Hepatitis B Awareness, Education, and Exposure Risk Among Academic Researchers

Stephanie Durst-Rael

Edson College of Nursing and Health Innovation, Arizona State University

Author Note

Stephanie Durst-Rael is a graduate student at the Edson College of Nursing and Health Innovation at Arizona State University. She is a Family Nurse Practitioner, and a graduate of the Emergency Nurse Practitioner program at Arizona State University.

She has no known conflicts of interest to disclose.

Correspondence concerning this article should be addressed to Stephanie Durst-Rael, Edson College of Nursing and Health Innovation, Arizona State University, 550 N. 3rd Street, Phoenix, AZ 85004 email: stephanie.durst-rael@asu.edu

Abstract

Background: Hepatitis B virus (HBV) is a complex disease that poses a significant global health concern and economic burden. In academic research, many researchers and student researchers lack awareness and education about hepatitis B. Many are unaware of their hepatitis B vaccination status, as well as their risk of blood-borne pathogen occupational exposure while performing academic research. ***Objectives:*** The project aims to determine the researcher's awareness, knowledge, and understanding of hepatitis B (HBV). ***Methods:*** The method utilized will be a survey questionnaire based on the Hepatitis B Assessment Questionnaire to assess understanding of pre- and post-hepatitis B education sessions. The responses to the survey questionnaire will be measured using a five-point Likert scale. The pre-education survey questionnaire results will show the impact of the intervention (HBV education) increasing awareness of hepatitis B knowledge, attitude, and practice (KAP). The post-education survey questionnaire responses should demonstrate the researchers increased knowledge and awareness of HBV. ***Results:*** Descriptive statistics were used to describe the sample (n=38) and outcome variables, such as awareness and education pre- and post-the educational PowerPoint intervention. The average score for the outcome variables, Awareness and Education, increased after the intervention from 89.05 to 92.86.

Conclusion: The educational intervention had a significant and positive impact on the awareness, education, and understanding of hepatitis B exposure risks among university researchers. This is a promising step towards a safer and more informed research environment.

Keywords: *Occupational Health, academic researchers, hepatitis B, exposure risk, awareness, prevention, and infection.*

Acknowledgement

The completion of my Doctor of Nursing Practice (DNP) degree would not have been possible without the support from faculty, colleagues, family, and friends. I would like to express my sincere gratitude to Dr. Heidi Sanborn. Thank you to Dr. Doug Lake for always providing inspiration and answering all my crazy questions. Thank you to Dr. Jennifer Isenberger, and Karen Stevenson for all of your support. Thank you to my family for all of your patience and love through this journey. Finally, I dedicate this to my mom.

Hepatitis B Awareness, Education, and Exposure Risk Among Academic Researchers

In the academic research setting, researchers who have contact with blood, body fluids, and human cell lines are at an increased risk for bloodborne pathogen (BBP) exposure and acquiring hepatitis B virus (HBV). Transmission of HBV in the academic research setting more commonly occurs due to inadequate and improper use of safety measures by the researchers. Low compliance with BBP awareness, education, and acknowledgment among high-risk university researchers additionally contributes to potential increased disease and economic burden.

Problem Statement

According to the Occupational Health and Safety Administration (OSHA), researchers who have reasonably anticipated contact with blood or other potentially infectious materials (OPIM) during the performance of their work are considered to have occupational exposure and to be at risk of HBV infection (Denault & Gardner, 2023). Denault & Gardner (2023) note that bloodborne pathogens are a genuine threat to human lives and remain a public health issue, with an estimation that approximately three million BBP exposures occur annually. In most healthcare, laboratory, and research settings, bloodborne exposures are often due to accidental punctures (Denault & Garner, 2023).

Individual academic researchers performing investigation that involves blood, body fluid, or human cell lines are at risk for occupational exposure to HBV. Hepatitis B vaccines are safe and more than 90% effective in preventing infection in at-risk adults, yet only approximately 25% of United States (US) adults for whom vaccination is recommended by the Centers for Disease Control and Prevention (CDC) are vaccinated (Schaffner et al., 2018).

Medical surveillance is the systematic assessment of employees exposed or potentially exposed to occupational hazards (Denault & Garner, 2023). This assessment monitors individuals for adverse health effects and determines the effectiveness of exposure prevention

strategies. According to national, regional, and university standards and guidelines, researcher lab medical surveillance requirements are mandatory before working with research animals, humans, blood borne pathogens, tissues, or OPIM.

In the academic setting project site, there is a critical need to improve compliance with medical surveillance requirements. This is particularly important because of the Health Insurance Portability and Accountability Act (HIPAA) protected information. Such sensitive data is currently stored across multiple non-collaborating sites that serve the university researchers. The deficiency of hepatitis B awareness and education further exacerbates this gap. Without process improvement through education and awareness, the project site academic researchers will continue to be at high-risk of hepatitis B exposure and infection.

Purpose and Rationale

Hepatitis B is a viral infection and is among the most common causes of chronic viral liver disease, and remains a significant public health burden throughout the US (Surofchy, 2023). In the academic research community, HBV may be transmitted through needlesticks, sharps injuries, and splash incidents via infected blood, body fluids, and human cell lines. Although the researchers acknowledge HBV to be a severe disease, most do not consider themselves at risk of contracting HBV in the laboratory arena. Preventing the occupational transmission of the HBV from blood, human cell lines, body fluids, and other potentially infectious materials is essential for maintaining biosafety in academic research laboratories (Malik et al., 2021). The purpose of this paper is to explore process improvement methods that will improve HBV awareness and education throughout the university researcher setting.

Background and Significance

Literature reviews have shown that persons with chronic HBV infection are at increased risk for hepatocellular carcinoma, liver failure, and cirrhosis. Those individuals inflicted with this

disease are 70%–85% more likely to die prematurely than the general population (Conners et al., 2023). Infected persons often remain asymptomatic for years but may unknowingly transmit HBV to others via pregnancy, birth, sex, and sharing contaminated needles (Lim et al., 2020). Vaccination is a key intervention for preventing and eliminating hepatitis B infections to fulfill the World Health Organizations (WHOs) 2030 global elimination goal (El-Sayed & Feld, 2022). The use of the first commercial FDA-approved hepatitis B vaccine "Heptavax" was initiated in 1981 (Hepatitis B Foundation, n.d.). By the beginning of 2019, 189 countries had adopted the universal hepatitis B vaccination program and guidelines, which dramatically reduced the global prevalence of hepatitis B surface antigen (HBsAg) in children <5 years of age, from 4.7% in the pre-vaccine era to 1.3% in 2015 (Zhao et al., 2020). Unfortunately, many of those born before 1981 have gone unvaccinated and have little knowledge or education on the benefits of the HBV vaccination. To address the increasing rates of HBV associated with individuals not captured in the universal childhood recommendations, the Advisory Committee on Immunization Practices (ACIP) vaccine recommendations for HBV were updated in 2022 (Surofchy, 2023). Despite ACIP evidence-based recommendations, survey data from 2018 highlight that only 30% of all US adults 19 years and older are protected against HBV (Surofchy, 2023). For instance, a study on health sciences students revealed that 30.1% had insufficient antibody levels, but administering a booster dose increased immunity in 96.9% of those retested, demonstrating the efficacy of preventive measures (Hosseini Shokouh et al., 2024).

Population

For the purpose of this paper, an academic researcher is an individual who is employed by an academic institution's laboratory research department. Academic research may include working with animals, humans, human cell lines, blood-borne pathogens, tissues, or OPIM. Researchers working in these laboratories may be exposed to HBV, which is highly infectious and

efficiently transmitted through percutaneous or mucosal exposure to infectious fluids. The exposure rate varies from six to 30% depending on the serology of the source (Denault & Gardner, 2023).

Despite extensive literature review, research documenting laboratory-acquired HBV among the population of academic researchers remains scarce. The gaps in knowledge contributes to significant education and compliance challenges within academic research settings.

Hepatitis B Education, Awareness, and Risk of Exposure

Though the precise infection risk after an exposure remains uncertain, laboratory-acquired infection (LAI) inspections revealed that hepatitis B presents a health-related biological risk in laboratory workers, who are exposed through various routes (Peng et al., 2018). Laboratory academic researcher education and training are crucial to promoting adequate awareness and understanding of handling biological hazardous materials and OPIM (Peng et al., 2018). Peng et al. (2018) recommend educating researchers on maintaining primary and secondary barriers, personal and procedural barriers, proper bio-waste management and safety, up-to-date training, first aid awareness, and incident reporting.

Medical screening and surveillance are two other essential strategies for enhancing the health protection of academic researchers. A comprehensive medical surveillance program includes several key components: identifying researchers who require hepatitis B surveillance, assessing hazards and the risk of exposure to hepatitis B, selecting appropriate tests and examinations, and performing these examinations alongside detailed medical and occupational histories (Denault & Garner, 2023). According to OSHA policy regarding hepatitis B and blood-borne pathogen medical surveillance, employers must provide medical examinations, education,

vaccinations, titer testing, and the option to decline these services at no cost to the employee (Denault & Garner, 2023).

Current State

In this academic environment, the established protocol involves recognizing medical surveillance requirements and recommendations tailored to the specific work environment, occupational risk exposures, and access needs associated with each research position. The assessment of an academic researcher's occupational risks and potential exposures is carried out through a collaborative effort among laboratory biosafety officers, safety partners, industrial hygienists, and the recommendations provided by employee occupational health providers. These requirements and recommendations align with national, regional, and University standards and guidelines.

All medical surveillance requirements for laboratory researchers are compulsory prior to their involvement with research involving animals, humans, tissues, or other potentially infectious materials (OPIM). The clinical services included in the initial annual surveillance program consist of questionnaires, physical examinations, laboratory tests, and screenings that are determined by job titles, types of exposure, and access requirements pertinent to each research position. Within this framework, academic researchers are permitted to start laboratory training in their respective labs while they complete their medical surveillance and Bloodborne Pathogen (BBP) training.

