Outpatient Drug Oversupply at a Teaching Hospital in Thailand

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Background: *A part of rising drug expenditure in Thailand was caused from drug oversupply, which was a result from policy of civil servants to get direct reimbursement from Ministry of Finance.*
Objective: *Describe the problem of oral drug oversupply at outpatient service in a teaching hospital and determine the cost that affects hospital between October 1, 2008 and September 30, 2009.*
Material and Method: *Data of oral drug prescribing for outpatients were retrieved from the hospital database in the format of Microsoft Visual Fox Pro 9.0 and analyzed by Microsoft Access 2007. Two assessment methods are applied to estimate drug oversupply more than 30 days, by month and by year. In addition, September 2009 was selected to study for a pattern of monthly drug oversupply.*
Results: *Total oversupply expenditure for fiscal year 2009 was 56.9 million Baht when summed from monthly basis and 62.0 million when performed as a whole year. Oversupply expenditure was 2.12 to 2.73% per month in term of money and 2.91 to 3.46% in term of quantity. In September 2009, cardiovascular & hematopoietic system had the most oversupply. By brand of drug, the most frequently oversupply were Calcium carbonate (7.60%), Simvastatin (3.69%) and Omeprazole (3.20%). In term of money, the top three highest costs were for Atorvastatin (7.27%), Clopidogrel (6.83%) and Rosuvastatin (4.24%). By health schemes, patients under CSMBS trend to be the most of prescribed drug oversupply at 8.31% (3.21 million Baht in September 2009) with average number of oversupply per patient at 1.83 items and average day left per drug item at 61.83 days.*
Conclusion: *The most oversupply expenditures were for chronic diseases. These data will focus the problem for hospital administrators to plan for suitable strategy to control drug oversupply in their hospital.*

Keywords: *Drug expenditure, Outpatient, Oral drug, Oversupply, Hospital database*

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Drug costs have risen rapidly in Thailand. National data revealed that Thailand spent 3.32 percent of GDP on health care in 2001 and increased to 3.5 percent in 2006[1,2]. Drug expenditure has increased over the last several years especially in outpatient service where civil servants started to get direct reimbursement from the Ministry of Finance since the fiscal year 2006[3].

Pharmaceutical System Research and Development Foundation in May 2009 estimated that patients under universal coverage overused 500 million Baht of drugs in the fiscal year 2006 in five therapeutic groups, which were drugs for pain, anti-hypertensive drugs, gastrointestinal drug, anti-diabetic agents, and dyslipidemic agents[4]. Data from 2008 and 2009 of a teaching hospital in Thailand shows that outpatient drug expenditure was rising 15.1% and oral drug was 68.44% of total drug expenditure[5].

The present study aims to describe the problem of drug oversupply to patients at outpatient service in a teaching hospital and determine the cost impacts between October 1, 2008 and September 30, 2009. Data of September 2009 was used on a monthly basis to identify trend of oversupply by group of drug and type of health care scheme. The information will help the administration detect an inappropriate prescribing in the hospital.

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Material and Method

Data of drug prescribing for outpatients between April 1, 2008 (6 months prior study period) and September 30, 2009 (end of study period), 18 months, were retrieved from the hospital database in the format of Microsoft Visual Fox Pro 9.0. Retrieved data were imported to and analyzed by Microsoft Access 2007. Each data record comprised of prescribed date, patient's hospital number (HN) and health care scheme, drug code and name, dose per day, unit per time and time per day, issued quantity, drug's unit selling price and prescribed physician code. Data were cleaned for any duplication and validated for irrational dose and frequency. Only oral drugs-which were identified by sixth digit in drug code as C-capsule, T-tablet, N-suspension and S-syrup-were included in the present study. Day supply was calculated by the following formula: issued quantity/dose per day; where dose per day is a multiplication of unit per time and time per day. Incomplete dose per day was ignored for day supply calculation and assumed that the patient did not get the drug on that visit. Drug item defined as drug with the same brand, same strength and same dosage form. Two oversupply assessment methods were applied in the present study. First, by month, according to one of hospital policies in controlling drug over prescribed-an outpatient quantity warning for more than 30 days oral drug supply-monthly drug oversupply was routinely calculated and maintained in the patient registration system. Second, to reconcile the accuracy of monthly basis, a value of whole year oversupply was performed and compared.

