

Creating an Accurate Medication List in the Outpatient Setting Through a Patient-Centered Approach

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Abstract

Objective: The objective of this project was to evaluate the efficacy of patient-centered strategies implemented in a community-based setting to improve the accuracy of the medication list in the outpatient setting. **Methods:** We conducted a quasi-experimental trial using two waves of cross-sectional data from patients aged 55 years or older conducted in five Aurora Health Care clinics in Walworth County, WI. Interventions included education, personal medication lists, and medication bags. The primary outcome measure was the rate of accurate medication lists in the intervention clinics compared with a group of 68 control clinics. **Results:** After disseminating over 16,600 medication lists and 7,800 medication bags at over 80 educational programs, the rate of accurate medication lists significantly increased from 55 percent to 72 percent ($P < 0.001$). This increase was significantly better than changes seen in the comparison group ($P < 0.001$). **Conclusion:** A community-based initiative providing tools and resources for patient engagement can improve the accuracy of the outpatient medication list.

Introduction

As the rate of drug use continues to grow among Americans, medication safety has become a major concern for both patients and providers. Over 60 percent of U.S. adults aged 65 or older take at least five different medications per week in the ambulatory setting, with 15 percent taking at least 10.¹ Although medication regimens requiring multiple drugs may be clinically appropriate, proper medication management by providers and patients is essential to prevent errors and adverse drug events (ADEs). The reported rate of medication errors and ADEs varies widely, depending on the care setting and the methods used to measure them, with growing evidence that errors and ADEs are common in the ambulatory setting.^{2, 3} The older adult population is at particularly high risk; individuals 65 years and older were shown to be 2.4 times as likely to sustain an ADE and 7 times as likely to be hospitalized as younger patients.⁴

Improving medication safety requires participation of, and interventions for, both providers and patients. A key strategy recommended by national and international patient safety experts is to engage patients in the medication process through a collaborative relationship with their provider.^{5, 6, 7} Providers can promote this relationship by providing patient-centered care that includes effective communication; accurate, accessible information and education; and patient self-care strategies. Research shows that patient-centered care can enhance outcomes of care,

patient adherence to medication regimens, chronic disease outcomes, and patient satisfaction.^{6, 8, 9, 10} Engaged, active patients who are given tools and support for self-management of their medications are associated with better health outcomes.⁶

The process recommended for providers to help prevent medication errors is called “medication reconciliation.”⁶ The first step in medication reconciliation is verification—i.e., obtaining a complete, accurate list of the medications a patient is taking and comparing this to the list documented in the medical record. The few studies conducted in the outpatient setting have identified significant discrepancies in the medication list (defined as inconsistency or lack of agreement between the provider medication list and what the patient is taking, based on comparison between the medical record and the patient’s medication list and/or medication bottles).^{11, 12, 13} An inaccurate medication list can lead to significant adverse events.¹³

Both patient-centered care and medication reconciliation are strongly recommended, but few studies have described how to achieve these goals in the outpatient setting and what their impact is on creating an accurate medication list. The aim of this project was to develop and implement patient-centered strategies to improve medication list accuracy.

A community-based advisory council was established to assist in identifying relevant strategies for patients. Through a collaborative process involving patients, providers, and community members, medication safety tools were created and disseminated throughout the community. The primary interventions focused on patient medication self-management tools. Secondary interventions addressed the redesign of the medication process for providers in the outpatient setting.

This study evaluated the effectiveness of these interventions by measuring the rate of accuracy in the medication lists in the medical records of outpatient clinics over a 2-year period, compared with a control group of clinics. Additional qualitative measures included patient, provider, and community surveys.

