NATIONAL QUALITY FORUM—Evidence (subcriterion 1a)

Measure Number: NQF 2988
Measure Title: *Medication Reconciliation for Patients Receiving Care at Dialysis Facilities.*
IF the measure is a component in a composite performance measure, provide the title of the Composite Measure here: Not applicable.
Date of Submission: 5/10/2016

Instructions

- *For composite performance measures:*
  - *A separate evidence form is required for each component measure unless several components were studied together.*
  - *If a component measure is submitted as an individual performance measure, attach the evidence form to the individual measure submission.*
- Respond to all questions as instructed with answers immediately following the question. All information needed to demonstrate meeting the evidence subcriterion (1a) must be in this form. An appendix of *supplemental* materials may be submitted, but there is no guarantee it will be reviewed.
- If you are unable to check a box, please highlight or shade the box for your response.
- Maximum of 10 pages (*incudes questions/instructions*; minimum font size 11 pt; do not change margins). ***Contact NQF staff if more pages are needed.***
- Contact NQF staff regarding questions. Check for resources at Submitting Standards webpage.

Note: The information provided in this form is intended to aid the Steering Committee and other stakeholders in understanding to what degree the evidence for this measure meets NQF's evaluation criteria.

1a. Evidence to Support the Measure Focus

The measure focus is evidence-based, demonstrated as follows:

- Health outcome: [3] a rationale supports the relationship of the health outcome to processes or structures of care. Applies to patient-reported outcomes (PRO), including health-related quality of life/functional status, symptom/symptom burden, experience with care, health-related behavior.
- Intermediate clinical outcome: a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [4] that the measured intermediate clinical outcome leads to a desired health outcome.
- Process: [5] a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [4] that the measured process leads to a desired health outcome.
- Structure: a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence [4] that the measured structure leads to a desired health outcome.
- Efficiency: [6] evidence not required for the resource use component.

Notes

3. Generally, rare event outcomes do not provide adequate information for improvement or discrimination; however, serious reportable events that are compared to zero are appropriate outcomes for public reporting and quality improvement.
4. The preferred systems for grading the evidence are the U.S. Preventive Services Task Force (USPSTF) grading definitions and methods, or Grading of Recommendations, Assessment, Development and Evaluation (GRADE) guidelines.
5. Clinical care processes typically include multiple steps: assess → identify problem/potential problem → choose/plan intervention (with patient input) → provide intervention → evaluate impact on health status. If the measure focus is one step in such a multistep process, the step with the strongest evidence for the link to the desired outcome should be selected as the focus of measurement. Note: A measure focused only on collecting PROM data is not a PRO-PM.
6. Measures of efficiency combine the concepts of resource use and quality (see NQF's Measurement Framework: Evaluating Efficiency Across Episodes of Care; AQA Principles of Efficiency Measures).

1a.1.This is a measure of: (*should be consistent with type of measure entered in De.1*)

Outcome

☐ Health outcome: Click here to name the health outcome

☐ Patient-reported outcome (PRO): Click here to name the PRO

PROs include HRQoL/functional status, symptom/symptom burden, experience with care, health-related behaviors

☐ Intermediate clinical outcome (*e.g., lab value*): Click here to name the intermediate outcome

☒ Process: **Monthly medication reconciliation for patients receiving care at dialysis facilities.**

☐ Structure: Click here to name the structure

☐ Other: Click here to name what is being measured

HEALTH OUTCOME/PRO PERFORMANCE MEASURE *If not a health outcome or PRO, skip to 1a.3*

1a.2. Briefly state or diagram the path between the health outcome (or PRO) and the healthcare structures, processes, interventions, or services that influence it.

1a.2.1. State the rationale supporting the relationship between the health outcome (or PRO) to at least one healthcare structure, process, intervention, or service (*i.e., influence on outcome/PRO*).

Note: For health outcome/PRO performance measures, no further information is required; however, you may provide evidence for any of the structures, processes, interventions, or service identified above.

INTERMEDIATE OUTCOME, PROCESS, OR STRUCTURE PERFORMANCE MEASURE

1a.3. Briefly state or diagram the path between structure, process, intermediate outcome, and health outcomes. Include all the steps between the measure focus and the health outcome.

