Comparison between Hospital Care Costs with Reimbursement on Diagnosis Related Group (DRG) Payment System and Outcomes of Therapeutic Plasma Exchange (TPE) at Naresuan University Hospital

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ABSTRACT

A retrospective study collected data on the costs of treatment and outcomes among patients receiving Therapeutic Plasma Exchange (TPE). Of 25 patients, 16 (64%) were females and mean age of patient was 53.2 ± 16.3 years. A total of 120 cycles of TPE were performed. The mean length of stay was 20.2 ± 16.9 days. The diagnosis revealed that 15 patients presented thrombotic thrombocytopenic purpura, 4 presented neuromyelitis optica, 2 had anti-glomerular basement membrane disease, 2 had Guillain-Barre Syndrome and 2 presented hyperthyroid. Mean TPE was 4.80 ± 2.27 cycles. A total of 60% of replacement fluid constituted fresh frozen plasma. The most common complication was hypokalemia (24%). In all 20% of patients died. The main cause of death was due to infection, not from acute TPE complications. The mean total hospital care costs were $254,255.46 \pm 166,876.26$ THB per patient while the mean adjusted relative weight was 17.08 ± 11.33 per patient. Regarding a comparison between total hospital care costs with reimbursement belonging to the payment system of the hospital among 16 patients, the mean of deficit was $167,594.32 \pm 32,760.76$ THB per patient. Total sum deficit for all 25 patients was $1,340,037.06$ THB. The situation of tertiary care hospitals in the referral system of health insurance in Thailand using the DRG payment system faces deficits in advance care. The national health policy should increase funding to the DRG payment system to ensure that all patients have access to high cost medical services with equity.

Keywords: hospital care cost, outcome, therapeutic plasma exchange, diagnosis related group

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Introduction

In recent years, TPE has been the first line of treatment in diseases such as thrombotic thrombocytopenic purpura (TTP), Guillain-Barre Syndrome (GBS), anti-glomerular basement membrane disease (Anti-GBM disease), myasthenia gravis (MG), and chronic inflammatory demyelinating polyradiculoneuropathy (CIDP).[1]

TPE involves plasma separation from blood cells, then removal of pathologic substances causing conditions or diseases in the patient's body and then replacement with fresh frozen plasma (FFP) or human albumin, to improve clinical conditions.

Even though TPE is accepted as the first line of treatment for some conditions or diseases, many important complications may occur during the entire process of TPE such as hypotension, hypersensitivity and the most severe being anaphylactic shock. Other complications include hypokalemia, hypocalcemia, coagulation factor depletion leading to abnormal bleeding, and infection or sepsis caused by the immunoglobulin depletion.[2-3]

The selection of patients for TPE, admitted in the Inpatient Department (IPD), was based on fulfilled criteria. In Thailand, and in Naresuan University Hospital, health services for Thais are provided under three health insurance schemes. The first scheme is the Universal Coverage Scheme (UCS); the second is the Civil Servant Medical Benefits Scheme (CSMBS) and the third is the Social Security Scheme (SSS), in which payments of all IPD patients are reimbursed under the DRG payment system. The related studies showed reimbursement under the DRG payment system could lead to financial risks in some hospitals.[4-6]

Nevertheless, TPE is a high cost treatment especially for patients with complications or chronic severity. Therefore, this factor influences the lack of access to health care services for some patients and has an impact on financial problems in some hospitals.

The objectives of this study were to determine the costs and appropriate DRG payment methods for patients requiring TPE and to identify important clinical outcomes and complications of TPE. The results could be used to create national policies to improve the health insurance system for this treatment procedure and to maintain the quality of treatment along with the concept of health equity.

Materials and Methods

The study was conducted employing a retrospective design of the patients, older than 18 receiving TPE at Naresuan University Hospital from December, 2011 to April 2015. The data was collected by reviewing medical records. These data comprised age, sex,

diagnosis, length of stay, cycle of plasma exchange, type of replacement fluid, total hospital care costs, costs of TPE, adjusted relative weight (adjusted RW), and reimbursement on DRG, Version 5.1.1 payment system. The primary outcome of this study was the determined total hospital care costs and costs of TPE while the secondary outcome was the determined mortality rate and complications of TPE. TPE at Naresuan University Hospital was performed using the membrane filtration technique with hemodialysis machines to exchange blood through a plasma filter that could separate plasma from blood cells. Pathologic substances were then removed from the patient's body and replaced with FFP or human albumin. In this procedure, we used medical equipment at variable costs specific for TPE such as a plasma filter, double lumen catheter and fluid replacement.

All data in this study was audited before coding, recorded and analyzed using a statistical program and expressed in frequency and percentage. For normal distribution, data was presented with mean and standard deviation. For nonnormal distribution, data was presented with median and interquartile range (IQR: Q1, Q3).