Current academic research practices regarding BBP awareness and education reveal discrepancies with OSHA’s comprehensive regulatory framework. Despite OSHA’s requirements for annual training, documented exposure and post-exposure control and protocol plans, many academic research laboratories and researchers demonstrate inconsistent implementation of training schedules, laboratory-specific risk assessments, hepatitis B vaccine and titer needs

assessment, and inadequate documentation of exposure incidents. This misalignment potentially compromises academic researcher safety.

Increased Awareness and Knowledge About the Risks of Hepatitis B

Increased knowledge and awareness of HBV in any setting aim to prevent disease transmission and reduce its associated morbidity and mortality. This project seeks to address the educational, awareness, and disease risk acknowledgment needs of academic researchers regarding hepatitis B. A key approach to achieving this goal is to focus on individuals at risk, specifically by assessing and identifying the low rates of hepatitis B vaccination status, education, and the prevalence of vaccination declination among researchers. The vaccination declination is a form completed by HBV at-risk academic researchers who opt not to receive the hepatitis B vaccine. Additionally, this project will explore the barriers to HBV vaccination and/or titer testing.

Hepatitis B, hepatitis C (HCV), and human immunodeficiency virus (HIV) account for the majority of occupationally-acquired infections and are associated with significant morbidity and mortality (Denault & Gardner, 2023). One-third of all liver cancer fatalities worldwide are attributed to HBV (Abdelhamed & El-Kassas, 2024). University strict adherence to OSHA regulations and guidelines will reduce the risk, minimize exposure, and help prevent the transmission of bloodborne pathogens. To fulfill this responsibility, university researchers are provided with initial and annual BBP education and training, as well as opportunity for hepatitis B screening, vaccinations and titers within ten days of the researcher's assignment.

Internal Data

An occupational health department at a large academic institution in the southwestern United States was tasked with identifying laboratory researchers who may have potential exposures to BBP, specifically hepatitis B. Initial gaps and issues among university researchers

were identified by university committees, including the Institutional Animal Care and Use Committee (IACUC), the Institutional Biosafety Committee (IBC), and Environmental Health and Safety (EHS) officers.

The IACUC, established by federal mandate, oversees all research, teaching, and testing activities involving live vertebrate animals at institutions. Its role includes evaluating all aspects of the institution's animal care and use program. The IBC, on the other hand, is responsible for reviewing and monitoring research and teaching activities that involve biohazards or infectious agents, select agents and toxins, as well as dual-use research of concern (DURC). The IBC has developed and implemented policies and procedures to ensure the safe and ethical conduct of research and to facilitate compliance with the National Institutes of Health (NIH) guidelines. Furthermore, EHS biosafety officers and safety partners identify potential laboratory risks and work in collaboration with occupational health to formulate recommendations for medical surveillance compliance requirements for researchers.

Four years ago, prior to the establishment of the university's occupational health department, laboratory researchers underwent medical surveillance at various non-collaborating HIPAA-compliant occupational health sites. Currently, medical surveillance information is consolidated within a single HIPAA-protected area of the university's employee health portal electronic medical record (EMR).

PICOT Question

A review of the literature led to the clinically relevant PICOT question: Among academic researchers (P), how does education regarding risks of exposure to hepatitis B (I) compared to those without such education (C) improve hepatitis B awareness (O) over a 12-week period (T)? This led to the following exhaustive search.

Search Strategy

An extensive search was conducted to address the PICOT question. The databases utilized included PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and PsychInfo. The focus on hepatitis B among university researchers guided the selection of appropriate databases for search results. By changing the search terms from "university" to "academic" and "academia," the scope of the search results was broadened. Each search engine offered varying results, and advanced search techniques were employed by integrating keywords and Boolean connectors “AND” and “OR”. Additional filters were applied to refine the research outcomes. To ensure the use of recent and relevant information, the articles considered were limited to those published within the last five years and written in English. Furthermore, grey literature was explored through web-based resources such as the United States Department of Health and Human Services (HHS), the Hepatitis B Foundation, the World Health Organization (WHO), and the Centers for Disease Control and Prevention (CDC).

Keyword Selection

Keywords related to the problem included *hepatitis B exposure, blood-borne pathogens, viral infectious disease, hepatocellular disease, occupational exposure, and economic burden.* For the population, keywords were *academic researcher, principal investigator, research assistant, and university population.* Keywords selected for comparison included *current practice, knowledge, pre-test, and post-test.* The keywords associated with the intervention encompassed *education, risks of exposure, acknowledgment, interventional tools, exposure awareness, resources, and needle-stick prevention.*

Initial and Final Search Yields

The initial CINAHL search resulted in 204 articles. Filters were applied and using different keyword combinations, the search results narrowed significantly. A total of 12 articles were selected to further evaluate.

The initial PubMed search resulted in 539 articles. Focusing specifically on HBV, academia researcher, and occupational exposure allowed the search engine to narrow these down substantially. After applying filters and different keyword combinations, the search results narrowed to 21 articles which were selected to further evaluate.

The PsychInfo search from Proquest resulted in 150 articles using the keyword combinations listed above. This was further narrowed utilizing similar filters and keyword combinations used for the other search engines. Nine articles were selected to consider for this paper.

Limitations, Inclusion, and Exclusion Criteria

The inclusion criteria focused on studies published in English, spanning from 2018 to the present. Articles older than five years were excluded. Criteria for inclusion encompassed *occupational exposure, needlestick and sharps injuries, academic researcher, university population, hepatitis B, disease burden, humanistic burden, education, screening and testing, and health promotion*. Global studies from various countries were included as long as they were published in English. The studies reviewed represented countries from around the world. Excluded were studies not hepatitis B, occupational health, occupational exposure, needlestick and sharp injuries, academic populations, or healthcare-related topics, as well as those lacking supportive evidence. The inclusion and exclusion criteria were consistently applied across all databases, with limitations set to English-language articles published within the last five years.

Critical Appraisal and Synthesis of Evidence

A rapid critical appraisal checklist was employed to assess the quality, strengths, and weaknesses of multiple studies (Melnyk & Fineout-Overholt, 2019). The ten selected studies were evaluated for the best available evidence. Among these, two studies were classified as level III, two as level IIII, one as level V, and five as level VI (refer to Appendix A, Table A3). Five studies were cross-sectional reviews, two were systematic reviews and meta-analyses, while others included a quasi-experimental design, a case study, and a cohort design. The studies were conducted across various settings, with five taking place in educational institutions, two in hospitals, one in primary care, and two in diverse healthcare environments. Notably, the studies shared common themes, focusing on knowledge, education, testing, attitudes, and practices regarding hepatitis B. The demographics of the studies were diverse, encompassing numerous countries (see Table A3). The participant demographics included five studies focused on students and university employees, and five studies involving healthcare providers and patients. Sample sizes varied significantly, ranging from 120 to 7,015 participants, although the smaller sample sizes do pose limitations on the studies' validity.

Discussion

Based on the evaluation of the ten final studies, there is substantial evidence that hepatitis B education and screening programs can effectively enhance researchers' health satisfaction, awareness, compliance, and reduce the incidence of needle stick injuries, as well as lower HBV exposure and infection rates. Academic institutions should be equipped with adequate resources, including policy support, appropriate HBV screening, and ongoing monitoring of researchers’ knowledge, attitudes, and practices regarding HBV exposure risks. Furthermore, awareness-building through education may also lead to an increase in vaccine uptake.

Theory/Theoretical Framework Application

The Health Belief Model (HBM) was chosen as the theoretical framework for this project (see Appendix B, Figure B1). Developed by psychologists from the U.S. Public Health Service in the 1950s, the HBM was one of the earliest theories addressing health behavior (National Cancer Institute, 2020). The model investigated the reasons behind low participation rates in programs aimed at disease prevention and detection. The psychologists posited that individuals' beliefs about their susceptibility to disease, along with their perceptions of the advantages of disease avoidance, significantly influenced their willingness to engage in preventive actions (National Cancer Institute [NCI], 2020). While the model has evolved over the years, it continues to emphasize health motivation as its core focus and remains a valuable tool in predicting individual changes in health behaviors.

The HBM comprises six key concepts that help to predict health behavior: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (see Figure B1). This theoretical framework guided health promotion and disease prevention initiatives through these six essential concepts. In the context of this academic research population, individuals in occupations at risk of exposure to HBV were identified. Despite the known risks, many researchers remained reluctant to acknowledge their susceptibility to contracting HBV. Through effective education, training, and guidance on hepatitis B, supported by the principles of the HBM, these researchers may cultivate a more accurate understanding of their exposure risk and feel empowered to act, ultimately reducing HBV occupational exposures and infections.

Implementation Framework

The Plan-Do-Study-Act (PDSA) Cycle was employed for this DNP project (See Appendix B, Figure B3). Utilizing this model allowed for testing an idea on a trial basis, and enabled the

team to learn from its impact while gradually enhancing their understanding of the outcomes (Melnyk & Fineout-Overholt, 2019). The four stages of the PDSA cycle included planning the change and conducting observations, implementing the change (education) on a small scale, analyzing the data to determine outcomes, and refining the change based on the insights gained (Melnyk & Fineout-Overholt, 2019). This process is then repeated with the newly implemented changes (see Figure B4).

This quality improvement model guided the project by facilitating changes based on the evolving needs of the researcher population to increase compliance with HBV acknowledgment. Initially, the model was applied in select laboratories with the highest potential for exposure to hepatitis B. As lessons are learned from the trial outcomes in these initial labs, additional educational strategies may be developed and implemented in further labs, thereby increasing the likelihood of success over time.

Implications for Practice Change

The importance of addressing this gap is significant as it related to the health and welfare of present and future researchers alike. In the practice setting, education is for both needle stick prevention and HBV awareness in the academic researcher setting. Researchers who are eligible to receive the vaccine would be required to sign a consent/declination form indicating that they have been given the opportunity to receive the vaccination, titers, and or declination of vaccination.

