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Impact of Including Prasugrel on the Formulary for Patients Who Undergo Percutaneous Coronary Intervention for Acute Coronary Syndrome

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ABSTRACT

OBJECTIVE: Budget impact models for new drugs provide estimates of the changes in annual costs of drug therapy, as well as estimates of the changes in other health care costs attributable to the underlying disease or the side effects of treatment.

METHODS: In this study, we estimated the annual change in disease and side effects costs associated with the addition of prasugrel to a drug formulary for treatment of those with acute coronary syndrome (ACS) undergoing a percutaneous coronary intervention (PCI) in a managed care organization with 1,000,000 covered lives. The model compared the annual costs in each of the first 3 years after addition of prasugrel to the formulary assuming a maximum treatment share of 50% after 1 year. The only alternative treatment was clopidogrel, and patients already being treated with clopidogrel were not switched to prasugrel. The relative risk of subsequent cardiovascular and bleeding events for each drug were taken from a head-to-head 15-month clinical trial. For those discontinuing prasugrel or clopidogrel treatment, the risk of cardiovascular events reverted to the risk of those taking only aspirin.

RESULTS: The estimated numbers of cardiovascular events (bleeding events) after an ACS episode with prasugrel on the formulary in the first 3 years were 541 (36), 528 (42), and 525 (43), respectively, and without prasugrel were 548 (35) in all 3 years. The annual reductions in total costs in the first 3 years after adding prasugrel to the formulary were estimated to be $91,281, $209,896, and $230,389, respectively.

CONCLUSIONS: Using a more effective dual oral antiplatelet regimen is likely to result in lower disease-related costs that are not offset by higher bleeding-related costs or prasugrel costs. The disease-event cost savings estimated in the model should be included in a comprehensive estimate of the budget impact of adding prasugrel to a formulary.

BACKGROUND

- ACS is a condition encompassing a range of clinical symptoms, including unstable angina (UA) and myocardial infarction (MI).[1]
- Appropriate management for ACS is determined based on the clinical diagnosis (e.g., non-ST segment elevation myocardial infarction [NSTEMI] or ST-segment elevation myocardial infarction [STEMI]) and presence of risk factors.
  - PCI is a procedure used to manage ACS.[2]
- Antiplatelet therapy that includes aspirin in combination with a thienopyridine is given as a loading dose (LD) before the PCI and as a maintenance dose (MD) after the procedure to reduce the risk of thrombotic events during and after PCI.[3]
- Prasugrel (Effient®), clopidogrel bisulfate (Plavix®), and ticlopidine hydrochloride (Ticlid®) are the three thienopyridines approved in the United States (US).[4,5,6]
  - Prasugrel was recently approved by the US Food and Drug Administration (FDA).
  - In the current market, clopidogrel is preferred over ticlopidine and is more widely used, with ticlopidine having less than 0.1% of the market share.[7]

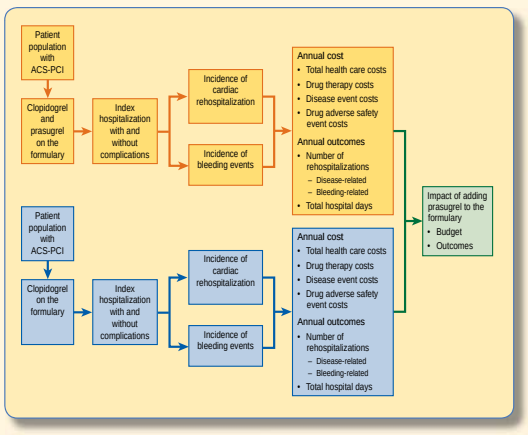
OBJECTIVE

To estimate the budget impact of including prasugrel on the formulary in addition to clopidogrel for patients who have ACS without history of stroke or transient ischemic attack (TIA) and who undergo a PCI in a managed care organization (MCO) setting.

METHODS

A literature- and trial-based budget impact model was developed to compare a year without prasugrel on the formulary to a year with prasugrel on the formulary (Figure 1).

