Words Matter: An Analysis of the Content and Readability of COVID-19 Information on Clinic Websites

Mayank Sakhuja[1], Brooks Yelton[1], Michelle A. Arent[1], Samuel Noblet[2], Mark M. Macauda[1,3], Delores Fedrick[4] and Daniela B. Friedman[1]*

[1]Department of Health Promotion, Education, and Behavior, University of South Carolina, Columbia, SC, United States, [2]Prevention Research Center, University of South Carolina, Columbia, SC, United States, [3]Core for Applied Research and Evaluation, University of South Carolina, Columbia, SC, United States, [4]Chester County Literacy Council, Chester, SC, United States

Objective: To examine content and readability of COVID-19 information on outpatient clinic websites in South Carolina.

Participants: Thirty-three outpatient clinic websites.

Methods: Using a multi-step search strategy, we located three COVID-19 information content sections from each website. Descriptive statistics were calculated for content section characteristics (focus, information source, target population/race, presence of graphics, mobilizing information). Flesch Reading Ease (FRE), Flesch Kincaid Grade Level (FKGL), and Simple Measure of Gobbledygook (SMOG) were used to calculate reading levels. Mann Whitney U and Kruskal Wallis tests were performed to examine readability levels by clinic type (primary care vs. specialty) and content section characteristics.

Results: Twenty-six clinics offered COVID-19 information; 70 content sections across all 26 clinics were analyzed. Sections focused on COVID-19 clinic policies (48.4%), prevention (22.6%), testing (19.4%), and symptoms (9.7%). 93.5% lacked target population, 41.9% provided no information source, 38.7% had no graphics, and none mentioned racial/ethnic groups. $M_{FRE} = 54.3$, $M_{FKGL} = 9.9$, $M_{SMOG} = 9.5$.

Conclusion: COVID-19 information focused mainly on clinic policy and was written at a ninth-grade skill level. Findings suggest there is opportunity for clinics to update their online content to convey more plain language and sourced information, especially for high-risk groups.

Keywords: COVID-19, coronavirus, content analysis, reading level, website information

INTRODUCTION

Health literacy is "the degree to which individuals have the capacity to obtain, process, and understand basic health information needed to make appropriate health decisions" (Ratzan et al., 2000). Health literacy is predictive of individual health status, and lower levels of health literacy are associated with increased hospitalization rates (MacLeod et al., 2017). The need to understand and assimilate health information through written or verbal communications is heightened during times of crisis when actions and behaviors may be required to change rapidly

as new information emerges (Paakkari and Okan, 2020). Health literacy is crucial to understanding information on COVID-19 disease prevention, symptom presentation, testing, local community relief, and access to care. In fact, according to the World Health Organization (WHO), "the best way to prevent and slow down transmission is to be well informed about the COVID-19 virus, the disease it causes, and how it spreads" (World Health Organization, 2021). However, only 12% of adults in the United States have proficient health literacy (Centers for Disease Control and Prevention, 2021a). Further impacting health literacy is racial, ethnic, and cultural bias in language accessibility, word choice, contextual references, and imagery (Arcia et al., 2016). Information source and formatting preferences may also differ by race and ethnicity. Taking these preferences into account is critical for effective communication about health issues (Friedman et al., 2009; Friedman et al., 2012; Best et al., 2016).

During the COVID-19 pandemic, many health care settings have discontinued or delayed in-person services, shifted care to telehealth platforms, and decreased the number and frequency of patients seen, thus limiting access to verbal information, treatment, and preventive services for a variety of health conditions (Bhaskar et al., 2020). With the majority of Americans having access to the Internet, these changes have increased online searches for health information (Worrall et al., 2020).