Methods

Ethical Considerations and Human Subject Protection

This Doctorate of Nursing Practice (DNP) project was guided by four core ethical principles: autonomy, beneficence, justice, and non-maleficence. Autonomy refers to the individual's capacity to make informed choices based on adequate information (American Nurses

Association, 2024). The project upheld these principles by ensuring that participants made informed decisions regarding their involvement. The project lead respected each individual's choice to participate or decline. Beneficence, which emphasized promoting good and prioritizing the welfare of individuals, was also a foundational principle (ANA, 2024). The project advocated for the safe health practices and overall well-being of the academic researcher population. Justice, defined as the right to equitable and fair treatment, was operationalized by ensuring the equal distribution of survey questionnaires, educational materials, and medical surveillance recommendations, including vaccinations and titers (ANA, 2024). Non-maleficence, which involved the commitment to minimize or avoid harm, was addressed through strict confidentiality measures and the implementation of interventions designed to provide benefits without adverse effects (ANA, 2024). The proposed methodology was reviewed by faculty mentors and the Arizona State Institutional Review Board (IRB) to ensure adherence to ethical standards and the protection of participants' rights.

The project was submitted to the Institutional Review Board at Arizona State University. Approval was granted on August 5th, 2024 for STUDY00020503 (Exemption granted), prior to the initiation of the project from Arizona State University Institutional Review Board (see Appendix C, Figure C2). Participation in this DNP project required written consent (see Appendix D, Figure D2), which served as a vital record of a participant’s voluntary and informed agreement. The consent documentation explicitly outlines the project’s objectives, methodologies, potential risks and benefits, expected duration, and participants' rights, including the provision to withdraw at any time without repercussions. The language used in the consent form was clear and accessible, avoiding medical jargon to facilitate understanding.

Consent forms were distributed via email (Figure D2), and participants had adequate time to review the information and pose questions prior to signing. The consent forms collected

participants' names and contact information to provide avenues for follow-up inquiries related to the DNP project. The signed consent forms were securely emailed back to the co-principal investigator and stored on a HIPAA-compliant computer to ensure confidentiality and data security.

Setting and Stakeholders

The selected site for this project was the employee occupational health department within a large academic institution located in the southwestern United States. The clinic's team consisted of an associate director, a nurse practitioner, a registered nurse, a medical office specialist, and an employee health aide, and is based in Arizona. Services offered at this clinic encompassed employee and researcher medical compliance, health physicals, immunizations, management of workers' compensation for illnesses and injuries, a respiratory protection program, travel consultations, and various other occupational health services.

Stakeholders involved in this initiative included the occupational health staff, the vice president of Environmental Health and Safety, the Institutional Animal Care and Use Committee (IACUC), the Institutional Biosafety Committee (IBC), as well as academic researchers, assistant researchers, student researchers, and volunteer researchers. The clinical staff and academic researchers played a crucial role in the project's success. Additionally, the other stakeholders had a vested interest in the project, as it will not only support the academic researchers but also ensure compliance with OSHA bloodborne pathogen regulations.

Participants and Recruitment

The participant population for this project comprised academic researchers, assistant researchers, student researchers, and volunteer researchers who are required to be compliant with OSHA standards and hepatitis B medical requirements. The inclusion criteria were: Eligible participants were required to be affiliated with a university research laboratory that engaged in

work involving animals, humans, human cell lines, BBP's, tissues, or other potentially infectious materials (OPIM). All participants had to be at least 18 years old. If a participant was a student, they must have met the criteria of a student researcher which stated that a student researcher is an undergraduate or graduate student who actively participates and contributes to overall research in the lab in academic research projects under the guidance of a faculty member who is conducting the research. Participants must have been able to read and write English. The exclusion criteria were: Individuals under the age of 18 years, adults who were unable to consent, adults who could not read, write, or understand English, and academic researchers who self-identified as not being at risk for HBV. No financial compensation was given to participants.

Recruitment methods used in this project included a recruitment email (see Appendix D, Figure D1), to potential participants identified by EHS biosafety officers. The email was sent to the potential participant's secure university email address. The email letter contained a description of the project, a recruitment flyer (see Figure D3), and a Participation with Consent form (see Figure D2). Once the participant consented to participate in the project through a return email of the signed Participation with Consent Form, a second email with a link to the survey questionnaire using Google Forms (Durst-Rael, 2024) was sent with directions to begin the project pre and post education questionnaire (Appendix E, Figure E1).

Participation in this project was entirely voluntary. Participant confidentiality was ensured by a participant-generated unique identification number. The selection process did not consider participants' income, race, or education level, although it was essential that they could read, write, and comprehend English.

Project Intervention

A Hepatitis B educational PowerPoint presentation was used as the DNP Project intervention. The educational intervention was between the pre- and post-HBV Awareness and

Education questionnaire. The PowerPoint was placed online on Google Slides (Durst-Rael, 2024) (see Figure E2). The content covered an introduction to hepatitis B, described liver functions, and what distinguishes HBV from other viral hepatitis. The presentation discussed hepatitis B occupational health risks and acute versus chronic hepatitis B signs and symptoms. It emphasized practical and effective prevention strategies, such as using personal protective equipment (PPE) and preventing sharps injuries, to equip the audience with the necessary knowledge and tools. Information was provided on protection through vaccination status, hepatitis B titers, and receiving vaccination series. The intervention presentation ended with a list of Hepatitis B resources. This evidence-based project focused on the knowledge, attitude, and practice (KAP) regarding HBV in the academic researcher population and on assessing awareness of hepatitis B, potential risks of occupational exposure, and vaccination or declination status.

Project Timeline

Week 1: Introduction and Consent

Once the Institutional Review Board (IRB) had approved the project, it was introduced to researchers via email (see Figure D1) along with the participant consent and project flyer (see Figure D3). The flyer was also distributed through relevant laboratory departments and during laboratory staff meetings. The introductory email provided details on how the evidence-based project employs process improvement methods to enhance awareness and education about hepatitis B among academic researchers.

Weeks 2-4: Intervention Hepatitis B Assessment

Participants provided their consent by replying to the email they received. Following that, they received another email containing a link to Google Forms (Durst-Rael, 2024), which directed them to a simple and straightforward DNP project registration process on Google Forms. During the registration process, each participant created a unique self-identifying number, which enabled

anonymous pairing of pre and post-survey questionnaire. Once the survey questionnaire was initiated, participants had to complete the entire intervention to ensure their responses were considered valid project data. The pre-intervention Hepatitis B Assessment Questionnaire took approximately 5 minutes to complete, followed by the intervention, a 15-minute educational PowerPoint presentation, and concluded with a 5-minute post-intervention Hepatitis B Assessment Questionnaire. Submissions were deemed invalid if any part of the assessment tool and intervention (pre and post-Hepatitis B Assessment Questionnaire or educational PowerPoint) were incomplete. Upon completing the post-intervention survey questionnaire, participants submitted their responses via the Google Form by pressing the submit button. The results were gathered using Google Forms.

Week 5: Conclusion of Intervention

The Hepatitis B Assessment Questionnaire and PowerPoint education intervention occurred occur over four weeks. At the end of this time period, the consenting participants received a third email thanking them for their participation in the DNP project.

Week 6: Data Analysis Plan

After the data was collected on Google Forms, the data was exported to Intellectus Statistics Software (Intellectus Statistics, 2023) for data analysis.

Outcome Measures and Data Analysis

Measures

The outcome variables that were measured were awareness and education. This project utilized a self-administered online survey questionnaire containing 24 items (see Appendix E) and it contains 3 domains: knowledge (K), attitude (A), and practice (P). Shrestha et al. (2020) developed and used a semi-structured pre-piloted knowledge, attitude, and practice (KAP) survey questionnaire to collect data, and its internal consistency was Cronbach's $\alpha=0.698$. This survey

questionnaire was originally used to interview preclinical medical students in Nepal who were at high risk for HBV occupational exposure in the lab. This author has obtained permission to utilize the survey questionnaire and change questions as applicable to the academic researcher population. Two questions were changed using the words academic researcher instead of healthcare worker. This survey questionnaire has been utilized through many KAP hepatitis B projects. The survey questionnaire was self-administered online through Google Forms pre- and post-the PowerPoint educational intervention.

In the absence of a pre-existing psychometric article to validate the research tool, the validity of the hepatitis B questionnaire was established through face validity. The validators were comprised of seasoned professionals with extensive experience in the healthcare and research domains, each possessing a proven track record of in-depth knowledge about HBV. These recognized experts within the healthcare and research community were strategically selected to assess the questionnaire's content, bringing their substantial expertise to bear on the evaluation process. Through a comprehensive review, these professionals provided critical feedback on the tool's content, relevance, and clarity, thereby contributing to the establishment of its face validity.

The survey questionnaire responses were measured using a five-point Likert scale. The pre-Hepatitis B Assessment Questionnaire results were focused on assessing awareness of HBV, potential risks of occupational exposure, and vaccination or declination. Using the post-intervention Hepatitis B Assessment Questionnaire, researchers should demonstrate sufficient knowledge and understanding of HBV to minimize their risk of occupational health exposure and infection.

Data Analysis

Data were collected and analyzed from both the pre- and post-education questionnaires

delivered through Google Sheets. Intellectus Statistics Software (Intellectus Statistics, 2023) was used to store, manage, and analyze the data. Descriptive statistics was used to describe the sample (n=38) and outcome variables Pre-HBV Awareness and Education and Post-HBV Awareness and Education.

Budget Justification

This author received no specific funding for this work. The DNP student time, internet emailing, printing, and parking costs were offset as these hours and costs were donated towards the DNP Project by the DNP student, and no additional compensation was needed (see Appendix H). The academic researcher time performing the before and after Hepatitis B Assessment Questionnaire and educational intervention was offset as it was performed during their regular daily work hours.

Once the DNP project has been determined to be beneficial in decreasing the potential risk of exposure and infection, the average time and cost of the university HBV intervention would be extremely minimal compared to the cost of HBV post exposure testing, education, medication, potential infection, and medical follow-up. The potential revenue or cost savings to the university setting would be reflected as a decrease in needle sticks, splashes, and sharps injuries sustained to the researchers post project intervention.

The cost of sustaining the education portion of the project as a permanent practice would be minimal, as the education may be added as an annual online education tool to employees and researchers identified as high-risk for BBP exposures. The university occupational health clinic would provide academic researchers with hepatitis B vaccines and titers, and the cost of this service would be billed to each individual lab. The occupational health clinic would incur the cost of staff and supplies needed for vaccinations and titers, such as vacutainers, needles, bandages,

and computer printing paper. The researcher population would continue to perform this practice during regular daily work hours, no additional cost is incurred.

