Measurement of Adherence in Pharmacy Administrative Databases: A Proposal for Standard Definitions and Preferred Measures

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BACKGROUND: A variety of measures have been developed to calculate refill adherence from administrative data such as pharmacy claims databases. These measures have focused on improving the accuracy of adherence measures or clarifying the evaluation time frame. As a result, there are many measures used to assess adherence that may or may not be comparable or accurate.

OBJECTIVE: To compare available refill adherence measures.

METHODS: A systematic literature review was conducted to identify current or recently used measures of calculating adherence from administrative data. A MEDLINE search (January 1990–March 2006) was undertaken using the search terms adherence or compliance in the title combined with administrative, pharmacy, or records in any field, including subheadings medical, nursing, and hospital records. Non-English articles were excluded. Seven hundred fifteen articles were available for review. Review articles and letters were excluded from measure selection, but were included in the search terms and used to identify additional research articles. Adherence measures were excluded if they were incompletely described, produced non-numeric values, or were duplicates. Eleven refill adherence measures were identified and compared using data from the LOSE Weight (Long-term Outcomes of Sibutramine Effectiveness on Weight) study. Measures compared include Continuous Measure of Medication Acquisition (CMA); Continuous Multiple Interval Measure of Oversupply (CMOS); Medication Possession Ratio (MPR); Medication Refill Adherence (MRA); Continuous Measure of Medication Gaps (CMG); Continuous, Single Interval Measure of Medication Aquisition (CSA); Proportion of Days Covered (PDC); Refill Compliance Rate (RCR); Medication Possession Ratio, modified (MPRm); Dates Between Fills Adherence Rate (DBR); and Compliance Rate (CR).

RESULTS: The results suggest that the CMA, CMOS, MPR, and MRA are identical in terms of measuring adherence to prescription refills throughout the study period, each with a value of 63.5%; CMG and PDC are slightly lower (63.0%) and are equivalent to MRA when oversupply is truncated. CR, MPRm, RCR, and CSA result in higher adherence values of 84.4%, 86.6%, 104.8%, and 109.7%, respectively.

CONCLUSIONS: Five measures produce equivalent results for measuring prescription refill adherence over the evaluation period. Of these, MRA has the fewest calculations, is easily truncated if one desires to exclude surplus medication issues, and requires the least amount of data. MRA is therefore recommended as the preferred measure of adherence using administrative data.

KEY WORDS: adherence, administrative data, compliance, measurement.

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Adherence is defined as "the extent to which a person's behavior coincides with medical or health advice."[1] Assessing patient medication adherence is important for both research and practice. In clinical research, poor adherence can reduce the statistical power to detect a difference between treatments and can affect study validity by increasing the risk of false negative results.[2,3] In clinical practice, poor adherence leads to suboptimal treatment of medical conditions and may lead to adverse health outcomes.[4-6]

Both direct and indirect measures can be used to assess patient medication adherence. Examples include drug assays or markers, self-report, pill counts, electronic monitoring systems, and review of pharmacy records or administrative data. Although comparisons have been made among methods of collecting data to assess adherence,[7-11] no gold standard measure has been applied.[10,12-17] Therefore, when presenting or interpreting adherence data, one should specify the measure used, with particular attention to the time frame evaluated and the medications included. The choice of adherence assessment measure also depends

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on data availability and cost. These factors additionally contribute to the accuracy of the final value.

Administrative data sets, "data files generally compiled in billing for healthcare services,"[18] are often assessed in pharmacoeconomic and pharmacoepidemiologic research. The adherence value obtained from administrative data does not provide medication consumption information, but rather provides assessment of possession. Medication intake calculations usually assume that patients consume the drug starting the day of dispensing, use the drug as prescribed, and consume all medications obtained. Administrative data can, therefore, provide the investigator only an estimate of the highest possible level of medication consumption. As described by Christensen et al.,[19] in cases in which the dosage prescribed (eg, determining days' supply of medication obtained) is unavailable or unable to be determined, it is difficult to assess adherence using administrative data. The length of the assessment period may be problematic in the evaluation of adherence using administrative data, as both shorter (eg, <60 days) and longer (eg, >90 days) time periods introduce potential bias when estimating medication adherence.[19] Adherence measures based on administrative data have not correlated with patient reported adherence.[11,20]

Despite these limitations, administrative data are convenient, noninvasive, objective, and inexpensive to obtain. In addition, adherence estimates based on administrative data appear to be associated with clinical outcomes.[11,21] Therefore, administrative data are frequently used to obtain medication adherence information. Ideally, an adherence assessment from administrative data should provide an accurate reflection of the number of days the patient had the correct dose of a drug available compared with the number of days the treatment was prescribed. To our knowledge, no study has compared measures of assessing adherence with administrative data using actual patient records.