The harms of misinformation and information uncertainty regarding COVID-19 are numerous and ultimately affect the health of both the individual and the community (Lin et al., 2020). Knowledge of or experience with historical medical abuses and biases in the healthcare setting can also foster mistrust, which may influence whether and how people use and apply health information (Jaiswal et al., 2020; Tai et al., 2020; Yelton et al., 2020). Familiar, local providers, however, may be perceived as reliable sources of health information, especially for older adults and some racial/ethnic populations (Friedman et al., 2009; Friedman et al., 2012; Best et al., 2016). In light of the overlap in heightened COVID-19 risk in those of older age and those with medical comorbidities with limited health literacy or limited health information access, it is important that local providers present clear, accurate, and timely prevention, testing, and treatment messaging.

The US Department of Health and Human Services, American Medical Association, and National Institutes of Health recommend that online health information be written at or below a sixth-grade reading level (Office of Disease Prevention and Health Promotion and United States Department of Health and Human Services, 2016). Studies have found that the majority of online health information does not meet these standards and thus causes difficulty for the general public (Friedman et al., 2014; Kulkarni et al., 2018). Similar assessments have been done regarding health information specific to COVID-19. Two separate studies using several general search terms for COVID-19 health information via popular search engines found that the majority of sites were difficult for the general public to understand (Szmuda et al., 2020; Treanor and Radonjic, 2020). A multinational search of 240 websites including

governmental and public health organization pages, social media pages, scientific and educational institution pages, and those categorized as "other" also found readability too difficult, noting that governmental/public health sources were the most readable for the general public (Mishra and Dexter, 2020).

The purpose of this current study was to examine the content and readability of COVID-19 information posted on outpatient clinic websites in South Carolina, a state that has the 13th highest rate of functional illiteracy in the country (The Literacy Center, 2021). Websites assessed belong to clinics with whom we are currently engaging on a separate health literacy initiative focused on improving patient-provider communication.

METHODS

Website Search Process

As part of a larger health literacy initiative aimed at improving patient-provider communication in outpatient clinics in South Carolina, approximately 67 clinics were invited via the state hospital association partner (Friedman et al., 2020) to complete a readiness assessment before implementation of an evidence-informed intervention. Of the 67 clinics, 34 completed the readiness assessment and indicated interest in participating in the intervention. Of those 34 clinics, 33 had clinic websites. Between September 14 and 15, 2020, we searched the websites of the participating 33 outpatient clinics for COVID-19 information. This purposive sampling approach has been used for other print and web-based content and/or readability analyses (Friedman et al., 2014; Choi et al., 2018; Olscamp et al., 2019). To standardize our data, we aimed to locate three sections of relevant content per clinic website, as has been done elsewhere in web-based content analysis research (Tanner and Friedman, 2011). For purposes of readability testing, we defined content sections as paragraphs or lists focused on COVID-19 information with a minimum of 10 sentences of text, in accordance with requirements for the validated tools used (Flesch, 1948; Mc Laughlin, 1969; Kincaid et al., 1975; Friedman and Hoffman-Goetz, 2006a). We employed the following multi-step search strategy to locate COVID-19 content on each of the clinic websites:

First, we visited the clinic homepage. If the clinic homepage had a COVID-19 notification banner at the top of the page, we clicked on this link. We scrolled through the resulting webpage to identify up to three separate content sections for coding and analysis. If no content sections were identified via scrolling, we went to the top of the page and clicked on the first COVID-19 relevant link (hypertext or button) located within the body of the webpage; some links directed to clinic-specific COVID-19 pages, while others directed to COVID-19 pages central to a health system. On the resulting page, we moved systematically from left to right across the row, and from top to bottom of the page, to attempt to identify three separate content sections. If all links had been selected from the dedicated COVID-19 information page and we were still not able to identify three separate content sections, then we returned to the clinic homepage. Once back on the clinic homepage, we scanned the page to identify content

sections without using any additional clicks. At that point, if we still had fewer than three total content sections between the dedicated COVID-19 information page search and the clinic homepage search, we proceeded to use the clinic website's search bar, if available, to locate information utilizing the keywords "coronavirus" and "COVID-19." Duplicate links resulting from using both terms, found on the first page of search results, were examined. If there were no duplicate content sections, we selected content sections from search results from the term "coronavirus" first, since this has been the most commonly searched term about the pandemic in South Carolina according to Google Trends (Google LLC, 2021). If we still did not have three total content sections at that point, we then used search results from the term "COVID-19." For one clinic in our sample, we could not identify any content sections using the aforementioned search strategies. Modification of our search strategy to include utilization of the search bar located on the link within the dedicated COVID-19 page (which was central to a health system) enabled us to find three content sections appropriate for analysis.

