

Resident Physician Empathy and Health Literacy Communications Associated with Diabetes Control

ABSTRACT

Background and Objectives: One third of U.S. adults struggle to understand health related information. To enhance patient understanding and outcomes, resident physicians must adapt communications to the patient's health literacy level. These communications are particularly important when treating the patient for diabetes that requires intensive self-management. The present study examined diverse patients' perceptions of resident physicians' communications after resident health literacy communication training.

Materials and Methods: We examined the association between patient perceptions of resident physician's communications and diabetes control in a cross-sectional, correlational study in a convenience sample of patients with diabetes who consented to the survey within a month of clinic visits. After resident physician training, 160 Medicaid managed care adults seen at a Federally Qualified Health Center for type 2 diabetes were invited to complete a one-page survey on patient-provider communications (i.e., empathy, health literacy from Consumer Assessment of Healthcare Providers and Systems), treatment understanding, and diabetes control in 2018. Clinic staff recorded HbA1c upon survey completion with no patient identifiers and data were analyzed with logistic regression.

Results: Non-Latino White and English-speaking Latino American patients rated resident physicians higher in empathy and health literate communications than Spanish-speaking Latino Americans. Patient perceptions of resident physician empathy and health literate communications were associated with diabetes treatment plan confidence. Patient perceptions of resident physician empathy were associated with diabetes control.

Conclusion: Empathetic resident physician communications consistent with health literacy levels may improve patients' understanding of the self-management required for diabetes control. Investing in training programs that target physician communication skills that are empathic and consistent with the patient's health literacy may improve diabetes control by encouraging dialogue and shared decision making about the treatment plan.

Paper Type: Research Article

Keywords: Information Literacy, Health Education, Stereotyping, Social Inclusion, Social Stigma.

Kelly R. Morton

* Department of Family Medicine, Department of Psychology, Loma Linda University. (Corresponding author): kmorton@llu.edu

Patricia M. Flynn

Department of Psychology, Department of Preventive Medicine, Loma Linda University.

Jeffrey Cho

Department of Family Medicine, Loma Linda University.

Ihuoma Chukwueke

Department of Family Medicine, Loma Linda University.

Received: 02 May 2023

Accepted: 01 July 2023

Doi: 10.22038/jhl.2023.73703.1455

► **Citation:** Morton KR, Flynn PM, Cho J, Chukwueke I. Resident Physician Empathy and Health Literacy Communications Associated with Diabetes Control. *Journal of Health Literacy*. Winter 2024; 8(4): 104-115.

Introduction

Health literacy is the ability to obtain, process, understand, and act on basic health information (e.g., prescription bottles, appointment slips, physician treatment recommendations, health education materials) (1, 2). It is estimated that over one third of adults struggle to understand healthcare information (3). Specifically, Latino Americans, the elderly, and those with less than a high school education are more likely to have lower health literacy that increases the risk of poor outcomes. Unfortunately, even patients with high health literacy can have difficulty understanding treatment recommendations due to physician use of medical jargon and/or anxiety during medical visits. As such, resident physician training should include activities to enhance empathic and health literate consistent communication skills. For example, asking patients to describe their plan for treatment and next steps of care can decrease miscommunication while empathy from the physician can help the encounter feel safe and nonjudgmental. Ultimately, patient understanding of the treatment plan is a critical precursor to facilitating treatment adherence and better health outcomes. Health professionals must take responsibility for improving health literacy so that health information can be understood by all patients, and this is especially true for patients with diabetes that requires intensive self-management with medication dosages potentially needing adjustments after daily dietary intake.

It is not well understood how patient perceptions of physician communications may impact diabetes treatment

understanding and subsequent health outcomes. We do know that managing diabetes requires significant changes to diet, exercise and medication management that are likely associated with health literacy. Physicians must empower and educate patients to manage this chronic illness as well as motivate patients to modify lifestyle behaviors for diabetes control (4). Diabetes prevalence worldwide is increasing; currently 10.5% of the world's adult population have diabetes and uncontrolled diabetes is a leading cause of poor health outcomes, early mortality and healthcare expenditures that may reach \$1,054 billion by 2045(5). Diabetes control is linked to rigorous self-management of medications and lifestyle changes (i.e., diet, exercise, sleep) though more research is needed to understand if physician communication skills can be taught and if these skills improve diabetes control(6). Due to the self-management requirements of diabetes, patients with diabetes are an ideal population to examine the relationship between health literacy consistent communication skills and their relationship to health outcomes. It is also of interest whether these skills can be taught to resident physicians to promote empathy and patient understanding and confidence in the treatment plan during diabetes care visits (7). This investigation examined this relationship between patient perceptions of physician communication and empathy to predict diabetes control after resident training on health literacy, patient-centered communications, and teach back methods. Diabetes health literacy has been identified as a driver of diabetes control worldwide and this investigation added to this literature by

examining resident physician communication skills that may enhance diabetes self-management and control (8).

