Effects of Pharmacist Chart Review and Pharmacist Interventions on Diabetes GAP Scores in the Rural Ambulatory Care Setting

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Abstract

Background: The Minnesota Community Measurement assesses health system performance for diabetes care based on five measures: blood glucose (A1c), blood pressure (BP), cholesterol (LDL), tobacco use, and aspirin use, aggregated and known as a "GAP score." Rural areas are negatively impacted by inadequate diabetes care. The positive impact of direct pharmacist patient care on diabetes management is well established, but research on indirect care is lacking.

Objective: To assess the impact of pharmacist chart review on GAP scores in a rural primary care clinic.

Methods: This was an evidence-based practice project conducted in a rural primary care clinic. Pre- and post-intervention GAP data were collected between January 1, 2023, and February 27, 2024. For each patient, pharmacists reviewed patient medical records for GAP score–related interventions. Reviews were completed at least one day prior to the patient's primary care appointment and sent to the appropriate providers via a secure messaging system. The primary study outcome was the frequency of patients experiencing a reduction in their GAP scores. Secondary outcomes included (1) the frequency of patients meeting the A1c, BP, LDL, tobacco use, and aspirin use GAP goals after one year, and (2) the frequency of patients transitioning from not meeting to meeting each of these GAP goals after one year. The primary and secondary outcomes were compared between the pharmacist and no-pharmacist intervention groups using Chi-square statistics.

Results: Patients in the pharmacist intervention group were more likely to experience a reduction in GAP score ($p<0.001$), and met the A1c and tobacco usage GAP goal more often. Meeting the tobacco use GAP goal, however, was related more to the greater number of patients at goal in the intervention group at baseline. The treatment group was more likely to transition from not meeting to meeting the A1c, blood pressure, and aspirin GAP goals after one year. No significant changes were seen for the LDL GAP goal.

Conclusions: Prospective pharmacist chart review may improve diabetes care in rural areas.

Keywords: pharmacists, diabetes mellitus, patient care, rural health, ambulatory care, electronic health records, glycated hemoglobin, aspirin, blood pressure, tobacco use, lipids

Background

In 2021, approximately 29.7 million people in the United States (U.S.) had a diagnosis of diabetes, and 1.2 million people are newly diagnosed with diabetes each year. Diabetes was the eighth leading cause of death in the U.S. in 2021, and in 2022, the total cost of diabetes, including direct and indirect costs, was estimated at $413 billion.[1]

Around 15% of the U.S. population lives in rural areas, equating to more than 46 million people, and they face disproportionately greater health disparities than seen in urban areas, resulting in a higher intrinsic risk of death. These disparities are linked to higher rates of diabetes, as well as to numerous factors including obesity, high blood pressure, cigarette smoking, less access to healthcare, higher rates of poverty, and lower insurance coverage, themselves each inextricably linked to diabetes.[2]

Health care organizations and policy makers in rural areas are implementing initiatives to address these disparities. One example is the "GAP score" initiative being implemented in rural areas of Minnesota. Minnesota Community Measurement is a nonprofit organization that assesses health system performance for diabetes care based on the "D5" metric identified by Foss et al. This metric covers the five major criteria—blood glucose (A1c), blood pressure (BP), LDL cholesterol, tobacco use, and aspirin use—at the center of holistic diabetes care, aggregating them into a single risk metric referred to a GAP score. Scores range from 0 to 5, with 0 indicating that all goals are met.[3]

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Minnesota's persistent attention to diabetes care through annual reporting of health system care quality and clinic performance, using metrics like the D5, has proven beneficial. Kazemian et al., for example, found that the likelihood of a patient achieving their diabetes management goals was nearly twice as high as in other studies conducted nationwide.[4]

Health disparities in rural areas are also related to a scarcity of physicians and other primary care providers.[5] One strategy to mitigate this issue is through the utilization of other clinicians, such as ambulatory care pharmacists, to support physicians in their patient care activities. The benefits of pharmacists in the ambulatory care setting are well established.[6,7] A rural clinic in Minnesota recently implemented a small quality improvement project utilizing pharmacist-led Medication Therapy Management (MTM) to reduce drug therapy problems and improve D5 markers. The project's pharmacist-led direct patient care services improved D5 metrics.[8]

Unfortunately, financial challenges limit the use of pharmacists in rural health care. Complex health insurance reimbursement models, combined with the costs of recruiting and retaining pharmacists to work in rural communities, often prohibit rural health care providers from utilizing pharmacists in new ways that improve patient outcomes. Case studies and pilot projects that assess the effectiveness of new roles for pharmacists are a critical first step in demonstrating proof of concept for those new roles.