Variables Coded

A comprehensive codebook was developed based on previously conducted content analysis studies (Tanner and Friedman, 2011; Kulkarni et al., 2018). Each clinic was coded for the type of clinic (primary or specialty) and where and how content sections were located (via COVID-19 bar or banner, clinic homepage, internal search engine, search bar on dedicated COVID-19 page). For our analysis, safety-net healthcare organizations were considered primary care clinics. Safety-net healthcare organizations are defined as organizations for lower socio-economic status individuals (Hadley and Cunningham, 2004), including federally qualified health centers, free medical clinics, and rural health clinics. Each content section was coded for multiple variables, including content section source (federal, state, clinic, other, not specified, and multiple sources), and content section author (name, qualification, position/job title). We also coded for focus of the content sections (COVID-19 testing information, facility policies during COVID-19, COVID-19 symptoms, COVID-19 treatment, and COVID-19 prevention) and for specific COVID-19 prevention strategies (handwashing, mask wearing, social distancing), physical activity, mental health, and nutrition. Additionally, content sections were coded for race/ethnicity (White, Black, Latino, other, and not specified), and population groups represented (children, adolescents, adults, older adults, pregnant patients, parents, and not specified). The webpages containing the selected content sections were coded for videos and images present on the page. Further, we coded for the presence or absence of mobilizing information (information that encourages patients and website visitors to seek out additional information) (Tanner and Friedman, 2011), and type of mobilizing information included (website link, phone number, email address, multiple options). Finally, we checked each website to determine if there was a language translation tool available for translating content sections in English to other languages, such as Spanish.

To examine the reading level of the clinic websites' COVID-19 information, we downloaded each content section and copied and pasted information (as plain text) directly into Microsoft Word. Content information was then copied and pasted into an online readability tool (https://www.webpagefx.com/tools/read-able/). Three published and validated readability instruments—Simple Measure of Gobbledygook (SMOG) (Mc Laughlin, 1969), Flesch-Kincaid Grade Level (FKGL) (Kincaid et al., 1975), and Flesch Reading Ease (FRE) (Flesch, 1948)—were used to calculate reading level using the online tool. SMOG and FKGL report results as a grade level, while FRE is a scale from 0–100, with 0 being most difficult to read, and 100 being easiest to read (Friedman and Hoffman-Goetz, 2006b). Coding was done using Microsoft Excel™. To ensure 100% consistency in coding, two authors (MS, SN) searched for and coded all content sections separately and compared results.

Analysis Plan

Data from Microsoft Excel were imported into IBM SPSS version 27 for analysis. Descriptive statistics (percentages, frequencies, means) were conducted on content section characteristics. Non-parametric tests, including Kruskal Wallis and Mann-Whitney U tests, were performed to examine readability level by clinic website and content section characteristics (significance at $p < 0.05$). We examined readability by clinic characteristics such as clinic type, location of content sections, focus of content sections, and presence of mobilizing information. Due to the small sample size, safety-net healthcare organizations were not analyzed independently of primary care clinics. To evaluate the impact and reach of the information as it would be available to users, analyses for readability and content location were conducted from a clinic perspective and included all content sections identified, even if that meant content sections were included more than once (such as if several clinics linked to the same health care system site). In order to present information about the specific content sections, we filtered out any repeat sections (sections with the exact same language) for analyses (source, focus, author, mobilizing information, population, graphics) and only included each unique content section once.