Part 1: to assess monthly oral drug oversupply in the present study period, data of drug prescribed in one month was analyzed at a time. The analyzed month was set as "index month". Once the index month was identified, the data of drug prescription in 6 months prior was retrieved. In this analysis, there are 12 index months (October 2008-September 2009). At individual level, each drug item prescribed for each patient was then compared to the most recently the patient was prescribed in the preceding visit. Drug oversupply was defined as quantity at the time of visit more than 30 day leftover from the preceding visit.

Fig. 1 illustrates a sample of calculation method. Patient A had two visits in December 2008-2 and 24. Data of drug a to g for patient A was retrieved back to June 1, 2008. From data, on the visit date, patient A still carried drug a, f, and g for more than 30 days from the previous visit, these three drugs then were defined as oversupply for 95, 36 and 40 days, respectively. Drug b, c, d, and e were identified as appropriate supply. The average oversupply days for patient A in December 2008 was calculated as (95 + 36 + 40)/3 = 57 days.

To find trend of drug oversupply in the present study period, cost of all drugs identified as oversupply in each index month was calculated, as a multiplicity of drug's unit selling price and oversupplied issued quantity. Percentages of oversupply to total, by quantity and expenditure, were then compared among months.

Part 2: detail of drug oversupply in September 2009 was selected for further analysis. In this part, different strengths of same brand of drug item were grouped and categorized by The Anatomical Therapeutic Chemical (ATC) Classification System, WHO Collaborating Centre. Group of drugs were analyzed for trend of irrationally prescribing. Drugs were then sorted by quantity and by expenditure and presented as top 10 lists. In addition, drug oversupply was analyzed by health care schemes-universal coverage (UC), social security scheme (SSS), civil servants medical benefit scheme (CSMBS) and others such as selfpay and private insurance.

Part 3: in order to analyze the impact of irregularity of prescribing on oversupply, monthly and yearly oversupply was compared.

From the same data as in part 1, the first and last dates of each drug prescribed for each patient between October 1, 2008 and September 30, 2009 were identified. At individual level, number of under or oversupply day was calculated as ((sum of day supply for whole year) - (last date - first date + day supply in last date)). More than 30 supply days left was defined as oversupply. A summation of drug's cost was then calculated and analyzed by health scheme was performed.

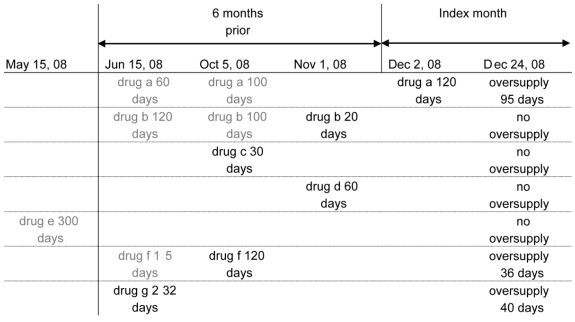

Fig.1 An example of drug oversupply calculation-patient A in December 2008

Table 1. Oral drug prescription by month: total records, percentage of incomplete dose per day, and day supply more than 1 year