The link between low health literacy and poor type 2 diabetes mellitus outcomes is known, (9) however, what is not known is whether a primary care physician can effectively address diabetes care knowledge by accounting for patient health literacy levels. Primary care physicians frequently treat diabetes during very brief patient encounters and therefore have a significant role to play in diabetes control and outcomes. If brief methods to communicate and enhance diabetes education are effective, then a large population of patients can achieve better diabetes outcomes and fewer complications (e.g., hospitalization; emergency care; and early mortality) (10, 11). Unfortunately, patients may feel embarrassed when not understanding a physician or uncomfortable asking follow-up questions. As a result, the communication burden often falls on the physician to provide a safe and empathic interaction with clear and unhurried communications so the patient can trust the physician enough to ask follow-up questions. Because patient health literacy level is not obvious, all patient-physician communications should use techniques to ensure understanding as patients often overestimate their own health literacy skills (12). Most diabetes care is provided in primary care where good patient education is associated with diabetes control(13, 14) However, what we investigate here is whether health literacy training in family medicine residency education impacts diabetes education in clinic visits to ultimately improve diabetes control. This

investigation examined this link between patient perceptions of physician communications (as an indicator of a patient-centered, health literacy aware communication) and diabetes control (HbA1c and patient confidence and understanding of diabetes care) to fill this gap.

Unfortunately, physicians often overestimate their use of clear communication with patients and are often not trained on health literacy consistent communication skills. For example, although resident physicians report using plain language 88% of the time, they actually used an average of two medical jargon terms per minute during a standardized patient encounter (15). Patients, particularly those with low health literacy, may not understand medical terms and then have poor understanding of the treatment plan leading to worse health outcomes. Though the ACGME (Accreditation Council for Graduate Medical Education) includes communication skills as a core competency, resident physicians report not receiving adequate training in health literacy skills to improve communication with patients (16). Residents who lack such training may feel uncertain about reasons for poor diabetes control. In fact, empathy for patients can decline during medical training and a lack of health literacy training could be one driver of this decline and both can adversely impact health outcomes (17-19). Fortunately, empathy is a trainable skill (20) and interventions can increase physicians' capacity to empathize with patients (21). In addition, health literacy training can increase physician self-reported knowledge, confidence, and use of plain language in patient care (22). Although these

physician self-report findings are promising, a better understanding of patients’ perceptions of their resident physician’s health literacy aware and empathic communication skills and the link to diabetes control is warranted.

The purpose of this study was twofold: 1) to examine patients’ perceptions of resident physicians’ communications after health literacy and empathic communication skills training to predict treatment plan understanding after controls (age, gender, ethnicity, language), and 2) to test whether patient perceptions of physician’s communication skills (health literacy, empathic communication, and treatment plan understanding) predicts diabetes control (HbA1c) after controls (age, gender, ethnicity, language, medication adherence to assess overall diabetes self-management) in a convenience sample of culturally diverse patients at a Federally Qualified Health Center (FQHC) based family medicine residency clinic. Inclusion criteria were patients diagnosed with type 2 diabetes attending a diabetes visit. This sample population is of interest because significant self-management education is typically discussed during this visit type to achieve diabetes control (e.g., medication, diet,

exercise, clinic visits every three months to assess HbA1c labs).

Materials and Methods

Participants and Procedures. Thirty Family Medicine residents providing care in a continuity clinic within an underserved, urban, Federally Qualified Health Center (FQHC) in Southern California participated in a 45-minute health literacy and a 45-minute empathic communication training session (see Table 1). The first training session included content from the Health Literacy Universal Precautions Toolkit (23) (e.g., definition, prevalence, health implications) with practice using the core health literacy communication skills (e.g., slow speech, avoid medical jargon, use plain language, listen, be specific, teach-back, focus on 1-3 key points). The second session included content on empathy and empathic communication skills (e.g., perspective-taking, active listening, empathic responding, and awareness of personal emotional experience) that were practiced in a role-play of a patient with low health literacy. Sessions included active learning strategies such as patient testimonials, games, role-play, and group discussions.