RESULTS

Seven clinics did not provide COVID-19 related information on their websites - these were primary care and safety-net health care organizations. Thus, 26 out of 33 clinics offered COVID-19 related information for analysis. Out of those 26 clinics, 15 were primary care clinics (5 of which were also safety-net health care organizations), and 11 offered specialty care. Three separate content sections were found for 22 of the 26 clinics; four primary care clinics (3 of which were also safety-net healthcare organizations) had only one available content section, resulting in a total of 70 content sections collected and analyzed. The majority of the total content sections ($n = 63/70$, 90%) were found by clicking on the COVID-19 notification banner (present at the top of the clinic homepage), which redirected to an internal or external dedicated COVID-19 information page. Two (2.9%)

content sections were found on the clinics' main homepage, 2 (2.9%) were found using a search engine provided on one clinic's main homepage, and the remaining 3 (4.2%) were found *via* search bar available on a linked COVID-19 information page central to a health system.

The content sections specifically associated with specialty care clinics ($n = 33$) focused mainly on facility policy ($n = 20/33$, 60.6%) and testing ($n = 10$, 30.3%) with only 2 (6.0%) content sections geared towards prevention and 1 (3.0%) focused on symptoms. Content sections specifically associated with primary care clinics ($n = 37$) focused equally on facility policy ($n = 11$, 29.7%), testing ($n = 11$, 29.7%), and prevention ($n = 12$, 32.4%), with a smaller contribution from information regarding COVID-19 symptoms ($n = 3$, 8.1%). Several clinic sites, however, shared content sections: nine clinics (1 primary care, 8 specialty) were associated with one healthcare system, and shared three content sections; five additional clinics (4 primary care, 1 specialty) were associated with another healthcare system, and also shared three content sections; two additional primary care (safety-net) clinics shared three content sections. Thus, only 31 of the 70 content sections were unique.

Analysis of 31 Unique Content Sections

Thirteen ($n = 13/31$, 41.9%) of the unique content sections did not specify any source for their information. Eight (25.8%) of the content sections cited federal sources [Centers for Disease Control and Prevention (CDC)] in the information they provided, while five (16.1%) cited both federal (CDC) and state [Department of Health and Environmental Control (DHEC)] sources, and two (6.5%) cited both federal (CDC) and health system sources. The remaining three content sections (9.7%) indicated state sources (DHEC) only.

Most ($n = 30$, 96.8%) unique content sections did not specify the content author details, such as author's name, qualification, or title; one content section was authored by the CEO and CMO of the clinic or hospital system. Almost half ($n = 15$, 48.4%) of the content sections focused on changes in clinic policies due to COVID-19, while seven (22.6%) provided information about how COVID-19 could be prevented, six (19.4%) provided COVID-19 related testing information, and three (9.7%) focused on COVID-19 related symptoms. None of the content sections shared information on physical activity, mental health, or nutrition. The majority ($n = 29/31$, 93.5%) of content sections did not specify an intended audience, while none ($n = 0$, 0.0%) of the content sections mentioned high-risk or racial/ethnic groups as their intended audience. One (3.2%) content section mentioned children, adults, and pregnant patients and outlined facility policy. One (3.2%) content section provided information for parents and focused on prevention, testing, and symptoms. Twelve (38.7%) content sections contained only text, eleven (35.5%) contained text, images, and videos, and eight (25.8%) contained a combination of text and images. Videos included information pertaining to hand washing, education for patients/visitors on maintaining social distancing inside the facility and the new protocols and structure of patient-provider interactions. Images depicted health care teams, doctors, COVID-19 testing sites, and health care facilities. A few images provided educational

information pertaining to COVID-19 symptoms, and how to wash face coverings. Additionally, 23 (74.2%) content sections contained mobilizing information while 8 (25.8%) did not. Of those 23 content sections, twelve (38.7%) included a website link for additional information, seven (22.6%) included a website link and a phone number, two (6.5%) included only a phone number, and two (6.5%) included both a phone number and an email address. Lastly, only four (12.9%) content sections could be translated into a language other than English. Findings from the content analysis are presented in **Table 1**.