Methods

Study Setting, Patient Population

This project was conducted from July 2005 through June 2007 in five Aurora Health Care outpatient clinics in Walworth County, WI. Aurora Health Care is a large, integrated health care system that includes 13 hospitals, over 75 clinics, 120 retail pharmacies, and a visiting nurse program. The physician staff includes approximately 650 employed and over 3,000 affiliated physicians. At the five intervention clinics in Walworth County, the targeted patients were those aged 55 years and older who were seen by any of the 23 Aurora primary care providers (two internal medicine, 18 family practice, and three obstetrics/gynecology). Efforts to engage older adults throughout Walworth County were part of the community-wide campaign. The comparison group included 68 other Aurora Health Care clinics located throughout southeastern Wisconsin. At the comparison clinics, data were collected from patients seen by any of 363 primary care providers, including 136 internal medicine, 171 family practice, and 56 obstetrics/gynecology physicians.

Support for the project was received from two partners, Consumers Advancing Patient Safety (CAPS) and Midwest Airlines.¹⁴ CAPS assisted in the development and facilitation of the council, and Midwest Airlines provided expertise in consumer engagement and marketing.

This project was reviewed and approved by the Research Subject Protection Program, the Institutional Review Board affiliated with Aurora Health Care.

Definitions

An “accurate clinic medication list” was defined as follows: the clinic’s chart medication list contained the same list of prescription medications as the patient’s list (or bag of prescription medications); i.e., none were missing from the clinic list nor were there medications listed that the patient was not taking. For this study, the outcome measure was to have the same medications documented on both the clinic list and the patient list. Dose, frequency, and route of medication administration were not evaluated in the measurement. The definition and measurement activities used in this study were based on a previously reported methodology.¹⁵

Interventions

The interventions consisted of multiple components intended to encourage and facilitate patients and providers to collaborate in the medication reconciliation process. First, the project team established a Patient Advisory Council as a structure through which providers could “partner” with their patients and the community. The Walworth County Patient Safety Council was established in November 2005. The methods used to establish the patient advisory council and develop the interventions have been described previously.¹⁶ To identify specific intervention strategies, the Council and project team conducted patient and provider focus groups, surveys, and interviews. This formative research identified the need for patient education and tools that would facilitate communication between patients and their providers and foster the patients’ self-management of their medications. For providers, interventions were directed at the assessment and redesign of the clinic workflow during the medication reconciliation process.

Patient-directed interventions. The patient-directed interventions developed by the Council included a personal medication list (paper-based) and an insulated bag for transporting medications to their provider visits. In addition, the medication lists and bags were distributed to patients and community members through a variety of venues: clinics, retail pharmacies, hospitals, health fairs, and community organizations. Patients received education and training on medication safety and the importance of communication with providers, as well as instructions on how to complete the medication list and use the bags. Council members and the project team provided the education and training in various settings.

Provider interventions. The provider interventions included education on medication reconciliation and patient engagement, an analysis of clinic workflow during the medication reconciliation process, and identification of “best practice processes” that were most efficient and effective toward achieving an accurate medication list.

Data Collection Method

The rate of accurate medication lists in the five intervention clinics was the outcome measure used to evaluate the impact of the interventions. Accuracy of the chart medication list was measured during two data collection periods, baseline and post-intervention. Targeted patients included all those aged 55 and older who were scheduled for a visit with a primary care provider during the data collection periods.

A member of the clinic staff contacted patients prior to their appointment and asked them to bring a list of their prescription medications (or the medications themselves) with them to their appointments. At the appointment time, the nurse (or medical assistant) interviewed the patient and compared the personal medication list (or the actual medications) the patient brought to what was documented in the clinic chart medication list. (The medication lists in all five intervention clinics were paper-based; none of these clinics had an electronic medical record at the time of the study. In the comparison group clinics, the medication list was either paper-based or electronic, depending on whether they had an electronic medical record.) If the patient forgot to bring their medication list or their medications, the patient was asked to recall the prescription medications they were taking.

The staff completed a data collection tool, which included patient age; sex; whether the patient was taking prescription medications; whether the patient brought a medication list and/or their actual medications or neither to the clinic; and whether the patient used supplements, herbals and/or over-the-counter medications. Although the procedure of reviewing medications at the time of a visit with their primary care provider was routine in Aurora clinics, the documentation of noted discrepancies between the patient list and the clinic chart medication list was only done during this measurement period. The data were scanned into a centralized database.