Month	Total records of oral drug prescription	% incomplete dose per day	% day supply more than 1 year
Apr 08	202,572	3.2	0.10
May 08	234,903	3.2	0.09
Jun 08	228,991	3.8	0.08
Jul 08	241,644	3.8	0.08
Aug 08	235,430	3.5	0.08
Sep 08	243,873	3.7	0.07
Oct 08	247,986	3.7	0.06
Nov 08	233,713	3.6	0.04
Dec 08	245,650	3.7	0.04
Jan 09	244,380	3.7	0.03
Feb 09	208,623	3.7	0.04
Mar 09	245,623	3.4	0.04
Apr 09	207,646	3.4	0.04
May 09	228,165	3.3	0.04
Jun 09	251,297	3.7	0.04
Jul 09	248,446	4.3	0.03
Aug 09	229,556	3.6	0.04
Sep 09	234,444	3.3	0.04

Results

Data validating

Between April 2008 and September 2009, there were 200,000 to 250,000 records prescribed oral drugs for outpatient per month (Table 1). Among these records, 3 to 4% could not be calculated for day supply because the dosing was "use as physician's order". Interestingly 0.03 to 0.10% of records revealed oversupply for more than 1 year. By drug item, the top five are Calcium carbonate 1,250 mg (12.9%), Eltroxin 0.1 mg (12.1%), Vitamin E 200 IU (6.6%), Folic acid 5 mg (6.0%), and Vitamin B 1-6-12 (4.1%).

Trend of monthly drug oversupply

Drug oversupply is defined as when patients had drug left more than 30 days from the previous visit at the time of that visit. Estimated oversupply expenditure per month for 12 index months were varied from 3.9 (Feb 09) to 5.6 (Mar 09) million Baht (Fig. 2), and a summation of 12-month oversupply expenditure for fiscal year 2009 was 56.9 million Baht. Fig. 3 presented percentage of oversupply expenditure to total oral drug expenditure each month. From Oct 08 to Sep 09, the percentage was slowly decreased from 2.72 to 2.27% with the maximum at 2.73% (Mar 09) and minimum at 2.12% (May 09). In terms of quantity, percentage to total prescription was also decreased from 3.46 to 2.91% with the maximum at 3.46% (Oct 08) and minimum at 2.71% (Jul 09).

Analysis of drug groups and drug brands on oversupply

In this part, drug items were grouped by brand of drug and categorized by ATC Classification System. By drug group, cardiovascular & hematopoietic system had the most oversupply expenditure in September 2009 at 1.73 million Baht, followed by central nervous system (0.80), endocrine & metabolic system (0.36), oncology (0.33) and allergy & immune system (0.32) (Table 2). By brand of drug, top 10 by quantity accounted for 33.33% of total drug oversupply prescription and cost 0.14 million Baht or 2.88% of total drug oversupply expenditure (Table 3). The most frequent oversupply was Calcium carbonate at 39,271 tablets with the average day supply left 64.15 days, followed by Simvastatin at 19,054, Omeprazole at 16,541, Vitamin B 1-6-12 at 16,321, and Metformin at 15,268 tablets. In term of money, top 10 by cost of drug oversupply accounted for 32.75% of total oversupply expenditure with only 4.63% of total drug oversupply prescription (Table 4). The highest expenditure was for Atorvastatin at 0.34 million Baht, followed by Clopidogrel 0.32, Rosuvastatin 0.20, Imatinib 0.19, and Ciclosporin A 0.14 million Baht.

There were 70,217 outpatient visits in September 2009, 4,513 patients or 5.89% had been prescribed the same drug on their visits although they had drug left for more than 30 days from their previous visits. By health care schemes, patients under CSMBS trend to be prescribed drug oversupply at 8.31%, the

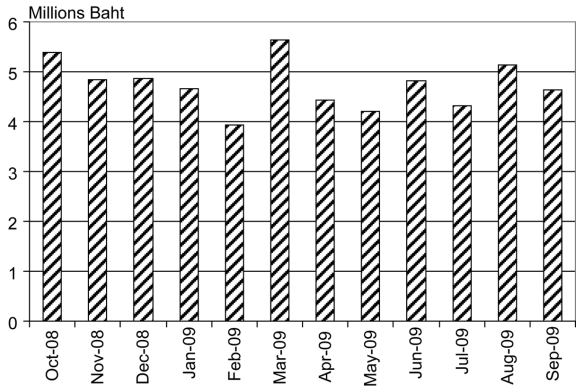

Fig. 2 Drug oversupply expenditure in the prior 6 months, October 2008-September 2009