Implementation of standardized medication reconciliation definitions, specifications, and frequency for accountability purposes by dialysis facilities

↓

Medication reconciliation (the process of creating the most accurate list of all home medications that the patient is taking, including name, indication, dosage, frequency, and route, by comparing the most recent medication list in the dialysis medical record to one or more external list(s) of medications obtained from a patient or caregiver, pharmacotherapy information network, hospital, or other provider) performed on a monthly basis for all dialysis patients

↓

Improved and expedited identification of real and potential medication-related problems (MRPs) in ESRD patients

↓

Reduction of MRP-associated hospitalizations, readmissions, mortality, and health care costs

1a.3.1. What is the source of the systematic review of the body of evidence that supports the performance measure?

☐ Clinical Practice Guideline recommendation – ***complete sections 1a.4, and 1a.7***

☐ US Preventive Services Task Force Recommendation – ***complete sections 1a.5 and 1a.7***

☐ Other systematic review and grading of the body of evidence (*e.g., Cochrane Collaboration, AHRQ Evidence Practice Center*) – ***complete sections 1a.6 and 1a.7***

☒ **Other – *complete section 1a.8***

Please complete the sections indicated above for the source of evidence. You may skip the sections that do not apply.

1a.4. CLINICAL PRACTICE GUIDELINE RECOMMENDATION

1a.4.1. Guideline citation (*including date*) and **URL for guideline** (*if available online*):

1a.4.2. Identify guideline recommendation number and/or page number and **quote verbatim, the specific guideline recommendation**.

1a.4.3. Grade assigned to the quoted recommendation with definition of the grade:

1a.4.4. Provide all other grades and associated definitions for recommendations in the grading system. (*Note: If separate grades for the strength of the evidence, report them in section 1a.7.*)

1a.4.5. Citation and URL for methodology for grading recommendations (*if different from 1a.4.1*)**:**

1a.4.6. If guideline is evidence-based (rather than expert opinion), are the details of the quantity, quality, and consistency of the body of evidence available (e.g., evidence tables)?

☐ Yes → ***complete section 1a.7***

☐ No → ***report on another systematic review of the evidence in sections 1a.6 and 1a.7; if another review does not exist, provide what is known from the guideline review of evidence in 1a.7***

1a.5. UNITED STATES PREVENTIVE SERVICES TASK FORCE RECOMMENDATION

1a.5.1. Recommendation citation (*including date*) and **URL for recommendation** (*if available online*):

1a.5.2. Identify recommendation number and/or page number and **quote verbatim, the specific recommendation**.

1a.5.3. Grade assigned to the quoted recommendation with definition of the grade:

1a.5.4. Provide all other grades and associated definitions for recommendations in the grading system. (*Note: the grading system for the evidence should be reported in section 1a.7.*)

1a.5.5. Citation and URL for methodology for grading recommendations (*if different from 1a.5.1*)**:**

Complete section 1a.7

1a.6. OTHER SYSTEMATIC REVIEW OF THE BODY OF EVIDENCE

1a.6.1. Citation (*including date*) and **URL** (*if available online*):

1a.6.2. Citation and URL for methodology for evidence review and grading (*if different from 1a.6.1*)**:**

Complete section 1a.7

1a.7. FINDINGS FROM SYSTEMATIC REVIEW OF BODY OF THE EVIDENCE SUPPORTING THE MEASURE

If more than one systematic review of the evidence is identified above, you may choose to summarize the one (or more) for which the best information is available to provide a summary of the quantity, quality,

and consistency of the body of evidence. Be sure to identify which review is the basis of the responses in this section and if more than one, provide a separate response for each review.

1a.7.1. What was the specific structure, treatment, intervention, service, or intermediate outcome addressed in the evidence review?

1a.7.2. Grade assigned for the quality of the quoted evidence with definition of the grade:

1a.7.3. Provide all other grades and associated definitions for strength of the evidence in the grading system.

1a.7.4. What is the time period covered by the body of evidence? (*provide the date range, e.g., 1990-2010*). Date range: Click here to enter date range

QUANTITY AND QUALITY OF BODY OF EVIDENCE

1a.7.5. How many and what type of study designs are included in the body of evidence? (*e.g., 3 randomized controlled trials and 1 observational study*)

1a.7.6. What is the overall quality of evidence across studies in the body of evidence? (*discuss the certainty or confidence in the estimates of effect particularly in relation to study factors such as design flaws, imprecision due to small numbers, indirectness of studies to the measure focus or target population*)

ESTIMATES OF BENEFIT AND CONSISTENCY ACROSS STUDIES IN BODY OF EVIDENCE

1a.7.7. What are the estimates of benefit—magnitude and direction of effect on outcome(s) across studies in the body of evidence? (*e.g., ranges of percentages or odds ratios for improvement/ decline across studies, results of meta-analysis, and statistical significance*)

1a.7.8. What harms were studied and how do they affect the net benefit (benefits over harms)?

