Frequency and predictors of tablet splitting in statin prescriptions: a population-based analysis

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ABSTRACT

Background: The price per milligram for most statin medications decreases at higher strengths, which provides an economic incentive to split tablets. We sought to determine the frequency with which statin tablets are split, and to evaluate factors associated with this practice.

Methods: We obtained prescription claims data for statins from the BC Ministry of Health for the period Jan. 1, 1996, to Dec. 31, 2006. We estimated the number of tablets per day, based on the ratio of the number of tablets to days-supply in each prescription, to estimate the frequency with which splitting occurred with each statin. We used multivariable logistic regression to assess patient and physician characteristics and the level of public drug plan coverage associated with tablet splitting. To estimate related cost savings, we used information on drug costs and quantities of dispensed statins reported by pharmacies.

Results: During the 11-year study period, we estimated that tablet splitting occurred in 2.6% of 7.2 million statin prescriptions. There was an increasing trend in the practice over time, to 4.5% of prescriptions in 2006. Lovastatin was the only scored tablet and was the most likely to be split, followed by rosvastatin and atorvastatin. Fifty percent of the prescriptions in which tablet splitting occurred were prescribed by only 7.9% of the routine statin prescribers (i.e., >10 statin prescriptions over the study period). Specialists were less likely than general practitioners to prescribe statins that were subsequently split (odds ratio [OR] 0.43, 95% confidence interval [CI] 0.40–0.46). Statin prescriptions that were fully covered by the public drug plan were half as likely as those with no such coverage to involve tablet splitting (OR 0.48, 95% CI 0.44–0.92). Having no public drug coverage, having a low annual household income and being female were patient factors found to be positively associated with tablet splitting. In 2006, the cost savings associated with tablet splitting was $2.3 million.

Interpretation: The frequency of tablet splitting in statin prescriptions in British Columbia was low but increased over time. It varied between patients, physicians and different levels of insurance coverage. In the final study year, 94.5% of the statin prescriptions were dispensed at strengths for which a tablet of twice the strength was available and could have been split, which suggests a potentially enormous cost savings.

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For many prescription drugs, the price per milligram decreases substantially at higher strengths. This circumstance provides an incentive to reduce costs by splitting higher-dose tablets to obtain a prescribed lower dose at a substantially lower price. In the United States, some major drug plan insurers have implemented tablet-splitting programs that target statins.\textsuperscript{1,2} Tablet splitting has been shown to reduce prescription costs substantially\textsuperscript{4,3,4} without negatively affecting laboratory outcomes or compliance.\textsuperscript{4,6} In addition, patients have found tablet splitting to be simple and acceptable.\textsuperscript{4,7}

Little is known about patient and physician characteristics associated with tablet splitting or how common the practice is in Canada. When looking at aggregated 2005 data from the province of British Columbia, we noticed that the mean number of tablets per prescription varied among the statins. Since statins are used only for long-term prevention of myocardial infarction and stroke, we thought that the most likely reason for this variation was that some patients were splitting tablets. We looked for the most specific method to measure tablet splitting and used that to examine the frequency and predictors of tablet splitting in British Columbia. Public and private insurers in the province have no programs requiring or encouraging tablet splitting, which means that the initiative for this practice comes solely from patients, pharmacists and physicians.

Methods

Data source. We obtained prescription records from the PharmaNet database, which contains all prescriptions dispensed at community pharmacies in British Columbia.\textsuperscript{8} We linked records in PharmaNet to information in the BC Ministry of Health’s databases for premium subsidy income level and medical services registration. These latter databases were used to determine patient income level and eligibility for provincial health coverage.

Study population. With some exceptions, the source population included all people who were residents of British Columbia at any time between Jan. 1, 1996, and Dec. 31, 2006. We excluded federally insured patients (about 4% of the provincial population) because we did not have access to their prescribing data. We also excluded patients who were receiving social income assistance, because concurrent changes in income support policies made that population unstable for analysis, and residents of nursing homes, because their medication use was expected to be highly regulated. The source population, after exclusions, numbered 4.1 million in 2006 (Statistics Canada, CANSIM database). We included all patients from the source population who received a statin from a community pharmacy.