Figure 1. Structure of the Prasugrel Budget Impact Model



- Only those patients having ACS+PCI with no history of stroke or TIA are included in the analysis (Table 1).
- The budget impact model estimates the market uptake of prasugrel in the first 3 years of its availability by changing, each month, the percentage of patients with ACS+PCI taking a thienopyridine who initiate treatment with a LD of prasugrel and then continue on a MD of prasugrel for 15 months. We assume a maximum market share of 50% after 1 year.
- Events related to ACS and treatment with thienopyridine drugs occur during the following three time periods:
  - Index hospitalization
  - Time from initial admission to 30 days
  - 31 days to 15 months.
- Index hospital events include periprocedural MIs and bleeding events.
- Disease- and bleeding-related events occur in the 15 months after the index PCI and include subsequent MI, stroke, subsequent bleeding events, cardiovascular death, angina, other cardiovascular events (e.g., pulmonary embolism, pulmonary edema, defibrillator implant, and arrhythmia), coronary artery bypass graft (CABG), and repeat PCI.
- Rates of index hospital events and disease- and thienopyridine-related events are taken from data from the Trial to Assess Improvement in Therapeutic Outcomes by Optimizing Platelet Inhibition with Prasugrel–Thrombolysis in Myocardial Infarction (TRITON-TIMI 38) based on assignment to a diagnosis-related group (DRG) (Tables 2 and 3).[8]
- Inpatient costs are incurred for the index hospital stay with or without periprocedural complications and for any disease- or bleeding-related events (Tables 2, 3, and 4).
- Outpatient costs are not included except for the cost for thienopyridine drugs using the drug package price adjusted for copayments and by any dispensing fees or discounts (Table 4).
- Complete (100%) adherence and persistence of therapy are assumed.

Table 1. Population Distribution Assumption

Parameter Description	Male	Female
MCO covered lives[a]	1,000,000	
MCO age distribution by sex[9]		
< 65 years	43.84%	44.16%
65-74 years	2.90%	3.43%
> 75 years	2.26%	3.43%
ACS hospitalization rate[9,10]		
< 65 years	0.33%	0.16%
65-74 years	2.55%	1.50%
> 75 years	4.07%	3.22%
PCI rate among those hospitalized for ACS[10]		
< 65 years	43.59%	32.02%
65-74 years	34.30%	28.04%
> 75 years	21.23%	16.88%
Percentage of those with ACS+PCI given thienopyridine drugs[b]	95%	95%

[a] Assumption of 1,000,000-member MCO.
[b] Assumption of 5% in each age group, male and female, have history of stroke or TIA.

Table 2. Index Hospitalization Periprocedural Event Rate and Costs

Parameter Description	Prasugrel	Clopidogrel
Percentage with no periprocedural MI or bleed[8]	90.8%	90.8%
Percentage with periprocedural MI[8]	4.3%	5.2%
Percentage with periprocedural bleed[8]		
Major	0.9%	0.8%
Minor	1.7%	1.4%
Minimal	2.7%	2.3%
Index hospitalization cost with no MI or bleeding episode[8,11]		
MedStat[a]	$24,910	
Medicare[b]	$19,391	
Additional cost of periprocedural bleed[c,12]		
TIMI major bleed	$7,176	
TIMI minor bleed	$7,176	
TIMI minimal bleed	$451	
Additional cost of periprocedural MI[c,13]	$2,543	

TIMI = thrombolysis in MI.
[a] Regression analysis of MarketScan (MedStat) database and assignment of TRITON-TIMI 38 patient population subset to diagnosis-related groups (DRGs).
[b] Regression analysis of Medicare (MedPar) database and assignment of TRITON-TIMI 38 patient population subset to DRGs. Additional costs for physician or professional services are added to DRG costs based on an estimated percentage of hospital costs for each DRG from Mitchell and colleagues.[11]
[c] Regression analysis of REPLACE-2 (Randomized Evaluation of PCI Linking Angiomax to Reduced Clinical Events 2) trial.[12]

Table 3. Monthly Rehospitalization Rates and Costs

Parameter Description	Repeat PCI	CABG	Other Vascular Interventions[a]	MI	Stroke	Angina	Other Cardiac Conditions[a]	Any Bleeding Episodes
Rehospitalizations per DRG – randomization to 30-day rates[8]								
Prasugrel	0.0328	0.0046	0.0006	0.0043	0.0012	0.0080	0.0303	0.0068
Clopidogrel	0.0423	0.0065	0.0009	0.0040	0.0031	0.0072	0.0267	0.0062
Rehospitalizations per DRG – 31-day to 15-month rates[8]								
Prasugrel	0.0077	0.0011	0.0003	0.0006	0.0006	0.0017	0.0052	0.0019
Clopidogrel	0.0098	0.0010	0.0002	0.0011	0.0007	0.0015	0.0044	0.0012
Rehospitalizations – costs[8]								
MedStat[b]	$20,060	$46,002	$18,280	$15,087	$12,143	$4,794	$9,683	$7,264
Medicare[c]	$16,232	$36,026	$15,889	$9,532	$7,910	$3,644	$7,522	$6,345

[a] Other vascular interventions and other cardiac conditions are catch-all categories that include all other cardiovascular DRGs, including pulmonary embolism, pulmonary edema, defibrillator implant, and arrhythmia.
[b] Regression analysis of Medicare (MedPar) database and assignment of TRITON-TIMI 38 patient population subset to DRGs. Additional costs for physician or professional services are added to DRG costs based on an estimated percentage of hospital costs for each DRG from Mitchell and colleagues.[11]
[c] Regression analysis of Medicare (MedPar) database and assignment of TRITON-TIMI 38 patient population subset to DRGs.

