Economic Problem of Referred Trauma Cases in Siriraj Hospital

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To improve the service for referred trauma patients, the authors have to know the types of injury, the cost, and the reimbursement for each individual category. Therefore, the authors studied the characteristics of accident of patients transferred for treatment at Siriraj Hospital, including types of trauma (wounds), cost of treatment (excluding doctor's fees) and charges for treatments for each group. There were 678 trauma cases referred to the Division of Trauma Surgery, Department of Surgery, Faculty of Medicine, Siriraj Hospital from 1st September 2002 to 31st August 2003 and of these, 571 cases were admitted. From the admitted cases, the most common injury was the musculoskeletal system (38.6%), followed by nervous system injury (15.1%), eye injury (8.1%), toxic substance injury (6.3%), burns (5.8%), and others. The total cost of treatment was 36,249,150 baht. The reimbursement was 30,135,709 baht. There were four categories where the reimbursed amount was below the actual cost. They were burns, followed by nervous system injury, eye injury and skin or subcutaneous tissue injury. To deal with the referred cases in trauma center level I, the center should prepare to manage the common trauma groups such as musculoskeletal system injury, nervous system injury and eye injury. Burns, nervous system injury, eye injury and skin or subcutaneous tissue injuries are the major groups that cost more than the reimbursement amount. The reimbursement of these groups should be reconsidered in the future to solve the problem.

Keywords: *Referred trauma cases, Cost, Reimbursement*

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At present, the government has a public health policy to provide effective treatment to all people equally, especially those who are injured in accidents or disasters. They should get help quickly and accurately, both with first aid treatment and a transfer to hospitals. There should be suitable procedures in place, especially for serious and complicated cases that need to be transferred to a hospital or emergency center with the capability to provide effective treatment[1].

The Division of Trauma Surgery, Department of Surgery, Faculty of Medicine, Siriraj Hospital receives approximately 50 transferred trauma cases every month[2]. Good preparation is needed to provide a high level of treatment. The Division needs to know the basic information such as type of injury, transferring hospital, cost or expenses, and the reimbursement, to prepare the service and budget.

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Material and Method

The authors collected all the reports of the patients who were transferred for treatment at the Trauma Center of Siriraj Hospital during 1st September 2002 to 31st August 2003. There were 678 patients. All the records provided information about the injury and transferring hospital.

The authors admitted 571 cases and recorded the Diagnosis Related Group (DRG), the number of days

stayed at the hospital, the status of patients on discharge, the right to claim for medical treatment, and all the expenses during the treatment. For the universal coverage group, the authors calculated the charging as DRG system according to Relative Weights (RW). For the present study, RW was 16000 baht[3].

Primary data were collected from the statistic record books of the out-patients section of the Trauma Center, admitted patients information from the register of the computer data center of Siriraj Hospital, and average cost data such as: medicine, medical supplies, charges for services and procedures, unit costs which are direct (excluding doctor's fees) and indirect costs from the cost controlling unit of the Finance Department of Faculty of Medicine, Siriraj Hospital.

Details of calculation of expense/cost[4]

1. Costs classified by Major Diagnostic Category (MDC), DRG, RW, admittance (Weighted Length of Stay "WLOS"), service charges paid by patients, welfare, the Accident Foundation or the universal coverage scheme.

2. Expenses classified by: disease identification, blood used, pathologic study, X-ray, operation, anesthesia, prosthesis, tools and instruments, chemotherapy, radio therapy, medicine and medical supplies, rehabilitation and other treatment, accommodation, food and other costs.

3. Calculation of per head expenses for each case compared with capital.

4. The expenses for the universal coverage group, calculated by the DRG system with RW = 16,000 baht plus any high expense service charges, such as replacing prostheses operation and brain operation.

5. High expense patient group needed for further study as related to the details of capital compared with treatment charges.