Prescription drug coverage. Residents aged 65 years and older were fully covered by the provincial drug plan for prescription ingredient costs before January 2002 but still had to pay the first Cdn$200 in dispensing fees each year. Between January 2002 and April 2003, patients over 65 paid a new charge of $25 per prescription ($10 for patients whose medical services premiums were subsidized by the province). Residents under 65 years of age were covered for prescription ingredient costs and dispensing fees under a public plan that included a deductible and a co-insurance payment. Coverage for families of all ages was combined into a single policy on May 1, 2003. The new policy included an income-based deductible and a 25% or 30% co-insurance payment. Full coverage for patients in nursing homes and those receiving social income assistance was continued. Data on private drug insurance coverage were unavailable.

Quantification of statin splitting. Each PharmaNet record includes the number of tablets and days-supply of medication dispensed. We used the ratio of these 2 values to estimate the number of tablets per day. We calculated relative frequencies for the tablets:days-supply ratios, in ratio intervals of 0.1. For example, a prescription with a tablets:days-supply ratio of 0.25 would be counted in the interval “0.2 to < 0.3.” Prescriptions with ratios exactly equal to 0.5 were presumed to have been split. Prescriptions with ratios exactly equal to 1.0 were presumed to have not been split. This method of estimating splitting in claims data has been applied previously.\textsuperscript{3} Table 1 shows the statins and splitting combinations that we analyzed.

We assessed factors associated with tablet splitting among new users of statins. One benefit of studying first-time prescriptions to new users was that within-patient clustering was not a factor. We defined new users as patients who had not received another statin prescription for at least 2 years before the current prescription. We compared new users who were presumed to be splitting tablets (tablets:days-supply ratio = 0.5) with those who...
were presumed to not be splitting tablets (ratio = 1.0). New users whose tablets:days-supply ratio was other than 0.5 or 1.0 were excluded from the analysis to maximize the specificity of the outcome.

**Statistical analysis.** We analyzed potential factors associated with tablet splitting using logistic regression analysis. We used generalized estimating equations (GEEs) to adjust standard errors for correlations between repeated observations for the same prescribers.\(^9\) Hence, the new-users analysis was implicitly adjusted for clustering at the patient level by analyzing each patient only once, and explicitly at the physician level by using the GEE method. The GEEs assumed an exchangeable correlation matrix. Odds ratios and corresponding 95% confidence intervals were estimated using the Genmod procedure in SAS, version 9.1 (SAS Institute, Inc., Cary, North Carolina). We included the following variables in the analysis: patient age; sex; annual household income, in Canadian dollars (high: \(\geq 28,000\); moderate: \(20,000 < \text{income} < 28,000\); and low: \(< 20,000\));\(^10\) level of public drug plan coverage for the prescription (full, partial, none); prescriber specialty (specialist or general practitioner); an indicator variable for whether the prescriber’s last statin prescription involved tablet splitting; type of statin; an indicator variable for whether the smallest strength of statin was dispensed; number of weeks-supply of drug dispensed; and type of pharmacy (independent, chain, other). In a secondary analysis, we performed the same logistic regression involving all statin patients (new plus continuing users) using the same variables. In that analysis, we used GEEs to adjust standard errors for correlations between repeated observations for the same patients. Our computer programs were unable to simultaneously adjust for clustering within patients and physicians because the data set was too large.

Ingredient cost savings from tablet splitting were estimated for the 2006 calendar year. First, we estimated the daily difference in cost between a split tablet and a whole tablet by subtracting from the cost of a whole tablet (e.g., one 10-mg tablet of atorvastatin) the cost of half a tablet of a higher strength (e.g., half of a 20-mg tablet of atorvastatin). We defined the cost per tablet as the mean dollar amount claimed per tablet in the PharmaNet database in 2006. Next, we estimated the total ingredient cost savings by multiplying the daily cost

| Statin† | 2.5 mg‡ | 5 mg‡ | 10 mg‡ | 20 mg | 40 mg |
|---------|--------|-------|--------|-------|-------|
| Atorvastatin | - | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | 0.5 × 80 mg |
| Fluvastatin§ | - | - | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Lovastatin | - | - | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Pravastatin | - | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Rosuvastatin | 0.5 × 5 mg | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Simvastatin | 0.5 × 5 mg | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | 0.5 × 80 mg |