The purpose of this study was to compare measures used to assess medication adherence from administrative pharmacy data. This comparison assists in identifying a preferred measure and in moving toward standardized terminology when reporting adherence.

Methods

A systematic literature review was conducted to identify current or recently used measures of calculating adherence from administrative data. A MEDLINE search (January 1990–March 2006) was undertaken using the search terms adherence or compliance in the title combined with administrative, pharmacy, or records in any field, including subheadings medical, nursing, and hospital records. Non-English articles were excluded. Seven hundred fifteen articles were available for review. Review articles and letters were excluded from measure selection, but were included in the search terms and used to identify additional research articles. Adherence measures were excluded if they were incompletely described, produced non-numeric values, or were duplicates. Eleven evaluable measures were identified.[13,16,17,22-27] These measures were then evaluated using existing data.

Refill data collected as part of a prospective, randomized study designed to assess the impact of sibutramine in combination with a weight management program—the LOSE Weight (Long-term Outcomes of Sibutramine Effectiveness on Weight) study—were used to test measures of adherence.[15] The LOSE Weight study and the current study were both approved by the Kaiser Foundation Institutional Review Board. In the LOSE Weight study, patients were randomized to a weight management program plus sibutramine (n = 296), or to the weight management program alone (n = 292). Mean weight loss at 6 months was 6.8 kg in the sibutramine group compared with 3.1 kg in the weight management alone group ($p < 0.001$). Weight loss was maintained at 12 months.

LOSE Weight study patients receiving sibutramine were given prescriptions for sibutramine during study visits. Patients presented these prescriptions to Kaiser Permanente Colorado pharmacies where the prescriptions were dispensed and sold using standard pharmacy procedures. Study patients paid retail price for sibutramine and were reimbursed for 75% of the price paid.[15]

Refill data were available from administrative pharmacy records for 283 study participants (96%) randomized to sibutramine. Refill data included participant identification number and date, quantity dispensed, and days' supply dispensed. Each record represented one sibutramine dispensation. Dates of study enrollment and study end were determined from the study database. The time frame evaluated was from the date the participant first obtained sibutramine through the one year anniversary date of study enrollment. The end date was selected based on the intent-to-treat design of the LOSE Weight study.[15]

SPSS Version 12.0.1 was used to calculate means and standard deviations (described below) for the adherence measures assessed. In addition to analyses of cumulative data, individual study participant data were sampled to compare each measure in 6 scenarios: (1) excessive medication, (2) insufficient medication, (3) adequate medication, (4) same-day refill, (5) refill on study completion date, and (6) single fill.[15]

CONTINUOUS, SINGLE-INTERVAL MEASURE OF MEDICATION AVAILABILITY

Single-interval medication availability was calculated by obtaining an adherence value for each sibutramine dispensation with use of Continuous, Single-Interval Measure of Medication Availability (CSA).[17] The days' supply of a drug was divided by the number of days in the interval from the dispensation date up to, but not including, the next dispensation date (or through study completion date). This provides an adherence value for each participant between dispensations—not for the overall study evaluation period. The mean of all dispensation adherence values provides an overall study adherence value.

CONTINUOUS MEASURE OF MEDICATION ACQUISITION

Continuous Measure of Medication Acquisition (CMA)[17] was calculated for each participant. The days' supply of medication obtained throughout the study period was divided by the number of days from the first dispensation until the participant's study completion date (number of days of study participation). The mean of each participant's CMA value provides an overall study adherence value.

COMPLIANCE RATE

Compliance rate (CR)[24] was computed by taking the sum of the days' supplies for each participant, minus the days' supply obtained at the last dispensation and dividing this by the number of days from first up to, but not including, the last dispensation. This provides an overall adherence rate based on day of last refill and does not require study completion date.

DAYS BETWEEN FILLS ADHERENCE RATE

The total days' supply was subtracted from the number of days between dispensations using the Days Between Fills Adherence Rate (DBR)[22]; this difference was divided by the number of days between dispensations. Since this value is a nonadherence value, the dividend was subtracted from 1 to obtain an adherence value. The result was multiplied by 100 to provide an adherence percentage for each participant for the overall study period.

