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Research Article

Enhancing Hepatitis B Care Competency through Project ECHO: A Program Evaluation

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Abstract

Background: Despite the availability of evidence-based testing and treatment guidelines for hepatitis B virus (HBV), there is a substantial gap in their use. As a result, chronic HBV is considerably underdiagnosed and undertreated in the US. **Methods:** This study examines the impact of a hepatitis B provider-training program to improve the knowledge and competence of primary care providers (PCPs) in managing hepatitis B (HBV). Project

ECHO (Extension for Community Health Outcomes) seeks to bridge knowledge gaps by connecting PCPs with expert-guided education on HBV care. The HBV Project ECHO program offers monthly educational webinars focusing on key aspects of HBV care including testing, treatment, prevention, and complications. Participants self-assessed their competence in key aspects of HBV care via pre- and post-session surveys. The assessed topics included: identifying patients for screening, identifying treatment candidates, assessing liver damage, managing HBV patients, and educating others about HBV. **Results:** Analysis indicates a positive shift in the perceived abilities in all five areas assessed. The findings emphasize the established role of the ECHO model in decentralizing HBV management and empowering PCPs to improve their clinical practices. Ultimately, our findings suggest the program has been successful in its aim to enhance the care of patients with HBV. As the HBV landscape evolves in the US, the flexible and adaptive nature of the ECHO model proves vital in meeting the educational needs of PCPs. This study underscores the importance of continuous evaluation.

Contributions to the Literature

- There is limited research on effective models for hepatitis B provider training programs globally, that work to decentralize hepatitis B service delivery.
- This program evaluation demonstrates the clear successes, impact and need for expansion of Project ECHO models in educating providers at the primary care level on hepatitis.
- The World Health Organization's (WHO) elimination goals call for improved testing and management for hepatitis B, to improve testing, care delivery services should be expanded, and decentralization of care should also be expanded. Project ECHO is an opportunity to help work towards these WHO elimination goals.
- Study findings highlight the importance and impact of Project ECHO for hepatitis B provider training programs.

Keywords: Hepatitis B (HBV); Project ECHO; Primary Care; Program Evaluation; Public Health; Provider Training; Chronic Hepatitis, Continuing Medical Education, Medical Education.

Background

In the United States, it is estimated that 2.4 million individuals are living with chronic HBV. Despite the burden of infection in the United States, testing for HBV remains low, even among those considered high-risk [1,2]. According to the World Health Organization (WHO), between 20% and 30% of those chronically infected with HBV will develop life-threatening complications, including liver cirrhosis and hepatocellular carcinoma (HCC) [3].

Those living with chronic hepatitis B are at an increased risk of developing hepatitis decompensation, cirrhosis, and hepatocellular carcinoma (HCC) [4]. The WHO estimated mortality associated with hepatitis B at 820,000 individuals due to these complications in 2019 alone [5]. Evidence-based testing and treatment protocols for HBV have been created to recommend the best clinical practices. Organizations such as the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and the American Association for the Study of Liver Diseases (AASLD) maintain guidelines created by panelists of experts [6].

However, the utility of such guidelines depends on clinicians understanding and implementing them into their routine practice. Researchers have conducted studies to assess the HBV screening practices around the United States. Studies suggest that primary care providers do not routinely follow HBV screening guidelines and they tend to not be familiar with the most current guidelines [7,8]. The literature demonstrated routine application of HBV care guidelines by primary care physicians is an area for significant improvement.

To address this significant gap in primary care provider knowledge and improve testing, management, treatment, and overall care surrounding HBV, a provider training model was adopted in January 2021. The Extension for Community Healthcare Outcomes (ECHO), known as Project ECHO, is an educational model designed to connect primary care providers (PCP) which include physicians, nurse practitioners, and physician assistants with experts on a specific topic [9]. This model, developed by the University of New Mexico, has successfully been adopted for diseases like hepatitis C, HIV, and many others [10-14]. This article seeks to evaluate the hepatitis B Project ECHO after two full years of provider training to understand if this model can be expanded upon and sustained to improve provider attendee knowledge and competency surrounding hepatitis B management.

