Archives of Gynecology and Obstetrics (2024) 309:2491–2498
https://doi.org/10.1007/s00404-023-07146-x

MATERNAL-FETAL MEDICINE

Physician-level determinants of HCV screening during pregnancy in a U.S. sample

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Received: 20 April 2023 / Accepted: 7 July 2023 / Published online: 16 July 2023

Abstract

Purpose The purpose of this study was to assess the association between select determinants and HCV screening guideline adherence among physicians who provide prenatal care. Research question: What factors may act as determinants of guideline adherence to HCV screening among physicians who provide prenatal care?

Methods We surveyed a national sample of physicians who provided prenatal care in 2021. The survey included questions from the Clinician Guideline Determinant (CGD) questionnaire, demographic characteristics, and medical practice characteristics. We estimated odds ratios and 95% confidence intervals (CIs) using semi-Bayesian logistic regression for the association between determinants and guideline adherence.

Results Participants included 224 physicians in the United States who reported providing prenatal care. Most physicians practiced in private practice (65%) and the majority were members of the American College of Obstetricians and Gynecologists (ACOG; 91%). Less than half (43%; 95% CI: 36%–49%) of physicians reported regular use of the HCV screening guideline. Physicians who reported general knowledge about HCV (OR = 9.0, 95% CI 3.1–30) or endorsed agreement with ease of implementation (OR = 8.0, 95% CI 2.7–25) had higher odds of adherence to the HCV screening guideline.

Conclusion Our study suggests that less than half of practicing prenatal care physicians adhere to HCV screening guidelines for pregnant patients. Our results may be useful as a preliminary screening of select determinants of guideline use for further investigation.

Keywords Prenatal · Hepatitis C · Guideline adherence · Screening

What does this study add to the clinical work

Little is known about factors that may act as determinants of prenatal care physician adherence regarding the Centers for Disease Control and Prevention (CDC) guideline to test all pregnant patients for HCV. Therefore, this study sought to assess the association between select guideline determinants and adherence to the HCV screening guideline among prenatal physicians in a sample taken from prenatal care physicians across the United States (U.S.).

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Introduction

Hepatitis C Virus (HCV) infection is the most common bloodborne infection in the United States (U.S.) [1]. It is estimated that 2.4 million people in the U.S. are living with chronic HCV, accounting for approximately 7 out of every 1000 people, and most people infected are asymptomatic or unaware they are infected [2]. In 2018, there were an estimated 50,300 new HCV infections in the U.S. [2]. Hepatitis C infection can cause liver inflammation and damage resulting in fibrosis, cirrhosis, and hepatocellular carcinoma [1]. These infections can result in negative outcomes across the life course, but there are key time periods, such as pregnancy, where the impacts may be compounded [3]. Pregnant women with HCV have worse pregnancy outcomes than uninfected pregnant women [4]. For example, HCV during pregnancy is associated with adverse fetal outcomes, including low birth weight and growth restriction of the fetus [4]. In addition, mother-to-child transmission of HCV occurs for ~ 5% of pregnant women [5]. Finally, prenatal care offers a unique opportunity to implement screening tests due to the relationship and frequent contact between pregnant women and their physicians.

Before 2019, recommendations for screening for HCV during pregnancy were risk based (e.g., intravenous drug use, born between 1945 and 1965, received a transfusion before 1992) [6]. Under this risk-based recommendation, approximately 6–13% of pregnant women have been screened, depending on the sample of women [7–11]. However, in December 2019, the Centers for Disease Control and Prevention (CDC) in the U.S. modified its guidelines from risk-based to universal screening for HCV in pregnant women [12]. Furthermore, the CDC added a new guideline in 2020 recommending HCV testing for all adults 18 years or older at least once in their lifetimes [13]. These guideline modifications to increase testing were because risk-based screening was suboptimal for identifying infected individuals [13]. This was due to risk-based screening not being implemented consistently and failing to identify HCV in individuals with no known risk factors [7].

Healthcare providers, such as physicians, are critical stakeholders in guideline implementation. Provider-level barriers identified in prior studies regarding HCV screening include lack of time, lack of knowledge of HCV, and discomfort in asking about risk behaviors [14]. Researchers Szeto et al. investigated barriers to HCV screening in primary care and observed that a lack of sufficient time (51%) and a lack of awareness of guidelines for screening (54%) were the top reasons for providers not screening patients [15]. Furthermore, sociodemographic factors, such as race/ethnicity, insurance status, education level, and income, may affect whether someone is screened for HCV and may be a result of provider bias [16, 17]. Nevertheless, we have limited evidence about whether these barriers or facilitators can be generalized to HCV screening of pregnant women or affect guideline adherence. Knowledge of prenatal care physicians' barriers and facilitators for HCV screening among pregnant women may help to create interventions to increase screening implementation, which may subsequently lead to an improvement in administering appropriate care for pregnant women and their infants. Therefore, we aimed to assess the association between select guideline determinants and adherence to HCV screening guidelines among prenatal physicians.

