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Information on Cardiovascular Disease in the Digital Era: Results From a Cross-Sectional Patient Survey

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ABSTRACT

Public health strategies to reduce cardiovascular disease (CVD) rely on the effective dissemination of evidence-based information to at-risk populations. An improved understanding of the information sources patients use can facilitate content development and promote awareness of effective interventions for CVD prevention, monitoring, and management. We therefore sought to determine the contemporary patterns of CVD information source usage via a prospective, cross-sectional survey study of CVD information sources in a primary care centre in Ontario, Canada. Primary source(s) used for CVD information were defined as: traditional media (television or print media), Internet-based sources, or community resources (community agencies and health care providers). Of 4682 consecutively screened patients aged $>$ 18 years 3189 (68%) participated in the survey. The mean age of the survey respondents was 37 $\pm$ 14 years and 54.4% were female. Traditional media (71%) were used more frequently than Internet-based sources (45%) or community health services (23%). Only 20% of respondents identified health care providers as the source of information for CVD. Compared with respondents aged $\geq$ 55 years, the adjusted odds of Internet-based source use were significantly higher

RÉSUMÉ

Les stratégies de santé publique visant à lutter contre les maladies cardiovasculaires (MCV) reposent sur la diffusion efficace d'une information fondée sur des données probantes auprès des populations exposées à un risque. Une meilleure compréhension des sources d'information utilisées par les patients peut faciliter la création de contenus et favoriser la sensibilisation aux interventions efficaces pour la prévention, la surveillance et la prise en charge des MCV. Nous avons donc voulu déterminer les tendances actuelles en matière d'utilisation des sources d'information sur les MCV en ayant recours à une étude prospective réalisée sous la forme d'une enquête transversale sur les sources d'information en matière de MCV dans un centre de soins primaires de l'Ontario (Canada). Les principales sources utilisées pour obtenir de l'information sur les MCV ont été définies comme suit : médias classiques (télévision et médias imprimés), sources utilisant Internet et ressources dans la communauté (organismes communautaires et fournisseurs de soins de santé). Sur 4682 patients sélectionnés de façon consécutive et âgés de plus de 18 ans, 3189 (68 %) ont pris part à l'enquête. Les répondants avaient un âge moyen de 37 $\pm$ 14 ans et étaient pour 54,4 % des femmes. Les

Because cardiovascular disease (CVD) remains the leading cause of morbidity and mortality in the industrialized world, increasing public awareness of modifiable CVD risk factors and their management is an important health policy objective. To successfully engage in primary prevention measures, patients require information regarding risk factors and behaviours that predispose toward CVD. Patients rely on a variety of sources to gather information about prevention, diagnosis, and management of CVD, and facilitate interactions with physicians.

A growing body of evidence suggests that the Internet is increasingly used to access diverse services and information.[1] However, it is poorly understood if similar trends extend to information related to CVD and how information access patterns vary with demographic and clinical characteristics. In the present study, we sought to determine the patterns of CVD information-source usage among patients who attended an outpatient adult general medical practice.

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among younger age groups, whereas the adjusted odds of print media and health services usage was lowest among ages 25-34 years. Although traditional print and electronic media remain the primary resource for CVD-related information, younger individuals increasingly rely on Internet-based sources. These findings have important implications for public health policy and resource allocation, highlighting the importance of maintaining traditional media presence in addition to the development of high-quality Internet-based sources of CVD information.

médias classiques (71 %) étaient utilisés plus fréquemment que les sources offertes sur Internet (45 %) ou les services de santé communautaires (23 %). Seuls 20 % des répondants ont mentionné les fournisseurs de soins de santé comme étant la source de l'information sur les MCV. Comparativement aux répondants âgés de 55 ans ou plus, les rapports de cotes ajustés de l'utilisation des sources sur Internet étaient significativement plus élevés dans les groupes de répondants plus jeunes, tandis que les rapports de cotes ajustés du recours aux médias imprimés et des services de santé étaient au plus bas chez les répondants âgés de 25 à 34 ans. Si les médias électroniques et imprimés classiques demeurent la source principale d'information sur les MCV, les personnes plus jeunes se tournent cependant de plus en plus vers les sources offertes sur Internet. Ces constats ont des conséquences importantes du point de vue des politiques de santé publique et de l'affectation des ressources à cet égard, en soulignant l'importance de maintenir la présence des médias classiques parallèlement à l'élaboration de sources d'information sur Internet en matière de MCV de haute qualité.

Methods

Study design

A cross-sectional observational survey was conducted at an outpatient ambulatory care centre in Ontario, Canada providing longitudinal and on-demand primary care services in addition to specialized consultations in internal medicine subspecialties, including general internal medicine and cardiology clinics. All patients $>$ 18 years of age who presented to the centre's centralized waiting room were consecutively enrolled and a questionnaire was administered to all consenting participants, without additional exclusion criteria; specifically, no exclusions were made on the basis of chief complaint, medical history, or specialist attendance. The study was approved by University of Toronto research ethics board and participants provided written informed consent.