One way to address these challenges is to use pharmacists as a source of indirect patient care, through activities such as prospective chart review. By reviewing patient charts ahead of regularly scheduled primary care visits, pharmacists can identify key areas of concern and alert providers. This allows providers more time to prepare for the patient visit, and more time to address identified concerns with the patient, leading to improved patient outcomes. Chart reviews are also very flexible, and can be structured around a pharmacist's existing workload.

Objective

The objective of this pilot study is to evaluate the impact of ambulatory care pharmacist chart review on GAP scores in a rural primary care clinic over a one-year period. This includes the frequency of patients meeting the A1c, BP, LDL, tobacco use, and aspirin use GAP goals after one year, and the frequency of patients transitioning from not meeting to meeting each of these GAP goals after one year.

Methods

The methods used in this study were approved by the North Dakota State University Institutional Review Board. This was an evidence-based practice project that utilized intervention and comparison cohorts.[9-11] Patients were included in the study if they had a diagnosis of diabetes and had multiple GAP scores during the study window. Patients were excluded if they did not have a diagnosis of diabetes on file in the clinic's electronic medical records, or if a complete set of pre-GAP and post-GAP data was unavailable for analysis.

Starting on January 1, 2023, the clinic's pharmacists reviewed medical records (inclusive of GAP score–related interventions) for any patients who met the study's inclusion criteria and were scheduled for an upcoming primary care appointment. Upon completing the review, the pharmacist forwarded any recommendations to the appropriate provider through a secure messaging system. All pharmacist recommendations, provider approvals of the recommendations, and patient outcomes were tracked. Recommendations were recorded in a Microsoft Excel spreadsheet, and responses to interventions were tracked the following day. For the purposes of this study, patients reviewed by a pharmacist were considered the "pharmacist intervention" group. An equal number of patients from the same health organization network and who were not reviewed by a pharmacist were randomly selected to serve as a comparative baseline. Pre-GAP and post-GAP data were collected for both groups between January 1, 2023, and February 27, 2024.

The primary study outcome was the frequency (whether expressed as a count or equivalently as a proportion) of patients with a reduction in their GAP score. Secondary outcomes included (1) the frequency of patients meeting the A1c, BP, LDL, tobacco use, and aspirin use GAP goals after one year, and (2) the frequency of patients who transitioned from not meeting to meeting each of these GAP goals after one year.

Chi-square tests were used to analyze the primary and secondary outcomes. Odds ratios were calculated for statistically significant outcomes. All hypothesis tests utilize a 5% significance level. All statistical analyses were computed using Microsoft Excel Version 2019.

Results

A total of 411 patients were reviewed by a pharmacist. Of the approximately 4,500 patients in the medical records who had a diabetes diagnosis but were not reviewed by a pharmacist, another 411 patients were randomly selected to serve as the comparison group. After excluding patients with only pre- or post-GAP data, 378 patients in the pharmacist intervention group and 337 patients in the non-pharmacist intervention group were included in the study. Primary and secondary outcome data can be found in Table 1.

Primary Outcome

Patients in the pharmacist intervention group were significantly (1.22 times) more likely to experience a reduction in their GAP score compared to patients in the comparison group ($p<0.001$). Overall, pharmacist chart review increased

the number of patients with an improved GAP score by 10% (n=57).

Secondary Outcomes

A1c Goal

A greater proportion of patients in the pharmacist intervention group met the A1c GAP goal (p=0.003). Similarly, patients in the pharmacist intervention group were 1.49 times more likely than those in the comparison group to transition from not meeting to meeting their A1c goal. Cumulatively, pharmacist review increased the number of patients making this transition by 17.3% (n=80).

BP Goal

There was no significant difference between the groups in the proportion of patients meeting the BP GAP goal (p=0.475). Patients in the pharmacist intervention group were, however, significantly (2.98 times) more likely than patients in the comparison group to transition from not meeting to meeting this goal (p<0.001). Pharmacist review increased the number of patients making this transition by 45.9% (n=39).

LDL Goal

The proportion of patients meeting the LDL GAP goal did not differ significantly between groups (p=0.944), nor did the proportion of patients transitioning from not meeting to meeting the LDL goal (p=0.064).

Tobacco Use Goal

While a greater proportion of patients in the pharmacist intervention group met the tobacco use GAP goal (p=0.004), no patients in either group transitioned from not meeting to meeting the goal.

Aspirin Use Goal

There was no significant difference between the groups in the proportion of patients meeting the aspirin GAP goal (p=0.438). Patients in the pharmacist intervention group were, however, 2.23 times more likely than patients in the comparison group to transition from not meeting to meeting the aspirin goal (p=0.009). Overall, pharmacist review increased the number of patients making this transition by 1.46% (n=6).