Results

Descriptive statistics was used to describe the sample (n=38) and outcome variables awareness and education pre- and post-educational intervention (See Appendix F). Researchers (n=38) completed the study. The majority of the sample were male 20 (53 %), and the remaining were female 18 (47 %) (Appendix F, Table 1). The average age was 39 (*SD* = 12.81) and the ages range from 21 to 74 years of age (see Appendix F, Table F1). The category of Race/Ethnicity was White/Caucasian 29 (76%), Hispanic/Latino 6 (16%), Black and White 1 (3%), and Asian American/Asian 2 (5%) (Table F1). The participants level of education was Doctorate 12 (32%), Master's and some college 8 (21%), Bachelor's 18 (47%). These descriptive statistics results are presented in Appendix F, Table 1.

Descriptive statistics was used to describe the outcome variables HBV awareness and education. The average score for HBV Awareness and Education Assessment before the intervention was 89.05 (*SD* = 7.06), the scores ranged from 76 to 100 points. The average score for HBV Awareness and Education Assessment after the intervention was 92.87 (*SD* = 6.44), the scores ranged from 79 to 94.50 points (see Table F1).

The description of the following domains, knowledge (K) , attitude (A) , and practice (P), were calculated pre- and post-educational intervention (see Table F4). The average score for Pre-HBV Awareness (A) & Education (E) Knowledge was 59.50 (*SD* = 5.45), the scores range from 49.00 to 68.00. The average score for the Post-HBV A & E Knowledge was 64.11 (*SD* = 3.73), the scores range from 56.00 to 70.00. The average score for Pre-HBV A & E Attitude was 13.47 (*SD* = 1.54), the scores range from 10.00 to 17.00. The average score for the Post-HBV A & E

Attitude was 12.37 (*SD* = 1.95), the scores range from 5.00 to 17.00. The average score for Pre-HBV A & E Practice was 16.08 (*SD* = 3.87), the scores range from 6.00 to 20.00. The average score for the Post-HBV A & E Practice was 16.39 (*SD* = 3.75), the scores range from 8.00 to 20.00. (Please see Table F1).

Interpretation of Results

The average score for the outcome variables, awareness and education, increased post-educational intervention. The clinical significance was described in the following domains: Knowledge (K), Attitude (A), and Practice (P). The average score for Knowledge increased after the intervention from 59.50 to 64.11. The average score for Attitude minimally decreased after the intervention from 13.47 to 12.37. The average score for Practice minimally increased from 16.08 to 16.39. Despite the KAP average scores noted, certain questions in the questionnaire indicate that education remains critical in assuring increased awareness, education, and prevention of HBV. For instance, in the Knowledge section, researchers were asked if a virus caused hepatitis B, and before the intervention, 74.5% strongly agreed; after the intervention, 97.4% strongly agreed (see Appendix G, Figure 1). In the Attitude section, researchers were asked if they believed that academic researchers should receive the hepatitis B vaccine before the intervention; 76.5% strongly agreed, and after the intervention, 97.2% strongly agreed (see Figure G2). In the Practice section, researchers were asked about never recapping used needles; before the intervention, 60% strongly agreed, and after the intervention, 66.7% strongly agreed (see Figure G3).

Impact of Project

Awareness, education, and risk assessment regarding Hepatitis B among university researchers have shown positive effects through the implementation of prevention strategies and safety improvements. It's crucial for educational institutions to develop appropriate hepatitis B

screening and risk assessment policies for high-risk laboratories (Kazmi et al., 2022). The outcomes of this DNP project will benefit researchers, medical providers, and the university system by enhancing their understanding of the specific and unique BBP exposure risks in their laboratory environments.

Based on my clinical expertise and education in hepatitis B management, researchers significantly benefit from annual BBP training combined with initial HBV screening. This dual approach is not just about ensuring compliance with occupational safety standards, but it's also about providing essential protection for researchers who may be at risk of exposure to human-derived materials. Compliance with these standards is not just a formality, it's a necessity for a safer research environment. Initial HBV screening would establish baseline immunity status, while training reinforces proper handling protocols and preventative measures to substantially reduce HBV transmission risk and contribute to a safer research environment overall.

Sustainability

Hepatitis B virus (HBV) represents a significant global health concern. Research indicates that the risk of HBV remains high, emphasizing the continued need for awareness, education, and screening (Abdelhamed & El-Kassas, 2024). In this DNP project, the use of an educational PowerPoint presentation on HBV resulted in increased knowledge, attitudes, and practice scores, as evidenced by the post-intervention survey questionnaire.

To ensure the long-term sustainability of this DNP project, aggregate data were shared with stakeholders at the project site, while participant anonymity was preserved by withholding individual data. After the site reviewed the data, the project site enhanced its approach to promoting hepatitis B awareness and education through the support of biosafety officers and better identification of at-risk researchers. The Hepatitis B Consent/Declination form has also been reviewed and updated and is available for use.

Future sustainability efforts should include periodic assessments of HBV knowledge levels, the development of peer-led educational sessions, and exploration of potential grant funding to expand on-site HBV screening opportunities. The improvements in knowledge, attitudes, and practice scores indicate the effectiveness of such educational interventions and suggest the potential for broader application across other academic research institutions.

Discussion

Summary of Findings

This project's findings, which align with those highlighted in the literature review and evidence synthesis, provide a solid foundation for the importance of enhanced awareness and education of hepatitis B risk. This alignment not only validates the project's findings but also emphasizes the transformative effect of such awareness on university researchers' understanding of transmission pathways, risks associated with BBP specific to their work environment, and the long-term health implications of potential HBV infections (Peng et al., 2018).

The targeted educational intervention on HBV led to significant improvements in biosafety awareness and education. This was evident in the participants' enhanced knowledge, attitude, and practice usage of PPE, universal precaution protocols, and when handling potentially infectious materials. The project's implementation demonstrated a statistically moderate increase in awareness and education regarding HBV after participants reviewed the educational PowerPoint, thereby reinforcing the effectiveness of the intervention.

Limitations and Barriers

It is important to note that the study had limitations, including a small sample size of 38 participants. Although recruitment emails were sent to approximately 175 university researchers, only 38 chose to participate, which could also affect the sample’s representativeness. The small

sample size representativeness impacted the data analysis and limited the significance of the results. This constraint potentially affected the generalizability of findings to broader populations of university researchers. It may have reduced the statistical power needed to detect more subtle knowledge, attitude, and practice changes.

Despite these limitations, the project's findings align with those highlighted in the literature review and evidence synthesis, providing a solid foundation for the importance of enhanced awareness and education of HBV in the university researcher population.

Recommendations

University researchers who work with human-derived materials face particular vulnerability to HBV infection due to their occupational exposure (Nwosu & Okonkwo, 2023). The project aimed to evaluate the impact of hepatitis B awareness and education on the academic researcher. Continuing education for researchers who work with human-derived materials is essential to decrease the risk of BBP exposure. Despite the clinical significance of the findings, the limited participation rate (only 38 out of 175 potential participants) highlights the need for more comprehensive implementation strategies. Therefore, a primary recommendation is to establish this educational intervention as mandatory for all new staff working with human-derived materials.

One of the other key recommendations is to integrate the educational PowerPoint into the standard onboarding materials for all new academic researchers identified as being at high risk for potential HBV and bloodborne pathogen (BBP) exposure. Additionally, implementing biannual refresher training sessions would help reinforce knowledge retention among existing staff. Establishing a formal HBV safety champion program within each research department could further promote adherence to safety protocols and increase participation in educational initiatives. Occupational health staff will maintain and update the educational materials as new evidence

becomes available.

To address knowledge gaps identified during the project, supplementary resources such as quick-reference laboratory safety cards, and departmental safety huddles focused on HBV prevention should be implemented. Furthermore, creating partnerships with infection prevention specialists to provide hands-on demonstrations of proper laboratory safety techniques would enhance practical skills. Finally, the university does have an incident reporting system; however, there may be underreporting of near-miss incidents involving human-derived materials, which could also provide valuable insights for the continual improvement of educational content.

Conclusion

While the prevalence of HBV among academic researchers and students is concerning, there is a clear opportunity to reduce exposure and transmission of HBV through education and awareness, thereby ensuring the health and safety of this population. This opportunity represents a critical intervention point within university research settings where targeted biosafety education can create meaningful change.

By implementing comprehensive HBV awareness programs specifically designed for laboratory environments, universities can equip researchers with the knowledge needed to identify potential exposure risks unique to their work. These educational initiatives can transform laboratory practices, promoting consistent adherence to universal precautions, proper use of PPE, and the safe handling potentially infectious materials.

Additionally, increasing awareness about HBV vaccination status and post-exposure protocols provides researchers with a comprehensive protection framework that fosters actionable safety behaviors. This proactive approach not only safeguards individual researchers but also contributes to cultivating a culture of safety consciousness within academic research

communities. Such a culture can persist throughout researchers' careers and potentially influence biosafety practices across scientific institutions.