UPDATE TO THE SYSTEMATIC REVIEW(S) OF THE BODY OF EVIDENCE

1a.7.9. If new studies have been conducted since the systematic review of the body of evidence, provide for each new study: 1) citation, 2) description, 3) results, 4) impact on conclusions of systematic review.

1a.8 OTHER SOURCE OF EVIDENCE

If source of evidence is NOT from a clinical practice guideline, USPSTF, or systematic review, please describe the evidence on which you are basing the performance measure.

1a.8.1 What process was used to identify the evidence? A search of relevant literature was conducted to identify studies on outcomes of medication reconciliation.

1a.8.2. Provide the citation and summary for each piece of evidence. Citations are listed alphabetically by lead author. We note 5 of the 11 citations are not specific to the dialysis population,

but given the previously-noted existing lack of empirical publications specifically addressing the ESRD population, these provide applicable background information on current medication management practices and medication-related problems.

ESRD POPULATION-SPECIFIC CITATIONS:

1. **Cardone KE, Bacchus S, Assimon MM, Pai AB, Manley HJ. Medication-related problems in CKD. *Adv Chronic Kidney Dis.* 2010;17(5):404-412.**
   Summary: The authors note patients with CKD often are prescribed heterogeneous medications to treat disease-associated comorbidities, to slow down progression of the disease, and to minimize morbidity and mortality rates. Medication regimens in this population are very complex, leading to an increased potential for medication-related problems (MRPs). As kidney function declines, the type and amount of medications a patient consumes increases, thereby putting CKD patients at a higher risk for MRPs. MRPs have been known to be associated with morbidity, mortality, and a lower quality of life.

2. **Hakim RM, Collins AJ. Reducing avoidable rehospitalization in ESRD: A shared accountability. *JASN.* 2014;25(9):1891-1893.**
   Summary: The authors note interventions and services by the healthcare team that can lead to reduced rehospitalization include one or more episodes of medication reconciliation facilitated by a knowledgeable pharmacist in the dialysis facility after each rehospitalization, and conclude medication reconciliation after hospital discharge is critically needed because it crosses all aspects of care. The article indicates ESRD patients are prescribed an average of 11-12 medications and take an average of 17-25 doses per day, and thus experience a high rate of medication-related problems (MRPs). MRPs are particularly acute at the time of hospital discharge because that process often involves changes to the prehospitalization prescribed medications. The involvement of pharmacists has been shown to both identify actual and potential MRPs, as well as to reduce rehospitalizations and lengths of stay of dialysis patients.

3. **Manley HJ, Carroll CA. The clinical and economic impact of pharmaceutical care in end-stage renal disease patients. *Semin Dial.* 2002;15:45-49.**
   Summary: The authors note ESRD patients are medically complex, require multiple medications for treatments of their various comorbidities, and cost the healthcare system billions of dollars each year. These patients are also at risk of drug-related problems (DRPs) that may lead to increased morbidity, mortality, and cost to the healthcare system. The authors note the literature demonstrates pharmaceutical care provided by pharmacists improves ESRD patient care. Specifically, pharmacist review of ESRD patients' medication profiles and medical records has shown to be beneficial in identifying and resolving DRPs, and an economic analysis suggests that for every $1 spent on pharmaceutical care, the health care system saves an estimated $3.98. The authors conclude provision of pharmaceutical care by pharmacists should be considered for all ESRD patients.