Methods

Program Structure

Hepatitis B Project ECHO webinars are held on the fourth Thursday of each month during the lunch hour (12 to 1 pm Eastern Standard Time) beginning January 2021. The 1-hour sessions are run by experts in HBV care. Each session includes a didactic lesson lasting around 15 minutes followed by case presentations and discussions. There were 20 sessions in our two-year study period, with an average of 40 attendees at each session. Regardless of background, all participants were eligible for inclusion in this program evaluation if they opted to complete the electronic surveys. Participants were required to fill out the survey if they were seeking Continuing Medical Education (CME) credit for attending.

Materials

Data were collected via survey. The survey guided participants through a self-assessment regarding HBV care. Participants rated their abilities using a Likert scale of 1 to 6 (1 = little or no competence; 6 = expert). The survey asked participants to rate their abilities for the following tenets of HBV care: 1) identifying patients who should be screened for HBV; 2) identifying candidates for the treatment of HBV; 3) assessing the severity of liver disease in HBV patients; 4) treating and managing HBV patients; 5) educating clinic staff about HBV. The full list of survey questions and answer choices are presented in (Table 1) Lastly, participants were given the chance to provide feedback on their experience, with open-ended questions.

Table 1: Project ECHO HBV survey questions & answer choice options for participants.

Question	Answer choices	Score
[Before/After] today's session, please rate your ability to:	None or no skill	1
(1) Identify patients who should be screened	Vague knowledge, skills, or competence	2
(2) Identify candidates for treatment for HBV	Slight knowledge, skills, or competence	3
(3) Assess the severity of liver disease in HBV patients	Competent	4
(4) Treat and manage HBV patients	Very competent	5
(5) Ability to educate clinic staff about HBV	Expert, can teach others	6

Analysis

The self-reported scores collected from the pre-and post-session survey were evaluated. Participants pre- session scores were subtracted from their post-session scores for each question. The relative change from pre- to post-represented the change in their perceived abilities as a result of participating. The program evaluation was noted by the relative changes in scores. Subgroup analysis was conducted by stratifying participants according to healthcare profession and the number of sessions attended. A cutoff score of 4.0, or "competence," was a key area of focus for our evaluation. Statistical analysis was performed to evaluate whether the changes in scores from pre to post were statistically significant. The nonparametric Wilcoxon signed-rank test for the overall pre to post test scores was utilized and a Kruskal-Willis test to analyze the scores for the subgroup analysis. This study and its analysis were approved by the Heartland Institutional Review Board.

Overview of Participants

There were 68 participants who completed 145 surveys over the study period. Among the participants who provided their profession, 18 were physicians, 9 were advanced practice providers (APPs), and 14 participants were registered nurses. The remaining 23 participants had other clinical or public health roles, such as care coordinators, public health program managers, or pharmacists. Four participants did not include their profession. One participant was excluded from the analysis due to indicating expertise in all subject areas in their survey both before and after the session. Forty survey participants attended one Project ECHO session, 23 attended between 2 and 4 sessions, and 5 attended more than 5 sessions.

Results

The analysis of the pre- and post-session survey results demonstrated an increase in the average score for each of the five questions included in the survey (Table 2). The number of participants indicating competency, or a score of four or greater, increased by an average of 23.4% for each of the five questions demonstrating roughly 15 more survey participants reported feeling competent for each question of the post-session survey, compared to the pre-session results. The largest increase of participants scoring four or above was on question three (assessing liver damage in HBV patients), which increased by 27%. Question 1, focusing on identifying patients for HBV screening, had the highest percentage of feeling competent in their abilities after the session (83%). In the post-survey, 59% of all participants reported feeling competent or better on question 4 (managing patients with HBV). Despite being the lowest rate of scoring 4 or greater among the five questions, it was a 24% increase from the pre-session survey.

The scores of questions 2, 3, and 5 each increased to between 69-70% of all participants scoring 4 or higher. Analysis of the pre- and post-session survey results showed a statistically significant increase in median scores for each of the five questions included in the survey, as evidenced by the Wilcoxon signed rank test (Table 3). Pairwise Comparisons were not statistically significant following Bonferroni correction.

Table 2: Analysis of the pre-and post-session survey results demonstrated an increase in the average score for each of the five questions included in the survey.