Table 1. Best Practices in Health Literacy and Empathic Communication

Health Literacy*	1- Create a shame-free environment.
	2- Talk slowly.
	3- Use simple words.
	4- Avoid medical jargon.
	5- Be specific rather than general.
	6- Focus on 1-3 key points.
	7- Use teach-back to confirm patient understanding.
Empathic Communication	8- Put yourself in your patients’ shoes (practice perspective taking).
	9- Actively listen to your patients (make eye contact).
	10- Use empathic words to communicate with your patients.
	11- Be mindful of your own emotional experience.

* Based on the AHRQ Health Literacy Universal Precautions Toolkit

After resident training, 160 Medicaid managed care adult patients (38 Non-Latino White; 122 Latino; Table 2) seen by resident physicians for a type 2 diabetes care visit were invited to complete anonymous surveys on perceived patient-physician communications and treatment understanding. Patients were on average middle aged (M=52.22), female (58.8%), and Latino American who spoke English (44.4%). Medical assistants added the patient's current Hemoglobin A1c (HbA1c) to the anonymous survey (in English or Spanish) before placing it in a locked box in the clinic. The study was deemed to be exempt by the Loma Linda University Institutional Review Board (#5140358). All participants were consented and completed the anonymous 10-minute survey after the diabetes care visit.

Table 2: Patient Demographic Characteristics (n=160)

Variable		Mean, N	SD, %
Age, Range (24-96)		52.22	11.70
HbA1c, Range (5.2-16.0)		8.6	2.26
Gender	Male	64	40
	Female	94	58.8
	Missing	2	1.3
Ethnicity, Language Preference	Non-Latino White American-English	38	23.8
	Latin American-English	71	44.4
	Latin American-Spanish	51	31.9

Measures

Patient Perceptions of Resident Health Literate and Empathic Communications.

Patients rated the resident physicians' health literacy communication skills on four items from the CAHPS scale (Consumer Assessment of Healthcare Providers and Systems). Specifically, they rated if their doctor: "talked too fast," "used difficult words," "explained

how and when to take my medications," and "didn't listen to me," on a 4-point Likert scale from "strongly disagree" to "strongly agree" (24). Higher scores indicate better communication skills and inter-item reliability was high ($\alpha = .92$). Patients rated perceived empathic communication on a single item: "My doctor showed compassion towards me" with a 4-point Likert scale; higher scores reflect greater perceived empathy, and the item has been used successfully in other research studies (25).

Patient Treatment Plan Understanding / Adherence.

Patients indicated how confidently they understand: "the things I discuss with my doctor" and "when and how often I should take my diabetes medication" on a 4-point Likert scale; higher scores represent greater confidence in treatment plan understanding. The items had high inter-item reliability ($\alpha = .93$). For statistical analyses, scores of 1-3 were coded as "0" to reflect "not confident I understand" and 4 was coded as "1" to reflect "confident I understand".

A single medication adherence item was created for this study: "How often do you miss more than one dose of your medication?" was rated on a 4-point scale ("always", "often", "sometimes," "never"). Higher scores indicate better medication adherence.

Diabetes Control - HbA1c. The medical assistant recorded patients' HbA1c from point of care testing that day or from a chart audit of a point of care test within the past 3 months. HbA1c was coded as controlled diabetes <7.5 or uncontrolled diabetes >7.5 for logistic regression analyses (26).

Statistical Analyses. Statistical analyses were conducted using IBM SPSS Statistics version 24. T-tests, chi-square tests, and analyses of variance (ANOVA) were conducted to examine differences in patient ratings of physicians' communication skills (i.e., health literacy, empathy) and diabetes outcomes (i.e., confident understand treatment plan, HbA1c control). Two binary logistic regression models were used to examine whether treatment plan understanding and HbA1c diabetes control are predicted by patient perceptions of resident physician communications after controlling for age, gender, and ethnicity/language preference. In the logistic regression predicting HbA1c, medication adherence was also included as a control. Odds ratios (OR) with 95% confidence intervals (CI) are reported.

Results

Health Literacy and Empathic Communication Skills. The trained family medicine resident physicians were evaluated favorably by patients on both health literate ($M= 3.27$, $SD=.84$, range 1-4) and empathic ($M= 3.28$, $SD=.89$, range 1-4) communications. There were no differences in ratings of physician communication based on patient age or gender. There were significant differences in these ratings by patients' ethnicity/language for both health literacy [$F(2, 156) = 8.68$, $p=.001$], and, empathy [$F(2, 152) = 13.36$, $p=.001$]. Post hoc comparisons revealed that Non-Latino White Americans and English-speaking Latino Americans evaluated residents better on health literacy (MNon-Latino White= 3.39, $SD=.73$; MLatino-English= 3.49, $SD=.64$; MLatino-Spanish =

2.90, $SD= 1.02$) and empathic (MNon-Latino White = 3.54, $SD=.61$; MLatino-English = 3.49, $SD=.66$; MLatino-Spanish = 2.78, $SD= 1.12$) communication than Spanish-speaking Latino Americans.