*The lowest strengths available were 5 mg (rosuvastatin, simvastatin), 10 mg (atorvastatin, pravastatin) and 20 mg (fluvastatin, lovastatin). The largest strengths available were 40 mg (pravastatin, lovastatin, rosuvastatin) and 80 mg (atorvastatin, fluvastatin, simvastatin). Strengths not included in the analysis are denoted by "-".†Between Oct. 16, 2006, and Oct. 15, 2007, the median costs per tablet dispensed for statins in the PharmaNet database were (generic prices in parentheses): atorvastatin 10 mg = $1.78, 20 mg = $2.23, 40 mg = $2.39, 80 mg = $2.39; fluvastatin 20 mg = $0.86, 40 mg = $1.20; lovastatin 20 mg = $1.98 ($1.11), 40 mg = ($2.11); pravastatin 10 mg = $1.67 ($0.95), 20 mg = $1.97 ($1.12), 40 mg = $2.37 ($1.35); rosuvastatin 5 mg = $1.38, 10 mg = $1.46, 20 mg = $1.82, 40 mg = $2.13; simvastatin 5 mg = $1.03 ($0.60), 10 mg = $2.04 ($1.12), 20 mg = $2.52 ($1.39), 40 mg = $2.52 ($1.41), 80 mg = $2.52 ($1.44).‡Prescriptions in which tablets were split for daily doses less than the lowest available strength of whole tablets were included in the analysis (atorvastatin 0.5 × 10 mg, lovastatin 0.5 × 20 mg, pravastatin 0.5 × 10 mg, rosuvastatin 0.5 × 5 mg and simvastatin 0.5 × 5 mg).§Fluvastatin is a capsule or extended-release tablet and should not be split.

### Table 1: Statins and splitting combinations included in the analysis

| Statin† | 2.5 mg‡ | 5 mg‡ | 10 mg‡ | 20 mg | 40 mg |
|---------|--------|-------|--------|-------|-------|
| Atorvastatin | - | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | 0.5 × 80 mg |
| Fluvastatin§ | - | - | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Lovastatin | - | - | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Pravastatin | - | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Rosuvastatin | 0.5 × 5 mg | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | - |
| Simvastatin | 0.5 × 5 mg | 0.5 × 10 mg | 0.5 × 20 mg | 0.5 × 40 mg | 0.5 × 80 mg |

*The lowest strengths available were 5 mg (rosuvastatin, simvastatin), 10 mg (atorvastatin, pravastatin) and 20 mg (fluvastatin, lovastatin). The largest strengths available were 40 mg (pravastatin, lovastatin, rosuvastatin) and 80 mg (atorvastatin, fluvastatin, simvastatin). Strengths not included in the analysis are denoted by "-".†Between Oct. 16, 2006, and Oct. 15, 2007, the median costs per tablet dispensed for statins in the PharmaNet database were (generic prices in parentheses): atorvastatin 10 mg = $1.78, 20 mg = $2.23, 40 mg = $2.39, 80 mg = $2.39; fluvastatin 20 mg = $0.86, 40 mg = $1.20; lovastatin 20 mg = $1.98 ($1.11), 40 mg = ($2.11); pravastatin 10 mg = $1.67 ($0.95), 20 mg = $1.97 ($1.12), 40 mg = $2.37 ($1.35); rosuvastatin 5 mg = $1.38, 10 mg = $1.46, 20 mg = $1.82, 40 mg = $2.13; simvastatin 5 mg = $1.03 ($0.60), 10 mg = $2.04 ($1.12), 20 mg = $2.52 ($1.39), 40 mg = $2.52 ($1.41), 80 mg = $2.52 ($1.44).‡Prescriptions in which tablets were split for daily doses less than the lowest available strength of whole tablets were included in the analysis (atorvastatin 0.5 × 10 mg, lovastatin 0.5 × 20 mg, pravastatin 0.5 × 10 mg, rosuvastatin 0.5 × 5 mg and simvastatin 0.5 × 5 mg).§Fluvastatin is a capsule or extended-release tablet and should not be split.