Content section readability (mean ± SD) was generally difficult with an overall mean FRE score of 53.4 ± 11.3 for all 70 content sections. The overall mean SMOG and FKGL for the 70 content sections were 9.5 ± 2.1 and 9.9 ± 2.6, respectively. Readability scores differed by type of clinic, with content sections of specialty clinics ($M_{SMOG-SC} = 10.3 \pm 1.5$; $M_{FKGL-SC} = 10.8 \pm 1.8$; $M_{FRE-SC} = 49.1 \pm 8.6$) written at a significantly higher grade level as compared to the content sections of primary care clinics ($M_{SMOG-PC} = 8.9 \pm 1.4$; $M_{FKGL-PC} = 9.2 \pm 1.8$; $M_{FRE-PC} = 57.4 \pm 8.3$). Readability scores also differed by the focus of content sections and availability of mobilizing information. Content sections which focused on change in clinics' policies or operations, because of COVID-19, were written at a significantly higher reading level ($M_{SMOG-POLICY} = 11.4 \pm 1.5$; $M_{FKGL-POLICY} = 12.1 \pm 1.7$; $M_{FRE-POLICY} = 44.1 \pm 9.0$) than the content sections focused on other areas. The content sections which included mobilizing information were found to have a higher reading grade level than those without mobilizing information ($M_{SMOG-MI} = 9.8 \pm 2.0$ vs. $M_{SMOG-NOMI} 8.2 \pm 2.3$; $M_{FKGL-MI} = 10.3 \pm 2.4$ vs. $M_{FKGL-NOMI} 8.3 \pm 2.7$; $M_{FRE-MI} = 52.1 \pm 10.8$ vs. $M_{FRE-NOMI} 59.6 \pm 12.0$). There were no significant differences in readability scores based on where content sections were found (COVID-19 notification banner, clinic homepage, search bar, COVID-19 page search bar). Readability scores are presented in **Table 2**.

DISCUSSION

Understanding risk factors, prevention measures, and treatment options for COVID-19 can be lifesaving; however, adequate access to, and understanding of such information is essential and is impacted by the availability and complexity of written and verbal communications (Arcia et al., 2016). Materials developed at or below a sixth-grade reading level are deemed appropriate for medical information communication (Office of Disease Prevention and Health Promotion and United States Department of Health and Human Services, 2016), and provider organizations should aim to develop or share existing credible COVID-19 information that is at this level. Our investigation of clinic websites found that not all offered COVID-19 specific information and those that did not were primary care clinics serving as safety-net healthcare organizations. These safety-net clinics may not have the necessary financial or personnel resources available to maintain and update website information. As a whole, content section focus heavily on

TABLE 1 | Clinic website characteristics [total content sections (*n* = 70) vs. unique content sections (*n* = 31)].

	Total content sections *n* (%)	Unique content sections *n* (%)
Content section location		
1. COVID-19 notification banner	63 (90%)	24 (77.4%)
2. Clinic homepage	2 (2.9%)	2 (6.5%)
3. Search bar	2 (2.9%)	2 (6.5%)
4. Search bar located on link within dedicated COVID-19 page	3 (4.3%)	3 (9.7%)
Content section source		
1. Federal	20 (28.6%)	8 (25.8%)
2. Federal and health system	10 (14.3%)	2 (6.5%)
3. Federal and state	8 (11.4%)	5 (16.1%)
4. State	3 (4.3%)	3 (9.7%)
5. Not specified	29 (41.4%)	13 (41.9%)
Content section author		
1. CEO and CMO	1 (1.4%)	1 (3.2%)
2. Not specified	69 (98.6%)	30 (96.8%)
Content section focus		
1. COVID-19 testing information	22 (31.4%)	6 (19.4%)
2. Facility policies during COVID-19	31 (44.3%)	15 (48.4%)
3. COVID-19 symptoms	4 (5.7%)	3 (9.7%)
4. COVID-19 prevention	13 (18.6%)	7 (22.6%)
Race/ethnicity mentioned		
1. Not specified	70 (100%)	31 (100%)
Population groups mentioned		
1. Children, adults and pregnant patients	9 (12.9%)	1 (3.2%)
2. Parents	5 (7.1%)	1 (3.2%)
3. Not specified	56 (80%)	29 (93.5%)
Content section graphics		
1. Text only	13 (18.6%)	12 (38.7%)
2. Text and images	20 (28.6%)	8 (25.8%)
3. Text, images and videos	37 (52.9%)	11 (35.5%)
Mobilizing information		
1. Yes	58 (82.9%)	23 (74.2%)
2. No	12 (17.1%)	8 (25.8%)
Mobilizing information type		
1. Website link	47 (67.1%)	12 (38.7%)
2. Website link and phone number	7 (10%)	7 (22.6%)
3. Phone number	2 (2.9%)	2 (6.5%)
4. Phone number and email address	2 (2.9%)	2 (6.5%)
5. None	12 (17.1%)	8 (25.8%)
Translation to Spanish		
1. Yes	15 (21.4%)	4 (12.9%)
2. No	55 (78.6%)	27 (87.1%)
Readability scores	Mean ± SD	Mean ± SD
1. FRE	53.4 ± 11.3	56.0 ± 10.4
2. FKGL	9.9 ± 2.6	9.5 ± 2.1
3. SMOG	9.5 ± 2.1	9.2 ± 1.9