References

Abdelhamed, W., & El-Kassas, M. (2024). Hepatitis B virus as a risk factor for hepatocellular carcinoma: there is still much work to do. *Liver Research*, *8*(2), 83-90. https://www.sciencedirect.com/science/article/pii/S2542568424000199

Alaridah, N., Jarrar, R. A. F., Joudeh, R. M., Al-Abdallat, H., Ismail, L., Alnajjar, Z., Jum'ah, M., & Abu-Humaidan, A. H. (2024). Knowledge Gaps and Determination of Attitude and Practice among Medical Students toward Hepatitis B Infection: A Nationwide Cross-Sectional Study. *International Journal of Hepatology*, *2024*(1). https://onlinelibrary.wiley.com/doi/epdf/10.1155/2024/2730516

American Nurses Association, (2024). *Why ethics in nursing matters: Ethical principles in nursing*. https://www.nursingworld.org/content-hub/resources/workplace/why-ethics-in-nursing-matters/

Bijani, M., Rostami, K., Momennasab, M., & Yektatalab, S. (2018). Evaluating the effectiveness of a continuing education program for prevention of occupational exposure to needle stick injuries in nursing staff based on Kirkpatrick's Model. *Journal of the National Medical Association*, *110*(5), 459–463. https://doi.org/10.1016/j.jnma.2017.11.002

Barron, K., Hulleman, C., & Hartka, T., and Inouye, R. (2017). Using improvement science to design and scale up social psychological interventions in schools: The case of the growth mindset app. *Unpublished manuscript.*

Cooke, C. E., & Stephens, J. M. (2017). Clinical, economic, and humanistic burden of needlestick injuries in healthcare workers. *Medical Devices (Auckland, N.Z.)*, *10*, 225–235. https://doi.org/10.2147/MDER.S140846

Conners, E. E., Panagiotakopoulos, L., Hofmeister, M. G., Spradling, P. R., Hagan, L. M., Harris, A. M., Rogers-Brown, J. S., Wester, C., Nelson, N. P., & Contributors. (2023). Screening

and testing for hepatitis B virus infection: CDC recommendations – United States, 2023. *MMWR. Recommendations and Reports: Morbidity and Mortality Weekly Report. Recommendations and Reports*, *72*(1), 1–25. https://doi.org/10.15585/mmwr.rr7201a1

Deming, W. E. (1993). The new economics for industry, government, education. Massachusetts Institute of Technology, Center for Advanced Engineering Study.

Denault, D., & Gardner, H. (2023). OSHA Bloodborne Pathogen Standards. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK570561/

Durst-Rael, S. (2024). Hepatitis B assessment questionnaire. Google Forms. https://docs.google.com/forms/d/151a0DpGbu9ILeIDQh2VR6ABcHXDlC9wA16S2dP5If40/edit

Durst-Rael, S. (2024). PowerPoint Hepatitis B Virus [PowerPoint presentation]. Google Drive. https://drive.google.com/drive/u/0/home

El-Sayed, M. H., & Feld, J. J. (2022). Vaccination at the forefront of the fight against hepatitis B and C. *Nature Reviews. Gastroenterology & Hepatology*, *19*(2), 87–88. https://doi.org/10.1038/s41575-021-00570-x

Hepatitis B Foundation | Baruch S. Blumberg Institute. (n.d.). https://www.hepb.org/

Hosseini Shokouh, S. J., Naseh, I., Barati, M., Gholami, M., & Farkhonderay, A. (2024). Hepatitis B Virus Immunity Status and Booster Dose Efficacy in Health Sciences Students: An Interventional Study. Annals of Military and Health Sciences Research, *22*(4). https://doi.org/10.5812/amh-153329

Intellectus Statistics [Online computer software]. (2023). Intellectus Statistics. https://statistics.intellectus360.com

Kazmi, S. A., Rauf, A., Alshahrani, M. M., Awadh, A. A. A., Iqbal, Z., Soltane, R., Tag-Eldin, E., Ahmad, A., Ansari, Z., & Zia-Ur-Rehman, null. (2022). Hepatitis B among university population: Prevalence, associated risk factors, knowledge assessment, and treatment management. *Viruses*, *14*(9), 1936. https://doi.org/10.3390/v14091936

Makan, N., Song, E., & Kramvis, A. (2023). Knowledge, attitudes and practices of undergraduate health sciences students on hepatitis B vaccination at a South African university highlight the need for improvement of policies, implementation and coordination. *South African Medical Journal = Suid-Afrikaanse Tydskrif Vir Geneeskunde*, *113*(5), 39–45. https://doi.org/10.7196/SAMJ.2023.v113i5.16556

Malik, S., Das, R. S., Khan, T., Anto, A. G., Rajagopal, L., & Das Bhattacharya, S. (2021). Building the evidence for hepatitis B vaccination programs for students and researchers working with biological samples in Indian Institutes of Higher Education. *Human Vaccines &Immunotherapeutics*, *17*(12), 5595–5602. https://doi.org/10.1080/21645515.2021.2011549

Melnyk, B. M., & Fineout-Overholt, E. (2019). *Evidence-based practice in nursing and healthcare: A guide to best practice* (4th ed.). Wolters Kluwer.

National Cancer Institute. (2020, June). *Theory at a glance: A guide for health promotion practice.* https://cancercontrol.cancer.gov/sites/default/files/2020-06/theory.pdf

Naqid, I. A., Mosa, A. A., Ibrahim, S. V., Ibrahim, N. H., & Hussein, N. R. (2023). Hepatitis B vaccination status and knowledge, attitude, and practice towards Hepatitis B virus among medical sciences students: A cross-sectional study. *PloS One*, *18*(11), e0293822. https://doi.org/10.1371/journal.pone.0293822

Ngwa, C. H., Doungtsop, B.-C. K., Bihnwi, R., Ngo, N. V., & Yang, N. M. (2022). Burden of vaccine-preventable diseases, trends in vaccine coverage and current challenges in the

implementation of the expanded program on immunization: A situation analysis of Cameroon. *Human Vaccines & Immunotherapeutics*, *18*(1), 1939620. https://doi.org/10.1080/21645515.2021.1939620

Nwosu, C. O., & Okonkwo, E. C. (2023). Understanding hepatitis B: A survey of knowledge and awareness among medical laboratory professionals. *Allied Journal of Medical and Health Sciences*, *11*(2), 38-46. https://aydenjournals.com/index.php/IRJD/article/view/554

Ortiz, E., Scanlon, B., Mullens, A., & Durham, J. (2020). Effectiveness of interventions for hepatitis B and C: A systematic review of vaccination, screening, health promotion and linkage to care within higher income countries. *Journal of Community Health*, *45*(1), 201–218. https://doi.org/10.1007/s10900-019-00699-6

Peng, H., Bilal, M., & Iqbal, H. M. N. (2018). Improved biosafety and biosecurity measures and/or strategies to tackle laboratory-acquired infections and related risks. *International Journal of Environmental Research and Public Health*, *15*(12), 2697. https://doi.org/10.3390/ijerph15122697

Ram, D., Bhandari, D. S., Sharma, K., & Tripathi, D. (2023). Progression of blood-borne viruses through bloodstream: A comparative mathematical study. *Computer Methods and Programs in Biomedicine*, 232. https://www.sciencedirect.com/science/article/pii/S0169260723000925

Razali, N. M., & Wah, Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modeling and Analytics, 2*(1), 21-33.

Richmond, J. A., Sasadeusz, J., & Temple-Smith, M. (2018). The role of primary health care in hepatitis B testing and management: A case study. *Journal of Community Health*, *43*(1), 38–47. https://doi.org/10.1007/s10900-017-0385-9

Santoro, P. E., Paladini, A., Borrelli, I., Amantea, C., Rossi, M. F., Fortunato, C., Gualano, M. R., Marchetti, A., Cadeddu, C., & Moscato, U. (2024). Vaccine-preventable diseases: Immune response in a large population of healthcare students. *Vaccine*, *42*(4), 930–936. https://doi.org/10.1016/j.vaccine.2024.01.038

Schaffner, W., Nichol, K. L., & Reingold, A. L. (2018). Preventing hepatitis B in US adults through vaccination. *Infectious Diseases in Clinical Practice (Baltimore, Md.)*, *26*(6), 304–312. https://doi.org/10.1097/IPC.0000000000000685

Shrestha, D. B., Khadka, M., Khadka, M., Subedi, P., Pokharel, S., & Thapa, B. B. (2020). Hepatitis B vaccination status and knowledge, attitude, and practice regarding Hepatitis B among preclinical medical students of a medical college in Nepal. *PLOS ONE*, *15*(11), e0242658. https://doi.org/10.1371/journal.pone.0242658

Surofchy, D. D., Shieh, N., & Tam, I. (2023). Evolving considerations for choice of hepatitis B vaccine. *The American Journal of Managed Care.*, *29*(1 Suppl), S3–S14. https://doi.org/10.37765/ajmc.2023.89325

Tonghui, W., Ying, L., Xiaolu, W., & Ming, H. (2023). A large-scale survey on epidemiology and underreporting of needlestick and sharp injuries among healthcare workers in China. *Frontiers in Public Health*, *11*, 1292906. https://doi.org/10.3389/fpubh.2023.1292906

Wai, C.-T., Wong, M.-L., Ng, S., Cheok, A., Tan, M.-H., Chua, W., Mak, B., Aung, M.-O., & Lim, S.-G. (2005). Utility of the Health Belief Model in predicting compliance of screening in patients with chronic hepatitis B. *Alimentary Pharmacology & Therapeutics*, *21*(10), 1255–1262. https://doi.org/10.1111/j.1365-2036.2005.02497.x

Zhao, H., Zhou, X., & Zhou, Y.-H. (2020). Hepatitis B vaccine development and implementation. *Human Vaccines & Immunotherapeutics*, *16*(7), 1533–1544. https://doi.org/10.1080/21645515.2020.1732166