Results

There were 678 trauma cases (521 males:157 females), transferred to the Division of Trauma Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital during 1 st September 2002 to 31 st August 2003. The age of the patients varied from 1-95 years old (Table 1). Of all the transferred patients, 522 (77%) were from other hospitals in Bangkok and cities nearby [357 (55.3%), from private hospitals, and 147 (21.7%) from government hospitals], and 156 (23%) patients were from up country [125 (18.4%) from government hospitals and 31(4.6%) from private hospitals].

Among the transferred patients, the six most common types were 174 (25.7%) extremity fractures, 135 (19.9%) head injuries, 53 (7. 8%) wounds, 53 (7.8%) eye injuries, 43 (6.3%) finger injuries, and 43 (6.3%) spinal injuries as shown in Table 2.

Of the 678 transferred patients, only 571 (84.2%) cases were admitted for treatment in the hospital. The five most common injury groups were extremity fracture (154 cases), head injury (117 cases), wounds (49 cases), eye injury (47 cases), and burns (37 cases) as shown in Table 3. When the 564 patients (7 persons were excluded from the present study due to incomplete financial arrangements) were classified according to their reimbursement scheme, it showed that the main scheme was the universal coverage scheme (203 patients), followed by own expense (132), the social security fund (76), the Comptroller General's Department (67), the asper road accident victims protection acts (47), work compensation funds (18) and others (21). The actual cost for treatment was 36,249,150 baht with reimbursements of approximately 30,135,709 baht. Therefore, the hospital lost approximately 6,113,441 baht during the study period. The main group that reimbursed less than the cost was the universal coverage scheme, followed by self- payment, work payment fund according to injury from work, Comptroller General's Department and then others, as shown in Table 4. Injuries sustained were categorized according to the major organ injury. There were four categories in 222 cases where the expenses were more than the reimbursements: burns, nervous system injury, eye injury and skin or subcutaneous tissue injury as shown in Table 5.

Burns were categorized according to the Diagnosis Related Group (DRG) as shown in Table 6. For 59% (67 out of 113) of the nervous system injury

Table 1. Age group of the patients (n = 678)

Age group (years)	Frequency	(%)
1-10	52	(7.7)
11-20	123	(18.1)
21-30	201	(29.6)
31-40	136	(20.1)
41-50	64	(9.4)
51-60	25	(3.7)
61-70	27	(4.0)
71-80	32	(4.7)
81-95	18	(2.7)
Total	678	(100.0)

Table 2. Accident patients transferred from other Hospitals to Siriraj Hospital (n = 678)

Type of Injury	Total cases	Bangkok & nearby Provinces		Distant Provinces	
		Private	Government	Private	Government
Extremity fracture	174 (25.7%)	95	40	3	36
Head injury	135 (19.9%)	76	25	8	26
Wounds	53 (7.8%)	33	11	3	6
Eye injury	53 (7.8%)	24	13	4	12
Finger injury	43 (6.3%)	23	14	1	5
Spinal injury	43 (6.3%)	25	4	2	12
Burns	37 (5.5%)	22	4	2	9
Abdominal injury	35 (5.2%)	22	7	3	3
Chest injury	33 (4.9%)	16	9	3	5
Snake bite	21 (3.1%)	15	6	0	0
Maxillo-facial injury	19 (2.8%)	10	2	2	5
Vascular injury	16 (2.4%)	8	2	0	6
Hand injury	11 (1.6%)	4	7	0	0
Airway obstruction	4 (0.6%)	2	2	0	0
Male reproduction organ injury	1 (0.1%)	0	1	0	0
Total	678 (100%)	375 (55.3%)	147 (21.7%)	31 (4.6%)	125 (18.4%)

Data from: The out-patient records of the Division of Trauma Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital

Table 3. Category of injury in admitted patients (n = 678)

