Literacy and Health Outcomes

Is Adherence the Missing Link?

Low literacy is associated with a variety of adverse health outcomes, including increased mortality, hospitalization, and in some cases poorer control of chronic health conditions.¹⁻⁴ An increasing body of research, including several of the articles in this special issue of *JGIM*, has sought to understand the nature of the relationship between low literacy and adverse health outcomes. One important question is the degree to which low literacy skills directly or indirectly affect health outcomes (see Fig. 1). Direct relationships include those in which literacy is a necessary component of achieving good health outcomes; indirect relationships are those in which literacy is a marker for, but not a cause of, the actual factors that lead to poor health outcomes.

Understanding the relative contributions of direct and indirect pathways is crucial for the development of effective interventions to improve health outcomes. To the extent that literacy directly affects health outcomes, interventions should focus on improving literacy skills or providing accommodations such that a high literacy level is no longer required for achieving good outcomes. If literacy is only a marker for other conditions, such as lack of health insurance or transportation, which are directly linked to adverse outcomes, then interventions should be focused on overcoming those specific barriers.

One of the most commonly postulated direct pathways that may explain the association between literacy and adverse health outcomes involves the potential limitations in self-care skills among patients with low literacy. Researchers have theorized that low literacy limits the ability of the patient to acquire optimal self-care knowledge and skills, because acquiring such skills may require processing a great deal of sometimes complex information. Such information is often not provided in easy-to-understand formats. In the absence of sufficient self-care support, patients with low literacy may be unable to meet the care requirements of their condition, leading to adverse outcomes.

In this special issue of *JGIM*, 4 articles examine the relationship between literacy and one important type of self-care skill, appropriate adherence to medication. Three studies examined the relationship between literacy and understanding of medication instructions.⁵⁻⁷ Understanding how to take one's medication is a necessary precondition to successful adherence. If a patient cannot obtain and understand basic information about how to take his or her medication, his or her ability to adhere to the prescribed treatment regimen is compromised; if he or she understands how to take the medication, then the issue of whether or not they can repeat that behavior on an ongoing basis becomes salient. Similarly, measuring self-reported adherence is only relevant if the patient understands the regimen they are being asked to adhere to.

Kripalani et al.⁵ found that patients with low literacy had trouble identifying their medication by name, but once the medication was pointed out to them, they could describe how

to take the medication just as well as those with higher literacy. Davis et al. found that a sizable percentage of patients could not correctly interpret medication warning labels. Fang et al.⁶ found that patients with low literacy had less knowledge about their warfarin therapy, but this knowledge test was targeted toward reasons to use anticoagulation rather than how to take warfarin itself. These studies reinforce previous research showing that patients with low literacy consistently perform worse on knowledge tests than patients with higher literacy.¹ Although these studies remind us of important limitations in our current information-giving system, they do not identify whether the specific knowledge deficits that were measured lead to worse health outcomes. In fact, the study by Fang demonstrates that the knowledge gap did not lead to a disparity in outcome (degree of proper anticoagulation control) according to literacy.⁶

Two studies examined the relationship among literacy, self-reported adherence to the medication regimen, and laboratory tests of medication effect.^{6,8} Paasche-Orlow et al.⁸ examined the relationship between literacy, self-reported medication adherence, and viral suppression among patients with HIV and alcohol abuse who were taking anti-retroviral therapy (ART).⁸ The aforementioned study by Fang et al.⁶ at San Francisco General Hospital examined the relationship between literacy, adherence with warfarin, and prevalence of time within therapeutic range for a population of vulnerable patients requiring chronic anticoagulation. In each study, the researchers did not find an association between low literacy and poor adherence or an association between literacy and the more distal health outcome (viral suppression or the % of time in therapeutic range with anticoagulation). In fact, Paasche-Orlow et al. found that patients with low literacy (<sixth grade level) were more likely to report perfect adherence with ART than patients with literacy levels above ninth grade on the Rapid Estimate of Adult Literacy in Medicine.

Previous studies have reached mixed results as to whether literacy is associated with poor adherence.^{9,10} Kalichman et al.⁹ found a relationship between literacy and self-reported adherence with ART among HIV-infected patients. This remains the only study that has demonstrated a relationship between literacy and medication adherence, but it had the limitations of a cross-sectional study with a one-time

Figure 1. Potential pathways between literacy and health outcomes.

