25	41	25
04 cranial nerve procedure	70	131	0	0	10	17	31	0	7	12
07 pituitary pineal procedure	136	285	4	3	22	38	23	13	32	37
total surgical procedure	2,650	4,353	56	35	143	212	185	143	192	278
% of admission	43.76	35.98	76.71	48.61	74.09	67.73	43.43	60.60	48.12	64.50
80 diagnostic procedure	1,728	7,073	38	53	108	89	184	190	193	166
922 radiation therapy	409	817	1	8	1	43	29	27	107	37
% radiation treatment	6.75	6.75	1.37	11.11	0.52	13.74	6.81	11.44	26.81	8.58
93 rehabilitation	154	1,121	4	1	4	16	6	0	17	30
990 blood transfusion	139	755	8	0	13	10	31	5	16	23
992 chemotherapy	408	841	0	2	10	41	159	44	49	41
% chemotherapy	6.74	6.95	0	0	5.18	13.1	37.32	18.64	12.28	9.51
Total admission	6,056	12,098	73	72	193	313	426	236	399	431

Table 7. Percentage of brain tumor treatment with in their health region

Treatment (%)	Meningioma		Brain and other CNS tumor		Cranial nerve tumor		Pituitary tumor		Pineal tumor		Craniopharyngioma		Metastatic brain tumor	
	2005	2014	2005	2014	2005	2014	2005	2014	2005	2014	2005	2014	2005	2014
Age (years)	47.63	52.04	39.76	42.90	45.96	48.79	43.49	49.24	19.69	17.79	27.3	24.59	57.94	59.40
Surgery	755 (87.9)	1,321 (66.1)	1,387 (39.6)	1,982 (30.5)	144 (114.3)	202 (98.6)	150 (61.5)	321 (60.8)	57 (55.9)	85 (43.4)	65 (92.9)	100 (71.4)	213 (18.1)	380 (15.1)
Radiation treatment	19 (2.2)	28 (1.1)	186 (5.3)	231 (3.6)	2 (1.6)	2 (1.0)	13 (5.3)	7 (1.3)	10 (9.8)	21 (10.7)	2 (2.9)	2 (1.4)	195 (16.6)	513 (20.4)
Chemotherapy	0	1 (0.1)	248 (7)	573 (8.8)	0	0	1 (0.4)	3 (0..6)	34 (33.3)	50 (25.5)	1 (1.43)	1 (0.7)	73 (6.2)	78 (3.1)
Total cases	859	1,998	3,478	6,510	126	206	244	528	102	196	70	140	1,174	2,515
Ave LOS	15.41	11.31	12.84	9.36	20.68	13.92	14.1	9.71	18.92	12.19	25.97	14.46	11.55	9.6
Ave adj. RW	3.958	5.999	2.910	3.709	4.631	6.52	2.16	4.917	3.594	4.934	3.154	6.275	2.474	3.268

Ave LOS = average length of stay; Ave adj RW = average adjusted relative weight

Table 8. Percentage of brain tumor patients divided by locations of treatment

Health region	1	2	3	4	5	6	7	8	9	10	11	12	13	Average
2005	98.2	70.9	51.2	55.0	68.1	61.4	91.2	74.1	76.1	80.2	65.4	96.6	95.9	75.72
2009	98.3	76.8	68.2	63.5	68.7	66.1	91.9	80.8	73.2	85.1	70.3	96.9	96.9	79.45
2014	99.0	78.1	68.8	71.3	69.3	67.7	92.8	80.4	79.3	82.5	69.3	92.9	95.8	80.55