CONTINUOUS MEASURE OF MEDICATION GAPS

The Continuous Measure of Medication Gaps (CMG),[17] which is used to determine the total days of treatment gaps (days for which a drug was unavailable), was calculated for each participant by subtracting the total days' supply obtained throughout the study period from total number of days of study participation. Negative values were set to zero. The total days of treatment gaps was then divided by number of days of study participation. The mean of each participant's CMG value provides an overall study nonadherence value based on lack of available medication, with 0.0 reflecting complete adherence, and 1.0 reflecting complete nonadherence.

CONTINUOUS MULTIPLE INTERVAL MEASURE OF OVERSUPPLY

The total days of treatment gaps was calculated using Continuous Multiple Interval Measure of Oversupply (CMOS).[13] Negative values were included to represent cases in which the participant obtained days' supply of medication exceeding days of study participation. The total number of days' supply or surplus was divided by days of study participation for each participant. The mean of each participant's CMOS value provides an overall study nonadherence value.

MEDICATION POSSESSION RATIO

The Medication Possession Ratio (MPR)[16] is a ratio of total days' supply to number of days of study participation per participant. The ratios alone could not be combined across participants due to different denominators; therefore, the ratios were divided and averaged to provide an overall study adherence value.

REFILL COMPLIANCE RATE

The total days' supply was multiplied by 100 and divided by the number of days from first to last medication dispensation with use of the Refill Compliance Rate (RCR).[25] Cases with only one dispensation of a drug were excluded from this calculation because of the invalid denominator. The mean of each participant's RCR provides an overall study adherence value.

MEDICATION POSSESSION RATIO, MODIFIED

Using the Medication Possession Ratio, modified (MPRm),[26] the total days' supply of a drug was divided by the sum of the number of days from first dispensation up to, but not including, the date of last dispensation and the number of days' supply obtained at the last dispensation. This value was multiplied by 100 to provide an adherence percent value that can be averaged to find an overall study adherence value.

MEDICATION REFILL ADHERENCE

The total days' supply was divided by number of days of study participation and multiplied by 100 to provide a percent adherence value. The mean of each participant's Medication Refill Adherence (MRA)[23] value provides an overall study adherence value.

PROPORTION OF DAYS COVERED

The total days' supply was divided by number of days of study participation using the Proportion of Days Covered (PDC).[27] This value was capped at 1.0 and multiplied by 100 to obtain a percent adherence value. The mean of each participant's PDC value provides an overall study adherence value. This measure is the same as MRA, but adherence was capped at 100%.

Results

The 283 patients involved in the study had 2057 sibutramine dispensations (7.3 ± 3.4; mean ± SD). The mean number of days' supply was 222.9 ± 103.6, and the mean number of days of study participation was 349.9 ± 16.1. Adherence values for each measure are presented in Table 1. Adherence was 63.5% using 4 measures: CMA, CMOS, MPR, and MRA. CMG and PDC were slightly lower (63.0%), because they do not include excess medication in the calculation. CR, MPRm, RCR, and CSA resulted in higher adherence values of 84.4%, 86.6%, 104.8%, and 109.7%, respectively.

Scenarios of excessive (eg, drug stockpiling),[17,28] insufficient, and adequate days' supply (obtaining medication as directed) and a variety of other refill scenarios that occurred in the LOSE Weight study are presented in Tables 2–4. Exceptions to expected refill patterns occurred in approximately 10% of study participants (eg, refills the day of study completion, filling study drug only once, same-day refills).

Discussion

Six medication adherence measures—CMA, CMOS, MPR, MRA, CMG, and PDC—provided essentially the same adherence values for participants in the LOSE Weight study (Table 2). Results for CMG and PDC were slightly lower because excess medication on hand is not included in that calculation. All 8 values were equal when excess medication beyond the assessment period was not included.

When participant attrition is an issue (Table 2) and in cases of single refills (Table 4), problems are encountered when using the MPRm, RCR, CR, and DBR adherence measures. These 4 measures evaluate the time period between dispensations and either cannot assess or overestimate adherence because of the smaller denominator (between fills instead of study evaluation period).

The denominator time period can contribute to overestimates of adherence. The measures with consistent results all use the total study evaluation period in the denominator. Regardless of how medication use is calculated by these measures, the final result is the same, suggesting that the choice among these 6 measures can be based on prefer-

ence or data availability. Measures that require multiple analytic steps and additional data fields (eg, gap days) may result in unnecessary work.