4. **Manley HJ, Drayer DK, McClaran M, Bender W, Muther RS. Drug record discrepancies in an outpatient electronic medical record: Frequency, type, and potential impact on patient care at a hemodialysis center. *Pharmacotherapy.* 2003;23(2):231-239.**
   Summary: The authors noted electronic drug record discrepancies are a potential source of drug-related problems and sought to determine the extent to which such discrepancies occur in a hemodialysis population through a prospective observational study of patients enrolled in a

pharmacist clinic at an outpatient hemodialysis center from August-December 2001. Patients participated in monthly drug interviews conducted by a pharmacist, during which drug record discrepancies were classified and assigned a potential drug-related problem. Patients with documented drug record discrepancies were compared with those patients for whom no discrepancy was identified. Over the 5-month period, 215 drug interviews were conducted for 63 patients; 113 drug record discrepancies were identified in 38 patients (60%). Electronic drug records were discrepant by one, two, and more than two drug records 60.0%, 26.2%, and 13.8% of the time, respectively. Drug record discrepancies placed patients at risk for adverse drug events and dosing errors in 49.6% and 34.5%, respectively, of 113 discrepancies. Patient age negatively correlated with the number of drug record discrepancies identified (r=-0.27, p=0.04). The authors concluded drug record discrepancies occur frequently among hemodialysis patients, and that incorporation of a pharmacist into the patient care team may increase the accuracy of the electronic drug records and avert unnecessary drug-related problems.

5. **Pai AB, Boyd A, Depczynski J, Chavez IM, Khan N, Manley H. Reduced drug use and hospitalization rates in patients undergoing hemodialysis who received pharmaceutical care: A 2-year, randomized, controlled study. *Pharmacotherapy.* 2009; 29: 1433–1440.**
   Summary: The authors conducted a prospective, randomized, controlled, longitudinal, 2-year pilot study intended to investigate the impact of a pharmaceutical care program managed by clinical pharmacists on drug use, drug costs, hospitalization rates, and drug-related problems (DRPs) in 104 adult ambulatory patients undergoing hemodialysis in a nonprofit university-affiliated dialysis clinic. Patients were randomly assigned to receive either pharmaceutical care, consisting of one-on-one care with in-depth drug therapy reviews conducted by a clinical pharmacist (57 patients), or standard of care, consisting of brief drug therapy reviews conducted by a nurse (47 patients). Baseline data on demographic and clinical characteristics were collected, and mean numbers of concomitant drugs, drug costs, hospitalization rates, and lengths of stay were compared between the groups. In the pharmaceutical care group, DRPs were identified and recorded. Baseline age, length of time receiving hemodialysis, etiology of ESRD, and mean number of concomitant drugs at baseline were similar between the groups.

   At the end of the 2-year follow-up, the authors found pharmaceutical care was associated with a significant decrease of 14% fewer drugs compared with standard of care, as documented during each drug therapy review ($p<0.05$). There were significantly fewer all-cause hospitalizations among patients assigned to pharmaceutical care compared with those receiving standard of care (mean +/- SD 1.8 +/- 2.4 vs 3.1 +/- 3 hospitalizations, p=0.02), and the cumulative time hospitalized was shorter in the pharmaceutical care group compared with the standard of care group (9.7 +/- 14.7 vs 15.5 +/- 16.3 days, p=0.06). During the study period, 530 DRPs were identified and resolved. The authors concluded the provision of pharmaceutical care is associated with tangible benefits on outcomes in ambulatory patients undergoing hemodialysis and should be considered in health care policy decisions.

6. **Spiegel B, Bolus R, Desai AA, Zagar P, Parker T, Moran J, Solomon MD, Khawar O, Gitlin M, Talley J, Nissenson A. Dialysis practices that distinguish facilities with below- versus above-expected mortality. *CJASN.* 2010;5:2024-2033.**
   Summary: The authors noted mortality rates vary widely among dialysis facilities, even after adjustment with standardized mortality ratios (SMRs); they hypothesized this

variation may occur because either top-performing facilities use practices not shared by others, the SMR fails to capture key patient characteristics, or both. The authors identified specific practices, including frequency of medication reconciliation by nurses, that distinguish top- from bottom-performing facilities by SMR. A cross-sectional survey of staff was performed across three dialysis organizations. Staff members rated the perceived quality of their units' patient-, provider-, and facility-level practices using a six-point Likert scale. Facilities were divided into those with above- versus below-expected mortality on the basis of SMRs from U.S. Renal Data Service facility reports. Mean Likert scores were computed for each practice using t tests. Practices that were statistically significant ($P \leq 0.05$) and achieved at least a medium effect size of ≥0.4 were reported. Significant predictors were entered into a linear regression model.

Dialysis facilities with below-expected mortality reported that patients in their unit were more activated and engaged, physician communication and interpersonal relationships were stronger, dieticians were more resourceful and knowledgeable, and overall coordination and staff management were superior versus facilities with above-expected mortality. Importantly, units with lower-than-expected mortality rates engaged in a more coordinated, multidisciplinary environment, including (but not limited to) convening multidisciplinary conferences sooner after dialysis patients return to the facility after hospitalization and performing medication reconciliation more frequently than high-mortality units. Staff ratings of these practices explained 31% of the variance in SMRs.