information about facility policy over information on COVID-19 testing, prevention, or symptoms, with specialty clinics sharing more information on facility policy and testing while primary care clinics offered a balance of information on COVID-19-related facility policies, as well as COVID-19 prevention and treatment. As primary care clinics typically provide a larger range of services, patients may look to them for sources of general COVID-19 information rather than to specialty care clinics. This may influence type of information that clinics offered.

TABLE 2 | Reading level by clinic website characteristics.

	Flesch reading ease	Flesch-kincaid grade level	SMOG
Clinic type			
1. Primary care	57.4 ± 8.3	9.2 ± 1.8	8.9 ± 1.4
2. Specialty care	49.1 ± 8.6[b]	10.8 ± 1.8[b]	10.3 ± 1.5[b]
Content section location			
1. COVID-19 notification banner	53.8 ± 11.3	9.9 ± 2.6	9.5 ± 2.1
2. Clinic homepage	54.2 ± 11.4	10.0 ± 0.9	9.6 ± 1.1
3. Search bar	51.9 ± 3.2	10.9 ± 1.1	10.1 ± 1.3
4. Search bar located on link within dedicated COVID-19 page	45.0 ± 15.9	10.7 ± 3.2	10.4 ± 2.8
Content section focus			
1. COVID-19 testing information	59.3 ± 5.5	7.9 ± 1.5	7.9 ± 1.1
2. Facility policies during COVID-19	44.1 ± 9.0[b]	12.1 ± 1.7[b]	11.4 ± 1.5[b]
3. COVID-19 symptoms	62.6 ± 9.7	8.4 ± 2.9	8.2 ± 2.1
4. COVID-19 prevention	62.9 ± 6.5	8.7 ± 1.4	8.3 ± 1.0
Mobilizing information			
1. Yes	52.1 ± 10.8[b]	10.3 ± 2.4[a]	9.8 ± 2.0[a]
2. No	59.6 ± 12.0	8.3 ± 2.7	8.2 ± 2.3

[a] $p < 05$.
[b] $p < 01$.

The difficulty level of the COVID-19 information offered by clinics will be quite challenging for most people to read and understand. Differences by clinic type were noted, as information from primary care clinics was written at a slightly lower grade level and shared a broader range of information than that offered by specialty clinics, however, the reading level of all information provided by the clinics in our sample is still much higher than recommended. These findings are similar to those from Treanor and Radonjic (2020), Szmuda et al. (2020), and Mishra and Dexter (2020), and highlight the need for COVID-19 specific information and materials written at a more appropriate reading level. Further, as readability of facility policy information was higher than that of other content section types, the favoring of facility policy information by specialty clinics may have impacted the overall readability scores for those clinics. Additionally, there was a missed opportunity to communicate health information through visuals such as videos and graphics. Only 11 content sections included videos along with text. Despite higher overall readability levels, inclusion of visuals could improve people's understanding of health information. Prior research demonstrates that visual animations in combination with spoken text significantly increased health information recall among people with lower health literacy levels (Meppelink et al., 2015).