This study was approved by the Human Research Ethics Committee of Naresuan University, Thailand (Institutional Review Board: IRB No. 329/58) since August 26, 2015.

Results

Of a total of 25 patients receiving TPE, 16 (64%) were females. Of these 25 patients, 12 (48%), 10 (40%) and 3 (12%) were under UCS, CSMBS and SSS, respectively. The mean age was 53.2 ± 16.3 years. A total of 120 cycles of TPE were performed. The mean length of stay was 20.2 ± 16.9 days. The diagnoses identified 15 patients with TTP patients (60%), 4 patients (16%) with neuromyelitis optica, 2 patients (8%) with the anti-GBM disease, 2 patients (8%) with GBS and 2 patients (8%) with hyperthyroid.

The mean TPE was 4.80 ± 2.27 cycles while the mean volume plasma exchange was 1.15 ± 0.27; time of the expected plasma volume. The mean fluid replacement volume was 2.91 ± 0.46 liters. A total of 15 patients (60%) had FFP and 10 patients (40%) had 5% human albumin. The complications of TPE were as follows: 6 patients (24%) had hypokalemia, 5 patients (20%) had prolonged coagulation, 3 patients (12%) had hypocalcemia, 3 patients (12%) had chill, 1 patient (4%) had allergic rash on skin, and 1 patient (4%) had hypotension (Tables 1 and 2).

In all, 20 patients (80%) in this study exhibited improved clinical conditions while 5 patients (20%) died. The major cause of death was due to infection (4 patients).

Table 1 Baseline Characteristics of Patients with TPE.

Data	n (percent) or mean ± SD
Sex	
- Female	16 (64.0)
- Male	9 (36.0)
Age (years)	53.2 ± 16.3
Length of Stay (days)	20.2 ± 16.9
Cycle of TPE (cycles)	4.80 ± 2.27
Diagnosis	
- Thrombotic Thrombocytopenic Purpura	15 (60.0)
- Neuromyelitis Optica	4 (16.0)
- Guillian-Barre Syndrome	2 (8.0)
- Anti-GBM disease	2 (8.0)
- Hyperthyroid	2 (8.0)
Volume of plasma exchange (times compare to EPV*)	1.15 ± 0.27
Replacement fluid	
- Fresh Frozen Plasma	15 (60.0)
- 5% human albumin	10 (40.0)
Death	5(20)

* Expected Plasma Volume = [0.065 X weight (kg)] X [1-Hct]

Table 2 Complications of TPE. (n=25)

Complications	n (percent)
Hypokalemia	6 (24.0)
Prolong coagulation	5 (20.0)
Hypocalcemia	3 (12.0)
Chill	3 (12.0)
Hypotension	1 (4.0)
Rash	1 (4.0)

The mean variable cost of TPE was 77,152.27 ± 32,155.12 THB per patient while the mean total hospital care cost was 254,255.46 ± 166,876.26 THB per patient. The mean adjusted RW was 17.08 ± 11.33 per patient. Comparing the total hospital care costs with the reimbursement belonging to the hospital payment system among 16 patients, the mean deficit was 167,594.32 ± 32,760.76 THB per patient. The total amount sum deficit for all 25 patients was 1,340,037.06 THB (Table 3).

Table 3 Adjusted RW, Variable Cost of TPE, Total Hospital Care Cost and Hospital Deficit in Patients Who Received TPE.

Data	Mean ± SD	Min-Max
Adjusted RW	17.08 ± 11.33	3.34-29.86
Variable cost of TPE	77,152.27 ± 32,155.12	25,950.00-178,129.00
(THB per patient)	16,954.05 ± 4,410.94	8,309.08-24,759.60
Variable cost of TPE	254,255.46 ± 166,876.26	89,600.00-879,539.00
(THB per cycle)	167,594.32 ± 32,760.76	23,340.31-439,759.18
Total hospital care cost		
(THB per patient)		
Hospital deficit in 16 patients		
(THB per patient)		
Total amount sum of hospital deficit	1,340,037.06	
(THB)		

Discussion

The findings indicated that TPE constituted a safe and efficient treatment procedure for selected patients. This study did not observe any severe acute complication but related studies had reported death with intra-operated patients or immediately after a TPE procedure of 5 in 10,000 cycles.[7] A common complication in this study was hypokalemia, caused by the dilution effect after plasma exchange. Other complications included prolonged coagulation from the depleted coagulation factor, hypocalcemia, chill, allergic rash of the skin and hypotension that were similar to related studies.[2-4,7-8]

The patients' death rate of 20% in this study was not caused by the TPE procedure; they received a diagnosis of severe TTP (80%).