Discussion

The objective of this pilot study was to evaluate the impact of pharmacist-provided prospective chart review, prior to an upcoming primary care visit, on the successful management of diabetes among rural Minnesota residents. Study results indicated that pharmacist intervention increased the likelihood of GAP score reduction—indicating an improvement in diabetic control—and raised the number of patients with an improved GAP score.

The results of this study are important for both rural health and pharmacy practice. Pharmacist chart review has been implemented in other ambulatory care services, and the few studies that have been conducted show that pharmacists can significantly improve patient outcomes. Pharmacists in a heart failure clinic, for example, evaluated the impact of medication reviews on drug-related problems, finding a statistically significant reduction in drug-related problems in the pharmacist intervention group compared to the control group.[12]

The clinical impact of prospective pharmacist chart review on diabetes care is not well-researched. Given the high prevalence of diabetes in rural areas, as well as the potentially catastrophic health outcomes that occur from consistently poor management of diabetes, research of this nature is vitally important. This study's results indicate that pharmacists can have a major impact on diabetic outcomes. Moreover, prospective pharmacist chart review is a flexible and relatively efficient means to positively impact health outcomes. These findings highlight the potential for integrating indirect pharmacist interventions into routine care, particularly in rural or underserved areas where direct care resources are limited.

Pharmacist recommendations were especially effective at transitioning patients from not meeting to meeting their A1c, BP, and aspirin use goals. Interestingly, prospective pharmacist chart review did not assist patients in meeting their LDL goals. This is likely due to the LDL goal algorithm's modest alignment with clinical guidelines and to problems with the calculation[13]—specifically, the algorithm's inability to define the result (met or not met) for patients age 40 years or older with an LDL of 40–70 mg/dL. For the purpose of this study, we assumed these patients did not meet the LDL goal because the algorithm defines the requirements for meeting the goal (Figure 1).

The implications of this finding are twofold. First, health care organizations seeking to implement prospective pharmacist chart review for their diabetic patients should direct their pharmacists to focus on those elements of the GAP scores—A1c, BP, and aspirin use—for which the pharmacist's recommendations to the primary care provider are more likely to help patients meet the related goals. Second, organizations seeking to improve the proportion of patients who meet their LDL goals are encouraged to examine and, if feasible, adjust the goal criteria.

This study exhibits several limitations. The individual goals for the GAP score are not entirely guideline-based targets for individualized therapy, but are instead more appropriately interpreted as population-level targets. The fluidity of the GAP score means that an individual could, for example, go from meeting to not meeting the BP goal based on a single measurement. While pharmacists make recommendations to

providers based on the chart review, they have no direct control over whether a recommendation is accepted by the provider, and it is impossible to use electronic health record data to determine whether a provider already had a pharmacist's recommendation in mind before the recommendation was provided. And the aspirin GAP algorithm does not define appropriate medications, allergies, or contraindications. For the purpose of this study, only salicylate, antiplatelet, and anticoagulant use, and the existence of an aspirin allergy, were used in the calculation.

Lastly, the patients in this study came from a single health system and geographic region, with an older adult majority, and all data tracking and manipulation were done manually. Both of these study characteristics may limit the generalizability of its findings, which could lead to errors. Future research should aim to replicate these findings in an array of healthcare settings and further investigate clinical outcomes of chart review in managing other chronic diseases.

Conclusion

Indirect pharmacist-led chart review services are a novel approach to delivering pharmacy services in rural areas. This study demonstrates the positive impact of pharmacist-led chart review on objective diabetes markers in the rural ambulatory care setting.

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Conflicts of Interest: The authors declare no relevant conflicts of interest or financial relationships.