Methods

Source population

Participants eligible for our study were licensed physicians (either MD or DO) in the U.S. who provided prenatal care. Participant recruitment was conducted by Dynata, which is a marketing research organization [18]. Dynata sends email invitations to potentially eligible individuals identified through verified lists of physicians from the American Medical Association to recruit participants. Individuals who expressed interest in participation were sent a cover letter describing the study, agreement to participate, confidentiality, risk/benefit, options for leaving the study, and contact information for questions or concerns [18]. Dynata provides incentives to participants based on a reasonable level of reward for the amount of effort required to take the survey; these incentives are based on the population and regional customs [18]. Dynata used the first three questions of our survey to screen eligibility (in order): 1) Are you licensed to provide healthcare in the U.S.? ("yes" was the required response), 2) Do you provide prenatal care to patients? ("yes" was the required response), and 3) Which of the following [credentials] best describes you? (MD or DO were required). Respondents were ineligible if they did not answer these 3 questions with the appropriate responses. The study was approved by the North Texas Regional Institutional Review Board.

Survey instrument

We used a cross-sectional survey to assess adherence to HCV screening during pregnancy and factors that may act as determinants among prenatal care physicians. This survey was based on the Clinician Guideline Determinants Questionnaire (CGD) [19] and hosted by Dynata through

the Qualtrics online survey platform [20]. The CGD is a comprehensive, standardized instrument to measure clinician guideline use [19] based on an evaluation of 178 prior instruments that were subsequently synthesized into a single comprehensive instrument. We modified the survey questions to specifically use the term "physicians" rather than "clinicians," as in the original CGD, because of our eligibility criteria. In addition, we selected only 5 of the 23 determinants given the potential for modifiability in interventions for this guideline (please see "guideline determinants" below). The CDC's guideline regarding hepatitis C screening during pregnancy was described in full in the survey after the first questions regarding screening behavior and familiarity with the guideline. Data collection took place between June 7th and June 14th, 2021. The median time to complete the survey was 15 min and 40 s.

Outcome

The outcome of interest was guideline adherence, which was measured based on response to the question "What is your intended or actual use of this HCV screening guideline?" Responses included "I have never used the guideline and do not plan to, I have never used the guideline but will consider using it, I have never used the guideline but will use it, I have used the guideline once only, I have used the guideline a few times, I regularly use the guideline, and Other (specify)." We dichotomized the outcome as regular use vs. all other categories for conceptual alignment with potential interventions, which may focus on improving regular use of the guideline rather than any use of the guideline.

Guideline determinants

The five determinants selected from the CGD questionnaire included general knowledge of HCV ("I possess general knowledge about the clinical condition that is needed to use this HCV guideline"), training needed to implement the guideline (I was trained in the skills [i.e., technical, procedural, cognitive] needed to use this HCV guideline), organizational support (My organization provides support [leadership, resources, assistance, etc.] needed to use this HCV guideline), perceived patient barriers (My patients do or are likely to, accept and follow the recommendations in this HCV guideline), and ease of implementation (The procedures, actions, or activities recommended in this HCV guideline are easy to incorporate in my practice). Each determinant was measured using a 7-point Likert scale where 1 represented strongly disagree and 7 represented strongly agree. The determinants were recategorized as agree (any agreement), neutral, or disagree (any disagreement). For the interpretation of results, participants who agreed to the guideline determinant are stated to have "endorsed agreement" to the guideline determinant.

Data analysis

Demographic and practice characteristics were described using frequencies and percentages. Overall and subgroup-specific frequencies of physician adherence were estimated using proportions and 95% confidence intervals. We estimated odds ratios and 95% confidence intervals using logistic regression with adjustment for a minimal sufficient set of covariates to reduce confounding bias based on application of the back-door criterion in directed acyclic graphs (DAGs) for each determinant of interest [21].

The minimal sufficient sets for each determinant were as follows: 1) general knowledge: age, American College of Obstetricians and Gynecologists (ACOG) membership, organizational support, practice setting, U.S. region of medical practice, years of practice, and training, 2) training: organizational support, practice setting, U.S. region of medical practice, and years of practice, 3) organizational support: ACOG membership, practice setting, U.S. region of medical practice, and years of practice, 4) perceived patient barriers: age, gender identity, general knowledge, ACOG membership, organizational support, practice setting, race/ethnicity, U.S. region of medical practice, years of practice, and training, and 5) ease of implementation: ACOG membership, organizational support, perceived patient barriers, practice setting, U.S. region of medical practice, and training.