CSA can be biased if participants obtain more than one refill per day (Table 3) and if refills occur close to the study completion date (Table 4). Use of CSA can be beneficial, however, for studies with high participant attrition. With CSA, each refill episode is calculated independently; participants who fill only one prescription do not have the same weight in a cumulative analysis as participants who have multiple refills. Although CSA takes each interval into account, the measure truncates the assessment period and does not permit carryover of medication from one refill interval to another, a practice likely to occur in most settings.

CR calculates adherence between dispensations and disregards the assessment period from last dispensation until study completion. This simplifies calculations but assumes adherence is consistent through study completion, and does not consider participants who discontinue medication prior to study completion. It assumes that the last fill is timely for all participants, which is not the case, as we see when applied to these study participant data.

The MPRm attempted to overcome the limitation of the RCR denominator (number of days in interval between first and last dispensation) by adding a number of days to the evaluation period equal to the days' supply obtained at the last dispensation. This reduced the amount of overestimation, but due to assumption of each participant being 100% adherent during the last dispensation period, consistently produced an adherence value higher than that achieved with other measures.

The gap measures (CMG and CMOS) produce similar adherence values; however, because more calculations and data fields are required, they are less attractive. To avoid misinterpretation, the gap and ratio values must be further converted to an adherence percentage.[5]

The greatest disadvantage with calculating an MPR is that there are at least 4 different published measures that have been termed "MPR."[14,16,26,29-31] The use of different measures that carry the same terminology leads to confusion in comparing adherence across studies. When evaluating or comparing what is described as MPR, one should be clear as to what the value represents.

PDC truncates total supply to not exceed the study evaluation period (eg, overall adherence is capped at 100% by subtracting surplus medication from the total days' supply available). When PDC is used or when adherence above 100% is not permitted for MRA, CMA, CMOS, or MPR, these measures, as well as CMG, are all equivalent. PDC is also occasionally calculated for smaller intervals within the

Table 1. Results of Measures Used to Calculate Adherence

Measure	Formula	Value	Result (Standard Deviation)
CMA[17]	cumulative days' supply of medication obtained/total days to next fill or to end of observation period	adherence value for cumulative time period	0.635 (0.29)
CMG[17]	total days of treatment gaps/total days to next fill or end of observation period	nonadherence value for cumulative period, winsorized at zero	0.370 (0.28)
CMOS[13]	total days of treatment gaps (+) or surplus[a] (–)/total days in observation period	nonadherence value for cumulative period, allowing for surplus	0.365 (0.29)
CR[24]	(total days supplied – last days' supply)/(last claim date – first claim date) × 100	adherence value for period between fills	84.4% (0.22)[b]
CSA[17]	days' supply obtained at beginning of interval/days in interval	adherence value for interval of study participation	1.097 (1.73)
DBR[22]	1 – {[(last claim date – first claim date) – total days' supply]/(last claim date – first claim date)} × 100	overall adherence percentage	104.8% (38.6)
MPR[16]	days' supply: days in period	ratio of medication available	0.635:1 (0.29)
MPRm[26]	[total days supplied/(last claim date – first claim date + last days' supply)] × 100	adherence percentage, adjusted to include final refill period	86.6% (16.6)
MRA[23]	(total days' supply/total number of days evaluated) × 100	overall adherence percentage	63.5% (29.1)
PDC[27]	(total days supply/total number of days evaluated) × 100%, capped at 1.0[a]	percentage of days with medication available	63.0% (28.3)
RCR[25]	[(sum of quantity dispensed over interval/quantity to be taken per day) × 100]/number of days in interval between first and last refill	overall adherence percentage	104.8% (38.6)

CMA = Continuous Measure of Medication Acquisition; CMG = Continuous Measure of Medication Gaps; CMOS = Continuous Multiple Interval Measure of Oversupply; CR = Compliance Ratio; CSA = Continuous, Single Interval Measure of Medication Acquisition; DBR = Days Between Fills Adherence Rate; MPR = Medication Possession Ratio; MPRm = Medication Possession Ratio, modified; MRA = Medication Refill Adherence; PDC = Proportion of Days Covered; RCR = Refill Compliance Rate.
[a]Surplus due to early refill or overfill, resulting in excess medication for the time period evaluated.
[b]Single refills accounted for 12 records that were not included in this analysis.

study period and averaged similar to CSA.[27,32] This may underestimate adherence, as capping adherence at each refill interval does not permit carryover of excess medication from one interval to another.