Address correspondence and requests for reprints to Dr. Pignone: Division of General Internal Medicine, 5039 Old Clinic Building UNC Hospital, Chapel Hill, NC 27599-7110 (e-mail: pignone@med.unc.edu).

self-report assessment of adherence. Golin et al.¹⁰ found that literacy was not related to adherence to ART in a prospective study of patients with HIV that used several validated strategies to assess adherence in addition to self-report.

Although adherence to taking pills is important, other aspects of self-care behavior require adherence and may be more susceptible to the barrier of low literacy. In an unpublished analysis of data from our randomized trial of patients with heart failure, we found that those patients with low literacy initially had more problems with correctly adhering to a diuretic self-adjustment plan, but after 4 months, there was no difference by literacy level in the number of incorrect actions.¹¹ Williams et al.¹² found that patients with asthma and low literacy were less likely to be able to demonstrate how to use an inhaler properly than patients with higher literacy skills. They did not examine other health outcomes such as self-reported adherence, symptom control, or hospitalizations.

So what can we conclude about the relationship between literacy and adherence? First, it is clear that low literacy is not universally associated with poor self-reported adherence to medications for the few conditions examined to date. Other research, however, suggests that patients with low literacy may have initial difficulty with learning self-care behaviors and enacting them, but that with ongoing support and additional training, they can overcome these barriers. Because few of the studies on adherence have been conducted within a study population that demonstrated a strong association between literacy and distal health outcomes, it remains unclear whether poor adherence mediates any of the relationship between low literacy and poor health outcomes seen in other studies. Future observational studies should measure self-care skills and adherence in the context of a documented association between low literacy and adverse health outcomes. Intervention trials should examine whether helping patients to learn and adhere to self-care plans can improve literacy-

related health disparities.¹¹—**Michael P. Pignone, MD, MPH,¹**
Darren A. DeWalt, MD, MPH,¹ ¹*University of North Carolina*
Division of General Internal Medicine, Chapel Hill, NC, USA.

REFERENCES

1. **DeWalt DA, Berkman ND, Sheridan SL, Lohr KN, Pignone M.** Literacy and health outcomes: a systematic review of the literature. *J Gen Intern Med.* 2004;19:1228–39.
2. **DeWalt DA, Pignone MP.** Reading is fundamental: the relationship between literacy and health. *Arch Intern Med.* 2005;165:1943–4.
3. **Wolf MS, Feinglass JM, Carrion V, Gazmararian J, Baker D.** Literacy and mortality among Medicare enrollees. [Abstract]. *J Gen Intern Med.* 2006;21:81.
4. **Sudore RL, Schillinger D, Satterfield S, et al.** Limited literacy is associated with mortality in the elderly: the health, aging, and body composition study. *J Gen Intern Med.* 2006;21:806–12.
5. **Kripalani S, Henderson LE, Chiu EY, Robertson R, Kolm P, Jacobson TA.** Predictors of medication self-management skill in a low-literacy population. *J Gen Intern Med.* 2006;21:852–6.
6. **Fang MC, Machtinger EL, Wang F, Schillinger D.** Health literacy and anticoagulation-related outcomes among patients taking warfarin. *J Gen Intern Med.* 2006;21:841–6.
7. **Davis TC, Wolf MS, Bass PF, et al.** Low literacy impairs comprehension of prescription drug warning labels. *J Gen Intern Med.* 2006;21:847–51.
8. **Paasche-Orlow MK, Cheng DM, Palepu A, Meli S, Faber V, Samet JH.** Health literacy, antiretroviral adherence, and HIV-RNA suppression: a longitudinal perspective. *J Gen Intern Med.* 2006;21:835–40.
9. **Kalichman SC, Ramachandran B, Catz S.** Adherence to combination antiretroviral therapies in HIV patients of low health literacy. *J Gen Intern Med.* 1999;14:267–73.
10. **Golin CE, Liu H, Hays RD, et al.** A prospective study of predictors of adherence to combination antiretroviral medication. *J Gen Intern Med.* 2002;17:756–65.
11. **Rogers N, DeWalt DA, Pignone M, et al.** Literacy and accuracy for self-adjusted diuretic dosing in patients with heart failure [Abstract]. *J Gen Intern Med.* 2004;19:174.
12. **Williams MV, Baker DW, Honig EG, Lee TM, Nowlan A.** Inadequate literacy is a barrier to asthma knowledge and self-care. *Chest.* 1998;114:1008–15.