Given sparse data, we dichotomized age, race/ethnicity, practice setting, and years in practice, and used a 4-category variable for U.S. region (Midwest, Northeast, South, and West). Nevertheless, given the potential for sparse data bias, we also estimated odds ratios and 95% confidence intervals using semi-Bayesian logistic regression [22]. This approach uses penalized likelihood estimation through data augmentation, which combines data from a specified prior to the observed data. We specified a null-centered prior (OR_{prior} =1) with prior variance (v_{prior}) of 1.175 which was based on a variance range of OR_{prior} between 0.10 and 10. This prior variance is compatible with most exposure and outcome associations observed in epidemiologic research [23]. All analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results

Our study population comprised 224 prenatal care physicians from across the U.S. Dynata, our third-party data collection vendor does not disclose information about the number of physicians who received a survey invitation. Therefore, we were unable to estimate participation proportions. Table 1

Table 1 Characteristics and prevalence of adherence to the guideline for prenatal hepatitis C virus screening among survey participants ($n = 224$)

Variable	*n*	%	Prevalence (%)	95% CI
Overall[a]			43	36–49
Demographics				
Age				
55 years and older	102	46	43	34–53
Less than 55 years	120	54	43	34–51
Missing	2	0.9	–	–
Gender identity				
Female	93	42	41	31–51
Male	130	58	43	35–52
Missing	1	0.4	NA	NA
Race/Ethnicity				
White	165	74	41	34–49
Other race	56	25	48	35–60
Missing	3	1.3	–	–
Practice Characteristics				
Is your organization a Federally Qualified Health Center (FQHC)?				
Yes	46	21	37	23–51
No	178	80	44	37–52
Missing	0	0.0	–	–
Is your organization affiliated with an academic/teaching organization?				
Yes	92	41	54	44–65
No	132	59	35	27–43
Missing	0	0.0	–	–
Practice setting				
Private practice	145	65	58	49–66
Other	79	35	56	44–67
Missing	0	0.0	–	–
Years in practice				
16 years or more	159	71	42	34–49
Less than 16 years	58	26	47	34–59
Missing	7	3.1	–	–
Percentage of patient use of Medicaid or self-pay for birth				
25% or less	118	53	42	34–51
More than 25%	106	47	43	34–53
Missing	0	0.0	–	–
Region of practice				
Midwest	41	18	34	20–49
Northeast	47	21	55	41–70
South	74	33	39	28–50
West	60	27	43	31–56
Missing	2	0.9	–	–
Provider Characteristics				
Member of ACOG[b]				
Yes	204	91	44	37–50
No	19	8.5	32	11–53
Missing	1	0.5	–	–
Screening behavior				
Which pregnant patients do you screen for HCV?				
All pregnant patients	117	52	71	62–80
Only high-risk pregnant patients	84	38	13	5.0–20
I do not screen pregnant patients for HCV	23	10	0	0
Missing	0	0.0	–	–

Table 1 (continued)

[a]The row for overall refers to physicians who adhered to the guideline (used the guideline regularly)

[b]American College of Obstetricians and Gynecologists (ACOG)

Table 2 Distribution of determinants by physician adherence to guidelines for prenatal hepatitis C virus (HCV) screening ($n=224$)

Guideline adherence						
	Overall		Regularly use the guideline ($n=96$)		Do not regularly use the guideline ($n=128$)	
Variable	*n*	%	*n*	%	*n*	%
General knowledge						
Agree	183	85	86	94	97	79
Neutral	21	9.8	5	5.4	16	13
Disagree	11	5.1	1	1.1	10	8.0
Training						
Agree	184	84	110	92	74	74
Neutral	15	6.8	2	1.6	13	13
Disagree	21	9.6	8	6.7	13	13
Organizational support						
Agree	172	81	83	88	89	75
Neutral	26	12	7	7.5	19	16
Disagree	15	7.0	4	4.2	11	9.2
Perceived patient barriers						
Agree	178	82	87	94	91	74
Neutral	27	13	3	3.2	24	20
Disagree	11	5.1	3	3.2	8	6.5
Ease of implementation						
Agree	194	88	90	98	104	81
Neutral	15	6.8	1	1.1	14	11
Disagree	11	5.0	1	1.1	10	7.8

summarizes the demographic and practice characteristics of the sample. Most physicians were younger than 55 years of age (54%), self-identified as male (58%), and were of White race (74%). There were 43% of physicians who reported regular use of the HCV screening guideline with a prevalence as small as 36% and as large as 49% being compatible with our sample (95% CI: 36%–49%). Most physicians were in private practice (65%), had 16 or more years of experience (71%), and most were members of the American College of Obstetricians and Gynecologists (ACOG; 91%). Around half of physicians (53%) reported that 25% or less of their patients used self-pay or Medicaid. The highest proportion of physicians practiced medicine in the southern U.S. (33%), while only 18% practiced in the Midwest.