There were significant differences in physician communication ratings by patients' diabetes outcomes. Following the diabetes care visit, 49% of patients indicated they were not confident they understood their treatment plan. Figure 1 represents the mean differences in physician communication skills for patients who understood their treatment plan compared to those who did not. ANCOVA (controls: age, gender, ethnicity/language) results indicate that patients who understood their treatment plan perceived better physician health literate, $F(1, 136) = 9.85$, $p=.002$, and, empathic communication skills, $F(1, 139) = 4.82$, $p=.03$, than patients who were not confident they understood the treatment plan.

Patient HbA1c levels indicated 36% were controlled and 57% were uncontrolled. Patients with controlled HbA1c perceived better physician empathic communication skills, $F(1, 134) = 4.28$, $p=.04$, than those with uncontrolled HbA1c (see Figure 2). There were no HbA1c group differences in resident physician health literacy skill ratings.

Diabetes Outcomes. The first logistic regression model predicting treatment plan understanding (controls: age, gender, ethnicity/language) with patient ratings of resident physician health literacy and empathic communication skills was significant ($X^2=29.48$, $p=.00$, $df = 6$). According to Nagelkerke's R^2 , 25% of the variation in treatment plan understanding

was accounted for by the predictors and the model correctly classified 72.3% of the cases. The Wald criterion demonstrated that resident physician health literacy ($p = .001$) and empathic ($p = .000$) communications were significant predictors of treatment plan understanding. Age, gender, and ethnicity/language were not significant

predictors. For every one-unit increase in physician health literacy communication, the odds a patient will understand their treatment plan is 2.35 times higher. Moreover, for every one-unit increase in physician empathic communication, the odds a patient will understand their treatment plan is 2.45 times higher (see Table 3).

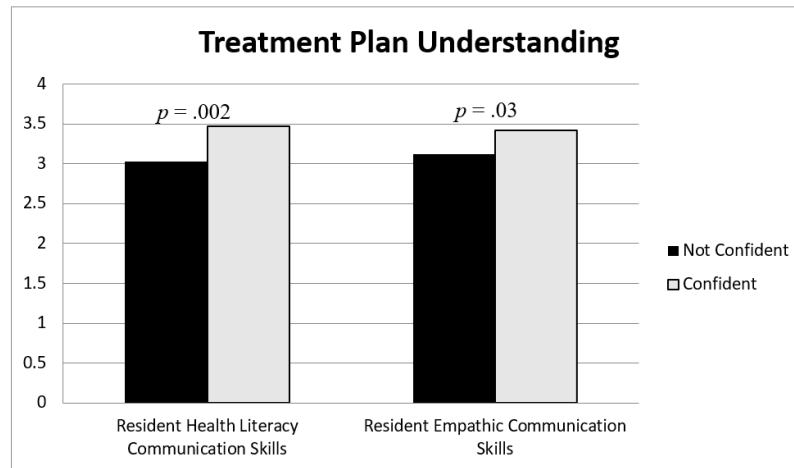


Figure 1: Mean scores for Perceived Resident Communication Skills based on Patients' Treatment Plan Understanding (controlling for age, gender, and ethnicity/language)

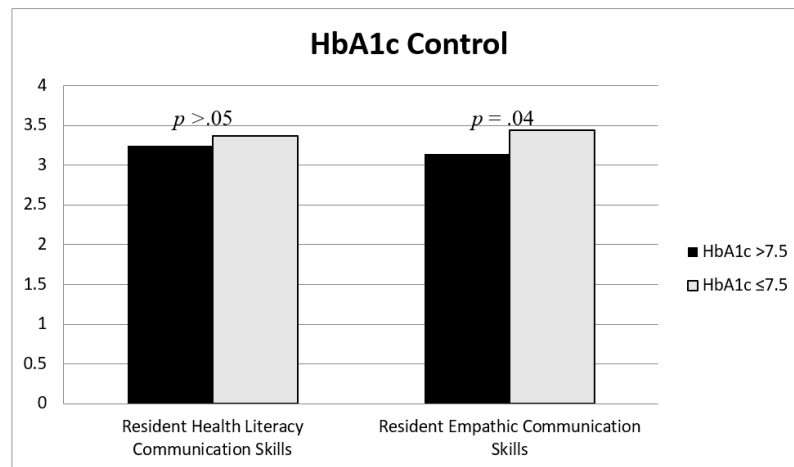


Figure 2: Mean scores for Perceived Resident Health Literacy and Empathic Communication Skills based on Patients' HbA1c Control (controlling for age, gender, ethnicity / language).