Table 4. Drug Parameters and Base Case Values*

Parameter Description	Prasugrel	Clopidogrel
Prasugrel uptake rate[a]		
Maximum uptake rate	50%	-
Month to maximum uptake	12 months	-
LD[14]	60 mg	300 mg
MD[14]	10 mg	75 mg
Index hospitalization (cost per mg)[15]	$0.55	$0.06
Package price[b]	$163.50	$144.00
Copayment per package[16]	$20.00	$20.00
Dispensing fees[c]	$0.00	$0.00
Discounts[c]	$0.00	$0.00

*Cost of aspirin was not included in analysis because similar use with prasugrel and clopidogrel resulted in offsetting costs.
[a] Assumption that prasugrel reached the maximum uptake rate 12 months after being placed on the formulary.
[b] Package price and copayment is for a 30-day supply of 10 mg tablets for prasugrel and a 30-day supply of 75 mg tablets for clopidogrel.
[c] Assumption that dispensing fees and discounts are $0.00.

RESULTS

- Base-case model results indicate that a scenario that includes clopidogrel and prasugrel on the formulary is less costly in each of the first 3 years of prasugrel on the formulary.
- The annual reduction in total costs (cost of index hospitalization, rehospitalization for disease- and bleeding-related events, and outpatient drug costs) in the first 3 years after adding prasugrel to the formulary were estimated to be $91,281, $209,896, and $230,389, respectively (Figure 2).
- Base-case model results indicate that prasugrel on the formulary increases the cost of an index hospitalization in the first 3 years after adding prasugrel to the formulary.
  - The annual increases in index hospitalization costs in the first 3 years were estimated to be $12,296, $29,756, and $30,415, respectively.
- The estimated numbers of cardiovascular events (bleeding events) after an ACS episode with prasugrel on the formulary in the first 3 years were 541 (36), 528 (42), and 525 (43), respectively, and without prasugrel were 548 (35) in all 3 years (Figures 3 and 4).
- The annual reductions in disease- and bleeding-related costs in the first 3 years after adding prasugrel to the formulary were estimated to be $141,901, $419,377, and $488,119, respectively.
- Reducing the maximum uptake rate of prasugrel to 15% by 12 months results in the annual reduction in total costs in the first 3 years of $27,384, $62,969, and $69,117, respectively.

Figure 2. Total Annual Costs

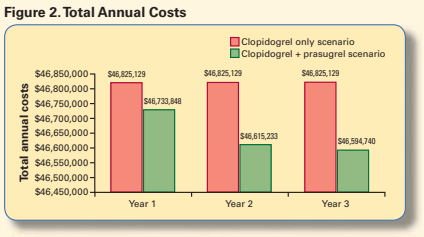


Figure 3. Annual Number of Disease-Related Events

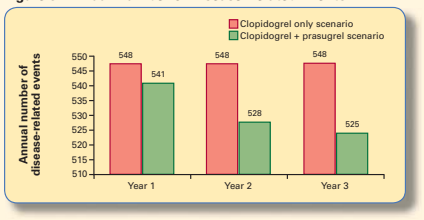
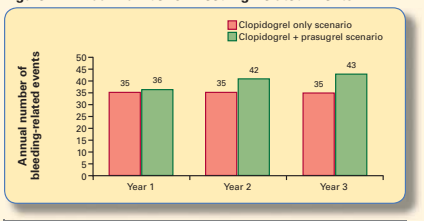


Figure 4. Annual Number of Bleeding-Related Events



CONCLUSIONS

- Including both clopidogrel and prasugrel on the formulary is less costly than clopidogrel alone in each of the first 3 years under the base-case scenario of prasugrel uptake of 50% by 12 months.
- Prasugrel on the formulary:
  - Decreases the number of disease-related events by 7, 20, and 23 in years 1, 2, and 3, respectively, while increasing the number of bleeding events by 1, 7, and 8 in years 1, 2, and 3, respectively
  - Increases outpatient drug costs due to the higher package price for prasugrel (10 mg)
  - Reduces the costs for rehospitalizations (disease- and bleeding-related events)
  - Increases the cost of index hospitalization due to slightly higher periprocedural bleeding rates

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