Table 9. Health region in Thailand

Health region	Provinces
1	Chiang Mai, Chiang Rai, Nan, Phrae, Phayao, Mae Hong Son, Lampang, Lampoon
2	Phitsanulok, Phetchabun, Tak, Sukhothai, Uttaradit
3	Nakhon Sawan, Phichit, Kamphaengphet, Uthaithani, Chainat
4	Saraburi, Nakhon Nayok, Nonthaburi, Pathumthani, Ayuthaya, Lopburi, Singburi, Angthong
5	Phetchaburi, Ratchaburi, Nakornpathom, Kanchanaburi, Samutsakhon, Samutsongkhram, Suphanburi, Prachuapkhirikhan
6	Chonburi, Chantaburi, Chachoengsao, Prachinburi, Sakaeo, Rayong, Trat,Samutprakarn
7	Khonkaen, Roi Et, Mahasarakham, Kalasin
8	Udornthani, Loei, Nongbualumpu, Sakhon Nakhon, Nakhon Phanom, Nong Khai, Bungkarn
9	Nakhon Ratchasima, Chaiyaphum, Buriram, Surin
10	Ubon Ratchathani, Amnat Charoen, Mukdaharn, Yasothon, Si Sa Ket
11	Suratthani, Nakhon Srithammarat, Krabi, Chumphon, Ranong, Phangnga, Phuket
12	Songkla, Narathiwat, Yala, Trang, Satun, Pattani, Pattalung
13	Bangkok

Neurological Institute gathering data between 2007 and 2009 and found that the patients received post-operative radiation for 62% and chemotherapy13%. Therefore, our data are very far from the standard reference[6-10] because of the coding limitation and treatment facilities.

Health regions in Thailand

The health regions in Thailand started some time ago. There are 12 areas covering all provinces in Thailand plus area 13 for Bangkok, a capital province. Each health region has around 5 million populations and has covered 4-8 provinces. The health region has at least one big hospital (advanced level) which has neurosurgical facilities. The National strategies try to strengthen the health regions to provide care of the patients in their area.

Suggestions for further study

Based on the results of this present study, we suggest that the number of new cases of each type of tumor should be identified by the actual incidence. For further comparison, the details of each patient's identification number are needed to collect the actual number of admissions, procedures received and the treatment outcomes for precise incidence analysis.

The reimbursement data from the NHSO should be included in analyses. The other issue is to compare the results of the treatment among other payment schemes such as civil servant or social security payment scheme.

Conclusion

The treatments of brain tumors in Thailand are implemented throughout the country, with the better outcomes, shorter lengths of stay. The treatments are more and more outside the neurosurgery training centers. The cost of treatment remarkably increased in the 10-year interval. The health region 1, 7, 12 and 13 have very high ability to treat the brain tumors in their area.

What is already known on this topic?

The treatment of specific brain tumors reported by hospitals in Thailand and the treatments for each tumor according to an international standard.

What this study adds?

This study adds brain tumor treatment outcomes in Thailand, both economical and other outcomes based on the database of the NHSO.

Potential conflicts of interest

None.

References

1. The Bureau of Public and Private Participation Promotion, The National Health Security Office. Handbook of the National Health Security for the Equality in health care. Bangkok: Srimuang Printing; 2014.
2. Data base from the National Health Security Office, Principle diagnosis of Brain tumor 2005-2014.