Qualitative data included patient focus groups, patient interviews and surveys, provider interviews and survey, and a community telephone survey. During the initial formative research, between August 2005 and June 2006, two patient focus groups of randomly selected Aurora Health Care patients from the five intervention clinics and individual patient and provider interviews were conducted.¹⁶ Post-intervention data included a survey of all patients aged 55 and older from the five intervention clinics. A provider survey was sent to physicians, nurses, medical assistants, and retail pharmacists from the five intervention clinics and the four Aurora retail pharmacies in Walworth County. In addition, a community telephone survey measured the project's penetration beyond the intended target group of Aurora patients. The sampling frame of this survey included adults aged 55 or older and residents of Walworth County who had not been Aurora patients within the previous year. All surveys and focus groups were developed and conducted by the project team, assisted by Aurora staff and external agencies with expertise in qualitative research.

The study was designed as a quasi-experimental, prospective, longitudinal trial using cross-sectional data for each measurement point. Individual patients were not linked across waves of data collection. Since a limited set of clinics in a specific county were targeted, a larger sample of comparison sites was used to establish reliable rates for comparison.

Data were collected during two 4-week periods: pre-intervention (baseline) in September 2005, and post-intervention in March 2007. Eligible patients included those aged 55 or older who were

taking prescription medications and were scheduled for a visit with a primary care provider during one of the data collection periods. Patients were sampled within ambulatory care clinics when being seen by primary care providers. In order to reduce staff and respondent burden, sampling from among eligible patients was done at random. Clinic staff (nurses and medical assistants) reviewed patients' personal medication lists and their clinic medical records and invited every other eligible patient to participate. In the intervention clinics, the clinic staff reviewed approximately 60 charts per primary care provider. In comparison clinics, sampling continued until 10 charts for each primary care provider had been reviewed.

Reported results include a descriptive analysis, based on the patient as the unit of analysis, and a final outcome analysis, using a hierarchical model in which patients were clustered within clinics, with the clinic serving as the primary unit of analysis. These models took into account the similarities of people within the clinic—the intraclass correlation. In these models, covariates measured on the patient level (age, sex, and physician specialty) were incorporated as adjustment variables. Condition—intervention site or comparison group—was assigned and measured on the clinic level. Although individual physicians might have had highly variable practice styles within a specific clinic, “physician” was not the unit of analysis, since the number of charts reviewed per physician was too low for reliable statistical modeling, and participation in the intervention was based on the clinic, not the individual physician.

Data were scanned to a Microsoft ACCESS® data set. Patients were excluded if they were not taking prescription medications by self-report (even if medications were listed on the clinic record) or if no medication record could be found in the patient's chart. Cases were also excluded if data necessary for the primary outcome measures were missing from the data collection tools. All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS®, version 15.01). For statistical tests, a 2-tailed test was used with the rejection region set to $P = 0.05$.

Results

The Walworth County Patient Safety Council was established in November 2005. The Council consisted of 11 patients (55 years and older) and 12 health care providers (four physicians, three clinic nurses, one parish nurse, one retail pharmacist, and three community health services professionals). The Council met on a monthly basis from November 2005 through June 2007 for a total of 17 meetings (excepting 3 months due to holiday and summer schedules). The mean attendance rate was 85 percent; evaluations completed by all members after each meeting showed an approval rating of 4.5 on a 5-point scale (5 = excellent).

Formative research conducted early in the project identified barriers and opportunities for improving the medication management process for both patients and providers. Two patient focus groups (with 22 participants combined), 21 individual patient interviews, and 21 provider interviews were completed. As previously reported,¹⁶ patients identified the challenge of effective communication with their health care providers as a barrier, as evidenced by comments such as, “I am timid about asking questions of my doctor;” and “We are speaking different languages.” Some patients were not using any medication self-management tools, as rationalized by one interviewee, who stated, “I don't keep a medication list; my doctor knows what I take.” In

the health care provider interviews, limited time was consistently identified as a major barrier to conducting a complete medication review during an office visit. In addition, providers often complained that patients did not maintain medication lists.