### Table 2: Tablets:days-supply ratios for statin prescriptions dispensed in British Columbia, 1996–2006

| Ratio* | No. of statin prescriptions† | Relative frequency, % |
|--------|-----------------------------|------------------------|
| < 0.1 | 319 | 0.00 |
| 0.1 to < 0.2 | 710 | 0.01 |
| 0.2 to < 0.3 | 6 311 | 0.09 |
| 0.3 to < 0.4 | 4 584 | 0.06 |
| 0.4 to < 0.5 | 2 852 | 0.04 |
| 0.5 | 189 182 | 2.62 |
| > 0.5 to < 0.6 | 6 197 | 0.09 |
| 0.6 to < 0.7 | 2 944 | 0.04 |
| 0.7 to < 0.8 | 2 054 | 0.03 |
| 0.8 to < 0.9 | 1 363 | 0.02 |
| 0.9 to < 1.0 | 2 206 | 0.03 |
| 1.0 | 6 731 886 | 93.41 |
| > 1.0 | 256 465 | 3.56 |
| Total | 7 207 083 | 100.00 |

*For prescriptions with a ratio of 0.5, tablet splitting was presumed; for prescriptions with a ratio of 1.0, no tablet splitting was presumed.†Excludes prescriptions to nonresidents, residents of long-term care facilities and patients receiving social income assistance.
difference for each statin by the total number of days-supply dispensed for that statin in split tablets. We multiplied the daily cost difference by 20% of the eligible days-supply to estimate the potential savings from tablet splitting in 20% of prescriptions. We arbitrarily chose 20% as a plausible rate that could result from a voluntary tablet-splitting program including financial incentives from a drug plan. To estimate potential savings from splitting in 100% of prescriptions, the theoretical maximum savings, we used 100% of the eligible days-supply. We excluded from the cost-savings analysis prescriptions for fluvastatin (because it is a capsule and thus should not be split) and statins already dispensed in the highest available strength. We also excluded prescriptions with a tablets:days-supply ratio other than 0.5 or 1.0. No adjustments to cost-savings estimates were made for drug waste, the cost of tablet splitters, or additional work by pharmacists and patients.

Results

A total of 7.2 million statin prescriptions were dispensed during the 11-year study period. Of these prescriptions, we estimated that 2.6% involved tablet splitting (Table 2) and that there was an increasing trend in tablet splitting over time, to 4.5% of prescriptions in 2006 (Fig. 1). In the last year of the analysis (2006), 94.5% of the statin prescriptions were dispensed at strengths for which tablets of twice the strength were available and could have been split. Of the remaining prescriptions, 0.8% were for fluvastatin (a capsule), and 4.7% were dispensed in the highest available strength. Also in 2006, rosuvastatin and atorvastatin were the most likely statins to be split (7.4% and 5.2% of prescriptions, respectively), whereas pravastatin (1.4%) and fluvastatin (a capsule, 0.5%) were the least likely to be split. Lovastatin, the only statin available in scored tablets, was split at a fairly constant rate of 2.5%–3% over the study period.

Of the prescriptions in which tablet splitting occurred, 50% were prescribed by only 7.9% of routine statin prescribers (> 10 statin prescriptions over the study period). These prescribers did not differ significantly in terms of their patients’ age, sex, household income level, level of public drug plan coverage or statin type. The proportion of general practitioners was higher among these prescribers (94.0%) than among those whose statin prescriptions involved less frequent tablet splitting (80.2%). The 7.9% of routine statin prescribers wrote over 4 times as many statin prescriptions on average as the other 92.1% of prescribers.

There were 312,760 statin prescriptions dispensed to new users. These patients had a mean age of 62.9 years, 44.8% were women, and 21.6% had low annual household incomes (< $20,000) (Table 3). The proportion of patients who had partial drug plan coverage was similar among those who split tablets and those who did not. This was not true for patients who received full coverage (13.8% of splitters v. 24.8% of non-splitters) or for those who had no coverage (61.0% of splitters v. 50.2% of non-splitters).