Table 2 summarizes the frequency of guideline determinants overall and by physician adherence (regularly use the guideline vs. do not regularly use the guideline). Overall, most physicians reported agreement with the guideline determinants. Regarding general knowledge ("I possess general knowledge about the clinical condition that is needed to use this HCV guideline"), 85% of physicians reported agreement. Similarly, 84% reported agreement with the training determinant ("I was trained in the skills [i.e., technical, procedural, cognitive] needed to use this HCV guideline"). There was also agreement with organizational support ("My organization provides support [leadership, resources, assistance, etc.] needed to use this HCV guideline") with 81% of physicians reporting they agreed with the statement. Furthermore, 82% of physicians reported agreement with perceived patient barriers ("My patients do, or are likely to, accept and follow the recommendations in this HCV guideline") and 88% reported agreement to ease of implementation ("The procedures, actions, or activities recommended in this HCV guideline are easy to incorporate in my practice"). Overall, adherent physicians who regularly use the guidelines had higher levels of agreement compared to those not implementing the guideline.

The unadjusted and adjusted associations of guideline determinants with guideline adherence are summarized in Table 3. Participants who endorsed general knowledge,

Table 3 Odds ratios and 95% confidence intervals (CIs) for associations between selected determinants with adherence to guidelines for prenatal hepatitis C virus (HCV) screening ($n = 192$)

	Unadjusted				Adjusted			
	Semi-Bayesian Estimates		Conventional Estimates		Semi-Bayesian Estimates		Conventional Estimates	
Variable	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
General knowledge[a]								
Agree	13	4.9–40	8.9	1.0–71	9.0	3.1–30	8.7	0.89–90
Neutral	3.4	0.95–13	3.1	0.32–31	2.5	0.65–8.9	4.2	0.41–50
Disagree	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Training[b]								
Agree	0.98	0.40–2.4	1.7	0.72–4.5	1.1	0.41–2.8	1.2	0.39–3.4
Neutral	0.52	0.16–1.5	0.34	0.11–1.8	0.65	0.18–1.9	0.35	0.10–1.8
Disagree	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Organizational support[c]								
Agree	1.0	0.32–2.8	2.6	0.82–8.4	1.1	0.32–3.2	2.1	0.62–7.2
Neutral	0.55	0.22–1.3	1.0	0.23–4.3	0.50	0.20–1.2	1.0	0.23–4.1
Disagree	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Perceived patient barriers[d]								
Agree	0.81	0.23–2.7	2.5	0.71–9.9	0.76	0.20–2.9	1.9	0.42–9.8
Neutral	0.26	0.09–0.68	0.33	0.12–2.0	0.35	0.11–1.1	0.31	0.10–2.6
Disagree	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Ease of Implementation[e]								
Agree	15	5.5–51	8.6	1.1–69	8.0	2.7–25	7.6	0.74–78
Neutral	1.8	0.35–8.4	0.71	0.10–13	1.5	0.25–7.0	1.5	0.12–34
Disagree	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref

[a]Adjusted for age, ACOG membership, organizational support, practice setting, U.S. region of medical practice, years of practice, and training

[b]Adjusted for organizational support, practice setting, U.S. region of medical practice, and years of practice

[c]Adjusted for ACOG membership, practice setting, U.S. region of medical practice, and years of practice

[d]Adjusted for age, gender identity, general knowledge, ACOG membership, organizational support, practice setting, race/ethnicity, U.S. region of medical practice, years of practice, and training

[e]Adjusted for ACOG membership, organizational support, perceived patient barriers, and practice setting

training, organizational support, perceived patient barriers, and ease of implementation had higher odds of guideline adherence compared with participants who did not endorse these determinants, but our estimates were imprecise. For example, participants who endorsed agreement with the general knowledge guideline had 9.0 times higher odds (semi-Bayesian aOR = 9.0, 95% CI = 3.1–30) of adhering to the guideline compared with participants who did not endorse agreement. Furthermore, participants who endorsed agreement with ease of guideline implementation had 8.0 times higher odds (semi-Bayesian aOR = 8.0, 95% CI = 2.7–25) of adhering to the guideline compared with participants who did not endorse agreement. Participants who endorsed training, organizational support, and perceived patient barriers had near-null odds ratios, with wide confidence intervals.