Two tools were created by the Patient Safety Council to improve communication between patients and their provider regarding medications—a personal medication list and a medication bag. The logo “Partners in Safety” was created and selected by the Council with community input and printed on both the tools for easy identification.

The Partners in Safety medication list was sent by U.S. mail to every patient aged 55 or older who was seen in any of the five Aurora clinics in Walworth County within the year ending August 2006. The Partners in Safety lists and bags were also distributed to patients by staff (physicians, nurses, medical assistants, and pharmacists) at the five clinics and through the four Aurora retail pharmacies. Formal presentations on medication safety and instructions on use of the lists and/or bags were given at over 80 community education programs, which drew over 2,300 participants.

Based on the Council’s recommendation, broader dissemination of the medication lists was initiated after the first 3 months of distribution. The Council members, through their links with community-based organizations and social groups, provided access to the community through organizations, such as the Kiwanis, Rotary, and Lions clubs; senior centers; health fairs; churches; and personal social gatherings. Using the PPECA (Partnering for Patient Empowerment through Community Awareness) model,¹⁷ two educational programs were provided at a Walworth County public library. Every member of the Council played an active role in the dissemination and education, with the top three distributors of the tools being the project coordinator, one of the patient representatives on the Council, and a parish nurse. Between August 2006 and June 2007, more than 16,600 Partners in Safety medication lists and 7,800 Partners in Safety medication bags were disseminated to patients and the community in Walworth County.

To address the provider issues in the clinics, a workgroup was created with representatives from each of the five clinics. Patient representatives from the Council participated at the eight meetings held between April 2006 through June 2007. At these meetings, the project team leaders provided education on medication safety, medication reconciliation, and patient-centered care. Barriers and opportunities for improving the medication review process were addressed.

Weekly communication between the project coordinator and staff at the individual clinics provided assistance and support. Physician education and engagement was promoted by the physician project leader through a variety of means, including presentations at physician leadership and management meetings, individual physician discussions, and workshops led by content experts. Additional Aurora staff, trained in conducting work flow analysis, were brought into each of the clinics to evaluate processes used during medication reconciliation that might be most efficient and effective for obtaining an accurate medication list.

“Best practices” identified by the evaluators included reminding patients (via reminder letters or telephone calls) in advance of their appointment to bring in their medication list or bag. This encouraged and enforced the message of patient ownership of their medication list. Those

physicians who had their assisting staff (nurse or medical assistant) verify the patients' medication lists prior to the actual physician encounter had more accurate lists, allowing the physicians time to reconcile the medication lists. Real-time physician documentation in the charts of these reconciled medications (i.e., immediately after the patient encounter) was critical for maintaining accuracy beyond that visit. These findings were shared with staff and physicians, with strong recommendations to incorporate these techniques into their practices.

To evaluate the impact of these interventions, the rate of accurate medication lists in the five intervention sites was measured and compared to the 68 other (control, nonintervention) Aurora clinics. Of the 6,242 charts reviewed at all Aurora clinics during the baseline and post-intervention periods, 845 were ineligible based on the exclusion criteria (exclusion rates were similar in both groups and both data collection periods).

Table 1 summarizes the characteristics of the eligible patients interviewed in the intervention and comparison (control) groups for both baseline and post-intervention periods. The differences between the intervention and control groups on age and physician specialty were statistically significant. The intervention sites served a significantly older population and had a significantly higher percent of visits to family practice physicians compared to the control sites. These variables were subsequently used as adjustment variables in the hierarchic models.