The results of the logistic regression analysis of predictors of tablet splitting are shown in Table 4. The likelihood of tablet splitting among new statin users increased significantly with age until 65, when it decreased
significantly. Female patients were 23% more likely than male patients to split tablets \((p < 0.001)\). Tablet splitting was 51% more likely to occur among patients in low-income households than among those in higher income groups \((p < 0.001)\). It was less likely to occur with prescriptions covered by the public drug plan than with prescriptions not covered by the drug plan \((29\% \text{ less likely for partially covered claims and } 52\% \text{ less likely for fully covered claims}; p < 0.001)\). Tablet splitting was 4 times more likely to occur if the prescribing physician’s last statin prescription had involved tablet splitting than if it had not \((p < 0.001)\). The likelihood of tablet splitting was also significantly associated with the type of statin prescribed and the number of weeks-supply of drug dispensed.

The estimated ingredient cost savings from tablet splitting in 2006 was $2.35 million (Table 5), or $18 per statin-patient. The potential cost savings from splitting tablets in 20% of eligible prescriptions was $10.5 million dollars. The potential savings from splitting all eligible prescriptions was $51.4 million.

**Interpretation**

Our study showed that tablet splitting in statin prescriptions was associated with patient and physician factors and with the level of coverage in the public drug plan. An increasing trend in tablet splitting over the study period coincided with market penetration of more expensive statins (atorvastatin and rosuvastatin) and with increases in levels of cost-sharing in the public drug plan in 2002 and 2003. Those policies are described in detail elsewhere.\(^{11,12}\)

The relation between patient age and tablet splitting was not monotonic. For decades, public drug coverage in

### Table 3: Characteristics of new users dispensed statin prescriptions in British Columbia, by tablet-splitting status, 1998–2006

| Characteristic                  | Split tablets, % \((n = 10,213)\) | Whole tablets, % \((n = 302,547)\) | Difference (95% CI)\(^*\) | \(p\) value\(^†\) |
|---------------------------------|-------------------------------------|-------------------------------------|---------------------------|-------------------|
| **Patient characteristics**     |                                     |                                     |                           |                   |
| Age, yr, mean                   | 61.1 \((48.2)\)                    | 63.0 \((44.7)\)                    | \(-1.9 \((-2.2 \text{ to } -1.7)\)\) | \(< 0.001\)       |
| Sex, female                     | 4,918 \((48.2)\)                  | 135,129 \((44.7)\)                | \(3.5 \((2.5 \text{ to } 4.5)\)\) | \(< 0.001\)       |
| Annual household income         |                                     |                                     |                           |                   |
| \(< \$20,000\)                  | 2,502 \((24.5)\)                  | 65,183 \((21.5)\)                 | \(3.0 \((2.1 \text{ to } 3.8)\)\) | \(< 0.001\)       |
| \(\$20,000 \text{ to } \$28,000\) | 528 \((5.2)\)                     | 11,831 \((3.9)\)                  | \(1.3 \((0.8 \text{ to } 1.7)\)\) | \(< 0.001\)       |
| \(\geq \$28,000\)              | 7,183 \((70.3)\)                  | 225,534 \((74.5)\)                | \(-4.2 \((-5.1 \text{ to } -3.3)\)\) | \(< 0.001\)       |
| **Public drug plan coverage**   |                                     |                                     |                           |                   |
| Partial                         | 2,580 \((25.3)\)                  | 75,508 \((25.0)\)                 | \(0.3 \((-0.6 \text{ to } 1.2)\)\) | 0.484             |
| Full                            | 1,405 \((13.8)\)                  | 75,088 \((24.8)\)                 | \(-11.0 \((-11.6 \text{ to } -10.3)\)\) | \(< 0.001\)       |
| None                            | 6,228 \((61.0)\)                  | 151,952 \((50.2)\)                | \(10.8 \((9.8 \text{ to } 11.7)\)\) | \(< 0.001\)       |
| **Statin dispensed**            |                                     |                                     |                           |                   |
| Atorvastatin                    | 6,311 \((61.8)\)                  | 190,802 \((63.1)\)                | \(-1.3 \((-2.2 \text{ to } -0.3)\)\) | 0.009             |
| Fluvastatin                     | 17 \((0.2)\)                      | 4,745 \((1.6)\)                   | \(-1.4 \((-1.5 \text{ to } -1.3)\)\) | \(< 0.001\)       |
| Lovastatin                      | 322 \((3.2)\)                     | 6,006 \((2.0)\)                   | \(1.2 \((0.8 \text{ to } 1.5)\)\) | \(< 0.001\)       |
| Pravastatin                     | 267 \((2.6)\)                     | 20,939 \((6.9)\)                  | \(-4.3 \((-4.6 \text{ to } -4.0)\)\) | \(< 0.001\)       |
| Rosuvastatin                    | 1,986 \((19.4)\)                  | 20,932 \((6.9)\)                  | \(12.5 \((11.8 \text{ to } 13.3)\)\) | \(< 0.001\)       |
| Simvastatin                     | 1,310 \((12.8)\)                  | 59,124 \((19.5)\)                 | \(6.9 \((-7.4 \text{ to } -6.1)\)\) | \(< 0.001\)       |
| **Pharmacy type used**          |                                     |                                     |                           |                   |
| Independently owned \((< 3 \text{ locations})\) | 1,935 \((18.9)\)                | 49,648 \((16.4)\)                 | \(2.5 \((1.8 \text{ to } 3.3)\)\) | \(< 0.001\)       |
| Chain \((\geq 3 \text{ locations})\) | 8,272 \((81.0)\)                 | 252,502 \((83.5)\)                | \(-2.5 \((-3.2 \text{ to } -1.7)\)\) | \(< 0.001\)       |
| Other facility \((\text{e.g., physician’s office})\) | 6 \((0.1)\)                     | 397 \((0.1)\)                     | \(-0.1 \((-0.1 \text{ to } 0.0)\)\) | 0.045             |