Injury groups	Referred cases	Admission		Transfers		Discharge	
		N	(%)	N	(%)	N	(%)
Burns	37	37	(100.0)	0	(0.0)	0	(0.0)
Chest injury	33	33	(100.0)	0	(0.0)	0	(0.0)
Airway obstruction	4	4	(100.0)	0	(0.0)	0	(0.0)
Male reproductive organ injury	1	1	(100.0)	0	(0.0)	0	(0.0)
Wounds	53	49	(92.5)	4	(7.5)	0	(0.0)
Abdominal injury	35	32	(91.4)	2	(5.7)	1	(2.9)
Eye injury	53	7	(88.7)	2	(3.8)	4	(7.5)
Extremity fracture	174	154	(88.5)	12	(6.9)	8	(4.6)
Head injury	135	117	(86.7)	1	(0.7)	17	(12.6)
Spinal injury	43	34	(79.1)	2	(4.7)	7	(16.3)
Maxillo-facial injury	19	15	(78.9)	1	(5.3)	3	(15.8)
Vascular injury	16	11	(68.8)	1	(6.3)	4	(25.0)
Finger injury	43	28	(65.1)	10	(23.3)	5	(11.6)
Hand injury	11	6	(54.5)	4	(36.4)	1	(9.1)
Snake bite	21	3	(14.3)	18	(85.7)	0	(0.0)
Total	678	571	(84.2)	57	(8.4)	50	(7.4)

Data from: The out-patient records of the Division of Trauma Surgery, Department of Surgery, Faculty of Medicine Siriraj Hospital

Table 4. Expenses classified by reimbursement scheme (n = 564)

Reimbursement scheme	Case	Cost (baht)*	Reimbursement (baht)	Profit/Loss (baht)
Universal coverage	203	12,452,832	8,131,251	-4,321,580
Self payment	132	6,965,833	5,318,015	-1,647,818
Work Payment Fund according to injury from work	18	1,604,754	917,511	-687,243
Comptroller General's Department	67	7,873,833	7,511,685	-362,148
Others	21	1,768,034	1,567,054	-200,980
Asper road accident victims protection acts.	47	1,790,666	2,097,336	306,670
Social security fund	76	3,793,199	4,592,857	799,658
Total	564	36,249,150	30,135,709	-6,113,441

Data from: Computer Data Center, Faculty of Medicine Siriraj Hospital
* Costs exclude doctor's fee

Table 5. Expense more than the reimbursement cases (n = 222)

Major Organ Injury		Cost (baht)*	Reimbursement (baht)	Profit/Loss (baht)
Burns	Sum (baht)	8,907,211	2,693,055	-6,214,156
	Mean (baht)	269,915	81,608	-188,308
	N (case)	33	33	33
	Std.	187,646	74,475	-134,702
Nervous System Injury	Sum (baht)	13,441,050	10,822,238	-2,618,813
	Mean (baht)	117,904	94,932	-22,972
	N (case)	114	114	114
	Std.	235,236	180,632	-118,849
Eye Injury	Sum (baht)	1,095,223	993,833	-101,390
	Mean (baht)	21,904	19,877	-2,028
	N (case)	50	50	50
	Std.	25,220	13,754	-27,076
Skin or SubcutaneousTissue Injury	Sum (baht)	1,073,718	983,657	-90,061
	Mean (baht)	42,949	39,346	-3,602
	N (case)	25	25	25
	Std.	91,587	76,724	-18,649

Data from: Computer Data Center, Faculty of Medicine Siriraj Hospital
* Costs exclude doctor's fee

group, the reimbursement was lower than the cost. In all categories of nervous system injury, the average cost of treatment per head was the lowest in the craniotomy with complications and co-morbidities (CC), age > 17 years group. The details are shown in Table 7. The third group was eye injury and was subdivided as shown in Table 8. The fourth group of skin or subcutaneous tissue injury was subdivided as shown in Table 9. The first two major losses per case were medical trauma to the skin, subcutaneous tissue age > 17 years with CC and injuries with blood disorders.

Of the 564 cases, it was found that 508 patients (90.1%) were discharged by doctors, 31 patients (5.5%) died, 22 patients (3.9%) were transferred to other facilities for treatment and three persons (0.5%) refused treatment and discharged themselves. Deaths were further categorized as follows: 20 from nervous system injuries, five from burns, two from complicated injuries, two from chest injury, and two from sepsis (Table 10).