Table 1. Patient characteristics for intervention vs. comparison clinics: Baseline vs. post-intervention periods

| Characteristics | Intervention clinics | | | Comparison clinics | | | P-value ^b |
|----------------------------------|-----------------------|-------------------|----------------|-------------------------|---------------------|----------------------|--|
| | Baseline (N = 596) | Post (N = 594) | P ^a | Baseline (N = 2,154) | Post (N = 2,053) | P-value ^a | |
| Number of clinics | 5 | 5 | na | 67 | 68 | na | na |
| Mean participants per clinic | 119 | 119 | na | 32 | 29 | na | na |
| Mean participant age (yrs) (±SD) | 73.1 (9.8) | 72.0 (10.5) | 0.07 | 70.6 (9.9) | 69.5 (10.0) | <0.001 | <0.001 ^c <0.001 ^d |
| Females (%) | 65 | 59 | 0.074 | 64 | 63 | 0.412 | 0.801 ^c 0.139 ^d |
| Patients seen by FP physician | 74 | 80 | 0.022 | 46 | 47 | .453 | <0.001 ^c <0.001 ^d |

a Within-group change.

b Intervention clinics vs. comparison clinics; difference between baseline^c and post-intervention^d periods.

na = not applicable

FP = Family practice

Table 2 summarizes the rate of accurate medication lists measured in the intervention and comparison clinics at baseline and post-intervention. The aggregate rate of accurate medication lists in the five intervention clinics at baseline was 55 percent. The baseline rate of accurate medication lists in the comparison group was 63 percent, which was significantly higher

compared to the five intervention sites ($P < 0.001$, Fisher's exact test). The post-intervention rate of accurate medication lists was 72 percent in the intervention sites, a 17 percent improvement from the baseline rate. In the comparison group, the rate of accurate medication lists was 56 percent at post-intervention (significantly lower than their baseline rate, $P < 0.001$). This rate was also significantly lower than what the intervention sites achieved compared to the baseline period ($P < 0.001$). Thus, when the project started, the intervention sites began with a significantly lower medication list accuracy rate than the comparison group; by the post-intervention period, the intervention clinics had improved and surpassed the rate in the comparison clinics.

Table 2. Rate of accurate medication lists at baseline and post-intervention, by patient as unit of analysis

| Sites | Baseline | Post-intervention | P-value ^a |
|--|------------------|-------------------|----------------------|
| Intervention clinics, [no./total (%)] | 328/596 (55) | 429/594 (72) | <0.001 |
| Comparison (control) clinics [no./total (%)] | 1,366/2,154 (63) | 1,142/2,053 (56) | <0.001 |
| P-value ^b | <0.001 | <0.001 | – |

a Within-groups difference.

b Baseline vs. post-intervention.

The results of the more conservative, mixed-model hierarchical linear analysis are summarized in Table 3. In this analysis, both the patient level and the clinic level data are used to adjust for between-group differences and to account for the intraclass correlation of individuals within clinics.

Since the same individuals were not measured at both time points, this model used only data collected in 2007. The baseline accuracy rate was significantly less for the intervention clinics than for the comparison clinics.

The mixed model results show a 15 percent difference in accuracy between the intervention and comparison sites, after adjusting for the covariates in the model. The higher rate of medication list accuracy for those patients seen in the intervention sites relative to the comparison sites was significant at $P = 0.034$.

Patients' rate of personal medication list and bag utilization, measured at both the intervention and comparison sites, is summarized in Table 4. The use of any personal medication list increased significantly in the intervention sites, from 51 percent at baseline to 61 percent post-intervention ($P < 0.001$). Those bringing in their medicines (i.e., use of a medication bag)

Table 3. Estimated marginal means for rate of accurate medication list (post-intervention results)^a

| Type of clinic | Estimated mean (%) | Standard error |
|----------------------|--------------------|----------------|
| Intervention | 69.9 | 6.5 |
| Comparison (control) | 54.9 | 2.2 |

a Based on mixed-model (hierarchical) regression. Marginal means estimated for clinic as unit of analysis with patient nested within, adjusting for individual patient level age, sex, and family medicine specialist as provider. The difference between conditions was significant at $P = 0.034$.

decreased in the intervention clinics from a baseline rate of 41 percent to a post-intervention rate of 25 percent ($P < 0.001$). In the comparison group, there was no significant change in the rate of utilizing personal medication lists (49 percent at both data collection periods), but the rate of medications brought into the clinics did increase (from 28 percent to 35 percent, $P < 0.001$). Comparing the intervention sites to the comparison sites, there was a greater rate of personal medication lists in the post-intervention period. (61 percent in the intervention sites, 49 percent in the comparison group, $P < 0.001$). There was no difference in whether patients brought neither a medication list nor their actual medications from baseline to post-intervention, 23 percent vs. 24 percent, respectively).