Appendix A

Evaluation and Synthesis Tables

Table A1

Evaluation Table for Quantitative Studies

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/Findings	Level of Evidence; Application to practice; Generalization
Richmond et al., (2018). *The role of primary health care in hepatitis B testing and management: a case study*. **Country**: Australia **Funding**: Not mentioned **Bias**: No conflicting interests or bias mentioned	HCM	**Design:** Single-Site Case Study **Purpose:** To explore the impact of four different interventions (education, audit and feedback cycle, review of EMR, and patient held reminder) on improving the rates of Hepatitis B testing and diagnosis in one primary care clinic over a 15-month period between 2015 and 2016.	**N=** 11 GPs, 3 nurses, and 2994 patients **Demographics:** Clinic Staff: 10 of 11 GPs female, majority employed part-time. Patients: Birth Country: 54% Australia, 3.2% China, 1.2% Egypt, 2.2% England, 1.2% Eritrea, 2.5% Ethiopia, 4.6% Greece, 3.6% Italy, 1.0% Malaysia, 1.5% New Zealand, 2.7% Somalia, 1.4% Sudan, 1.1% Turkey, 3.3% Vietnam, 3.3% Not Stated.	**IV1:** Education **IV2:** Audit and feedback cycle (gamification) **IV3:** Review EMR **IV4:** Patient-held reminder card **DV1:** Number of previously untested patients for hepatitis B **DV2:** Number of patients correctly tested for HbsAg, anti-HBc, and anti-HBs **DV3:** Proportion of patients from priority populations tested for hepatitis B **DV4:** Number of hepatitis B vaccine doses administered	**Tools:** EMR **Validity/ Reliability:** Advisory Committee of three clinic staff (GP, lead nurse, practice manager), an infectious disease specialist, a tertiary hospital based viral hepatitis nurse, and a community-based organization representative met quarterly during the study and advised on the design, implementation, and evaluation of study interventions.	**Data Analysis:** # patients tested for hepatitis B. Testing and vaccination rates were gathered and compared at base in 2014 to changes between 2015-2016. **Statistical Tests Used:** Data frequencies calculated using pivot tables in Excel	**DV1:** Hepatitis B tests ordered = 183 in 2014, 206 in 2015, and 285 in 2016 **DV2:** Number of patients correctly tested for HbsAg, anti-HBc, and anti-HBs = 17% in 2014, 40% in 2015, and 61% in 2016 **DV3:** Proportion of patients born in Africa and Asia tested for hepatitis B did not change between 2014 (20%) and 2016 (19%) **DV4:** Hepatitis B vaccines administered =	**Level of Evidence**: IIII **Strengths**: Patient-held reminder card allowed patient to initiate conversation about hepatitis B testing, the most successful intervention involved patients requesting a test through their patient-held reminder **Weakness**: Tracking number of vaccine doses administered was difficult due to incomplete EMR documentation, variability in testing behavior of individual GPs, concurrent implementation of interventions made it hard to identify which intervention had the greatest impact

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/Findings	Level of Evidence; Application to practice; Generalization
			Setting: Primary care clinic in inner metropolitan Melbourne area **Exclusion:** No clinic patients excluded from study (included all active patients of all ages), aimed to identify underreported rates of testing, diagnosis, and treatment among current patients **Attrition:** Not Stated	**Definitions:** **Education:** case-based education delivered by hepatitis B GP champion to clinic staff and patients **Gamification:** applying elements associated with game playing such as point scoring or competition with others **High Hepatitis B Prevalence Countries:** Australia, Greece, Italy, Vietnam, Somalia, Ethiopia	Ethics approval obtained from La Trobe University Human Ethics Committee and the primary care clinic Human Ethics Advisory Group.		35 in 2014, 110 in 2016	**Feasibility**: Found that study feasibility is dependent on GPs inclusion in the study design, engagement and interest in the study, and alignment with their clinical priorities **Application**: CHB care can shift from tertiary to primary care only if GPs are engaged and prioritize hepatitis B as an issue within their patient cohort, and a coordinated and systematic approach is used where there is a shared understanding and commitment by all staff to the intended outcomes.
Bijani et al., (2018). *Evaluating the effectiveness of a continuing education program for prevention of occupational exposure to needle stick injuries in nursing staff*	Kirkpatrick's Model – 4 Levels of Evaluating Effectiveness (Reaction, Learning, Behavior, and Results)	**Design:** Quasi-experimental design, two-group before-after evaluation **Purpose:** Study aimed to evaluate the effectiveness of a continuing education program for	**N=** 120 nurses (60 in control group, 60 in experimental group) **Demographics:** ED Nurses, internal ward, surgical unit, maternity ward, and the infection units. 80%	**IV1:** Continuing education intervention **DV1:** Frequency of exposure to needle stick injury **DV2:** Frequency of exposure to blood and bodily fluids **Definitions:**	**Tools:** Reaction: 12-question questionnaire assessing program contents, teacher, and facilities. Learning: 15-question MC questionnaire, answers rated from 0 (min) to 1 (max).	**Data Analysis:** Data analyzed using SPSS-22 statistical software, significance level $P \leq 0.05$. **Statistical Tests Used:** Pearson's correlation	**DV1:** EG: *Before Intervention:* 24 (40%) exposed, 36 (60%) not exposed *After Intervention:* 9 (15%) exposed, 51 (85%) not exposed. P = 0.013	**Level of Evidence**: III **Strengths**: Use of model for evaluation of education effectiveness reveals a programs strengths and weaknesses, how to plan for improvement, and demonstrates the effects of continuing education on changing participants' behavior and

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/Findings	Level of Evidence; Application to practice; Generalization
based on Kirkpatrick's Model. **Country**: Iran **Funding**: No outside funding **Bias**: No conflicting interests or bias		prevention of occupational exposure to needle stick injury, blood and body fluids in a nursing staff based on Kirkpatrick's model	women, 20% men. Experimental Group: average age of 31.7 years, average work experience of 8.7 years. Control Group: average age of 30.4 years, average work experience of 7.9 years. **Setting:** Valiasr hospital of Fasa of Medical Sciences in southern Iran **Exclusion:** Nurses with refusal to continue and being absent in the training program **Attrition:** None	**Continuing Education Intervention:** 10-hr training with lecture, Q&A, videos & demo. Emphasis on standard precautions, appropriate measures with needle stick and reporting exposures **Experimental Group:** Received continuing education intervention **Control Group:** Did not receive continuing education intervention	Behavior: 15 MC performance questionnaire. Results: exposure to sharp objects, blood and body fluids questionnaire used **Validity/ Reliability:** Reaction: validity by 15 nursing professionals; reliability verified using Cronbach's alpha (87%). Learning: reliability verified by Paterson and Askarian using Cronbach's alpha (87% & 85%). Behavior: validity verified by 15 nursing professors; reliability verified with a Cronbach's alpha of 78%. Results: reliability evaluated by Patterson and Askarian using test-retest method	coefficient, chi-square test, paired t-test, independent samples t-test, and descriptive statistics	CG: *Pre-Intervention:* 21 (35%) exposed, 39 (65%) not exposed *Post-Intervention:* 18 (30%) exposed, 42 (70%) not exposed. P = 0.54 **DV2:** Experimental Group: *Before Intervention:* 15 (25%) exposed, 45 (75%) not exposed *After Intervention:* 6 (10%) exposed, 54 (90%) not exposed. P = 0.0002 Control Group: *Before Intervention:* 18 (30%) exposed, 42 (70%) not exposed. *After Intervention:* 12 (20%) exposed, 48 (80%) not exposed. P = 0.65	performance with concrete evidence. **Weakness**: Limitations in comparing results of this study with those of similar studies because Kirkpatrick's model has not been used in similar studies conducted in other countries. **Feasibility**: Study results showed improved satisfaction, awareness, performance, and exposure rates among the experimental group compared to the results of the control group **Application**: Occupation exposure to needle stick injury and blood exposure can be reduced by designing education programs and raising awareness in nursing personnel.

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/Findings	Level of Evidence; Application to practice; Generalization
					(0.89 & 0.87 correlation coefficient)			
Tonghui et al., (2023*) A large-scale survey on epidemiology and underreporting of needlestick and sharp injuries among healthcare workers in China.* **Country**: China **Funding**: Study funded by the Department of Science and Technology of Gansu Province: Technology Innovation Guidance Program – Soft Science Special Project	HCM	**Design:** Cross-Sectional Study through use of retrospective online survey **Purpose:** To examine the epidemiology of NSIs and NSI underreporting and identify the determinants associated with the occurrence of NSIs and the underreporting of these injuries	**N=** 7,283 study participants, only 6,464 included in final analysis **Demographics:** HCWs (1,681 from primary hospitals, 2,683 secondary, 2,100 tertiary). Gender: 4,873 females, 1,591 males. Occupation: 2,544 doctors, 3,266 nurses, 694 others. Education: 2,742 junior college, 3,659 undergraduate, 63 graduate or above. **Setting:** 646 public hospitals across Gansu Province in NW China (361 general hospitals, 116 traditional Chinese medicine hospitals, 169	**IV1:** Type of healthcare institution **IV2:** Type of healthcare department **IV3:** Level of training on occupational exposure prevention and management **DV1:** NSI reporting rate **DV2:** Overall NSI prevalence **Definitions:** **Healthcare Institutions Studied:** primary hospitals (P/H), secondary hospitals (S/H), tertiary hospitals (T/H) **Healthcare Departments Studied:** pediatric, internal medicines, obstetrics and gynecology, surgery,	**Tools:** Online survey questionnaire accessed through a QR code to an online platform. Microsoft Office 2016 used for data management and Stata 17 used for comprehensive statistical computation and analysis. **Validity/ Reliability:** Questionnaire maintained anonymity (did not collect personal identifiers from participants such as name or ID number) to promote candid, unbiased responses. Ethics approval obtained from	**Data Analysis:** Descriptive analysis of distribution of NSI prevalence and reporting rates across various demographic categories. **Statistical Tests Used:** Chi-squared test used to determine gap among distinct demographic groups. Margin model used to calculate marginal impact of different training frequencies and diverse reimbursement claims on the incidence and	**Institution:** **DV1:** Underreporting Rate: 49.6% in P/H, 22.07% in S/H, 21.73% in T/H ($p < 0.001$) **DV2:** NSI rate: 29.74% in P/H, 32.09% in S/H, 36.81% in T/H ($p < 0.001$) **Department:** **DV1:** Internal Medicines had highest underreporting rate (31.99%), followed by Pediatric (29.09%). ED had lowest (16.13%) $p = 0.006$ **DV2:** ED had highest NSI rate of 45.37%, followed by Surgery (43.22%) ($p < 0.001$)	**Level of Evidence**: VI **Strengths**: Determined primary cause of NSIs and underreporting to be lapses in concentration and not perceiving patients as infectious. Findings emphasize positive impact of frequent training & improved reimbursement policies on reducing NSIs and encouraging reporting. **Weakness**: Use of convenience sampling and self-reported data introduces bias. Retrospective nature of participants' recall of NSIs from the past year influences recall bias. **Feasibility**: Research constraints in objectives and questionnaire length did not allow the study to extensively investigate the impact of diverse training durations, types, and effectiveness of NSI

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/Findings	Level of Evidence; Application to practice; Generalization
Bias: No conflicts of interest or bias			specialized hospitals), 698 community health centers **Exclusion:** Health centers and clinics situated below the county level and health facilities without inpatient beds not included **Attrition:** 819 study participants	ED, ICU, and other departments **Training Levels:** No training, 1 year, 2 years, 3 or more years	Lanzhou University Second Hospital review board, used waiver of informed consent. All methods carried out in accordance with the Declaration of Helsinki and relevant guidelines and regulations.	reporting rates of NSIs based on results of logistical regressions. Adopted a significance threshold of $p < 0.05$ to establish statistical significance.	**Training Level: DV1:** Underreporting rate 70.29% for 0 years, 26.88% for 1 year, 18.69% for 2 years, 14.61% for 3 or more years ($p < 0.001$) **DV2:** NSI rate 34.89 for 0 years, 32.94% for 1 year, 38.83% for 2 years, 28.22% for 3 or more years (28.22%) ($p < 0.001$).	incidence and reporting rates **Application**: Findings emphasize the positive impact of frequent training and improved reimbursement policies on reducing NSIs and encouraging reporting. Pressing need for enhanced surveillance, tailored training programs, and more efficient reporting mechanisms to combat significant prevalence of NSIs.