The second logistic regression model predicted HbA1c control using patient perceptions of resident physician health literacy communication, empathic

communication, and treatment plan understanding after controls (age, gender, ethnicity/language, medication adherence). The overall model was significant ($X^2=18.04$,

p=.021, df=8). Nagelkerke’s R2 indicated that the predictors accounted for 17% of the variation in HbA1c control and the model correctly classified 64.2% of cases. The Wald criterion demonstrated that resident empathic communication (p = .048) and medication adherence (p = .018) were significant predictors of HbA1c control. Age, gender, ethnicity/language, resident health

literacy communication, and treatment plan understanding were not significant predictors. For every one-unit increase in resident empathic communication, the odds of having controlled HbA1c (i.e., ≤7.5) was 1.81 times higher. In addition, for every one-unit increase in medication adherence the odds a patient will have controlled HbA1c was 2 times higher (see Table 3).

Table 3: Logistic Regression Predicting Diabetes Treatment Plan Understanding and HbA1c

Variable		Treatment Plan Understanding		HbA1c Control	
		OR	95% CI	OR	95% CI
Age		0.97	0.94-1.00	1.01	0.98-1.05
Gender	Female	1.00	referent	1.00	referent
	Male	1.00	0.45-2.18	0.71	0.32-1.61
Latin American-Spanish	Non-Latino White American- English	1.00	referent	1.00	referent
	Latin American- English	.39	0.14-1.09	0.46	0.17-1.24
	Latin American- Spanish	1.31	0.42-4.10	0.40	0.13-1.26
Medication Adherence		-	-	2.00*	1.13-3.57
Resident Health Literacy Communication		2.35***	1.41-3.92	1.15	0.69-1.92
Resident Empathic Communication		2.45***	1.51-3.97	1.81*	1.01-3.25
Treatment Plan Understanding		-	-	0.68	0.28-1.65

Discussion

Because a third of adults have low health literacy (3), and because diabetes requires intensive understanding of health information for self-management (5, 6, 9) we examined the association between perceived resident physician empathic and health literate consistent communications with patient treatment understanding and diabetes control (4). Our hope is that these skills can be taught, and that the delivery of these more skilled communications will ultimately enhance patient outcomes (7, 21). To this end, we assessed patients’ perceptions of their resident physician’s health literacy and empathic communication skills and the association of these perceptions

with diabetes outcomes in a sample of culturally diverse patients from an FQHC-based family medicine residency clinic. According to patients, the resident physicians exhibited many of the behaviors taught during the health literacy and empathic communication skills training such as talking slowly, using words the patient could understand, listening to the patient, and demonstrating compassion. Further, resident physicians’ use of health literacy and empathic communication skills are associated with patient confidence in understanding their diabetes treatment plan. It is notable that perceived physician empathy was the main predictor of diabetes control (i.e., HbA1c < 7.5) which is consistent literature

that shows the importance of empathy in patient care interactions (21).

These findings support the concept that physician communications that are empathic and promote health literacy may improve patient treatment plan understanding and diabetes control. Others, including Hojat et al also find an association between physician empathy and diabetes control, but this study adds an assessment of health literacy as well(27,28). Empathy for the patient reflects an affective and cognitive understanding of the patient's perspective. Communicating empathy may involve inviting a patient to share their experiences and explicitly acknowledging the validity of their perceptions and experiences (29, 30) Empathy is shown here to be important for treatment understanding and diabetes control, above and beyond the effects of reported medication adherence. As such, the patient sensing support and respect in the clinical encounter may facilitate an open and clear interaction that allows effective treatment plan discussions and shared decision-making. This may indicate that empathy can lead to interactions that promote health literacy for patients who need to take an active role in their disease management such as for patients who have been diagnosed with type 2 diabetes.

Patients with low health literacy report feeling shame and embarrassment when they do not understand health information (31, 32). If the resident physician conveys compassion and empathy when communicating health information in ways the patient can understand, then shame may be decreased and understanding the treatment plan will be enhanced (33). We

conclude that resident physician training in health literacy and empathic communication can potentially improve treatment understanding to also improve diabetes health outcomes.