References

1. National Diabetes Statistics Report. May 15, 2024. https://www.cdc.gov/diabetes/php/data-research/index.html
2. About Rural Health. About Rural Health. May 16, 2024. https://www.cdc.gov/rural-health/php/about/index.html
3. Foss R, Fischer K, Lampman MA, et al. Disparities in Diabetes Care: Differences Between Rural and Urban Patients Within a Large Health System. *Ann Fam Med*. 2023;21(3):234-239. doi:10.1370/afm.2962
4. Kazemian P, Shebl F, McCann N, Walensky R, Wexler D. Evaluation of the Cascade of Diabetes Care in the United States, 2005-2016. *JAMA Intern Med*. 2019;179(10):1376. doi:https://doi.org/10.1001/jamainternmed.2019.2396
5. Gong G, Phillips SG, Hudson C, Curti D, Philips BU. Higher US Rural Mortality Rates Linked To Socioeconomic Status, Physician Shortages, And Lack Of Health Insurance. *Health Aff (Millwood)*. 2019;38(12):2003-2010. doi:10.1377/hlthaff.2019.00722
6. Mohammad I, George J, Zimmerman J, Elteriefi R. Impact of Ambulatory Care Pharmacist-Led Diabetes Mellitus Management on Hemoglobin A1c Values Among Patients With Diabetes in a Primary Care Clinic Over Two Years. *Innov Pharm*. 2022;13(2):5. doi:10.24926/iip.v13i2.4815
7. Sease JM, Franklin MA, Gerrald KR. Pharmacist management of patients with diabetes mellitus enrolled in a rural free clinic. *Am J Health Syst Pharm*. 2013;70(1):43-47. doi:10.2146/ajhp120221
8. Sirek A. *Medication Therapy Management Implementation in Conjunction with a Rural Health Clinic in Minnesota: A CQI Impact on Diabetes Metrics*. Dissertation. 2022. https://digitalcommons.centracare.com/theses-dissertations/4
9. Dusin J, Melanson A, Mische-Lawson L. Evidence-based practice models and frameworks in the healthcare setting: A scoping review. *BMJ Open*. 2023;13(5). doi:10.1136/bmjopen-2022-071188
10. Sackett DL. Evidence-based Medicine. *Semin Perinatol*. 1997;21(1):3-5. doi:10.1016/s0146-0005(97)80013-4
11. Rosswurm MA, Larrabee JH. A model for change to evidence-based practice. *Image J Nurs Sch*. 1999;31(4):317-322. doi:10.1111/j.1547-5069.1999.tb00510.x
12. Yates L, Valente M, Wadsworth C. Evaluation of Pharmacist Medication Review Service in an Outpatient Heart Failure Clinic. *J Pharm Pract*. 2020;33(6):820-826. doi:10.1177/0897190019842696
13. American Diabetes Association Professional Practice Committee, ElSayed NA, Aleppo G, et al. 10. Cardiovascular Disease and Risk Management: *Standards of Care in Diabetes—2024*. *Diabetes Care*. 2024;47(Supplement_1):S179-S218. doi:10.2337/dc24-S010

Table 1. Primary and Secondary Outcome Counts		
A: GAP Score Changes		
	Groups	
Score Change	**Pharmacist Intervention**	**No Pharmacist Intervention**
Improvement	214	157
No Improvement	164	180
Pearson Chi-square Prob.		<0.001
B: A1c GAP Goal Postintervention		
	Groups	
Goal Result	**Pharmacist Intervention**	**No Pharmacist Intervention**
Met	277	223
Not Met	101	114
Pearson Chi-square Prob.		0.003
C: A1c GAP Goal Transition		
	Groups	
Transition	**Pharmacist Intervention**	**No Pharmacist Intervention**
Transitioned to Meeting Goal	199	119
No Transition	179	218
Pearson Chi-square Prob.		<0.001
D: LDL GAP Goal Postintervention		
	Groups	
Goal Result	**Pharmacist Intervention**	**No Pharmacist Intervention**
Met	188	170
Not Met	190	167
Pearson Chi-square Prob.		0.783
E: LDL GAP Goal Transition		
	Groups	
Transition	**Pharmacist Intervention**	**No Pharmacist Intervention**
Transitioned to Meeting Goal	75	55
No Transition	303	282
Pearson Chi-square Prob.		0.064

F: BP GAP Goal Postintervention		
	Groups	
Goal Result	**Pharmacist Intervention**	**No Pharmacist Intervention**
Met	281	245
Not Met	97	92
Pearson Chi-square Prob.		0.475
G: BP GAP Goal Transition		
	Groups	
Transition	**Pharmacist Intervention**	**No Pharmacist Intervention**
Transitioned to Meeting Goal	117	78
No Transition	261	259
Pearson Chi-square Prob.		<0.001
H: Tobacco Use GAP Goal Postintervention		
	Groups	
Goal Result	**Pharmacist Intervention**	**No Pharmacist Intervention**
Met	326	271
Not Met	52	66
Pearson Chi-square Prob.		0.004
I: Tobacco Use GAP Goal Transition		
	Groups	
Transition	**Pharmacist Intervention**	**No Pharmacist Intervention**
Transitioned to Meeting Goal	0	0
J: Aspirin GAP Goal Postintervention		
	Groups	
Goal Result	**Pharmacist Intervention**	**No Pharmacist Intervention**
Met	368	330
Not Met	10	7
Pearson Chi-square Prob.		0.438
K: Aspirin GAP Goal Transition		
	Groups	
Transition	**Pharmacist Intervention**	**No Pharmacist Intervention**
Transitioned to Meeting Goal	10	4
No Transition	368	333

Pearson Chi-square Prob.		<0.001

Figure 1. Requirements to Meet the Individual GAP Goals