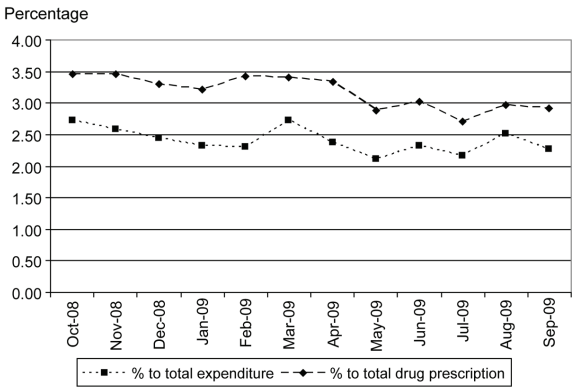

Fig. 3 Expenditure and quantity of drug oversupply, percentage to total by month, October 2008-September 2009

second was UC patients at 7.09%, the third was SSS patients at 5.38%, and others at 3.76%. In addition, CSMBS patients also trend to have the highest average number of oversupply/HN at 1.83 items, average day left/drug item at 61.83 days, and total oral drug oversupply expenditure at 3.21 million Baht (Table 5).

A whole year drug oversupply

Estimated oral drug oversupply at outpatient services for the whole fiscal year 2009 was at 62.0 million Baht or 2.62% to total expenditure (Table 6). By health care scheme, CSMBS was prescribed most oversupply at 45.2 million Baht. Compared to a summation from monthly oversupply (Table 7), total oversupply was 56.9 million Baht and CSMBS was overprescribed most at 40.5 million Baht.

Discussion

Several measures using prescription data have been developed for estimating drug oversupply and undersupply, such as medication possession ratio (MPR) more than 120 percent for oversupply and less

Table 2. Oversupply expenditure compared to total oral drug expenditure by drug group-September 2009

Drug group	Total oral expenditure (baht)	Oversupply expenditure (baht)	Percent oversupply to total expenditure (%)
Cardiovascular & hematopoietic system	63,474,023	1,728,282	2.72
Central nervous system	31,266,838	801,457	2.56
Endocrine & metabolic system	18,757,051	360,496	1.92
Oncology	23,650,916	332,384	1.41
Allergy & immune system	15,736,520	322,900	2.05
Anti-infectives (systemic)	11,728,390	305,329	2.60
Gastrointestinal & hepatobiliary system	14,063,110	289,951	2.06
Genito-urinary system	6,936,947	175,256	2.53
Musculo-skeletal system	7,041,243	140,015	1.99
Vitamins & minerals	4,341,546	131,438	3.03
Respiratory system	3,486,701	76,621	2.20
Hormones	1,791,570	26,245	1.46
Antidotes, detoxifying agents & drugs used in substance dependence	1,221,429	5,572	0.46
Ear & mouth/throat	21,992	3,377	15.36
Dermatologicals	223,904	3,220	1.44
Nutrition	228,035	-	0.00
Contraceptive agents	246,589	-	0.00
Miscellaneous	144,013	-	0.00

Table 3. Top 10 drugs left by quantity-September 2009

Drug name	Number of issued quantity (tablets)	Average day supply left (days)	Cost of drug left (baht)
Calcium carbonate	39,271	64.15	32,871.50
Simvastatin	19,054	57.37	21,701.25
Omeprazole	16,541	68.27	14,465.00
Vitamin B 1-6-12	16,321	64.54	13,978.05
Metformin	15,268	60.94	14,214.00
Prednisolone	15,179	60.02	6,926.68
Folic Acid	15,012	56.57	6,987.00
Atenolol	12,808	55.61	7,365.05
Aspent M	11,659	56.32	11,785.50
Multivitamin	11,054	55.81	5,159.50
Total top 10	172,167		135,454.53
Total oversupply	516,583		4,702,542.61
% top 10 to total	33.33%		2.88%