The major cause of death was infection due to immunoglobulin depletion after the TPE procedure. Physicians should be aware of the infectious conditions of patients with TPE receiving immunosuppressive treatment.[9]

The mean variable cost of TPE was 77,152.27 ± 32,155.12 THB per patient because 60% of patients had FFP replacement. The study by Patcharee *et al.* in 2010 reported that the cost of TPE (5 cycles) with human albumin replacement was 100,000 to 150,000 THB per patient.[10]

The total sum deficit for all 25 patients was 1,340,037.06 THB. The related study of IPD medical care expenditure under the Universal Coverage Scheme by Sirin *et al.*[11] found a deficit of 98.92 million THB per fiscal year (2010) for reimbursement concerning the DRG payment system.

In conclusion, tertiary care hospitals in the referral system of Thailand's health insurance system using the DRG payment system cannot avoid financial problems. However, if stronger policies cannot solve the problem, it will adversely affect the delivery of other health services, access to essential drugs and high technology equipment delivery will be affected too. The DRG payment system may give hospitals an incentive to select profitable, low cost patients (cream skimming) in each DRG and transfer or avoid unprofitable, higher cost patients.[12]

Acknowledgement

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403

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404

การเปรียบเทียบระหว่างค่าใช้จ่ายในการรักษาพยาบาลกับระบบการจ่ายเงินคืนแบบกลุ่มวินิจฉัยโรคร่วม (ดีอาร์จี) และผลลัพธ์จากการรักษาด้วยวิธีการเปลี่ยนถ่ายพลาสมาในโรงพยาบาลมหาวิทยาลัยนเรศวร

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บทคัดย่อ

การวิเคราะห์ค่าใช้จ่ายและผลลัพธ์ผู้ป่วยที่ได้รับการรักษาด้วยวิธีเปลี่ยนถ่ายพลาสมา ช่วงธันวาคม พ.ศ. 2554 - เมษายน พ.ศ.2558 ผลการศึกษามีผู้ป่วย 25 คน ร้อยละ 64 เป็นเพศหญิง อายุเฉลี่ย 53.2 ± 16.3 ปี เปลี่ยนถ่ายพลาสมารวม 120 ครั้ง วันนอนเฉลี่ย 20.2 ± 16.9 วัน ผู้ป่วยได้รับการวินิจฉัย Thrombotic Throbocytopenic Purpura 15 คน Neuromyelitis Optica 4 คน Anti-Glomerular Basement Membrane disease 2 คน Guillain Barre Syndrome 2 คน และ Hyperthyroid 2 คน ค่าเฉลี่ยของการเปลี่ยนถ่ายพลาสมา 4.80 ± 2.27 ครั้ง ร้อยละ 60 ได้รับ Fresh Frozen Plasma เป็นสารน้ำทดแทน พบภาวะโพแทสเซียมในเลือดต่ำ ร้อยละ 24 และมีผู้ป่วยเสียชีวิตร้อยละ 20 ซึ่งมีสาเหตุหลักมาจากการติดเชื้อ (ไม่สัมพันธ์กับภาวะแทรกซ้อนของการเปลี่ยนถ่ายพลาสมาแบบเฉียบพลัน) ค่าใช้จ่ายของการรักษาพยาบาลเฉลี่ย 254,255.46 ± 166,876.26 บาทต่อคน ค่าเฉลี่ยของ adjusted relative weight คือ 17.08+11.33 ต่อคน และหากเปรียบเทียบค่าใช้จ่ายในการรักษาพยาบาลกับเงินที่ได้รับกลับคืนมาจากกองทุนมีค่าเฉลี่ยการขาดทุนในผู้ป่วยจำนวน 16 คน คือ 167,594.32 ± 32,760.76 บาทต่อคน โดยรวมแล้ว โรงพยาบาลขาดทุนทั้งสิ้น 1,340,037.06 บาท สรุปได้ว่า โรงพยาบาลระดับตติยภูมิที่เป็นศูนย์รับส่งต่อผู้ป่วย ใช้การเบิกจ่ายเงินด้วยกลุ่มวินิจฉัยโรคร่วมต้องเผชิญกับการขาดทุน ดังนั้น ควรมีนโยบายระดับประเทศในการจ่ายเงินเพิ่มให้กับโรงพยาบาลเพื่อทำให้เชื่อมั่นได้ว่า ผู้ป่วยทุกคนสามารถเข้าถึงบริการสุขภาพที่มีค่าใช้จ่ายสูงได้อย่างเท่าเทียม

คำสำคัญ: ค่าใช้จ่ายในการรักษาพยาบาล, ผลลัพธ์, การรักษาด้วยวิธีเปลี่ยนถ่ายพลาสมา, กลุ่มวินิจฉัยโรคร่วม

405

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