Note: CI = confidence interval.

\(^*\)Difference in proportion of patients in the split-tablet group compared with whole-tablet group (except for age, which was reported as the difference in mean age). Except for age, CIs were estimated assuming a binomial distribution. The CI for the difference in mean age was estimated using a standard normal distribution.

\(^†\)\(p\) values were based on a standard normal distribution (difference in mean age) or a \(\chi^2\) distribution with 1 degree of freedom (all other differences).
British Columbia was more generous for patients over 65 years of age than for younger patients. A correlation between better public coverage and higher age most certainly accounted for some of the lower relative likelihood of tablet splitting observed among older patients. Other factors such as frailty, cognitive impairment and concurrent use of other medications, which could make tablet splitting inappropriate and which are more common among older patients, could also have contributed to the lower relative likelihood of tablet splitting.

Our observation that patients in low-income households were more likely than those in higher-income households to split tablets was expected, since lower-income people have a greater need to save money. However, we could not determine whether the initiative to split tablets for this reason was initiated by the physicians or the patients. Females were more likely than males to split tablets. A test of interaction between female sex and income level showed that the combined effect was greater than the independent effects; this suggested that, at any given income level, female patients were more sensitive than male patients to the cost. This observation is similar to that from another study in British Columbia on switching drugs as a consequence of reference pricing.\textsuperscript{13}

Of the statin prescriptions, 4% showed a tablets:days-supply ratio greater than 0.5 (tablet splitting presumed) or less than 1.0 (no tablet splitting presumed). This could have been due to data-entry errors at the pharmacy or to tablets being split more than once. Our analysis of fluvastatin, a statin that should not be split because it is a capsule, showed that splitting occurred in about 0.5% of prescriptions each year (Fig. 1). This result could indicate the proportion of prescriptions that our algorithm falsely