Question			N	Mean ± SD, Pre	Mean ± SD, Post	Change, Pre -> Post	Pre: Score ≥4 (%)¶	Post: Score ≥4 (%)¶	Change, Pre -> Post (%)
Q1	Profession	All	64	3.7 ± 1.1	4.3 ± 0.9	0.6 ± 0.9	61	83	22
		Physician	18	4.2 ± 0.9	4.6 ± 0.9	0.4 ± 0.6	83	89	6
		Nurse	14	3.4 ± 1	4.3 ± 0.8	0.9 ± 0.7	64	86	21
		APP	9	4.1 ± 0.9	4.6 ± 0.7	0.5 ± 0.9	78	100	22
		Other†	23	3.3 ± 1.3	4 ± 1	0.7 ± 1.1	35	70	35
	Sessions Attended	1	40	3.8 ± 1.1	4.4 ± 0.9	0.6 ± 0.7	68	85	17
		2-4	23	3.6 ± 1	4.1 ± 0.7	0.5 ± 0.8	57	83	26
		5+	5	3.8 ± 1.5	4.8 ± 1.6	1 ± 1.6	60	80	20
Q2	Profession	All	64	3.5 ± 1.2	4.1 ± 1	0.6 ± 0.8	47	69	22
		Physician	18	4.2 ± 1.1	4.7 ± 0.9	0.4 ± 0.6	72	83	11
		Nurse	14	3 ± 1	3.9 ± 1	0.9 ± 0.6	29	57	29
		APP	9	3.8 ± 1.1	4.4 ± 0.7	0.7 ± 1.1	67	89	22
		Other†	23	3 ± 1.1	3.6 ± 0.9	0.6 ± 1	30	57	26
	Sessions Attended	1	40	3.5 ± 1.1	4.1 ± 1.1	0.5 ± 0.8	48	65	18
		2-4	23	3.3 ± 1.3	4 ± 0.8	0.7 ± 0.8	44	74	30
		5+	5	4 ± 1.4	4.4 ± 1.5	0.4 ± 1.8	80	80	0
Q3	Profession	All	64	3.1 ± 1.3	4 ± 1.1	0.8 ± 0.9	42	69	27
		Physician	18	4.2 ± 0.8	4.7 ± 0.9	0.4 ± 0.8	83	89	6
		Nurse	14	2.7 ± 1.1	3.7 ± 1.1	1 ± 0.7	21	50	29
		APP	9	3.8 ± 1.1	4.4 ± 0.5	0.7 ± 0.9	67	100	33
		Other†	23	2.3 ± 1.1	3.4 ± 1.1	1.1 ± 0.9	13	52	39
	Sessions Attended	1	40	3.2 ± 1.3	4 ± 1.2	0.8 ± 0.8	43	68	25
		2-4	23	3.1 ± 1.3	3.8 ± 0.9	0.7 ± 1	44	65	22
		5+	5	2.8 ± 1.3	3.8 ± 1.8	1 ± 1.2	20	80	60
Q4	Profession	All	64	3 ± 1.4	3.7 ± 1.3	0.7 ± 1	36	59	24
		Physician	18	4 ± 1.1	4.4 ± 0.9	0.4 ± 0.8	67	83	17
		Nurse	14	2.6 ± 1.1	3.6 ± 1.3	1 ± 0.7	14	50	36
		APP	9	3.6 ± 1.4	4.2 ± 1	0.7 ± 1.4	67	89	22
		Other†	23	2.2 ± 1.2	3 ± 1.3	0.9 ± 1.1	13	35	22
	Sessions Attended	1	40	3.1 ± 1.4	3.6 ± 1.4	0.6 ± 0.8	38	53	15
		2-4	23	2.9 ± 1.5	3.8 ± 1	0.9 ± 1	35	65	30
		5+	5	2.6 ± 1.7	3.8 ± 1.9	1.2 ± 2.2	20	60	40
Q5	Profession	All	64	3.2 ± 1.3	4 ± 1.1	0.8 ± 1	48	70	22
		Physician	18	4 ± 0.8	4.6 ± 1	0.6 ± 0.8	72	83	11
		Nurse	14	3.1 ± 1	3.8 ± 1.2	0.6 ± 1.1	43	57	14
		APP	9	3.8 ± 1.4	4.6 ± 0.5	0.8 ± 1.4	67	100	33
		Other†	23	2.5 ± 1.4	3.5 ± 1.2	1 ± 1.1	26	57	30
	Sessions Attended	1	40	3.4 ± 1.3	4.1 ± 1.2	0.7 ± 0.8	53	73	20
		2-4	23	3.3 ± 1.2	4 ± 1	0.7 ± 1.1	48	70	22
		5+	5	2.4 ± 1.9	4.2 ± 1.9	1.8 ± 1.6	40	80	40