Use of the project-specific “Partners in Safety” medication list (measured only in the intervention clinics during the post-intervention period) was 31 percent (Table 4). At the intervention clinics, 13 percent of patients brought in the “Partners in Safety” medication bag, and 7 percent brought in both their medication list and a medication bag. Thus, in total, about half the patients at the intervention clinics, who brought in a medication list or bag of medications, used the project-specific materials.

The post-intervention surveys conducted among patients, providers, and the community supported the quantitative results. Of the 7,724 surveys mailed in May 2007, to Aurora patients aged 55 and older 6 months after they were sent the medication list, 1,577 completed and returned the forms (response rate, 20.4 percent). Seventy-six percent of the respondents had documented their medications on the list, and 73 percent had brought this list to their physician appointments; 69 percent felt the personal medication list made it easier to talk with their provider about their medications. Only 23

percent used the medication bag to transport medicines to their clinic visits. Comments from surveyed patients included “The list is a very good idea. Although I had prepared a list for my 91-year-old mother, I had not thought of doing one for myself.” “Having the list of medicines helps me remember to take information to my doctor’s appointment... so I can discuss it with my

Table 4. Rate (%) of patient use of personal medication lists and bags during baseline and post-intervention periods

| | Clinic type | | | |
|---|---------------------------|--------------------|---------------------------|-----------------|
| | Intervention (N = 586) | | Comparison (N = 2,040) | |
| | Pre | Post | Pre | Post |
| Brought personal medication list | 51 ^b | 61 ^{b, c} | 49 | 49 ^c |
| Brought medications | 41 ^b | 25 ^b | 28 ^d | 35 ^d |
| Brought neither | 18 | 24 | 28 | 23 |
| Brought both ^a | 10 | 10 | 4 | 7 |
| Intervention clinics only | | | | |
| Used “Partners in Safety” medication list | 31 | | | |
| Used “Partners in Safety” medication bag | 13 | | | |
| Used both project materials ^a | 7 | | | |
| Used neither of the project materials | 49 | | | |

Percentages also included in entries above for use of lists and bringing medications.

$P < 0.001$ Pre- vs. post-intervention.

$P < 0.001$ Post-intervention, intervention vs. comparison groups.

$P < 0.001$ Pre- vs. post-intervention

doctor.” “Being visually impaired, the bag helps me keep my medications in one place and allows me to take it easily when I go visit my family.”

In April 2007, the provider survey was sent to 92 providers—including physicians, nurses, and retail pharmacy staff in Walworth County—through the Aurora e-mail system. Fifty-two providers completed the survey, for a response rate of 57 percent. Of those responding, 85 percent (44/52) agreed or strongly agreed that medication list on file was more accurate because of the personal medication list; only 54 percent (28/52) felt the medication bag improved accuracy. Although 96 percent of respondents (50/52) agreed or strongly agreed that the list facilitated communication, 12 percent felt the bag did not improve communication.

Comments from the providers regarding the project included “I think patients are more aware of how this is a partnership tool for their health.” “It has increased awareness with the patients of the importance of sharing all their meds with all their physicians and pharmacists.” “This project caused patients and health care providers to examine medication administration and its effects on patient health and safety.” “[This was] a collaborative effort that empowers patients to inspire providers to achieve best practice standards.”

In April 2007, 60 Walworth County residents participated in a telephone survey to measure the penetration of the project into the community beyond those members who were patients in the Aurora system. Of these 60 community members, 13.3 percent (8/60) had received a “Partners in Safety” medication list, while 5 percent (3/60) had been given a medication bag. Applying the response rate of 13 percent to the approximately 10,000 Walworth County residents aged 55 years or older who were not Aurora patients,¹⁸ up to 2,600 community members might have been affected by this project.