Discussion

Of the patients transferred for treatment at

Table 6. Cost and reimbursement according to burns (n = 33)

Diagnosis related group (DRG)	Cases	LOS (day/case)	Cost* (baht/case)	Reimbursement (baht/case)	Profit/Loss (baht/case)
Surgical extensive 3rd degree burns with skin graft	6	66	536,907	196,427	-340,481
Full thickness burn with skin graft or inhalation injection without CC** or significant trauma	1	46	331,811	30,537	-301,274
Extensive 3rd degree burns with skin graft, with or without CC**	1	56	444,997	198,483	-246,514
Extensive 3rd degree burns without skin graft	19	27	225,371	58,571	-166,800
Non-extensive burn with CC** or significant trauma	2	25	152,841	56,123	-96,719
Full thickness burn without skin graft or inhalations or injections without CC** or significant trauma	3	14	93,064	15,421	-77,643
Non-extensive burn without CC** or significant trauma	1	5	42,032	14,118	-27,914
Total	33	33	269,915	81,608	-188,308

Data from: Computer Data Center, Faculty of Medicine Siriraj Hospital
* Costs exclude doctor's fee
** CC = Complications and co-morbidities

Table 7. Cost and reimbursement according to nervous system injury

Diagnosis related group (DRG)	Cases	LOS (day/case)	Cost* (baht/case)	Reimbursement (baht/case)	Profit/Loss (baht/case)
Surgical craniotomy age > 17 with CC**	3	73	382,861	84,506	-298,355
Medical respiratory infections & inflammations age > 17 with CC**	3	34	287,615	183,776	-103,839
Medical traumatic stupor & coma, coma < 1 hr age > 17 with CC**	6	12	108,675	30,747	-77,928
Tracheotomy except for face, mouth and neck diagnoses	24	69	350,686	308,045	-42,642
Medical nervous system neoplasm with CC**	1	22	50,266	22,080	-28,186
Medical simple pneumonia and pleurisy age > 17 with CC**	1	39	53,431	28,685	-24,747
Medical specific cerebrovascular disorders excluding TIA	3	11	29,500	26,663	-2,837
Medical traumatic stupor & coma, coma < 1 hr age > 17 without CC**	24	6	18,675	15,903	-2,771
Medical cranial and peripheral nerve disorders without CC**	2	2	1,560	890	-670
Total	67	268	1,283,269	701,295	-581,975

Data from: Computer Data Center, Faculty of Medicine Siriraj Hospital
* Costs exclude doctor's fee
** CC = Complications and co-morbidities

Table 8. Cost and reimbursement according to eye injury

Diagnosis related group (DRG)	Cases	LOS (day/case)	Cost* (baht/case)	Reimbursement (baht/case)	Profit/Loss (baht/case)
Medical other disorders of the eye age > 17 without CC**	2	10	18,983	10,836	-8,147
Medical hyphema	2	6	10,832	4,324	-6,507
Surgical orbital procedures	4	17	31,079	27,678	-3,401
Surgical extra-ocular procedures except orbit age > 17	25	11	24,519	21,394	-3,125
Medical other disorders of the eye age > 17 with CC**	1	8	14,519	12,269	-2,250
Medical other disorders of the eye age 0-17	1	12	21,504	20,341	-1,163
Total	35	64	121,436	96,842	-24,593

Data from: Computer Data Center, Faculty of Medicine Siriraj Hospital
* Costs exclude doctor's fee
** CC = Complications and co-morbidities

Table 9. Cost/reimbursement according to skin or subcutaneous tissue injury (n = 21)

Diagnosis related group (DRG)	Cases	LOS (day/case)	Cost* (baht/case)	Reimbursement (baht/case)	Profit/Loss (baht/case)
Medical trauma to the skin, subcutaneous tissue & breast age > 17 with CC**	2	24	203,576	192,079	-11,497
Injury with blood or immunological disorders	1	2	14,124	2,812	-11,312
Surgical skin graft and/or debris excision for ulcer or cellulitis without CC**	9	24	49,520	43,065	-6,455
Medical trauma to the skin, subcutaneous tissue & breast age > 17 without CC**	6	3	15,521	10,954	-4,567
Surgical other skin, subcutaneous tissue and breast procedures without CC**	2	4	11,609	10,978	-630
Medical trauma to the skin, subcutaneous tissues & breast age 0-17	1	1	572	0	-572
Total	21	58	294,922	259,888	-35,033