\begin{table}[h]
\centering
\begin{tabular}{lcccc}
\hline
\textbf{Factor} & \textbf{New statin users*} & \textbf{All statin users†} \\
 & \textbf{Crude OR} & \textbf{Adjusted OR (95\% CI)‡} & \textbf{Crude OR} & \textbf{Adjusted OR (95\% CI)§} \\
\hline
\textbf{Public drug plan coverage} & & & & \\
None & 1.55 & 1.00 (ref) & 2.20 & 1.00 (ref) \\
Partial & 1.02 & 0.71 (0.67–0.75) & 0.92 & 0.57 (0.55–0.59) \\
Full & 0.48 & 0.48 (0.44–0.52) & 0.39 & 0.35 (0.34–0.37) \\
\textbf{Physician characteristics} & & & & \\
Specialist & 0.66 & 0.43 (0.40–0.46) & 0.92 & 0.56 (0.54–0.59) \\
Last statin prescription involved tablet splitting & 3.64 & 4.24 (4.01–4.49) & 2.77 & 3.21 (3.13–3.29) \\
\textbf{Statin dispensed} & & & & \\
Atorvastatin & 0.95 & 1.00 (ref) & 1.77 & 1.00 (ref) \\
Rosuvastatin & 3.25 & 1.22 (1.15–1.30) & 2.54 & 1.16 (1.10–1.22) \\
Lovastatin & 1.61 & 2.18 (1.93–2.47) & 1.01 & 1.17 (1.09–1.26) \\
Simvastatin & 0.61 & 0.37 (0.34–0.39) & 0.54 & 0.37 (0.35–0.39) \\
Pravastatin & 0.36 & 0.23 (0.20–0.26) & 0.28 & 0.20 (0.18–0.22) \\
Fluvastatin & 0.11 & 0.05 (0.03–0.08) & 0.17 & 0.09 (0.08–0.12) \\
\textbf{Strength and supply} & & & & \\
Smallest strength of tablet dispensed & 0.46 & 0.30 (0.29–0.32) & 0.81 & 0.50 (0.48–0.52) \\
No. of weeks supply dispensed & 1.08 & 1.08 (1.08–1.09) & 1.07 & 1.08 (1.07–1.08) \\
\textbf{Pharmacy type used} & & & & \\
Independently owned (> 3 locations) & 1.19 & 1.00 (ref) & 1.02 & 1.00 (ref) \\
Chain (≥ 3 locations) & 0.96 & 0.95 (0.91–0.99) & 1.08 & 0.96 (0.93–0.99) \\
Other facility (e.g., physician’s office) & 0.45 & 0.55 (0.24–1.24) & 0.51 & 0.60 (0.35–1.01) \\
\hline
\end{tabular}
\caption{Factors associated with tablet splitting}
\end{table}
identified as split. If so interpreted, the percentage of statin prescriptions in which splitting occurred in 2006 may have been 4% instead of 4.5%.

We were unable to determine from the claims data whether any given instance of tablet splitting was initiated by the physician, the patient or the pharmacist. However, 3 results in our analysis suggest that physicians influenced decisions to split tablets. First, most of the prescriptions that involved splitting were prescribed by only 7.9% of routine statin prescribers. Second, the likelihood of tablet splitting was 4-fold higher if the physician’s last statin prescription involved tablet splitting. Third, tablet splitting was less likely to occur with statins prescribed by specialists than with those prescribed by general practitioners, perhaps because general practitioners knew more about their patients’ ability to pay for drugs. Our observation that tablet splitting did not occur in most physicians’ statin prescriptions but that it was a frequent practice in some physicians’ prescriptions suggests that educational initiatives could increase its frequency. Educational interventions could also be directed at pharmacists, since they too have the discretion to split tablets.

The generalizability of our results to other jurisdictions is unknown. Tablet splitting seems to be more common in at least some jurisdictions such as the Netherlands and Germany. The matter of generalizability is complicated by the fact that drug insurance plans and drug prices vary substantially around the world. Our analysis also lacked information on private insurance coverage, which likely led to an underestimation of the effect of public drug plan coverage on tablet splitting. Patients with private coverage would have less of an incentive to split tablets than patients with no coverage. Despite these limitations, the direction of our effect estimates for insurance coverage should still translate to patients in other jurisdictions who are subject to flat or substantially flat prices for statins (e.g., the price for one 40-mg tablet of atorvastatin is substantially less than the cost of two 20-mg tablets) and who pay a percentage of their prescription costs out of pocket.