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurements/ Instrumentation	Data Analysis	Research Findings	Level of Evidence; Application to practice; Generalization
Naqid et al., (2023). *Hepatitis B vaccination status and knowledge, attitude, and practice towards hepatitis B virus among medical sciences students: A cross-sectional study.* **Country**: Iraq **Funding**: No outside funding **Bias**: No conflicting interests or bias	standards for Strengthening the Reporting of Observational Studies in Epidemiology	**Design:** Analytic cross-sectional study **Purpose:** Determine knowledge, attitude, and practice (KAP) towards Hepatitis B among medical students, as well as their vaccination status to explore underlying reasons for those unvaccinated	**N=** 511 medical students **Demographics:** Mean age of 20.74 years, 53% female & 47% male. 48.5% medical students, 31.5% dental students. 42.5% vaccinated & 57.5% not vaccinated. **Setting:** Duhok Province in the Kurdistan Region of Iraq **Exclusion:** Students less than 18 years of age, non-medical students, students from other provinces. **Attrition:** None	**IV1:** Basic demographic characteristics **IV2:** HBV vaccination status & reasons for not being vaccinated **DV1:** Assessment of knowledge related to HBV **DV2:** Assessment of attitude towards HBV **DV3:** Assessment of practice towards HBV **<u>Definitions:</u>** **KAP Score:** KAP question points totaled to produce KAP score varying between 16 and 80. Scores at or above	**Tools:** 22-item, self-administered questionnaire assessing basic demographic characteristics (3 items), vaccination status (3 items), and student's knowledge (6 items), attitude (5 items), and practice (5 items) on Hepatitis B. Delivered using Google Forms platform & paper and pen method. KAP questions measured using Five-point Likert scale ranging from strongly disagree to strongly agree. **Validity/ Reliability:** Survey derived	**Data Analysis:** Analysis performed using Microsoft Excel and GraphPad Prism 9 software. Frequencies & percentages used to describe descriptive statistics. **Statistical Tests Used:** Association between basic demographic characteristic variables & KAP score assessed using Chi-Square or Fisher's exact test. Statistical	**DV1:** Mean KAP score of 25.61, median of 26 **DV2:** Mean KAP score of 18.5, median of 19 **DV3:** Mean KAP score of 19.7, mean of 20 **Total KAP Score:** Mean of 63.81, median of 65. Of 217 vaccinated students, 39.17% inadequate KAP score, 60.83% good. Of 294 non-vaccinated students, 55.44% inadequate KAP score, 44.56% good. P-value of 0.0003. Of 182 students not vaccinated due to no vaccination program offered, 46.7% inadequate	**LoE**: VI **Strengths**: Large sample size helped minimize likelihood of bias. Results serve as a background for future studies although they are not generalizable. **Weakness**: Vaccination status was self-reported, potential recall bias could affect findings. Narrow study population, results cannot be generalized to all medical science colleges in the region. Study design did not measure cause-and-effect relationship. **Feasibility**: Students found to be unvaccinated mainly due to absence of vaccination programs. Vaccinated students exhibited better knowledge, attitude, and

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurements/ Instrumentation	Data Analysis	Research Findings	Level of Evidence; Application to practice; Generalization
				median was considered favorable/good, scores below median were considered inadequate.	from previously validated questionnaire with certain adjustments made by researchers to meet current study aims. All participants consented to be recruited in the study, all data with incomplete information was removed from the study results.	significance defined as a p-value of 0.05 or less.	KAP. Of 26 students not vaccinated due to perceived low risk of HBV, 73.1% inadequate KAP. Of 36 students not vaccinated due to lack of knowledge, 66.7% inadequate KAP. Of 28 students not vaccinated due to doubted efficacy, 82.1% inadequate KAP.	practice toward HBV than non-vaccinated students. **Application**: Results recommend implementation of a vaccination program and the provision of training on infection prevention guidelines through lectures/workshops to increase students' KAP toward HBV.
Malik et al., (2021). *Building the evidence for hepatitis B vaccination programs for students and researchers working with biological samples in Indian Institutes of Higher Education.*	Thompson's 5A Model – framework to assess access, affordability, acceptance, activation, and awareness	**Design:** Prospective cohort study – Documented need for HBV vaccination, developed HBV vaccination program, delivered HBV vaccines, and assessed determinants of vaccine uptake **Purpose:** Assess the need for HBV	**N=** 185 **Demographics:** 109 males, 76 females. Ages ranged from 18 to 64 years, 74% were between 18 and 29 years. Most (70%) from Eastern India. **Setting:** School of Medical Science and Technology (SMST) at	**Initial Survey:** **IV1:** Vaccination status **DV1:** Participation in vaccine clinic **F/U Survey:** **IV1:** Participation in vaccine clinic **DV1:** Access to HBV vaccine **DV2:** Affordability of HBV vaccine **DV3:** Acceptance of HBV vaccine **DV4:** Activation of HBV vaccine	**Tools:** Cross-sectional survey to determine HBV vaccination status & willingness to vaccinate. *F/U survey to 64 vaccine clinic participants to understand determinants of vaccine uptake. Surveys administered using online	**Data Analysis:** Questionnaire data extracted using Google Sheets. Baseline vaccination status categorized as fully vaccinated, not vaccinated, incompletely vaccinated, dose unknown, & status unknown.	**Initial Survey** **DV1:** 136 people eligible, 96 (71%) came forward for vaccination **F/U Survey:** **DV1:** getting vaccine in institute 77% very important, having options of multiple days for vaccine 70% very important **DV2:** availability of free vaccine 78% very	**LoE**: IIII **Strengths**: Participants from diverse geographic, educational & literacy backgrounds – representative of a major academic institution. **Weakness**: Could not reach those who refused to get vaccinated to determine why. Single-institution study could introduce bias to the statistical analysis.

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurements/ Instrumentation	Data Analysis	Research Endings	Level of Evidence; Application to practice; Generalization
Country: India **Funding**: No outside funding **Bias**: No conflicts of interest or bias reported		Vaccines for people working with biological materials in a major Indian institution, and identify factors affecting vaccine uptake	Indian Institute of Technology Kharagpur (IIT-KGP) **Exclusion:** Not mentioned, all vaccine clinic participants were included in survey **Attrition:** 121 participants (185 participated in initial HBV vaccination status survey, only 64 participated in follow-up survey at vaccine clinic)	**DV5:** Awareness of HBV **Definitions:** **Access:** vaccine availability & vaccination decision **Affordability:** getting vaccine free & during work hours **Acceptance:** getting vaccine with peers & recommendation of doctors/others in their decision **Activation:** phone calls, e-mail, posters, & in-person reminders **Awareness:** vaccine knowledge perceived benefits and risks	Google forms or in-person forms. **Validity/ Reliability:** Approval from the Institute of Ethics Committee Participants provided written informed consent. If participant reported they had been vaccinated, they were asked to upload proof of vaccination to ensure data reliability. Questionnaire was pretested on 8 participants and modified for ease of understanding.	**Statistical Tests Used:** Proportions calculated for vaccination categories & uptake. OR for being unvaccinated by occupation calculated using logistic regression. Z-test used to calculate two-sided p-values for the difference of proportions using STATA 13.	important, 42% neutral about getting vaccine during work hours **DV3:** getting vaccine with others in department 48%. Doctor recommendation 70% in their decision to be vaccinated **DV4:** rates of activation methods reported very important 63% phone calls, 58% emails, 38% in-person reminder, 38% posters, and 69% government requirement **DV5:** only 40% strongly agreed that HBV vaccine is safe & 47% that it is effective in preventing HBV	**Feasibility**: Additional studies needed to help inform policies on BBP awareness, biosafety training, and need for HBV vaccination **Application**: HBV vaccination programs needed in academic institutions beyond medical schools as part of institutional biosafety programs. Vaccine uptake is increased by building awareness & addressing practical issues by making vaccines more accessible & affordable.
Kazmi et al., (2022).	Not Mentioned, inferred to be Health Belief Model	**Design:** Observational, cross-sectional, analytical study	**N=** 7,015 employees & students	**IV1:** Disease prevalence **DV1:** Associative risk factors	**Tools:** Comprehensive questionnaire for knowledge assessment filled	**Data Analysis:** GraphPad Prism Version 7.04 used to.	**DV1:** Risk factors significant with disease prevalence: dental treatment (p = 0.0008), history	**LoE**: VI **Strengths**: Awareness sessions successful in increasing participants'