The patients in this study sample were predominantly low-income and almost a third were Spanish speaking, which are both risk factors for low health literacy. These risks as well as the high rate of uncontrolled diabetes put these patients at risk for low treatment plan understanding. Spanish-speaking patients rated resident physicians lower in both empathy and health literacy communication skills than English-speaking patients and many required a translator during their diabetes care visit. Though resident physician communication training is likely important, it may also need to be extended to the translators in the clinic visits. Though some resident physicians did speak Spanish we found no moderating effect of shared language and did not assess the level of Spanish speaking fluency of the resident physicians. Physicians could benefit from additional training in cultural sensitivity, medical Spanish, and the effective use of medical interpreters to improve clinical outcomes for vulnerable populations with complex treatment regimens like diabetes (34).

A study limitation was a lack of assessment of the use of translators within the diabetes visits. This aspect of the clinic visit requires further study; it may be more difficult to ask questions about the treatment when using translation services that may be via an on-line platform. Another study limitation was the single item assessments of the empathy and

medication adherence study variables as well as the spoken languages during the clinic visit.

In addition, this study had no control group of residents, had only patient perceptions of communications rather than objective observer ratings, and only one HbA1c level rather than tracking levels over time. Overall, though the resident physician training may have been effective based on patient perceptions of high levels of empathy and health literacy consistent communications; a control group of resident physicians who received no communication training is needed to determine training efficacy. In addition, a cross-sectional, correlational design cannot determine causation, however, the resident training was delivered before the clinic visits indicating temporality in measurements.

Study strengths include a sample of diverse and underserved patients with diabetes as well as resident physicians from a moderately sized residency program that had provided empathy and health literacy training. The study findings are promising and suggest that such training efforts may be effective to improve patient outcomes. It is a study strength that clinic visit perceptions are associated with an objective measure of HbA1c as an assessment of glycemic control over the past three months. However, future research could benefit from following patients over time to examine whether empathic and health literate physician communication benefits patient outcomes longitudinally via enhanced doctor-patient relationship and patient education.

Conclusion

Health literacy communication skills may improve patient understanding of the treatment plan while empathic communication may impact treatment adherence and health outcomes. Both skillsets should be included in physician residency training to facilitate the growth of patient-centered physicians. Future studies should use longitudinal designs to determine long term diabetes outcomes in relation to physician communication and patient perceptions of these communications. It is likely that having continuity with a primary care physician could enhance an empathetic and compassionate physician-patient relationship to facilitate health literate aware communications to improve patient outcomes of a chronic illness like diabetes. Residency training programs can include such communication skill training to improve patient outcomes.

Acknowledgements: We would like to thank all participants who assisted the authors to run this study.

Availability of data and materials: Data will be provided by the corresponding author upon request

Conflicts of interest: The authors declare that they have no competing interests.

Consent for publication: Not applicable

Ethical considerations: this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable.

Funding: No financial support was received for this study.

Author's contributions: All researchers have participated equally in this research