Discussion

Through a collaborative process involving patients and providers, interventions were developed and implemented at the community level to engage patients in the medication process and foster patient-centered care among ambulatory care providers. By using tools—including personal medication lists, bags, and education—to facilitate patient medication self-management, the rate of accurate medication lists improved by 17 percent in five outpatient clinics. As evidenced by the rate of patient use of a medication list and by providers’ perception of what improves the accuracy of their chart list, the personal medication list was the preferred self-management tool by both patients and providers. Although the use of a medication list in the intervention clinics increased, patients bringing in their actual medications declined. Perhaps the preference of providers for the medication list influenced which tool their patients utilized. Overall, the increased rate of accuracy in the intervention clinic charts, in contrast to the decline in the comparison group clinics, suggests that the aggregate impact of the various interventions contributed to the observed improvement.

This project identified the need to address both patient and provider issues, as well as the importance of community involvement, which is consistent with national and international recommendations.^{6,7} Patients need to understand the inherent risks related to the complexity of the medication process, but they also need tools to facilitate greater self-management. Education

and training for patients are needed in easily accessible and culturally acceptable formats. Trained community leaders can bring the message and education about medication self-management to older adults in a familiar setting using community-based organizations and social networks.

Our findings are consistent with previous research, which found that the more effective interventions for improving medication adherence included a variety of components.¹⁹ Personal medication lists were utilized at a greater rate and were preferred over the medication bags, but a variety of self-management tools are needed to meet individual patients needs (e.g., visual impairment). The Walworth County Patient Safety Council did not pursue technologic interventions, in part due to costs, but also in recognition of the fact that many older adults are not comfortable with computer-based resources. However, there are many patients—old and young—who would prefer a computerized process for managing their medications. Further research should be done to evaluate the role of a Web-based medication list, accessible to patients and providers.

Just as patients need education and tools to facilitate the medication process, provider issues must be addressed. In order for clinic staff to adopt new approaches to the medication reconciliation process, their system-based issues—clinic workflow, time availability, staff roles—must be modified. Creating an accurate medication list through a collaborative, patient-centered process requires patient participation that is reinforced and encouraged by providers. Patient-centered care should not be interpreted as merely shifting the responsibility onto patients to manage their medications.²⁰ Patients who do not receive positive reinforcement from providers may feel their participation is neither necessary nor valued. One patient representative on the Council expressed frustration after he brought all his medications to three clinic visits, but the staff never asked to check them. To improve the workflow around medication reconciliation in the outpatient setting, “best practices” identified in this study are being further evaluated for replication throughout all Aurora clinics.

The most significant lesson from this project was the important role of community-based and nontraditional partners in creating a collaborative relationship between patients and providers. This study expanded the concept of patient partnering to a broader scale, in both the structure and the process used. The Walworth County Patient Safety Council exemplified the type of partnership relationship between patients and providers that defines patient-centered care but on a community scale. Including health care providers—such as retail pharmacists, parish nurses, and social service groups—as additional partners facilitated the dissemination of a consistent message heard by a wide audience of patients. Partnerships with non-health care providers—such as CAPS and Midwest Airlines—provided expertise and guidance for both engaging consumers and marketing methods.

The processes used—establishing a collaborative structure between the research team and the community, including representatives affected by and concerned with medication safety issues, and involving them in all aspects of the research process with the goal of improving the health of the community—were consistent with the principles of community-based participatory research (CBPR).^{21, 22} As others have suggested,²³ applying public health concepts, theories, and

interventional methods, such as CBPR and social marketing, may be more effective than the traditional medical model for addressing the challenge of medication safety.