† Other professions represented include: Pharmacists, Outreach/Education Coordinators, Health Navigators

¶ Score of 4.0 or higher indicates "competency" or greater (see Table 1)

Table 3: Analysis of the results showed a statistically significant increase in median scores for each of the five questions included in the survey, as evidenced by the Wilcoxon signed rank test; [a]Significance level defined as $p < 0.05$; [b]Test compared distribution of answers by profession.

			Wilcoxon Rank Test	
Question	**Pre-test Median**	**Post-test Median**	Z score	p-value[a]
Q1	4	4	-4.874	<.001
Q2	3	4	-4.625	<.001
Q3	3	4	-5.374	<.001
Q4	3	4	-4.75	<.001
Q5	3	4	-4.951	<.001
			Kruskal-Willis Test[b]	
Question		df	Test Statistic	p value[a]
Q1	Before	3	7.954	0.47
	After	3	4.887	0.18
Q2	Before	3	13.656	0.003
	After	3	12.933	0.005
Q3	Before	3	26.955	<.001
	After	3	14.934	0.002
Q4	Before	3	20.418	<.001
	After	3	13.604	0.003
Q5	Before	3	13.872	0.003
	After	3	10.348	0.016

Subgroup Analyses

Survey scores were stratified according to participant profession for further analysis. As shown in Table 2, the subgroups included physicians, nurses, APPs, and others. Survey scores for each question rose for all professions from pre to post. The highest mean pre-session scores were among physicians, followed by APPs. Physicians saw the smallest growth in the rise of participants indicating competency, although the proportion reporting competency ranged from 83%-89% across the five questions in the post-session survey.

The proportion of nurses and APPs scoring 4.0 or higher increased by an average of 26% on each question, compared, to 10% for physicians, and 30% for other professions. The mean score increased by 1.1 points from pre to post for nurses, compared to 0.6 for the whole cohort. The Kruskal-Wallis test revealed a statistically significant difference in the distribution of scores between professions, except for the post-session scores to question 1 ($H = 4.887$, $df = 3$, $p = 0.180$), as shown in Table 3.

A second subgroup analysis was performed based on the number of sessions attended by each participant. Most attendees (59%) attended one session. The proportion of this group scoring four or greater rose by 19% on average in the post-survey, compared to 26% for the cohort that attended between 2 to 4 sessions. The cohort that attended five or more sessions had the highest post-session average score across all five questions (mean: 4.2), for an average increase of 32%. However, a Kruskal-Wallis test analyzing the survey scores by the number of sessions attended revealed no statistically significant difference in the distribution of scores between these subgroups (Table 3).

Participant Feedback

Participants were asked to list topics they would like to see covered at future ECHO sessions and provide additional qualitative feedback on the sessions. The most common topics requested included HBV treatment and evaluation, including nuances in treatment decisions, resources for the uninsured, and lifestyle implications. Coinfections with HBV were another topic, including co-infection with HIV and hepatitis D (HDV). Management of special groups was another common theme. Strategies to increase testing for high-risk populations assess maternal/perinatal HBV infections, and who to screen for HCC were all mentioned as ideal future topics. Qualitative feedback was found to be overwhelmingly positive. Highlights from the participant's expressed sessions were "informative," "interactive," and "the case discussions are very valuable to facilitate discussion among all attendees."