3. International Statistical Classification of Diseases and Related health problems, 10th revision, Thai modification. (ICD 10 TM). Nonthaburi: Office of the Permanent Secretary, Bureau of Policy and Strategy, Ministry of Public Health, Thailand; 2014.
4. International Classification of Diseases, 9th revision, Clinical modification (ICD-9-CM) Diagnosis and Procedure Codes: Abbreviated and Full Code Titles. Atlanta, GA: CDC/National Center for Health Statistics; 1999.
5. Coronini-Cronberg S, Laohasiriwong W, Gericke CA. Health care utilisation under the 30-Baht Scheme among the urban poor in Mitrapap slum, Khon Kaen, Thailand: a cross-sectional study. Int J Equity Health 2007; 6: 11.
6. NCCN clinical practice guideline in oncology. Central nervous system cancer, version 1-2015 [Internet]. 2015 [cited 2016 Apr 30]. Available from: https://www.nccn.org/professionals/physician_gls/PDF/cns.pdf
7. NCCN clinical practice guideline in oncology. Neuroendocrine tumors, version 1-2015 [Internet]. 2015 [cited 2016 Apr 30]. Available from: https://www.nccn.org/professionals/physician_gls/pdf/neuroendocrine.pdf
8. Stupp R, Mason WP, van den Bent MJ, Weller M, Fisher B, Taphoorn MJ, et al. Radiotherapy plus concomitant and adjuvant temozolomide for glioblastoma. N Engl J Med 2005; 352: 987-96.
9. Brada M, Hoang-Xuan K, Rampling R, Dietrich PY, Dirix LY, Macdonald D, et al. Multicenter phase II trial of temozolomide in patients with glioblastoma multiforme at first relapse. Ann Oncol 2001; 12: 259-66.
10. Stupp R, Brada M, van den Bent MJ, Tonn JC, Pentheroudakis G. High-grade glioma: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. Ann Oncol 2014; 25 (Suppl 3): iii93-101.
11. Noiphithak R, Veerasarn K. Clinical predictors for survival and treatment outcome of high-grade glioma in Prasat Neurological Institute. Asian J Neurosurg [Internet]. 2016 [cited 2016 Apr 30]. Available from: http://www.asianjns.org/temp/AsianJNeurosurg000-1001721_024657.pdf

การรักษาโรคเนื้องอกสมองในประเทศไทยระหว่างปี พ.ศ. 2548 ถึง ปี พ.ศ. 2557 ข้อมูลจากสำนักงานหลักประกันสุขภาพแห่งชาติ

กุลพัฒน์ วีรสาร, วุฒิศิริ วีรสาร

วัตถุประสงค์: *เพื่อศึกษาเนื้องอกสมองในประเทศไทย*

วัสดุและวิธีการ: *วิเคราห์ข้อมูลการรักษาเนื้องอกในสมองจากสำนักงานหลักประกันสุขภาพแห่งชาติ (สปสช) โดยดูจากข้อมูลการวินิจฉัยหลัก เป็นโรคเนื้องอกในสมองที่เข้ารับการรักษาระหว่างปี พ.ศ. 2548 ถึง ปี พ.ศ. 2557*

ผลการศึกษา: *ระหว่างปี พ.ศ. 2548 ถึง ปี พ.ศ. 2557 มีผู้ป่วยเข้ารับการรักษาด้วยการวินิจฉัยว่าเป็นเนื้องอกในสมองรวมทั้งสิ้นจำนวน 93,810 ครั้ง (6,056 ครั้งในปี พ.ศ. 2548 เพิ่มขึ้นเป็น 12,098 ครั้งในปี พ.ศ. 2557) จำนวนวันนอนเฉลี่ยลดลงจาก 13.28 วันในปี พ.ศ. 2548 เหลือเพียง 9.94 วันในปี พ.ศ. 2557 ค่าเฉลี่ยความยากการรักษา (adj RW) เพิ่มขึ้นจาก 2.946 ไปเป็น 4.383 ในช่วงเวลาเดียวกันผู้ป่วยที่ผลการรักษาไม่ดีลดลงจาก 23.7% เหลือ 18.1% ในปี พ.ศ. 2557 การรักษาเนื้องอกในสมองสามารถทำได้ในเขตบริการสุขภาพได้มากกว่า 80% ของการอยู่โรงพยาบาลทั้งหมด เขตบริการสุขภาพที่หนึ่งเจ็ดสิบสองและสิบสามสามารถรักษาเนื้องอกในสมองได้ในพื้นที่เป็นอย่างดี*

สรุป: *การรักษาเนื้องอกในสมองสามารถให้บริการได้ทั่วประเทศไทย ได้ผลการรักษาที่ดีขึ้นอยู่โรงพยาบาลสั้นลงแม้ว่าความยากของการรักษาจะสูงขึ้น เขตบริการสุขภาพที่หนึ่งเจ็ดสิบสองและสิบสามสามารถให้การรักษาประชากรในพื้นที่ได้มากกว่าเขตอื่น*