Increased dissemination of COVID-19 information *via* social media and other platforms has contributed to an "infodemic" (Jaiswal et al., 2020; Lin et al., 2020; Parmet and Paul, 2020; Sentell et al., 2020). In addition, rapid academic and scientific publication, contradictory prevention messaging, and an evolving treatment narrative have complicated understanding of COVID-19 health information, prompting the WHO to identify the need to "communicate critical information to all communities and prevent the spread of misinformation" as a key strategic objective regarding COVID-19 management (World Health Organization, 2020). Around 80% of American adults

polled in April 2020 reported that they trust both the CDC and Director of the National Institute of Allergies and Infectious Diseases, Dr. Anthony Fauci, for reliable COVID-19 information; similarly the majority of respondents report trust in the information from state governmental officials (74%) and WHO information (70%) (Kirzinger et al., 2020). Health Information National Trends Survey in the US found that local healthcare providers have remained the most trusted source of health information among American adults (Jackson et al., 2019). While more than half of content sections analyzed in this study indicated inclusion of information from federal, state, or health system organizations, the remaining content sections had no specified source for information given. Additionally, most of the content sections did not provide details about the author which could potentially be local healthcare providers. Use of trusted, credible sources of information, such as local healthcare providers, in communicating health information could improve patients' receptiveness to the information and their uptake of the recommended health message (Jackson et al., 2019). Lack of an identifiable source may result in failure to heed recommendations and/or suggestions and reduce people's perceptions of the credibility of the information. Opportunities exist for increased clarity of information source and potentially increased recommendation adherence. Further, very few content sections included any form of mobilizing information (either internal or external links) that would link users to additional information or sources of information. Linkage to credible, reliable federal and state sources that are frequently updated (CDC, DHEC, etc.) may allow clinics to provide up-to-date scientific recommendations without the added financial or personnel burden of website maintenance.

COVID-19 disease burden is significant among underrepresented racial/ethnic minority groups. Nationally, African Americans (AA), American Indians, and Alaska Natives demonstrate a hospitalization rate over five times that

of non-Hispanic Whites, while Hispanic or Latinx persons experience a rate four times greater (National Center for Immunization and Respiratory Diseases and Division of Viral Diseases, 2020). In South Carolina, AA hospitalization (40.3%) and death rates (31.9%) are disproportionately high compared to respective rates of other races (South Carolina Department of Health and Environmental Control, 2021) and SC population data (27% AA) (United States Census Bureau, 2021). Findings on content focus and intended audience in this study demonstrated that facility policy was largely represented, no indication of relevance to older age populations and race/ethnicity was provided, and few offered the ability to access information in a language other than English. Thus, clinics missed an important opportunity to provide educational information for high-risk groups. This is especially important at the local level, where patient-provider trust may increase receipt of information. In addition, while health is determined by a combination of social, economic, environmental, and biological factors, there are many behavioral factors (e.g., physical activity and healthy eating) that can improve physical health, mental health, and prevention of disease (Office of Disease Prevention and Health Promotion, 2020a). In this current analysis, no information on physical activity, nutrition, or mental health were found. With the large contribution of lifestyle and environmental factors to overall health (Office of Disease Prevention and Health Promotion, 2020a; Office of Disease Prevention and Health Promotion, 2020b), it is recommended that information and resources dedicated to modifiable lifestyle and environmental factors be included in online COVID-19 health information.

In general, clinics have an opportunity to provide accurate, appropriate, and easily understandable online COVID-19 information from reliable and trustworthy sources. In the current environment of misinformation and disinformation, clinics may also serve to clarify and reinforce the prevailing scientific opinion, dispelling any confusion or disinformation regarding COVID-19 and a potential vaccine. Opportunity exists for clinics to better serve their communities in this manner. With the paucity of easily readable science-based COVID-19 information, it appears that clinics may not have taken full advantage of this opportunity.