Accurate calculation of the number of evaluation days is important. One should not select a measure that mandates an end date; the end date should be based on the study design and nature of data collection. In the LOSE Weight study, each participant had specified enrollment and end dates. When using claims databases in which patient-specific end dates are not available, a time frame should be established a priori so that values can be calculated consistently per the study design. One should be cautious in comparing adherence values between studies without a clear understanding of how adherence was calculated, the time frame considered, and how missing values and/or time periods were managed.

The days' supply must be carefully determined in any adherence assessment. When available, it can be calculated by dividing the prescribed dose by the number of pills obtained (eg, 30 tablets twice per day dosage equals 15 days' supply). If the prescribed dosage changes during the study, this must be noted and calculated accordingly. Alternative measures to estimate days' supply are available, such as using standard practice estimates for prescribed dosage assumptions, but these methods are less reliable than using information contained within the administrative data set.

Important features when assessing the usefulness of adherence measures go beyond those associated with the numerator or denominator to include the presentation of the final value, the complexity of the calculations, variables required to perform the calculations, and terminology used when publishing results. The footnotes in Tables 2–4 indi-

Table 2. Example Excessive and Insufficient Supply Refill Data Comparison of Medication Adherence Measures

Excessive Days' Supply for Period Evaluated					Insufficient Days' Supply for Period Evaluated				
Day Dispensed	Days' Supply Dispensed (A)	Days in Interval (B)[a]	CSA[b]	Results	Day Dispensed	Days' Supply Dispensed (A)	Days in Interval (B)[a]	CSA[b]	Results
Jun 19	35	21	1.67	mean CSA[b] 3.68	Apr 27	35	26	1.35	mean CSA[b] 0.97
Jul 10	35	35	1.00	CMA[d] 1.10	May 23	35	48	0.73	CMA[d] 0.33
Aug 14	30	30	1.00	CMG[e] 0.00	Jul 10	8	4	2.00	CMG[e] 0.67
Sept 13	30	30	1.00	CMOS[f] –0.10	Jul 14	30	42	0.71	CMOS[f] 0.67
Oct 13	30	31	0.97	MPR[g] 1.10:1	Aug 25	10[c]	237	0.04	MPR[g] 0.33:1
Nov 13	30	35	0.86	MPRm[h] 102.6%				0.67	MPRm[h] 90.8%
Dec 18	30	15	2.00	RCR[i] 111.1%					RCR[i] 98.3%
Jan 2	30	38	0.79	MRA[j] 110.5%					MRA[j] 33.1%
Feb 9	30	26	1.15	CR[k] 102.7%					CR[k] 90.0%
Mar 7	30	5	6.00	DBR[l] 111.1%					DBR[l] 98.3%
Mar 12	30	58	0.52	PDC[j] 100.0%					PDC[j] 33.1%
May 9	30	36	0.83						
Jun 14	30[c]	1	30.00						
completion date: Jun 15					completion date: Apr 18 (of following year)				
total days' supply available (C): 400					total days' supply available (C): 118				
total days evaluated (D): 362					total days evaluated (D): 357				
total gap days (F): 0					total gap days (F): 239				
days first – last fill (G): 360					days first – last fill (G): 120				
+gap days/–surplus days (H): –38					+gap days/–surplus days (H): 239				

CMA = Continuous Measure of Medication Acquisition; CMG = Continuous Measure of Medication Gaps; CMOS = Continuous Multiple Interval Measure of Oversupply; CR = Compliance Ratio; CSA = Continuous, Single Interval Measure of Medication Acquisition; DBR = Days Between Fills Adherence Rate; MPR = Medication Possession Ratio; MPRm = Medication Possession Ratio, modified; MRA = Medication Refill Adherence; PDC = Proportion of Days Covered; RCR = Refill Compliance Rate.

[a]B = time from dispensation to next dispensation or through study end date.

[b]A/B.

[c]E = last amount dispensed.

[d]C/D.

[e]F/D.

[f]H/D.

[g]C:D.

[h]$C/(G + E) \times 100$.

[i]$(C/G) \times 100$.

[j]$(C/D) \times 100$ (capped at 100% for PDC).

[k]$[(C – E)/G] \times 100$.

[l]$\{1 – [(G – C)/G]\} \times 100$.

cate the variables required to calculate each adherence measure. It is important to understand data available to researcher when selecting the appropriate adherence measure to assess adherence using administrative data sets.