Table 4. Top 10 drugs left by expenditure-September 2009

Drug name	Number of issued quantity (tablets)	Average day supply left (days)	Cost of drug left (baht)
Atorvastatin	8,192	59.69	341,826.04
Clopidogrel	3,699	57.80	321,122.25
Rosuvastatin	4,372	66.35	199,444.00
Imatinib	180	60.00	191,880.00
Ciclosporin A	2,588	51.00	137,925.00
Rabeprazole	1,897	49.65	75,805.00
Mycophenolate mofetil	1,124	44.88	74,844.00
Esomeprazole	1,324	51.56	67,356.50
Entecavir	198	58.75	66,235.00
Donepezil	362	44.83	63,482.00
Total top 10	23,936		1,539,919.79
Total oversupply	516,583		4,702,542.61
% top 10 to total	4.63%		32.75%

Table 5. Number of out patients and oral drug oversupply by health scheme-September 2009

Health schemes	UC	SSS	CSMBS	Others	Total
Total outpatients	4,879	3,661	28,003	33,674	70,217
Number of patients who have oral drug oversupply	248	189	2,348	1,728	4,513
% to total outpatients	7.09%	5.38%	8.31%	3.76%	5.89%
Average number of oversupply drug/HN	1.74	1.75	1.83	1.54	1.71
Average day left/drug	49.89	50.04	61.83	60.76	60.29
Total cost of oversupply drug	154,007	108,101	3,211,616	1,253,874	4,727,598

UC = universal coverage; SSS = social security scheme; CSMBS = civil servants medical benefit scheme

than 80 percent for undersupply[6-8]. Drug oversupply in the present study is counted when patients get more prescription although their drugs left more than 30 days from the previous visit. Number of day supply calculation is from number of drugs issued/dose per day. While study from Pharmaceutical System Research and Development Foundation in 2006 measured drug supply by accumulate drug dispensing per year and

Table 6. Value of oral drug oversupply by health scheme – for whole fiscal year 2009

Health schemes	UC	SSS	CSMBS	Others	Total
Total outpatient oral drug expenditure (Million Baht)	99.3	62.5	1,460.7	741.7	2,364.2
Value of drug oversupply (Million Baht)	2.7	1.6	45.2	12.6	62.0
% to total	2.69%	2.52%	3.10%	1.69%	2.62%

UC = universal coverage; SSS = social security scheme; CSMBS = civil servants medical benefit scheme

Table 7. Value of oral drug oversupply by health scheme – a summation of monthly oversupply for fiscal year 2009

Health schemes	UC	SSS	CSMBS	Others	Total
Total outpatient oral drug expenditure (Million Baht)	99.3	62.5	1,460.7	741.7	2,364.2
Value of drug oversupply (Million Baht)	2.3	1.2	40.5	12.8	56.9
% to total	2.32%	1.96%	2.77%	1.73%	2.40%

UC = universal coverage; SSS = social security scheme; CSMBS = civil servants medical benefit scheme

defined as oversupply if the number is more than 365 tablets/capsules[4].

The present study found that total oversupply expenditure for the fiscal year 2009 was 56.9 million Baht when summed 12 months and was 62.0 million Baht when performed as a whole year. Among this oversupply, there were 0.03 to 0.10% of total oral drugs record per month having day supply for more than 1 year. Most of them were vitamins such as Calcium carbonate 1,250 mg, Vitamin E 200 IU, Folic acid 5 mg, and Vitamin B 1-6-12. However, by expenditure, the top five turned to be drugs for chronic diseases same as the results from Pharmaceutical System Research and Development Foundation.