GENERAL POPULATION CITATIONS:

7. **Bedell SF, Jabbour S, Goldberg R et al. Discrepancies in the use of medications: Their extent and predictors in an outpatient practice. *Arch Intern Med.* 2000;160:2129-2134.**
Summary: The authors noted misuse of medications is a major cause of morbidity and mortality, and few studies had yet examined the frequency of and factors associated with discrepancies between what doctors prescribe and what patients take in actual practice. Specifically, 312 patients from the practices of 5 cardiologists and 2 internists who were returning for their routine follow-up visits were included in the study. Patients' medication bottles and their reported use of medications were compared with physicians' records of outpatients seen between November 1997 and February 1998 in a private practice affiliated with an academic medical center in Boston, MA. Discrepancies were found in medications for 239 patients (76%). The 545 discrepancies were the result of patients taking medications that were not recorded (n = 278 [51%]), patients not taking a recorded medication (n = 158 [29%]), and differences in dosage (n = 109 [20%]). Overall, discrepancies were randomly distributed among different drugs and discrepancy types with no discernible pattern. Multivariate analysis revealed patient age and number of recorded medications were the 2 most significant predictors of medication discrepancy.

   Discrepancies among recorded and reported medications were common and involved all classes of medications, including cardiac and prescription drugs. Older age and polypharmacy were the most significant correlates of discrepancy. The authors concluded the pervasiveness of discrepancies can have significant health care implications, and action is urgently needed to address their causes; such action would likely have a positive impact on patient care.

8. **Isetts BJ, Schondelmeyer SW, Artz MB, Lenarz LA, Heaton AH, Wadd WB, Brown LM,**

Cipolle RJ. Clinical and economic outcomes of medication therapy management services: The Minnesota experience. *J Am Pharm Assoc.* 2008;48:203–211.
Summary: The authors conducted a prospective study of six ambulatory clinics in Minnesota from August 1, 2001, to July 31, 2002 consisting of 285 intervention group patients with at least 1 of 12 medical conditions using pre-study health claims, 126 comparison group patients with hypertension, and 126 patients with hyperlipidemia selected among 9 clinics without Medication Therapy Management (MTM) services for HEDIS analysis. The authors assessed the clinical effects associated with the provision of MTM services by measuring the percent of patients achieving HEDIS goals for hypertension and hyperlipidemia in the MTM services intervention group in relationship to a comparison group who did not receive MTM services. Patients' total health expenditures for the year before and after receiving MTM services were also compared. MTM services were provided by pharmacists to health plan beneficiaries in collaboration with primary care providers. Main outcomes included resolution of drug therapy problems, percentage of patients' goals of therapy achieved, and meeting HEDIS measures for hypertension and hypercholesterolemia. Total health expenditures per person were measured for a 1-year period before and after enrolling patients in MTM services.

Findings from the study were: 637 drug therapy problems were resolved among 285 intervention patients, and the percentage of patients' goals of therapy achieved increased from 76% to 90%. HEDIS measures improved in the intervention group compared with the comparison group for hypertension (71% versus 59%) and cholesterol management (52% versus 30%). Total health expenditures decreased from $11,965 to $8,197 per person (n = 186, P < 0.0001). The reduction in total annual health expenditures exceeded the cost of providing MTM services by more than 12 to 1. The authors concluded patients receiving face-to-face MTM services provided by pharmacists in collaboration with prescribers experienced improved clinical outcomes and lower total health expenditures. Clinical outcomes of MTM services have chronic care improvement and value-based purchasing implications, and economic outcomes support inclusion of MTM services in health plan design.