Limitations

Days' supply can be problematic, particularly in a nonexperimental setting, with administrative data sets that do not track the dosage for individual prescriptions. Fortunately, in the LOSE Weight study, individual dosage prescribed was maintained in the study records. A limitation of this study—and of all adherence calculations of administrative data—is the inability to determine whether the medication was ingested by the patient. In obtaining adherence values, administrative data analyses all assume that all medication obtained is taken by the patient. The result is an overestimation of actual adherence and only provides a value of the medication obtained by the participant. Therefore, reliance on administrative data may not enable the investigator to determine periods of under- or overuse of drug between refill episodes.[33] This study required a one year medication intervention, a time period that may "smooth out" shorter periods of over- or underadherence. Administrative data have limitations in cases in which patients obtain refills from a variety of pharmacies, and they are not submitted as insurance claims or when patients pay out-of-pocket and no insurance claim is entered. In the LOSE Weight study, study medication could be obtained only at Kaiser Permanente pharmacies, reducing the risk of refill underestimation.

Conclusions

Calculation of refill adherence from administrative data can be useful to assist in evaluating patient medication adherence, provided that the context and limitations of the measure and source data are recognized. Further, the work

Table 3. Example Adequate Supply and Same-Day Refill Data Comparison of Medication Adherence Measures

Adequate Days' Supply for Period Evaluated

Day Dispensed	Days' Supply Dispensed (A)	Days in Interval (B)[a]	CSA[b]	Results
Mar 13	35	22	1.59	mean CSA[b] 1.16
Apr 4	30	36	0.83	CMA[d] 1.01
May 10	30	49	0.61	CMG[e] 0.00
Jun 28	30	30	1.00	CMOS[f] –0.01
Jul 28	30	24	1.25	MPR[g] 1.01:1
Aug 21	30	30	1.00	MPRm[h] 101.7%
Sept 20	30	7	4.29	RCR[i] 110.9%
Sept 27	30	36	0.83	MRA[j] 100.8%
Nov 2	30	27	1.11	CR[k] 101.8%
Nov 29	30	35	0.86	DBR[l] 110.9%
Jan 3	30	33	0.91	PDC[j] 100.0%
Feb 5	30[c]	33	0.91	

completion date: Mar 9
total days' supply available (C): 365
total days evaluated (D): 362
total gap days (F): 0
days first – last fill (G): 329
+gap days/–surplus days (H): –3

Same Day Fill for Period Evaluated

Day Dispensed	Days' Supply Dispensed (A)	Days in Interval (B)[a]	CSA[b]	Results
Jan 28	35	32	1.09	mean CSA[b] 0.84
Feb 29	30	27	1.11	CMA[d] 0.79
Mar 27	35	37	0.95	CMG[e] 0.21
May 3	8	8	1.00	CMOS[f] 0.21
May 11	30	33	0.91	MPR[g] 0.79:1
Jun 13	30	51	0.59	MPRm[h] 78.9%
Aug 3	30	55	0.55	RCR[i] 86.0%
Sept 27	30	92	0.33	MRA[j] 79.3%
Dec 28	30	0		CR[k] 77.0%
Dec 28	30[c]	28	1.07	DBR[l] 86.0%
				PDC[j] 79.3%

completion date: Jan 24 (of following year)
total days' supply available (C): 288
total days evaluated (D): 363
total gap days (F): 75
days first – last fill (G): 335
+gap days/–surplus days (H): 75

CMA = Continuous Measure of Medication Acquisition; CMG = Continuous Measure of Medication Gaps; CMOS = Continuous Multiple Interval Measure of Oversupply; CR = Compliance Ratio; CSA = Continuous, Single Interval Measure of Medication Acquisition; DBR = Days Between Fills Adherence Rate; MPR = Medication Possession Ratio; MPRm = Medication Possession Ratio, modified; MRA = Medication Refill Adherence; PDC = Proportion of Days Covered; RCR = Refill Compliance Rate.

[a] B = time from dispensation to next dispensation or through study end date.
[b] A/B.
[c] E = last amount dispensed.
[d] C/D.
[e] F/D.
[f] H/D.
[g] C:D.
[h] $C/(G + E) \times 100$.
[i] $(C/G) \times 100$.
[j] $(C/D) \times 100$ (capped at 100% for PDC).
[k] $[(C – E)/G] \times 100$.
[l] $\{1 – [(G – C)/G]\} \times 100$.

presented here suggests that, because of the comparability of measures, there is no need for the variety of measures and strategies currently used to assess adherence with administrative data. In cases where the days' supply and time period assessed are available, we recommend the MRA technique because of its simplicity, the few data required to obtain the value, and the fact that it provides results identical to those achieved with other refill adherence measures.