By drug group, cardiovascular & hematopoietic system had the most oversupply expenditure at 1.73 million Baht per year, followed by central nervous system, endocrine & metabolic system, oncology and allergy & immune system at 0.80, 0.36, 0.33 and 0.32 million Baht per year, respectively. While the study from the Pharmaceutical System Research and Development Foundation found that from 14 hospitals including three teaching hospitals, five provincial hospitals and six general hospitals, drugs for pain were the most oversupply at 56.96 million Baht, followed by anti-hypertensive, gastrointestinal drug, anti-diabetic agents and dyslipidemic agents at 39.38, 17.57, 17.32 and 8.26 million Baht per year, respectively[4].

Some limitations of the present study should be recognized. First, electronic data does not record the drug's prescription completely. Among oral drug prescription records in each month, 3 to 4 percent could not be calculated for day supply. Second, the present study compared drugs in the smallest item. Shift between dosage form, dose and drug shift within groups was not considered.

Prescribing drug quantity more than necessary is a waste and causes unnecessary burden on the health care expenditure while the budget is severely restrained. The physicians without computer prescribing have no information on how many drugs were left. Direct reimbursement from the Ministry of Finance relieves the burden of cash advancement from the patients and encourages drug oversupply.

In addition, the price of some drugs may be very high so the current loophole may encourage fraud of drug oversupply by giving oversupplied drug to their relatives or even worse by selling in the black market. The present study tries to estimate the impact of oversupply on the health care expenditure and the need for oversupply information at the time of prescribing.

In order to help hospital administrator monitoring and controlling drug oversupplies, many strategies have been discussed recently; such as utilization review, prescriber profiling, substitution policy, restricted formulary, prescription cap. However, it was an administrator's role to choose suitable strategy to implement in the hospital while being beware of its effect to the patients, especially their clinical and humanistic outcomes.

Conclusion

In a Thai teaching hospital, about 2 to 3% of outpatient oral drug expenditure was oversupplied in each month. This accounted for 56.9 million Baht in the fiscal year 2009. Four from the top five drugs prescribed for more than one year were vitamins. By drug group, the most oversupply expenditures were for chronic diseases. In addition, patients under CSMBS trended to have the most drug oversupply. These data will focus the problem for hospital administrators to plan for suitable strategy to control drug oversupply in their hospital.

Potential conflicts of interest

None

References

1. International Health Policy Programme, National Economic and Social, National Statistical Office, Ministry of Public Health. National health account in Thailand 1994-2001 [database on the Internet]. 2010 [cited 2010 Jan 2]. Available from: http://www.ihppthaigov.net/index.php
2. World Health Organization. Countries Thailand [database on the Internet]. 2010 [cited 2010 Jan 2]. Available from: http://www.who.int/countries/tha/en/
3. Ministry of Finance. Guideline of civil servants database management. Bangkok: The Comptroller General's Department, Ministry of Finance; 2006.
4. Research revealed Thais use over medicine 500 million baht per year. Manager online [database on the Internet]. 2009 [cited 2009 May 29]. Available from: http://www.manager.co.th/QOL/ViewNews.aspx?NewsID=9520000060267
5. Ramathibodi Hospital. Hospital database, October 1st, 2008 to September 30th, 2009. Bangkok: Ramathibodi Hospital; 2010.
6. Sikka R, Xia F, Aubert RE. Estimating medication persistency using administrative claims data. Am J Manag Care 2005; 11: 449-57.
7. Krigsman K, Melander A, Carlsten A, Ekedahl A, Nilsson JLG. Refill non-adherence to repeat prescriptions leads to treatment gaps or to high extra costs. Pharm World Sci 2007; 29: 19-24.
8. Vink NM, Klungel OH, Stolk RP, Denig P. Comparison of various measures for assessing medication refill adherence using prescription data. Pharmacoepidemiol Drug Saf 2009; 18: 159-65.