References

- Christie GP, Ratzan SC. Beyond the Bench and Bedside: Health Literacy Is Fundamental to Sustainable Health and Development. *Stud Health Technol Inform*. 2020; 269:544-60.
- Njeru, J. W., Hagi-Salaad, M. F., Haji, H., Cha, S. S., & Wieland, M. L. (2016). Diabetes Health Literacy among Somali Patients with Diabetes Mellitus in a US Primary Care Setting. *Journal of racial and ethnic health disparities*, 3(2), 210-216. <https://doi.org/10.1007/s40615-015-0129-4> PMID: 27271060 PMCID: PMC4901386
- Parker RM, Ratzan S. Re-enforce, Not Re-Define Health Literacy-Moving Forward with Health Literacy 2.0. *J Health Commun*. 2019; 24(12):923-5. <https://doi.org/10.1080/10810730.2019.1691292> PMID: 31752603
- Lambrinou, E., Hansen, T. B., & Beulens, J. W. (2019). Lifestyle factors, self-management and patient empowerment in diabetes care. *European journal of preventive cardiology*, 26(2_suppl), 55-63. <https://doi.org/10.1177/2047487319885455> PMID: 31766913
- Sun, H., Saeedi, P., Karuranga, S., Pinkepank, M., Ogurtsova, K., Duncan, B. B., Stein, C., Basit, A., Chan, J. C. N., Mbanya, J. C., Pavkov, M. E., Ramachandaran, A., Wild, S. H., James, S., Herman, W. H., Zhang, P., Bommer, C., Kuo, S., Boyko, E. J., & Magliano, D. J. (2022). IDF Diabetes Atlas: Global, regional, and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes research and clinical practice*, 183, 109119. <https://doi.org/10.1016/j.diabres.2021.109119> PMID: 34879977
- Kim, S. H., & Lee, A. (2016). Health-Literacy-Sensitive Diabetes Self-Management Interventions: A Systematic Review and Meta-Analysis. *Worldviews on evidence-based nursing*, 13(4), 324-333. <https://doi.org/10.1111/wvn.12157> PMID: 27104337
- Paiva, D., Abreu, L., Azevedo, A., & Silva, S. (2019). Patient-centered communication in type 2 diabetes: The facilitating and constraining factors in clinical encounters. *Health services research*, 54(3), 623-635. <https://doi.org/10.1111/1475-6773.13126> PMID: 30815858 PMCID: PMC6505418
- Fina Lubaki, J. P., Omole, O. B., & Francis, J. M. (2022). Glycemic control among type 2 diabetes patients in sub-Saharan Africa from 2012 to 2022: A Systematic Review and Meta-Analysis. *Diabetology & Metabolic Syndrome*, 14(1), 134. <https://doi.org/10.1186/s13098-022-00902-0> PMID: 36127712 PMCID: PMC9487067
- Abdullah, A., Liew, S. M., Salim, H., Ng, C. J., & Chinna, K. (2019). Prevalence of Limited Health Literacy among Patients with Type 2 Diabetes Mellitus: A Systematic Review. *PLoS One*, 14(5), e0216402. <https://doi.org/10.1371/journal.pone.0216402> PMID: 31063470 PMCID: PMC6504081
- Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. (2011). Low health literacy and health outcomes: an updated systematic review. *Annals of Internal Medicine*, 155(2):97-107. <https://doi.org/10.7326/0003-4819-155-2-201107190-00005> PMID: 21768583
- De Abreu, I.R., Baia, C., Silva, J.M., Santos, A.M., Oliveira, M., Castro, F., Mozes, M., Ferreira, R., Alves, L.A. (2022). LitKDM2 study: The impact of health literacy and knowledge about the disease on the metabolic control of type 2 diabetes mellitus. *Acta Diabetologica*, 59:819-825. <https://doi.org/10.1007/s00592-022-01875-2> PMID: 35305157
- Macauda, M. M., Arent, M. A., Sakhujia, M., Yelton, B., Noblet, S., Fedrick, D., Zona, D., New, C., Isenhower, W. D., Wandersman, A., & Friedman, D. B. (2022). Elements for successful implementation of a clinic-based health literacy intervention. *Frontiers in public health*, 10, 977765. <https://doi.org/10.3389/fpubh.2022.977765> PMID: 36388330 PMCID: PMC9650509
- Kumah E, Afriyie EK, Abuosi AA, Ankomah SE, Fusheini A, Otchere G. (2021). Influence of the Model of Care on the Outcomes of Diabetes Self-Management Education Program: A Scoping Review. *Journal of Diabetes Research*, 2969243. <https://doi.org/10.1155/2021/2969243> PMID: 33688505 PMCID: PMC7914106
- Kim MT, Kim KB, Ko J, Murry N, Xie B, Radhakrishnan K, et al. (2020). Health Literacy and Outcomes of a Community-Based Self-Help Intervention: A Case of Korean Americans with Type 2 Diabetes. *Nurs Res*, 69(3):210-8. <https://doi.org/10.1097/NNR.0000000000000409> PMID: 31972848 PMCID: PMC7266039
- Howard T, Jacobson KL, Kripalani S. (2013). Doctor talk: physicians' use of clear verbal communication. *Journal of Health Communication*, 18(8):991-1001. <https://doi.org/10.1080/10810730.2012.757398> PMID: 23577746
- Ali NK, Ferguson RP, Mitha S, Hanlon A. (2014). Do medical trainees feel confident communicating with low health literacy patients? *J community Hosp Intern Med Perspect*, 4:1-5. <https://doi.org/10.3402/jchimp.v4.22893> PMID: 24765262 PMCID: PMC3992362
- Neumann M, Edelhauser F, Tauschel D, Fischer MR, Wirtz M, Woopen C, et al. Empathy decline and its reasons: a systematic review of studies with medical students and residents. *Acad Med*. 2011; 86(8):996-1009.