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Table 4. Example Fill on Study Completion Date and Single Fill of Medication Comparison of Adherence Measures

Refill on Study Completion Date					Single Fill of Medication During Period Evaluated				
Day Dispensed	Days' Supply Dispensed (A)	Days in Interval (B)[a]	CSA[b]	Results	Day Dispensed	Days' Supply Dispensed (A)	Days in Interval (B)[a]	CSA[b]	Results
Jun 30	35	38	0.92	mean CSA[b] 4.32	Mar 27	35[c]	359	0.10	mean CSA[b] 0.10
Aug 7	30	41	0.73	CMA[d] 0.87					CMA[d] 0.10
Sept 17	30	19	1.58	CMG[e] 0.13					CMG[e] 0.90
Oct 6	30	32	0.94	CMOS[f] 0.13					CMOS[f] 0.90
Nov 7	30	41	0.73	MPR[g] 0.87:1					MPR[g] 0.10:1
Dec 18	35	17	2.06	MPRm[h] 80.6%					MPRm[h] 100%
Jan 4	35	65	0.54	RCR[i] 87.3%					RCR[i] n/a
Mar 10	30	30	1.00	MRA[j] 87.3%					MRA[j] 9.7%
Apr 9	30	78	0.38	CR[k] 78.9%					CR[k] n/a
Jun 26	30[c]	1	30.0	DBR[l] 87.3%					DBR[l] n/a
				PDC[j] 87.3%					PDC[j] 9.7%
completion date: jun 26					completion date: mar 21 (of following year)				
total days' supply available (C): 315					total days' supply available (C): 35				
total days evaluated (D): 361					total days evaluated (D): 360				
total gap days (F): 47					total gap days (F): 325				
days first–last fill (G): 361					days first–last fill (G): 0				
+gap days/–surplus days (H): 47					+gap days/–surplus days (H): 325				

CMA = Continuous Measure of Medication Acquisition; CMG = Continuous Measure of Medication Gaps; CMOS = Continuous Multiple Interval Measure of Oversupply; CR = Compliance Ratio; CSA = Continuous, Single Interval Measure of Medication Acquisition; DBR = Days Between Fills Adherence Rate; MPR = Medication Possession Ratio; MPRm = Medication Possession Ratio, modified; MRA = Medication Refill Adherence; PDC = Proportion of Days Covered; RCR = Refill Compliance Rate.

[a] B = time from dispensation to next dispensation or through study end date.
[b] A/B.
[c] E = last amount dispensed.
[d] C/D.
[e] F/D.
[f] H/D.
[g] C:D.
[h] C/(G + E) x 100.
[i] (C/G) × 100.
[j] (C/D) × 100 (capped at 100% for PDC).
[k] [(C – E)/G] × 100.
[l] {1 – [(G – C)/G]} × 100.

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EXTRACTO

INTRODUCCIÓN: Se han desarrollado varios métodos de medida para calcular la adherencia a los tratamientos prescritos partir de datos administrativos como las bases de datos de recetas dispensadas en las farmacias. Estos métodos de medición se han centrado en mejorar la precisión de las medidas de la adherencia o en clarificar la evaluación de la secuencia temporal. En consecuencia, hay muchos métodos de medición de la adherencia que pueden o no ser comparables o precisos.

OBJETIVO: Comparar los métodos de medida de la adherencia a los tratamientos prescritos disponibles.

MÉTODOS: Se realizo una revisión sistemática para identificar métodos actuales o recientemente utilizados para calcular la adherencia a partir de datos administrativos. Se hizo una búsqueda en MEDLINE (enero 1990–marzo 2006) utilizando los términos adherence o compliance en el título combinados con administrative, pharmacy, or records en cualquier campo, incluyendo los subheadings medical, nursing, and hospital records. Se excluyeron los artículos no publicados en inglés. Se localizaron setecientos quince artículos disponibles para su revisión. Se excluyeron los artículos de revisión y la cartas a la hora de seleccionar los métodos de medida, pero se incluyeron en los términos de busqueda y se utilizaron para localizar articulos de investigación adicionales. Se excluyeron los métodos de medida de la adherencia cuya descripción era incompleta, producían variables no numéricas o estaban duplicados. Se identificaron y compararon 11 métodos de medición de la adherencia utilizando datos del Estudio Resultados a largo plazo de la Efectividad de Sibutramina en el peso (LOSE Weight). Los métodos comparados fueron: Medida Continua de la Adquisición de Medicación (CMA); Medida Continua de los intervalos múltiples de Sobreabastecimiento de Medicación (CMOS); Ratio de Posesión de Medicación (MPR); Adherencia a la Reposición de Medicación (MRA); Medida Continua de los Intervalos de Medicación (CMG); Medida Continua del Intervalo Único de Adquisición de Medicación (CSA); Tasa de Cumplimiento con la Reposición de Medicación (RCR); Ratio de Posesión de Medicación, modificado (MPRm), Tasa de Adherencia a las Fechas de Reposición de Medicación (DBR) y Tasa de Cumplimiento (CR).