Limitations

This study had limitations. While the purposive sample of clinics used in this study functioned well to better inform authors regarding readability and content of website information from clinics already engaged in another health literacy initiative, this sample of clinics may not be representative of all outpatient primary and specialty clinics in South Carolina or in other states. We acknowledge that there are limits to the readability measures employed, and thus aimed to mitigate errors by triangulating readability scores with three validated tools. These formulas calculate readability based on an estimate rather than the actual number of syllables included, and produce different grade-level scores depending on the selected content sections and the criterion of comprehension employed (Friedman and Hoffman-Goetz, 2006b; Friedman and Kao, 2008). Given the scope of this

study, the three readability tools used were the most appropriate for calculating reading levels. However, future work focused on assessing communication effectiveness of health information and website usability could employ using tools such as CDC Clear Communication Index (Centers for Disease Control and Prevention, 2021b). While we analyzed the inclusion of images and videos with text, readability measures do not account for the influences of graphics, content format, and readers' prior knowledge. Further, analysis was performed at one point in time and for a maximum of three content sections per clinic. As web content is constantly changing, a single snapshot of data collected may not be representative of all information from any (clinic) website over time. Additionally, the time elapsed from the first COVID-19 appearance in the US to when the clinic websites were searched may have impacted the focus of information found thus explaining the few content sections dedicated to COVID-19 symptoms. For these reasons, future work should include analyses from multiple timepoints, and for a greater number of content sections from a larger, randomized sample of outpatient clinics.

CONCLUSION AND IMPLICATIONS

Content source, readability, and cultural sensitivity influence trust in and receipt of health messaging. As local providers are often seen as trusted sources of information, clinics have a duty to ensure content is accurate, relevant, and written in plain language. Inclusion of content source and mobilizing information to verified, state and national information sources (e.g., DHEC, CDC), facilitates access to accurate, real-time information in nested layers of complexity (e.g., plain language content, infographics, full reports, etc.). Trust in health messaging relies on a variety of factors including cultural perceptions, e-literacy, and heuristics, and trust in official/governmental entities differs among races/ethnicities and in relation to specific concerns (Choi, 2020; McFadden et al., 2020; Peterson et al., 2020; Thompkins et al., 2020). Thus, information sources should be considered when tailoring information for specific patient populations, and inclusion of accurate information from or endorsed by a variety of sources (e.g., faith-based leaders, local community organizations, federal/state health authorities) may improve receipt of general information without a specific consumer focus. As financial and personnel resources differ greatly among clinic type/affiliation, mobilizing information to trusted entities reduces the resource burden of content creation and management. For increased effectiveness and usability, clinics should also consider ease of website navigation to help users quickly locate both important, urgent information, as well as specific content tailored to a variety of patient populations of different ages, races/ethnicities, and/or concerns. Additionally, information targeted to clinical staff can be separated from plain-language information through consumer-specific navigational links to content (e.g., "for providers", "for patients"). Patient-focused information should also include links to content in languages other than English

(Rodriguez et al., 2019). The Department of Health and Human Services (HHS) has developed a number of suggestions to improve health information website readability and usability for a variety of users including those with disabilities, providing free online access through the HHS *usability. gov* website and the Office of Disease Prevention and Promotion *Health Literacy Online* website (Office of Disease Prevention and Health Promotion and United States Department of Health and Human Services, 2016; United States Department of Health and Human Services, U.S. General Services Administration Technology Transformation Services, 2020). Clinics may benefit from utilizing or mobilizing users to evidence-based health information portals, similar to the approach used by The McMaster Optimal Aging Portal, for effective, tailored, and accurate health messaging for specific patient concerns (Barbara et al., 2016). Clinical-academic partnerships can also aid development of effective clinic health messaging through collaborative needs assessments and assistance with health communication/research translation and cultural sensitivity (Gubbins et al., 2014; Friedman et al., 2020).

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