- <https://doi.org/10.1097/ACM.0b013e318221e615>
PMid: 21670661
18. Derksen F, Bensing J, Lagro-Janssen A. Effectiveness of empathy in general practice: a systematic review. *Br J Gen Pract.* 2013; 63(606):e76-84. <https://doi.org/10.3399/bjgp13X660814> PMid: 23336477 PMCID: PMC3529296
 19. Chu CI, Tseng CC. A survey of how patient-perceived empathy affects the relationship between health literacy and the understanding of information by orthopedic patients? *BMC Public Health.* 2013; 13:155. <https://doi.org/10.1186/1471-2458-13-155> PMid: 23421348 PMCID: PMC3584842
 20. Halpern J. From idealized clinical empathy to empathic communication in medical care. *Med Health Care Philos.* 2014; 17(2):301-11. <https://doi.org/10.1007/s11019-013-9510-4> PMid: 24343367
 21. Riess H. Empathy can be taught and learned with evidence-based education. *Emerg Med J.* 2022; 39(6):418-9. <https://doi.org/10.1136/emermed-2021-212078> PMid: 34933918
 22. Green JA, Gonzaga AM, Cohen ED, Spagnoletti CL. Addressing health literacy through clear health communication: a training program for internal medicine residents. *Patient Educ Couns.* 2014; 95(1):76-82. <https://doi.org/10.1016/j.pec.2014.01.004> PMid: 24492156
 23. Brega AG, Barnard J, Mabachi NM, et al. AHRQ Health Literacy Universal Precautions Toolkit, Second Edition; 2014.
 24. Weidmer BA, Brach C, Hays RD. Development and evaluation of CAHPS survey items assessing how well healthcare providers address health literacy. *Med Care.* 2012; 50(9 Suppl 2):S3-11. <https://doi.org/10.1097/MLR.0b013e3182652482> PMid: 22895227 PMCID: PMC5102018
 25. Amador JA, Flynn PM, Betancourt H. Cultural beliefs about health professionals and perceived empathy influence continuity of cancer screening following a negative encounter. *J Behav Med.* 2015; 38(5):798-808. <https://doi.org/10.1007/s10865-015-9646-1> PMid: 26032574
 26. National Institute for health and Care Excellence. Type 2 diabetes in adults: management. (NICE guideline 28.) 2015. www.nice.org.uk/guidance/ng28.
 27. Rakel DP, Hoefft TJ, Barrett BP, Chewing BA, Craig BM, Niu M. Practitioner empathy and the duration of the common cold. *Fam Med.* 2009 41(7), 494.
 28. Hojat M, Louis DZ, Maio V, Gonnella JS. Editorial: Empathy and Health Care Quality. *Amer J of Med Quality.* 2013 28(1), 6-7. <https://doi.org/10.1177/1062860612464731> PMid: 23288854
 29. Davis MH. Empathy: A social psychological approach. Social psychology series. 1994. Boulder, CO: Westview Press.
 30. Suchman A, Markakis K, Beckman H, 13. Christie GP, Ratzan SC. Beyond the Bench and Bedside: Health Literacy Is Fundamental to Sustainable Health and Development. *Stud Health Technol Inform.* 2020; 269:544-60.
 31. Ağralı, H., & Akyar, İ. (2022). The effect of health literacy-based, health belief-constructed education on glycated hemoglobin (HbA1c) in people with type 2 diabetes: A randomized controlled study. *Primary care diabetes,* 16(1), 173-178. <https://doi.org/10.1016/j.pcd.2021.12.010> PMid: 34980562
 32. Catapan, S. C., Nair, U., Gray, L., Cristina Marino Calvo, M., Bird, D., Janda, M., Fatehi, F., Menon, A., & Russell, A. (2021). Same goals, different challenges: A systematic review of perspectives of people with diabetes and healthcare professionals on Type 2 diabetes care. *Diabetic medicine: a journal of the British Diabetic Association,* 38(9), e14625. <https://doi.org/10.1111/dme.14625> PMid: 34154035
 33. White RO, Eden S, Wallston KA, Kripalani S, Barto S, Shintani A, Rothman RL. Health communication, self-care, and treatment satisfaction among low-income diabetes patients in a public health setting. *Patient Educ and Couns.* 2015:98(2), 144-149. <https://doi.org/10.1016/j.pec.2014.10.019> PMid: 25468393 PMCID: PMC4282939
 34. Nguyen GT, Bowman, MA. Culture, language, and health literacy: communicating about health with Asians and Pacific Islanders. *Fam Med.* 2007 Mar; 39(3):208-10.