RESULTADOS: Los resultados sugieren que la CMA, CMOS, MPR, and MRA fueron métodos idénticos de medir la adherencia a los tratamientos prescritos a lo largo del período de estudio, cada uno con un valor del 63.5%; CMG y PDC obtienen valores algo más bajos (63.0%) y son equivalentes al MRA cuando se trunca el sobreabastecimiento de medicación. CR, MPRm, RCR, y CSA obtienen mayores valores para la adherencia: 84.4%, 86.6%, 104.8%, y 109.7%, respectivamente.

CONCLUSIONES: Cinco métodos de medida produjeron resultados equivalentes en la medición de la adherencia a los tratamientos prescritos a lo largo del período de evaluación. De ellos, MRA es el que menos cálculos precisa, es fácil de truncar si se desea excluir los casos de sobreabastecimiento, y requiere el menos volumen de datos. MRA es por tanto el método recomendado para medir la adherencia a partir de datos administrativos.

Juan del Arco

RÉSUMÉ

OBJECTIF: Comparer les différentes échelles d'adhérence lors du renouvellement d'une ordonnance.

MÉTHODES: Une revue systématique de la littérature a été effectuée afin d'identifier les échelles utilisées pour mesurer l'adhérence dans les banques de données. Une recherche MEDLINE de janvier 1990 à mars 2006 a été effectuée en utilisant les mots clés adhérence, observance

dans le titre associé avec les termes suivants -administration, pharmacie ou dossiers en incluant les sous titres médical, dossiers hospitaliers, soins infirmiers. Seuls les articles rédigés en anglais ont été retenus et 715 articles disponibles pour évaluation. Les articles de revues et les lettres à l'éditeur ont été exclus pour évaluation mais ont été utilisés pour tenter d'identifier des articles de recherche. Les mesures d'adhérence ont été exclues si elles étaient décrites de façon incomplète ou s'il ne s'agissait pas de la version originale. Onze échelles d'adhérence lors du renouvellement d'une ordonnance ont été identifiées et comparées en utilisant les données de l'étude d'efficacité à long terme de la sibutramine. (étude LOSE). Les échelles étaient les suivantes: Continuous Measure of Medication Acquisition (CMA); Continuous Multiple Interval Measure of Oversupply (CMOS); Medication Possession Ratio (MPR); Medication Refill Adherence (MRA); Continuous Measure of Medication Gaps (CMG); Continuous, Single Interval Measure of Medication Aquisition (CSA); Refill Compliance Rate (RCR); Medication Possession Ratio, modified (MPRm), Dates Between Fills Adherence Rate (DBR) and Compliance Rate (CR).

RÉSULTATS: Les résultats suggèrent que les échelles CMA, CMOS, MPR, et MRA étaient identiques lors du renouvellement d'une ordonnance durant la période de l'étude, avec une valeur de 63.5%; les échelles CMG et PDC ont obtenu une valeur de 63.0% et étaient équivalentes à l'échelle de MRA lorsque le surplus était tronqué. Par contre, les échelles CR, MPRm, RCR, et CSA ont obtenu des résultats plus élevées soit 84.4%, 86.6%, 104.8%,et 109.7%, respectivement.

CONCLUSIONS: Cinq échelles ont démontré des résultats semblables afin de mesurer l'adhérence lors du renouvellement d'une ordonnance durant la période de l'étude. L'échelle de MRA était plus facile à utiliser au niveau de calculs, était plus facilement tronquée si on voulait exclure les données quant au surplus de médicaments et demandait moins de données à analyser. Les auteurs recommandent donc l'échelle de MRA pour évaluer l'adhésion au traitement lors du renouvellement d'une ordonnance.

Louise Mallet