Data from: Computer Data Center, Faculty of Medicine Siriraj Hospital
* Costs exclude doctor's fee
** CC = Complications and co-morbidities

Siriraj Hospital, 77% were from hospitals in Bangkok or the cities nearby. There were six groups of injuries: extremity fracture, head injury, wounds, eye injury, finger injury, and spinal injury were the most frequent as shown in Table 2. The reason for transfer may be the need for a higher level of service facilities[3]. However, there were many other reasons for transferring cases of the head injury, burns, and wound groups. Patients may have received primary treatment from referring hospital but did not improve or some had economic/financial problems. Some were based on the attitudes or beliefs of patient's relatives towards Siriraj Hospital and some were seeking new treatments.

571 patients or 84.2% were admitted for treatment at Siriraj Hospital, 57 (8.4%) transferred to other hospitals, and 50 (7.4%) were discharged (as shown in Table 3).This has shown the intent of patients and their rights to transfer for treatment according to Govern-

Table 10. Discharge type (n = 564)

Discharge type	Frequency	(%)
Approval	508	(90.1)
Death	31	(5.5)
Transferal	22	(3.9)
Against advice	3	(0.5)
Total	564	(100)

Data from: Computer Data Center, Faculty of Medicine Siriraj Hospital

ment Policy. From the present study, the authors noticed that the "Snake Bite" group in Bangkok or cities nearby constituted 21cases or 3.1%**.** That meant antivenom or serum treatments in small or private hospitals in Bangkok or cities nearby were limited. Fifty-seven cases or 8.4% of patients transferred to Siriraj Hospital, had emergency treatment, and were then transferred back to the original hospitals (as shown in Table 3). This demonstrates the effectiveness of Siriraj Hospitals' transferring system policy according to patients' rights. Because 84.2% of the referred cases were admitted, this implied that transferred cases constituted seriously injured patients. It was confirmed by the mortality rate of the group, which was 5.5%. For major injuries of organs such as burns, head injury, multiple injuries, and chest injury, the treatments were very difficult and complicated. It is very important for the hospital to prepare its services for these serious injuries.

Of the 564 cases treated, the actual cost (excluding doctor's fees) was 36,249,150 baht with reimbursement of 30,135,709 baht. The loss to the hospital was 6,113,441 baht. The hospital lost most in reimbursement from the universal coverage group (Table 4). This proved that the reimbursement as DRG was not equal to the actual cost. Even though other groups could reimburse the hospital for the actual cost, the hospital still lost money in burns, nervous system injury,eye injury, and skin or subcutaneous tissue injury groups (Table 5). Burn cases had to stay in the hospital longer than the average length of stay (LOS), therefore, the actual costs were higher (Table 6).This cost also included the increased use of facilities such as administration, cleansing wounds, operations, quantity and higher cost of medicine and the burn unit cost. From the nervous system injury group (67 cases as shown in Table 7), the hospital lost more money in the group that needed tracheotomy. This was used in severe head injury during recovering period. This may be the result of length of hospital stay (average 69 days) and the leading number of patients. It also indicated that the LOS and surgery type affected the monetary loss and that the reimbursement system was not appropriate. The surgical craniotomy age > 17 years with CC was the group that caused the highest loss per case in the present study. Among the eye injury group (Table 8), it was found that most patients did have very severe injury that needed the use of more specialized facilities resulting in higher treatment costs. Some patients stayed in the hospital for longer time because of associated injuries. Furthermore, some patients were seriously ill and needed special treatment in the ICU, thus making the treatment cost higher [5-7]**.**

Transferred patient treatment causes financial burden and monetary loss[8-11]. This is an issue that the staff and doctors of the Faculty of Medicine, Siriraj Hospital have been aware of, and continually strive to provide the best quality of service to all patients according to the departmental budget. The authors need to find the best way to prepare the department's growth and increase service utilization of the trauma center. The authors also need to revise and prepare budgets based on changes in reimbursement systems, in accordance with government policies.