A 200-patient pilot survey was undertaken before the principle survey to assess basic demographic characteristics and the survey instrument (Supplemental Appendix S1) was tested among 100 individuals in a run-in phase for consistency and face validity before being implemented. The written survey was self-administered in the English language in a private room; research assistants and clinic volunteers were available to facilitate clarification of the questions, perform verbal administration, and provide ad hoc in-person translation, as needed. The questionnaire noted demographic characteristics including age, sex, ethnicity, and education. Respondents identified the source(s) that have increased awareness and/or provided information on CVD. The sources of information included on the survey were classified as: (1) "traditional media," defined as print media (newspaper, magazine, books) and electronic media (television, radio, cable, satellite); (2) Internet-based sources (any source accessed via the World Wide Web on an electronic device); (3) "community health services," defined as nonprofit organizations/foundations, community health agencies, and health care providers; and (4) family and/or friends.

Statistical analysis

Descriptive data were summarized as percentages for categorical data and mean $\pm$ SD for continuous data. Age was stratified into age categories of $\geq$ 55, 45-54, 35-44, 25-34, and $<$ 25 years. The Pearson χ^2 test was used to assess differences within age category, sex, and education for each information source. Multivariable logistic regression was performed to determine the association between information source and demographic variables. Covariables in the model included age, sex, self-identified ethnicity, and education level. All analyses were 2-sided and significance was established as an α of 0.05 for all P values and confidence intervals (CIs). SAS version 9.4 (SAS Institute, Cary, NC) was used to generate all statistical computations.

Results

A total of 4682 consecutive patients were screened, of whom 3189 (68%) consented for participation and completed the

Table 1. Demographic characteristics of the study population (total denominator n = 3189)

Category	n (%)
Age	
$<$ 25	585 (18.4)
25-34	903 (28.4)
35-44	718 (22.6)
45-54	495 (15.6)
$\geq$ 55	392 (12.3)
Not available	90 (2.7)
Sex	
Female	1734 (54.5)
Male	1373 (43.1)
Not available	76 (2.4)
Ethnicity	
Caucasian	1321 (41.5)
Asian	330 (10.4)
South Asian	704 (22.1)
Black	432 (13.6)
Other	315 (9.9)
Not available	81 (2.5)
Educational attainment	
Secondary school or lower	769 (24.2)
College	1019 (32.0)
University or higher	1343 (42.2)
Not available	52 (1.6)

Table 2. Use of each information source overall and stratified according to age and education

Source category	n (%)	Source	n (%)	Age, %						Education, %			
				< 25	25-34	35-44	45-54	≥ 55	*P*	Secondary school	College	University	*P*
Traditional media	2256 (70.8)	Print media	1761 (55.2)	55.9	50.9	55.7	59.8	61.5	0.002*	47.3	56.4	59.6	< 0.0001*
		Television	1728 (54.2)	53.9	55.3	56.8	54.8	54.1	0.84	49.4	57.1	55.0	0.004*
Internet-based sources	1432 (44.9)	Internet	1432 (44.9)	53.3	48.4	44.7	43.0	33.7	< 0.0001*	35.5	45.5	50.5	< 0.0001*
Health services	746 (23.4)	Community agencies	201 (6.3)	7.4	4.9	5.9	7.1	8.9	0.05	5.1	5.3	7.7	0.01*
		Health provider	643 (20.1)	18.3	16.0	17.0	23.8	22.7	0.001*	23.7	20.3	18.2	0.01*
Other	1198 (37.6)	Family or friends	1198 (37.6)	41.0	37.2	37.7	37.4	33.7	0.23	35.9	35.9	37.8	0.44

Stratified columns reflect the percentage of respondents within each category that used the particular information source. Information source selection(s) are not mutually exclusive; columns therefore do not sum to 100%. *P* value for Pearson χ^2 test for overall differences between age or education categories for each information source.

* Statistically significant association ($P < 0.05$).

survey. Demographic characteristics are shown in Table 1. Mean participant age was 37 ± 14 years and 54% were female.

CVD information source use

The use of CVD information sources (unadjusted) is shown in Table 2. Overall, traditional media (71%) was more frequently used than Internet-based sources (45%) or community health services (23%). Print media (55%) and television (54%) were the most frequently identified traditional media sources. Health care providers constituted the source of CVD information for only 20% of respondents. Internet-based source use was inversely related to age: rates of Internet-based source use were 33.7%, 43.0%, 44.7%, 48.4%, and 53.3%, respectively, for age categories ≥ 55, 45-54, 35-44, 25-34, and < 25 years (Table 2).

