

Revisiting Literacy and Adherence

Future Clinical and Research Directions

Since the publication of the National Adult Literacy Survey (NALS) in 1993 that reported surprisingly high prevalence of low literacy in the United States,¹ the relationship of literacy to health and health care delivery has received intense scrutiny. As the interest in the link between literacy and poor health outcomes has gained momentum, the attention of professional societies and policy makers has followed. The Institute of Medicine² and American Medical Association³ have each proposed research agendas focused on better understanding, education, and interventions addressing the complex relationship of literacy and health. Recently, in his forward to the special *JGIM* issue on health literacy, U.S. Surgeon General Dr. Richard Carmona referred to the current state of health literacy as a crisis in America.⁴

A well-conducted systematic review in 2004 summarized the state of research in literacy and health outcomes and found a significant association between literacy and knowledge of health outcomes, global measures of health, and hospitalization.⁵ Establishing a link between literacy and chronic disease control has been more elusive, although prior investigators have demonstrated this in diabetes and asthma.^{6,7} In addition to the association with health beliefs, behaviors, and outcomes, Rothman et al.⁸ suggested that literacy may be an important predictor of response to health service interventions. Most recently, the recent *JGIM* supplement devoted to this important topic produced several articles of note including results from the Health, Aging, and Body Composition Study that for the first time showed low literacy to be an independent predictor of mortality.⁹ In the same supplement, Weiss et al.¹⁰ also suggested that educational interventions targeting literacy can improve health outcomes. In spite of the growing list of associations between literacy and health outcomes, the degree to which literacy causally mediates adverse effects or is a surrogate for more direct mediating variables is not known. In addition, it is not yet clear under what set of conditions literacy is relevant to health outcomes.

Gazmararian et al. advance the growing field of health literacy with their prospective cohort study in this month's issue of *JGIM*. They examine the relationship between literacy to cardiovascular medication refill in a large sample of Medicare managed care enrollees. Although prior studies have examined the relationship of literacy and medication adherence, their study has the advantages of a prospective design in a large, well-defined, inception cohort that is ethnically and geographically diverse. They use medication refill to calculate a cumulative medication gap (CMG) as their measure of adherence, the preferred measure of medication refill adherence as it does not allow an early medication lapse to be erased by later stockpiling, but does allow an early oversupply to carry forward and

fill a later gap between refills.¹¹ Furthermore, they are able to minimize the bias of medication access since all patients had prescription drug coverage through their plan. While they do not measure markers of disease control, adherence to medication is well established as a necessary condition of chronic disease management.

With prior studies showing that low literacy is strongly associated to decreased disease knowledge, ability to identify their medications,¹² and interpret warning labels,¹³ there is good reason to believe that adequate literacy would be important for medication adherence. While it may be an intuitive or intellectually satisfying explanation to suggest that literacy leads to poor adherence, there is currently little evidence to support this model. Gazmararian et al. found a small increased odds of poor adherence in patients with inadequate literacy, however, when they adjusted for the additional factors such as race and regimen complexity, the relationship of literacy and adherence became statistically non-significant (an odds ratio of 1.23; 95% confidence interval 0.92 to 1.64 in an adjusted model).

How are we to interpret this finding in light of other studies of literacy and medication adherence? Those who follow the literature in literacy and adherence may not be surprised by Gazmararian's findings. While Kalichman et al.¹⁴ found low literacy to be associated with lower self-reported adherence to antiretroviral therapy in HIV infected patients in a cross-sectional design, this association has not been duplicated in other attempts to link literacy with adherence. When adherence has been measured prospectively, combining self-report with electronic monitoring of bottle caps and pill count, there was no association between low literacy and adherence in patients on antiretrovirals for HIV.¹⁵ In fact, the study by Paasche-Orlow et al.¹⁶ suggested patients with low literacy may even be more adherent to prescribed therapy and have better virologic control than patients with higher literacy. Similarly, patients with low literacy on warfarin did not report differences in adherence compared with patients with higher literacy and they were equally likely to achieve target anticoagulation.¹⁷

In the case of the Gazmararian's study, potentially understanding the role of racial disparities with adherence and complexity of regimen may be more beneficial in explaining poor adherence than literacy. Investigators have reported distinct health beliefs among African Americans.¹⁸ Thus, it may be more important to address patients' medication beliefs before prescribing medications than to focus on literacy in some situations. To reduce the non-adherence rate among African Americans and improve health outcomes, it may also be necessary to integrate health beliefs into educational interventions.

However, before we disregard literacy, it is worth considering that the impact of literacy may vary according to disease. Some chronic conditions require better patient self-management skills than others to achieve adequate disease control. For example, a patient with diabetes or asthma may require a higher level of self-monitoring and regular medication adjustment to achieve adequate control than a patient with hypertension or hyperlipidemia. Even within an individual illness, varying degrees of severity may interact with literacy (e.g., the diabetic patient on 4 shots of insulin a day with a

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sliding scale may depend more on adequate literacy than one who can be controlled on metformin only). It may be that literacy becomes increasingly important as the disease complexity and requirements from the patient increase.

Finally, if adequate literacy is required for a patient to successfully navigate encounters with a health care delivery system, there may be specific physician and health system organizational factors that exacerbate or mitigate the impact of low literacy. Literacy may matter more for patients who are cared for in a chaotic and discontinuous system that is not organized around delivering high quality care in a multidisciplinary setting. Of note, the present study included a population of older adults who all had access to a managed care plan and its prescription benefits. It is also interesting that while low literacy is prevalent in many different health care settings, most studies reporting a significant association between low literacy and health outcomes have been conducted in public hospitals or clinics.

While the jury may still be out on the relationship of literacy and adherence, the current preponderance of evidence appears to "acquit" low literacy as a cause of non-adherence. As Paasche-Orlow et al.¹⁹ suggested, limited literacy is likely to coexist and interact with other social vulnerabilities. The relationship of literacy to health outcomes may be a more complex relationship than initially thought and further research is needed to better understand the relative contributions literacy has on treatment adherence and other health outcomes. Additionally, it is critical to further describe which conditions (patient, disease, and health system) need to be present for literacy to be relevant for health outcomes. By understanding these conditions further, better methods for either improving literacy skills or providing accommodations such that low literacy skills are no longer clinically relevant can be identified.—**Benjamin J. Powers, MD,^{1,2} Hayden B. Bosworth, PhD,^{1,2,3,4}** ¹Center for Health Services Research in Primary Care, Durham VAMC, Durham, NC, USA; ²Division of General Internal Medicine, Department of Medicine, Duke University, Durham, NC, USA; ³Department of Psychiatry and Behavioral Sciences, Duke University, Durham, NC, USA; ⁴Center for Aging and Human Development, Duke University, Durham, NC, USA.

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