Discussion

The primary aim of this study was to evaluate the impact of the Hepatitis B Project ECHO program on the HBV care competency of PCPs. Our results demonstrated a significant increase in self-reported competence across several key aspects of HBV care, as assessed through pre- and post- session surveys. The analysis suggests an overall positive impact of the Project ECHO program on improving the self-reported competence of primary care providers in managing HBV. It is particularly promising to see that the participants felt most confident in identifying patients who should be screened for HBV post-implementation of the program. Considering that up to 68% of the estimated 2.4 million patients living with chronic HBV in the US are unaware of their diagnosis, screening remains exceptionally important [15].

The implementation of universal screening guidelines as per 2023 CDC recommendations could improve these figures and help to further reduce the disease burden [16]. In addition, there was a substantial increase in self-reported competence in assessing liver damage in HBV patients. This is a crucial aspect of HBV management as it directly impacts treatment strategies and patient prognosis, especially as patients may be diagnosed at various stages of the disease. While not statistically significant, results suggests that perceived competency improved the most for participants attending multiple ECHO sessions (2-4 or >5). This can be a consideration moving forward, to design strategies that promote repeat participation.

The lowest post-survey competence score was for managing patients with HBV. While this score was significantly improved from pre-session levels, it may indicate that further emphasis on patient management strategies in the ECHO sessions is warranted. It is possible that non-clinicians shy away from the idea of managing patients themselves, and the improvement across the other areas still suggests an overall improvement in HBV care competency. The program was beneficial to all professional categories, including physicians, nurses, APPs, and other healthcare roles. Even attending one session demonstrated improved knowledge from pre to post testing. However, the most substantial improvements were observed among nurses and the other healthcare professionals who participated. The improvements suggest the potential for this program to enhance the knowledge and confidence of the groups working adjacently to direct patient care. Feedback from participants was acquired to guide future ECHO sessions. Participants displayed a desire for practical clinical knowledge, particularly surrounding the evaluation and treatment of HBV, signifying the necessity for applicable lessons that can be readily utilized in everyday practice.

Furthermore, feedback suggested a need for more comprehensive instruction on managing patients with complex clinical scenarios and co-existing conditions. This encompasses not only co-infections with diseases like HIV, hepatitis C and D, but also the presence of conditions such as cirrhosis and non-alcoholic fatty liver disease. Moreover, the attention drawn towards the care of special populations such as infants, pregnant women, the uninsured, and individuals with substance use disorders further underscores the requirement for multi-faceted education to manage a diverse patient population.

One of the key strengths of this study is the use of the pre- and post-session surveys, providing direct insight into the perceived improvement in the participants' competency. Furthermore, the analysis of subgroups provided valuable data on the impact of this program on various healthcare professionals, enhancing the generalizability of our findings. However, there are some limitations to our study. The reliance on self-reported competency is subjective, and it may not directly translate to clinical practice improvement. Objective measures, such as auditing patient outcomes or provider adherence to HBV care guidelines, would offer a more accurate measure of competency. Our study did not assess long-term retention of knowledge or the impact on actual patient outcomes. The survey response rate was not assessed in our results, limiting our understanding of the response bias.

Conclusion

This study adds to the evidence for the utility of the Project ECHO model for training healthcare providers. The program is efficacious in enhancing HBV care competence among PCPs, which aligns with public health goals of mitigating the burden of HBV. The model of Project ECHO connects experts to resource-limited settings, which emphasizes the role of telehealth in knowledge dissemination. Ongoing projects utilizing this model could be instrumental in bolstering healthcare education in underserved regions and encouraging the decentralization of knowledge from

specialty care to PCPs. Further research should assess the long-term impact of the ECHO program on outcomes among patients with HBV and refine it to address specific care needs. This paper offers valuable insights for public health officials and educators involved in healthcare professional development. The findings should guide similar initiatives for other diseases. The Project ECHO model facilitates the development of a more competent and confident primary care workforce and has the potential to improve the management of diseases worldwide.

Availability of Data and Material

Deidentified survey data is available upon reasonable request to the

Declarations

Ethics Approval

This program evaluation was approved by the Heartland Institutional Review Board as HIRB Project No. 11092023-520b and complies with all ethical standards.

Funding

No funding was received for the evaluation of this program.

Availability of Data and Material

Deidentified survey data is available upon reasonable request to the

Author Declarations

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