Conclusion

The present study was on transferred trauma cases treatment in the Department of Surgery, Faculty of Medicine, Siriraj Hospital. It was found that most admitted cases were extremity fractures, head injuries, wounds, eye injuries and burns, and needed specialized treatment and specialist doctors resulting in higher treatment costs. Although the authors could get reimbursement for treatments according to the DRG system, the reimbursement amount was lower than the actual cost. The present study also found that even if the patient paid for treatment, the fee was lower than the actual cost of treatment, especially in the groups such as burns, nervous system injury, eye injury and skin or subcutaneous tissue injuries. Therefore, the trauma center management team needs to learn more about efficient treatment systems or to revise the reimbursement system to prevent future financial loss[12].

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ปัญหาการเงินในการรักษาผู้ป่วยอุบัติเหตุที่ส่งมารักษาต่อในโรงพยาบาลศิริราช

ปรีชา ศิริทองถาวร, นงลักษณ์ พื้นชมภู

การศึกษาถึง ลักษณะการบาดเจ็บและงบการใช้จ่าย เพื่อให้รู้ถึง ลักษณะของการส่งต่อผู้ป่วยอุบัติเหตุ ทั้งด้านประเภทการบาดเจ็บ ต้นทุน และค่าตอบแทนในการรักษาพยาบาลผู้ป่วยแต่ละกลุ่ม จะช่วยในการเตรียมรับผู้ป่วยเหล่านี้ได้ดีขึ้น ผลการศึกษาผู้ป่วยอุบัติเหตุที่ส่งมารับการรักษาต่อในโรงพยาบาลศิริราช ระหว่างวันที่ 1 กันยายน พ.ศ. 2545 ถึง วันที่ 31 สิงหาคม พ.ศ.2546 มีจำนวน 678 ราย รับไว้รักษาต่อในโรงพยาบาล 571 ราย ส่วนใหญ่ของผู้ป่วยที่รับไว้รักษาในโรงพยาบาล เป็นการบาดเจ็บระบบกระดูกและข้อ (38.6%) รองลงมา คือ การบาดเจ็บระบบประสาท (15.1%) บาดเจ็บที่ตา (8.1%) ได้รับพิษหรือสารพิษ (6.3%) ไฟไหม้/น้ำร้อนลวก (5.8%) และอื่น ๆ รวมค่าใช้จ่ายในการรักษา (ไม่รวมค่าตอบแทนเงินเดือนแพทย์) เป็นเงิน 36,249,150 บาท สำหรับค่าตอบแทนที่โรงพยาบาลได้รับรวมเป็นเงิน 30,135,709 บาท ซึ่งมีผู้ป่วย 4 กลุ่ม ที่มีค่าตอบแทนการรักษาต่ำกว่าต้นทุน มากที่สุดในกลุ่ม ไฟไหม้/น้ำร้อนลวก รองลงมาคือ บาดเจ็บระบบประสาท บาดเจ็บที่ตา และบาดแผลชนิดต่าง ๆ

***สรุป**: ในการจัดการเกี่ยวกับ การส่งต่อการรักษาผู้ป่วยอุบัติเหตุ ต้องเตรียมการในการจัดการกับกลุ่มผู้ป่วย ที่ส่งต่อที่พบบ่อย ๆ เช่น กลุ่มการบาดเจ็บกระดูกและข้อ บาดเจ็บระบบประสาท บาดเจ็บที่ตา สำหรับกลุ่มไฟไหม้/น้ำร้อนลวก กลุ่มการบาดเจ็บระบบประสาท บาดเจ็บที่ตา และกลุ่มที่มีบาดแผลชนิดต่าง ๆ ซึ่งเป็นกลุ่มที่มีต้นทุนสูงกว่าค่าตอบแทน ควรที่จะมีการนำค่าตอบแทนมาพิจารณาใหม่ เพื่อลดปัญหาทางการเงินในอนาคต*