



## Disparities in Using Technology to Access Health Information: Race Versus Health Literacy

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Leveraging computers and mobile devices to understand one's health, support self-management, and interact with providers is associated with favorable diabetes outcomes (1,2). However, not everyone uses these technologies, potentially limiting broad benefit. We examined whether patient race and health literacy (HL) status are associated with technology use.

We analyzed data from a cross-sectional study of adults (age  $\geq 18$  years) with type 2 diabetes from a federally qualified health center in Nashville, TN. Research assistants worked with clinic personnel to recruit eligible patients arriving for appointments. Research assistants conducted in-person interviews to collect self-reported information on demographics and technology access and use (Table 1), administered the Short Test of Functional Health Literacy in Adults (3), and reviewed medical charts. All participants received a point-of-care (POC) A1C test on the day of participation (4). Only 38% had a chart-reviewed A1C that same day (with POC,  $\rho = 0.87$ ,  $P < 0.001$ ), requiring use of POC. We used SAS version 9.3 to limit the analysis to non-Hispanic white (NHW) and African American/black (AA/black) participants, and conducted

$t$  tests and  $\chi^2$  tests to make comparisons by race and, separately, by HL status (limited [inadequate/marginal] vs. adequate).

Research assistants approached 86.2% of the 588 type 2 diabetic patients who had a clinic appointment during the study period. Of those eligible (372), 84% participated ( $n = 314$ ); 283 were NHW or AA/black (Table 1). Race was not associated with HL status as a categorical or continuous variable. Participants with limited HL were less likely than participants with adequate HL to own a computer or a cell phone, be comfortable with or use the Internet on either device, have an e-mail account, send text messages, or use the Internet to get information about diabetes or medications (all  $P < 0.001$ ) (Table 1). AA/blacks were as likely as NHWs to access and use technologies, but AA/blacks had worse glycemic control than NHWs. HL status was not associated with A1C ( $P = 0.33$ ).

The "digital divide" may be narrowing by race, but not by HL, which mirrors recent increases in technology use by racial and ethnic minorities (5). There were no differences in A1C by HL status despite differences in technology use. In contrast, AA/blacks had worse glycemic control than NHWs despite similarities

in having access and using technologies. Other patient factors (e.g., treatment regimen) may be more strongly related to A1C, contribute to disparities in A1C despite equity in technology use (e.g., medication noncompliance), and explain the association between technology use and outcomes (e.g., age). Future research should explore these questions using a cohort study design to evaluate the impact of technology use on A1C over time. In addition to the cross-sectional design limitation, other limitations include sampling from one clinic, reliance on self-report measures, and not assessing the use of health information technologies (e.g., patient portals), which have the sole purpose of communicating health information.

Increased reliance on technology to promote patient health may have limited value if certain groups lack access and/or the skills to leverage these tools. Efforts are needed to engage individuals with limited HL in the development of technology-based interventions that they would use.

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**Table 1—Participant characteristics and differences by race and health literacy status**

	Race				HL			
	Total* n = 283	NHW n = 116	AA/black n = 167	P	Total† n = 280	Limited n = 79	Adequate n = 201	P
<b>Demographics</b>								
Age, years	52.4 ± 11.6	54.7 ± 10.6	50.8 ± 12.0	<0.01	52.6 ± 11.5	59.2 ± 11.1	50.0 ± 10.6	<0.001
Gender, female	65.0 (184)	54.3 (63)	72.5 (121)	<0.01	65.0 (182)	59.5 (47)	67.2 (135)	0.23
Education, years	12.1 ± 2.7	12.3 ± 2.9	12.0 ± 2.6	0.49	12.1 ± 2.7	10.4 ± 2.3	12.8 ± 2.6	<0.001
Income, \$								
<10,000	45.5 (116)	43.1 (47)	47.3 (69)	0.76	45.2 (114)	51.4 (37)	42.8 (77)	<0.05
10,000–15,000	26.7 (68)	28.4 (31)	25.3 (37)		27.0 (68)	34.7 (25)	23.9 (43)	
15,000–20,000	14.1 (36)	15.1 (14)	15.1 (22)		13.9 (35)	8.3 (6)	16.1 (29)	
>20,000	13.7 (35)	15.6 (17)	12.3 (18)		13.9 (35)	5.6 (4)	17.2 (31)	
Insured, yes	57.9 (164)	51.7 (60)	62.3 (104)	0.08	57.9 (162)	74.7 (59)	51.2 (103)	<0.001
<b>Diabetes characteristics</b>								
Insulin use, yes	47.0 (133)	42.2 (49)	50.3 (84)	0.18	46.8 (131)	48.1 (38)	46.3 (93)	0.78
Diabetes duration, years	8.0 ± 6.9	7.9 ± 6.2	8.1 ± 7.3	0.86	8.0 ± 6.8	9.1 ± 7.4	7.5 ± 6.6	0.08
<b>Technology use</b>								
Own a computer?	49.1 (139)	51.7 (60)	47.3 (79)	0.46	49.3 (138)	22.8 (18)	59.7 (120)	<0.001
With Internet?	39.9 (113)	44.8 (52)	36.5 (61)	0.16	40.0 (112)	16.5 (13)	49.2 (99)	<0.001
Comfortable with computer?	59.6 (168)	56.0 (65)	62.0 (103)	0.31	59.1 (165)	33.3 (26)	69.1 (139)	<0.001
Use an e-mail account?	41.7 (118)	46.5 (54)	38.3 (64)	0.17	41.8 (117)	10.1 (8)	54.2 (109)	<0.001
Use Internet for diabetes info?	42.4 (120)	47.4 (55)	38.9 (65)	0.15	42.9 (120)	11.4 (9)	55.2 (111)	<0.001
Use Internet for medication info?	40.6 (115)	46.5 (54)	36.5 (61)	0.09	41.1 (115)	10.1 (8)	53.2 (107)	<0.001
Have a cell phone?	87.6 (248)	87.1 (101)	88.0 (147)	0.81	87.9 (246)	73.4 (58)	93.5 (188)	<0.001
Comfortable with cell phone?	85.5 (242)	83.6 (97)	86.8 (145)	0.45	86.1 (241)	70.9 (56)	92.0 (185)	<0.001
Use text messaging?	47.3 (134)	44.0 (51)	49.7 (83)	0.34	47.5 (133)	25.3 (20)	56.2 (113)	<0.001
Use Internet on cell phone?	17.7 (50)	15.5 (18)	19.2 (32)	0.43	17.5 (49)	3.8 (3)	22.9 (46)	<0.001
Glycemic control (A1C %)	8.1 ± 2.2	7.6 ± 2.0	8.5 ± 2.3	<0.01	8.1 ± 2.2	7.9 ± 2.2	8.2 ± 2.2	0.33

Data are presented as mean ± SD or % (n). \*NHW and AA/black participants only; †NHW and AA/black participants who completed the Short Test of Functional Health Literacy in Adults.

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