Demographic predictors of information source use

After adjustment for education, sex, and ethnicity, age < 25 years (odds ratio [OR], 2.43; 95% CI, 1.83-3.23), 25-34 years (OR, 1.68; 95% CI, 1.29-2.19), and 35-44 years (OR, 1.40; 95% CI, 1.01-1.80) were independently associated with higher odds of Internet-based source use for CVD-related information compared with age ≥ 55 years (Supplemental Table S1). In contrast, age groups 25-34 and 35-44 had lower adjusted odds of obtaining information from print media, health care providers, or community agencies compared with the ≥ 55 age group (Supplemental Table S1). There were no significant age differences for CVD information access via television or family and friends.

Participants with secondary school level education had significantly lower odds of using the Internet-based sources (OR, 0.62; 95% CI, 0.51-0.77) or print media (OR, 0.67; 95% CI, 0.55-0.82) compared with university-educated respondents. There was no significant difference for CVD information source use between sexes.

Discussion

In the present study we examined CVD information source use by patients from a diverse urban population. The main findings were: (1) traditional media was more frequently used compared with Internet-based sources or health services; (2) an important age effect existed with Internet-based source use: among those of younger age, odds of Internet use were significantly higher; and (3) health care providers are an underutilized health information source, reported by a small percentage of respondents.

There are diverse sources available for CVD information, with variable access and use rates documented across previous studies. In an Australian study of information sources for specific diseases and treatments by Hogue et al., the most commonly cited sources for patient health information were physicians (81.3%) and the Internet (42.2%).[2] In contrast, in an American study of general health information (including dietary, exercise, and other health promotion activities), Redmond et al. reported friends and family to be the most frequent source of health-related information.[3] This illustrates potential variability in information sources particular to specific health-related information queries. For general content, patients might favour engaging with family and friends

whereas for specialized queries regarding particular diagnoses or treatments, patients might seek authoritative sources.[2,3] In the present study, CVD-related information was primarily sought from traditional media and Internet-based sources. Whereas the relative use of traditional media and Internet mirrored that reported by Redmond et al.,[3] there was a lower use of interpersonal contacts, potentially related to the more specialized focus on CVD. Such information source variability suggests the need for public health initiatives and patient resources to be tailored appropriately to target populations.

Age has been identified as a barrier to the use of the Internet as a source of health information.[4] A previous survey of 1000 patients showed that age $\leq$ 66 years was associated with significantly higher levels of Internet usage for cardiovascular awareness (35.2% vs 15.3%).[4] The present study showed a similar age-related phenomenon for the use of Internet-based source use. In view of increasing online reliance among young adults for the acquisition of CVD health information, development of high-quality internet-based resources might be an emerging tool for primary prevention of future CVD.[5] However, this must be balanced against the fact that most patients afflicted with CVD are elderly; traditional media-based methods of information dissemination must therefore remain available and contemporaneous amid the simultaneous transition toward online resources.

Further research is required to determine which Internet-based sources are most effective for knowledge transfer to patients. This is particularly important because the Internet-based sources might not be subject to strict quality review and are known for significant variations in quality, reliability, and currentness of information, which might potentially hamper their usefulness.

Limitations

The screened patients who declined participation in this survey might introduce nonresponder bias and the absence of nonresponder demographic information prevents direct analysis of intergroup differences between responders and nonresponders. However, a contemporaneous consecutive pilot sample of 200 patients with a complete response rate (100%) showed a mean age of 37 $\pm$ 14 years with 47% of participants being female. Because the age distribution is identical to that of the principle survey, it might therefore be assumed that, from the perspective of age, the principle survey's respondents likely did not differ from nonrespondents. However, because the principle survey had a significantly higher proportion of female respondents (54% vs 47%; χ^2 test $P = 0.015$), the specific analysis regarding the finding that sex was not correlated with CVD information source use might not be valid if there is systematic bias due to the under-representation of men. This study used self-report measures with consequent potential for introducing recall and social desirability bias. Variables not included within the survey cannot be analyzed, and potential residual confounders might therefore remain unaccounted for, including burden of cardiovascular comorbidity. Although a large sample of participants was surveyed, the study was primarily conducted in the English language at a single Canadian urban location and might thus not be representative of other populations and geographic regions.

Conclusion

Traditional print and electronic media remain the primary resource for CVD-related information, whereas younger individuals increasingly rely on Internet-based sources. These findings have important implications for public health policy and resource allocation, highlighting the importance of maintaining traditional media presence in addition to the need for the development and maintenance of high-quality online cardiology information resources.

Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

To access the supplementary material accompanying this article, visit the online version of the *Canadian Journal of Cardiology* at www.onlinecjc.ca and at https://doi.org/10.1016/j.cjca.2019.03.015.