By creating the educational message and tools for medication self-management in a culturally acceptable format, then disseminating them through community-based organizations, the community itself became empowered to address the public-health burden of medication safety that affects everyone, either directly or indirectly. This community engagement, led by formal and informal leaders, was evidenced by the measure of penetration of the project beyond just Aurora patients. In February 2007, the Walworth County Board presented a Certificate of Accomplishment to the Patient Safety Council “in recognition of their efforts to improve medication safety through the unique model of a partnership between medical providers and their patients.” The measured success of the Walworth County project suggests community engagement could be a significant component of the patient-provider partnership for medication safety.⁶

Even with the project’s achievements, we recognized several limitations. Our definition of “accurate medication list” required only that the name of the medication was on both the clinic chart and patient medication lists. Route of administration, dose, and frequency—critical details for an accurate medication list—were not evaluated. In addition, measurement did not include a comparison of documented over-the-counter drugs (OTC), herbals, or supplements. With over 65 percent of the Aurora patients surveyed self-reporting use of OTC drugs (2007 data not shown), nonprescription drugs present a significant risk for problems, such as drug-drug and drug-supplement interactions. This study did not evaluate the relationship between an accurate medication list and outcomes, such as errors, ADEs, or medication adherence. Despite this limited definition and analysis, our results are consistent with findings previously reported, which reveal significant discrepancies between patient and provider knowledge of the medication list.^{3, 11, 12, 13}

The data collection process and analysis had the potential for bias and error. Data were obtained by a variety of staff at each clinic. Therefore, variability and inconsistency in the process might have occurred. Relying on a patient’s memory to confirm or deny their current medications might have biased the results. However, this method of measuring the accuracy of the medication list had been used annually since 2004. Therefore, clinic staff had up to 4 years of experience with this process. Data analysis at the clinic level did not account for individual physician practices. The clinic data were linked over time, but patients were not matched over time. To adjust for this discrepancy, a sequential cross-sectional design was used to study outcomes within the same set of clinics.

The relationship between the interventions and the measured outcomes was not defined. The project provided extensive education and self-management tools to the target population, but a direct causal effect on the improved accuracy of the medication lists could not be confirmed. Confounding variables might have influenced the results. Information directed at consumers has become readily available from other sources on medication safety.²⁴ Changing behaviors and practices takes time; measured results might improve as more patients adopt the use of personal medication lists. Some of the patients, who received a medication list or bag, might not have been seen in the clinic during the data collection period. Therefore, the findings might be more

conservative than if they had been measured over a longer period of time. The results of this study suggest that patient self-management tools are important, but broader evaluation is necessary to determine which specific interventions are most effective at improving medication list accuracy.

The interventions identified for providers might not be relevant in other outpatient settings. At the time of the study, the intervention clinics used paper-based charting, not electronic medical records (EMR). The medication reconciliation processes could differ depending on differences in system issues, such as staffing patterns and technology. However, during replication efforts at some of the comparison clinics, the project team identified similar process issues, regardless of level of staff or electronic charting. Although technology, such as EMR, has great potential to reduce the risk of errors in the medication process, process issues—such as medication reconciliation—still need to be addressed.^{25, 26}

As with patients, a behavior change in providers may also take time, and results may improve as processes change. Providers could have been influenced by interventions other than those identified by the project, including recent emphasis and education by professional organizations.^{6, 7} Although multiple interventions were implemented, this study did not assess the effects of each one separately. Therefore, the results might not be attributable to a single intervention.

Conclusion

Patient-centered care strategies, applied at the community level, are associated with significant improvement in the accuracy of the medication list in the outpatient setting. Both patient and provider interventions are necessary to facilitate a collaborative approach to medication management. While a perfectly accurate medication list cannot be attributed to a single intervention or tool, addressing medication safety as a public health problem could be an effective approach. As Americans continue to consume medications with a voracious appetite, humans (both patients and providers) will continue to err. Using a collaborative approach involving education, accountability, and technology, consumers and providers can tackle the public health challenge of medication safety together.

The success of the Walworth County Patient Safety Council in creating an effective patient-provider partnership that improved medication safety was recognized with a 2007 Institute for Safe Medication Practices Cheers Award.²⁷ The methods and tools used in Walworth County are available in two toolkits accessible through the CAPS Web site at www.patientsafety.org.

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