การใช้ยาเกินความจำเป็นในโรงพยาบาลโรงเรียนแพทย์แห่งหนึ่งของประเทศไทย

สมิง เก่าเจริญ, บุญส่ง องค์พิพัฒนกุล, อรลักษณ์ พัฒนาประทีป

ภูมิหลัง: *ค่าใช้จ่ายยาที่เพิ่มขึ้นอย่างต่อเนื่องในประเทศไทย ส่วนหนึ่งมาจากการจ่ายยาเกินความต้องการ อันเนื่องมาจากนโยบายที่เอื้อต่อการเบิกจ่ายยาโดยขาดการควบคุมเป็นต้น*

วัสดุและวิธีการ: *การศึกษานี้เป็นการศึกษาเชิงพรรณนาเพื่ออธิบายปัญหาการจ่ายยาเกินในโรงพยาบาลโรงเรียนแพทย์แห่งหนึ่งในกรุงเทพมหานคร โดยการใช้ข้อมูลการจ่ายยา รูปแบบรับประทานสำหรับผู้ป่วยนอกจากฐานข้อมูล เพื่อประมาณมูลค่าของการจ่ายยาเกินในปีงบประมาณ 2552 โดยการวิเคราะห์การจ่ายยาเกินที่มากกว่า 30 วัน ใน 2 รูปแบบคือรายเดือนและรายปี รวมทั้งวิเคราะห์รูปแบบการจ่ายยาเกินเฉพาะเดือน ในเดือนกันยายน พ.ศ. 2552*

ผลการศึกษา: *ประมาณมูลค่ายาที่มีการจ่ายเกิน ในปี 2552 เท่ากับ 56.9 ล้านบาทเมื่อรวมจากการคำนวณแต่ละเดือน และเท่ากับ 62.0 ล้านบาทเมื่อคำนวณทั้งปี โดยแต่ละเดือนมีสัดส่วนยาเกินร้อยละ 2.12 ถึง 2.73 เมื่อเทียบกับมูลค่ายารับประทานโดยรวม หรือ ร้อยละ 2.91 ถึง 3.46 เมื่อเทียบกับจำนวนใบสั่งยาทั้งหมดในเดือน กันยายน พ.ศ. 2552 กลุ่มยาที่มีมูลค่าการจ่ายยาเกินมากที่สุด คือ กลุ่มยาโรคหัวใจและหลอดเลือด ยาที่มีปริมาณการจ่ายเกินมากที่สุด 3 อันดับ ได้แก่ calcium carbonate (7.60%), simvastatin (3.69%), omeprazole (3.20%) ยาที่มีมูลค่าการจ่ายเกินมากที่สุด 3 อันดับ ได้แก่ atorvastatin (7.27%), clopidogrel (6.83%), rosuvastatin (4.24%) นอกจากนี้ตามสิทธิการเบิกจ่าย ผู้ป่วยกลุ่มข้าราชการเป็นกลุ่มที่มีสัดส่วนผู้ป่วยเบิกจ่ายยาเกินมากที่สุด คือ ร้อยละ 8.31 มียาเกินเฉลี่ยต่อคน 1.83 ชนิด ด้วยจำนวนวันเกิน 61.83 วัน คิดเป็นมูลค่ายา 3.21 ล้านบาท ในเดือนกันยายน พ.ศ. 2552*

สรุป: *การศึกษานี้แสดงให้เห็นถึงปัญหาที่เกิดจากการจ่ายยาเกิน ซึ่งส่วนใหญ่มาจากการจ่ายยาสำหรับโรคเรื้อรัง ข้อมูลเหล่านี้จะมีประโยชน์ต่อผู้บริหารในการวางนโยบายที่เหมาะสมเพื่อควบคุมการจ่ายยาเกินในโรงพยาบาล*