9. **Stewart AL, Lynch KJ. Medication discrepancies despite pharmacist led medication reconciliation: The challenges of maintaining an accurate medication list in primary care. *Pharm Pract.* 2014;12(1)360.**
Summary: The authors report on an observational case series study of established patients from an urban, indigent care clinic intended to describe the types of medication discrepancies that persist despite pharmacist-led medication reconciliation using the primary care electronic medical record (EMR). Medication reconciliation was conducted immediately prior to the physician visit at baseline and return visit. Main outcome measures included frequency, types, and reasons for discrepancies, patient knowledge, and adherence. There was a 14.5% reduction in the number of patients with a discrepancy, the frequency of discrepancies was reduced by 7.3%, and the rate of medication discrepancies in the chart was reduced by 31.3% with pharmacist-led medication reconciliation. The most common type of discrepancy that persisted at follow-up despite the intervention were medications listed on the chart that the patient had discontinued. Additionally, discrepancies were more likely to persist despite the pharmacist-led intervention in Caucasian subjects when compared to African Americans. The authors concluded that while pharmacist led medication reconciliation appears

effective at reducing the likelihood of a medication discrepancy in the EMR, challenges persist in maintaining this accuracy, specifically as it relates to patient-driven changes to the medication regimen.

10. **Tache SV, Sonnichsen A, Ashcrof, DM. Prevalence of adverse drug events in ambulatory care: A systematic review. *The Annals of Pharmacotherapy*. 2001; 45(7-8):977-989.**
Summary: The authors note while most medications are prescribed, dispensed, and administered in ambulatory care settings, little information exists on the adverse effects of drugs in this setting. This review was conducted to estimate the prevalence of adverse drug events (ADEs) and the proportion of preventable ADEs in ambulatory care settings, as well as to compare data for different age groups and review drug classes most commonly associated with ADEs. Four electronic databases—PubMed (1966-March 2011), International Pharmaceutical Abstracts (1970-March 2011), EMBASE (1980-March 2011), and the Cochrane Database of Systematic Reviews (1993-March 2011)—were systematically searched for published data, and bibliographies of retrieved articles were searched individually for additional relevant studies. A standardized definition of ADE was used to select studies in populations living in the community, with medical visits to primary care facilities, non-specialty ambulatory care facilities, and/or admissions to a hospital for medication-related adverse events. Forty-three studies met inclusion criteria.

    The median ADE prevalence rate for retrospective studies was 3.3% (interquartile range [IQR] 2.3-7.1%) vs 9.65% (IQR 3.3-17.35%) for prospective studies. Median preventable ADE rates in ambulatory care-based studies were 16.5%, and 52.9% for hospital-based studies. Median prevalence rates by age group ranged from 2.45% for children to 5.27% for adults, 16.1% for elderly patients, and 3.45% for studies including all ages. The authors concluded the identified notable differences in prevalence rates by age groups and responsible drug categories offer guidance on how to direct attention toward effective targets for improvement of medication safety in ambulatory care settings.

11. **Wagner MM, Hogan WR. The accuracy of medication data in an outpatient electronic medical record. *J Am Med Inform Assoc.* 1996;3:61-68.**
Summary: The objective of this prospective cohort study was to measure the accuracy of medication records stored in the electronic medical record (EMR) of an outpatient geriatric center. The authors analyzed accuracy from the perspectives of a clinician using the data and a computer-based medical decision-support system (MDSS). During scheduled office visits for medical care, the treating clinician determined whether the medication records for the patient were an accurate representation of the medications the patient was actually taking. Using the available sources of information (the patient, the patient's vials, any caregivers, and the medical chart), the clinician determined whether the recorded data were correct, whether any data were missing, and the type and cause for each discrepancy found.

    The authors found 83% of medication records correctly represented the compound, dose, and schedule of a current medication; 91% represented correctly the compound; and 0.37 current medications were missing per patient. The principal cause of errors was found to be the patient (36.1% of errors), who misreported a medication at a previous visit or changed (stopped, started, or dose-adjusted) a medication between visits. The second most frequent cause of errors was failure to capture changes to medications made by outside clinicians, accounting for 25.9% of errors. Transcription errors comprised 8.2% of errors. When the accuracy of records from the center was

analyzed from the perspective of an MDSS, 90% were correct for compound identity and 1.38 medications per patient were missing or uncoded. The cause of the additional errors of omission was a free-text "comments" field, assumed to be unreadable by current MDSS applications, used by clinicians in 18% of cases to record the identity of the medication. The authors concluded medication records in an outpatient EMR may have significant levels of data error. Based on an analysis of correctable causes of error, the authors suggested the most effective extension to the EMR studied would be to expand its scope to include all clinicians who can potentially change medications. However, even with EMR extensions ineradicable error due to patients and data entry will likely remain. It was noted the provision of a free-text "comments" field increased the accuracy of medication lists for clinician users at the expense of accuracy for an MDSS.