The PharmaNet data we obtained for our study did not include data for prescriptions dispensed in acute care hospitals or prescriptions to federally insured patients (e.g., Status Indians, prisoners, Royal Canadian Mounted Police and Canadian Armed Forces), who comprised about 4% of the population. Since these patients were mostly younger and accounted for a small portion of the total population, we do not believe that excluding them substantially affected our results or conclusions. Misclassification in our study was likely very rare because the PharmaNet system performs data-quality checks when prescriptions are processed. The completeness and accuracy of the BC Ministry of Health databases are probably comparable to those of similar databases in other North American jurisdictions that have been evaluated for quality.

For drug insurance plans that include a patient cost-sharing component, savings from tablet splitting can benefit both the patients and the plan. In addition, drug

| Statin     | Total ingredient cost expenditure, $ | 4.5% of prescriptions† | 20% of prescriptions‡ | 100% of prescriptions§ | Dispensing fees in 2006, $ |
|------------|-------------------------------------|-------------------------|-----------------------|------------------------|--------------------------|
| Atorvastin | 83 499 620                          | 1 601 358               | 6 932 675             | 35 657 790             | 5 848 746                |
| Lovastatin | 2 595 963                           | 745                    | 21 978               | 121 441                | 241 325                  |
| Pravastatin| 5 253 757                           | 25 356                 | 270 199              | 1 324 925              | 555 662                  |
| Rosuvastin | 12 215 068                          | 458 421                | 1 276 057            | 4 798 244              | 1 125 060                |
| Simvastatin| 20 208 116                          | 258 915                | 1 944 698            | 9 513 963              | 2 195 822                |
| All        | 123 772 525                         | 2 344 795              | 10 445 607           | 51 416 363             | 9 966 615                |

* The estimated maximum savings on drug ingredient costs assuming no drug waste, no extra pharmacist remuneration and the same drug plan sharing component, savings from tablet splitting can benefit both the patients and the plan.
† The observed percentage of statin prescriptions in 2006 in which tablet splitting was presumed.
‡ An arbitrarily chosen percentage of prescriptions involving tablet splitting that might be expected from a voluntary tablet-splitting program including financial incentives from a drug plan.
§ Maximum potential cost savings assuming tablet splitting occurred in all eligible prescriptions. Prescriptions for fluvastatin (0.8% of statin prescriptions) and for statins already dispensed in the highest available strength (4.7% of prescriptions) were considered ineligible for splitting.
plans could influence tablet splitting by using financial incentives. Some plans have recognized this possibility and have adopted voluntary tablet-splitting programs. In the Veterans Affairs health care system in Palo Alto, California, statin drug costs were lowered by 39%, including the cost of tablet splitters, among patients volunteering for a tablet-splitting program. The savings were large even though Veterans Affairs purchased drugs below wholesale prices. In that program, pharmacists were not compensated for any additional time they spent splitting tablets and educating patients; however, additional pharmacist costs would easily have been covered by a portion of the savings. In British Columbia, our analysis showed that $145.3 million was spent on statins in 2006; $123.8 million of this amount was for prescriptions to patients who were not taking the highest-strength tablet or fluvastatin, and who were not receiving social income assistance or residing in a nursing home. Pharmacists charged $12.2 million in dispensing fees for those prescriptions. Even if dispensing fees were doubled for prescriptions that involved tablet splitting, the cost would be less than one-fifth the savings in ingredient costs. Rationally, most patients can split their own statin tablets. Other costs related to splitting, such as tablet splitters and ingredient waste, can also be expected to be minor compared with the savings on ingredient costs.

Although most statins are not scored, our experience with prescribing statins in split doses — by having patients take half a tablet at bedtime and the other half the following night — suggests that it is a simple and safe procedure for most patients, although some may not be good candidates because of frailty or cognitive impairment. Our analysis showed that tablet splitting is becoming more popular and that potential savings are enormous as more physicians, pharmacists and patients become aware of this simple cost-saving measure. Provincial and territorial governments seeking ways to lower costs in their drug plans could learn from innovative examples in other jurisdictions and implement programs designed to encourage tablet splitting.

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