Discussion

Our results suggest that less than half of prenatal care physicians reported regular use of the HCV screening guideline. However, most physicians endorsed agreement with the determinants of guideline implementation, including general knowledge, training, organizational support, perceived patient barriers, and ease of implementation. Physicians who reported endorsement to the guideline determinants of general knowledge and ease of implementation had higher odds of guideline adherence.

Our study has several limitations. We used cross-sectional measurements of exposures and outcome, which may be problematic. In particular, guideline determinants (exposures) pertained to the time of the survey, but guideline adherence (outcome) pertained to an historical measure over

some unknown duration. Protopathic bias (i.e., reverse causation) is a consideration given this lack of temporal ordering of exposure and outcome. The magnitude and direction of protopathic bias is unpredictable. Selection bias is possible if prenatal care physicians chose not to participate for reasons, including lack of time, insufficient incentive, or length of survey, which have been identified as factors influencing nonparticipation of physicians in research [24, 25]. In addition, our survey was conducted during the COVID-19 pandemic, which could have influenced physicians' choice or ability to participate in the survey or implement a new guideline. We attempted to minimize nonparticipation. For example, our survey was anonymous and median time to completion was approximately 15 min. Nevertheless, if determinant agreement and guideline adherence were more common among participants than nonparticipants, then our estimates may bias away from the null. Misclassification is also a consideration in our study. For example, clinician self-reports overestimate guideline adherence [26]. Unfortunately, we did not have access to more objective measures of guideline adherence, such as data from electronic health records. If overestimation of guideline adherence was more common among physicians who reported agreement with the determinant (i.e., differential misclassification), then our estimates may be biased away from the null.

According to a study investigating prenatal care providers' adherence to 22 items of prenatal care content, including prenatal urine checks at every visit, less than half of pregnant women received adequate screening [27]; thus, the lack of screenings in the majority of pregnant women indicates lack of adherence among prenatal care providers. Similarly, the current study observed less than half (43%) of physicians adhered to the HCV screening guidelines, indicating that many pregnant women are not being tested [27]. Promoting knowledge of the guideline and having guideline components that are easily integrated into clinical practice may be viable strategies to improve uptake of HCV screening during pregnancy.

Little prior research has been conducted using the CGD Questionnaire. However, a study that investigated clinical practice guidelines for the management of thyroid nodules measured response to the CGD determinant "The guideline clearly describes underlying evidence supporting the recommendations" reported 92% of respondents endorsed agreement [28]. Prior research identified an association between physicians' education and training and guideline adherence among physicians [29]. A systematic meta-review reported a lack of knowledge about guidelines as a common factor influencing physician guideline adherence, which could be improved through training and educational resources [29]. Southern et al. observed that the patient being male, being a new patient, or having their doctor's visit in the morning were associated with higher odds of physician adherence to the interventions HCV screening protocol [30]. However, physicians lacking sufficient time and patient–physician gender concordance resulted in lower odds of physician adherence [30]. Several other factors are also putatively associated with the ease with which guidelines are implemented, including a lack of credible evidence to support the use of the guideline and unclear evidence [29]. Similarly, the current study observed physicians who endorsed agreement with determinants of general knowledge and ease of implementation had higher odds of adherence than those who did not endorse the determinant.

In summary, a high proportion of physicians reported not adhering to prenatal HCV screening guidelines, which suggests potential barriers to guideline use. Given limited prior evidence about potential barriers and facilitators of HCV guideline adherence among prenatal care physicians, our results may be useful as a preliminary screening of select determinants of guideline use for further investigation. To address limitations of our study and strengthen the evidence, future studies should be designed to clarify temporality between guideline determinants and guideline adherence, reduce selective participation, and minimize misclassification of guideline adherence. In addition, qualitative research involving focus groups or individual interviews with physicians may enrich understanding about barriers to guideline adherence.

Author contributions All authors contributed to the development of the project, as well as writing and editing the manuscript. Data collection and data management were performed by JDM, SBG, and ELT. Data analysis was performed by JDM. The first full draft was written by JDM and all authors commented on previous versions of the manuscript. All authors read and approved of the final manuscript.

Funding The funds used to conduct this research were provided by the University of North Texas Health Science Center School of Public Health.

Data availability Datasets used and analyzed are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest We have no known conflicts of interest to disclose.

Ethical approval This study was approved by the North Texas Regional Institutional Review Board.

Consent to participate Informed consent was obtained from all individual participants included in this study.

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