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurements/ Instrumentation	Data Analysis	Research Endings	Level of Evidence; Application to practice; Generalization
Hepatitis B among university population: Prevalence, associated risk factors, knowledge assessment, and treatment management. Viruses. **Country**: Pakistan **Funding**: Rahma Islamic Relief Pakistan, The Department of Zoology at University of AJ & K, and the Deanship of Scientific Research at Umm Al-Qura University **Bias**: None		**Purpose:** Estimate HBV prevalence, knowledge & associated risk factors assessment, and management of HBV treatment among University of AJ and K population.	**Demographics:** 3,210 males, 3,805 females. Mean age = 22 yrs. Males: 86 HbsAg pos, 3,124 HbsAg neg. Females: 64 HbsAg pos, 3,786 HbsAg neg. Of those HbsAg pos, 32 males HBV pos & 54 HBV neg; 7 females HBV pos & 57 HBV neg. **Setting:** University of Azad Jammu and Kashmir, Muzaffarabad **Exclusion:** None, included all individuals willing to participate in the study **Attrition:** None	**IV2:** Awareness sessions **DV2:** Knowledge assessment of participants **Definitions:** **Awareness Session:** included a multimedia presentation and the distribution of awareness materials	out by each candidate before & after awareness sessions. Risk factors assessed through a questionnaire especially designed for university students & employees. **Validity/ Reliability:** Study approved by Board of Advanced Studies and Research (BASR).	analyze the data **Statistical Tests Used:** Relationship between disease and associative risk factors as well as knowledge assessment assessed through a Chi-square test (at $p = 0.05$ with 95% CI) and again through a Fisher's exact test at $p = 0.05$ with 95% CI) to assess valid outcomes.	of hospitalization ($p = 0.018$), other immunosuppressive diseases ($p = 0.0002$), tattooing/ piercing any part of body ($p > 0.0001$). **DV2:** 36.6% reported hearing of HBV B/A, 100% A/A. 36.6% reported HBV as a viral disease B/A, 100% A/A. 72.3% reported early symptoms of HBV are the same as cold/flu B/A, 2.6% A/A. 4% reported there are no symptoms of HBV in some patient's B/A, 72.5% after awareness. 36.6% reported HBV can be transmitted by unsterilized syringes/needles B/A, 100% A/A. 15.9% reported HBV as curable/treatable	knowledge about HBV (32% to 85%). **Weakness**: Included students/employees from all departments of university, unable to compare results to data of other studies that only include medical students. **Feasibility**: Details of the information included in awareness session materials not provided – difficult to determine which knowledge interventions will result in study's level of improvement. **Application**: All educational institutes should implement the proper screening & related assessments to better control HBV at a national level. Efforts to increase HBV awareness were impactful and should be adopted into university policy to more proactively improve awareness of HBV.

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Purpose	Sample/Setting	Variables	Measurements/ Instrumentation	Data Analysis	Research Endings	Level of Evidence; Application to practice; Generalization
Santoro Citation al., (2024). *Vaccine-preventable diseases: Immune response in a large population of healthcare students.* **Country**: Italy **Funding**: No external funding **Bias**: No conflicting interests or bias	No theoretical framework used.	**Design:** Cross-sectional study **Purpose:** To investigate the seroprevalence characteristics of anti-HbsAg antibodies in healthcare students of a large teaching hospital in Rome.	**N=** 2,523 health students **Demographics:** 68.5% female, 31.5% male. 49.9% three-year students, 50.1% six-year students. Mean age = 22.2 yrs. **Setting:** Medicine, Dentistry, or Health professions at Catholic University of the Sacred Heart in Rome **Exclusion:** Those less than 18 years of age, those who did not complete a health surveillance visit, those who do not have result of at least one of five disease tests	**IV1:** Gender **IV2:** Study field **IV3:** Years of birth **DV1:** Serum anti-HbsAg **Definitions:** **Gender:** male or female **Study Field:** either six-year single-cycle degrees (medicine & dentistry) or three-year health profession degrees **Years of Birth:** 1966-1997, 1998-1999, 2000-2001, 2002-2004	**Tools:** Data collected from health Surveillance visit. Antibodies detected by chemilumine-scence immunoassay (CLIA) on the Atellica platform of the Siemens company. **Validity/ Reliability:** Research approved by Ethics Committee for Scientific Research (CERS). Study conducted under Declaration of Helsinki & under the requirements of privacy and informed consent enforced by current Italian law.	**Data Analysis:** Antibody levels reported as positive or negative. Bivariate analyses performed to study association of presence of antibody positivity, assuming this result indicates immunization against the virus, with relevant variables. Performed with STATA, version 17. **Statistical Tests Used:** Chi-square tests; logistic regression performed to evaluate	B/A, 85.5% A/A (p = 0.0001 for all). **DV1: Gender:** Females – 30.6% seropositive, 37.9% seronegative. Males – 13.9% seropositive, 17.6% seronegative (p-value > 0.05). **DV1: Study Field:** students of six-year degrees were less likely positive for anti-HbsAg (21.9% seropositive, 28.1% seronegative); students of three-year degrees 22.5% seropositive, 27.4% seronegative (p > 0.05). **DV1: Age:** Anti-HBVs seronegative had inverse correlation with older age (younger students more likely negative, p < 0.001) (1998-99 OR=0.75, CI 0.61-	**LoE:** VI **Strengths**: Large sample population, multidisciplinary of student degree courses, various birth years, and a ten-year visit range. **Weakness**: Only collected one sample per student with no possibility of F/U. Type of vaccine administered & date of last vaccine inoculation unknown. **Feasibility**: Healthcare procedures often differ for medical staff versus students; satisfactory vaccine coverage for both populations cannot be achieved without federal regulations. Seropositivity rate for HBV was often inadequate to prevent possible biological risks connected with activities carried out in ward. **Application**: Checking antibody coverage,

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Sampling	Sample/Setting	Variables	Measurements/ Instrumentation	Data Analysis	Research Endings	Level of Evidence; Application to practice; Generalization
			Attrition: None		Data collected was recorded on single anonymized and computerized database accessible to only researchers.	factors independently associated with antibody positivity for HBV. Significance level of 0.05.	0.93; 2000-01 OR= 0.50, CI 0.41-0.62;2002-04 OR=0.4, CI 0.31-0.52). **HBV Seropositivity:** notably low at 44% (1119 students positive, 1399 students negative at 55.6%)	along with timely immunization, are fundamentally important tools in reducing transmission of HBV.
Makan N, Song E, Kramvis A (2023). *Knowledge, attitudes and practices of undergraduate health sciences students on hepatitis B vaccination at a South African university highlight the need for improvement of policies, implementation and co-ordination.*	No framework mentioned, inferred to be Thompson's 5A Model	**Design:** Cross-sectional analytical study **Purpose:** To investigate the HepB uptake and KAP of undergraduate HSSs in relation to international and institutional HepB policies, and further investigate factors associated with HepB uptake.	**N=** 269 student survey responses, only 221 regarded as satisfactory (reported vaccination history) **Demographics:** 69.2% female, mean age of 22.5 years, 85.5% born after 1995, 94.1% of SA nationality, 85.5% had grown up in urban settings, & 76.9% were studying a	**IV1:** HepB uptake **DV1:** Sociodemographic characteristics of students **DV2:** Knowledge around HBV vaccination policy and implementation **DV3:** Attitudes towards HBV vaccination **DV4:** Vaccination practices at Wits **Definitions:**	**Tools:** Electronic, self-administered questionnaire created using an electronic data capture system (REDCap Software). SPSS Statistics version 20.0 used for data analysis. **Validity/ Reliability:** Questionnaire validated through a pilot study. Ethics approval for study obtained from Wits Human	**Data Analysis:** Continuous variables reported as means with standard deviation for normally distributed data & median and interquartile ranges (IQR) for non-normally distributed data. **Statistical Tests Used:**	**DV1:** Course enrollment only significant predictor of vaccine history (OR 4.69, p = 0.023). Sex (p=0.502, marital status (p=1.00), # of children (p=1.00) had no significant association. **DV2:** HSSs aware of Wits vaccination policies 12x more likely to be vaccinated (p<0.001). HSSs stating vaccines form part of standard infection	**LoE**: VI **Strengths**: Identified major reasons for lack of vaccination to be vaccine stock-outs, inadequate education & info around benefits / side-effects, & costs. Study recommendations supported by existing study findings. **Weakness**: Low survey response rate among students (7.1%), single academic institution limits generalizability of results, self-reported survey responses subject to recall bias.

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Sampling	Sample/Setting	Variables	Measurements/ Instrumentation	Data Analysis	Research Endings	Level of Evidence; Application to practice; Generalization
Country: South Africa **Funding**: Professor Earnest Song, Administered Fund, University of the Witwatersrand **Bias**: No conflicting interests or bias			Bachelor of Medicine and Surgery. **Setting:** University of Witwatersrand (Wits) in South Africa **Exclusion:** Students who were unaware of their vaccine status **Attrition:** 48 student survey responses not regarded as satisfactory	**Levels of HepB Uptake:** three doses of HBV vaccine (HepB3), at least one dose of HBV vaccine, not vaccinated for HBV	Research Ethics Committee (Medical). Questionnaires anonymized (personal identifiers removed) and raw data was imported into a password-protected Excel document.	Loglinear analysis used to determine any significant associations between any categorical variables. Fisher's Exact test conducted on all variables showing statistical significance in loglinear analysis. This multivariable binary logistic regression model conducted to calculate the effect size (in form of an adjusted OR and 95% CI) of predictor variables on the outcome. All tests were two-tailed and a p-value of <0.05.was statistically significant.	prevention for HCWs 5x more likely to be vaccinated (p=0.009). **DV3:** No significant associations between variables – 84.6% believed vaccination should be mandatory for all HSSs at Wits, 62% thought post-vaccination antibody testing was necessary to confirm immunity, 42.5% agreed this should be mandatory. **DV4:** Of 197 vaccinated students: 86.3% received most recent dose while attending university (78 vaccinated by university, 85 by private health facilities). 80% of HSSs not vaccinated at Wits did not provide vaccine evidence to university, all 73 students reported no F/U made by Wits to confirm vaccination proof.	**Feasibility**: Many university health centers not currently equipped to monitor and evaluate vaccination practices of HSSs, may be difficult to centralize and enforce policy to ensure completed vaccine series. **Application**: Universities need to be equipped with sufficient powers & resources for monitoring, F/U & facilitation of a completed three-dose vaccination. Collaboration with the national Department of Health can assist in enacting a formal policy to increase Hep B uptake.

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Appendix A

Evaluation and Synthesis Tables

Table A2

Evaluation Table for Qualitative Studies

Citation	**Theoretical/ Conceptual Framework**	**Design/Method/ Sampling**	**Sample/Setting**	**Major Themes Studied/ Definitions**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/Themes**	**Level/Quality of Evidence; Application to practice; Generalization**
Ortiz et al., (2020). *Effectiveness of interventions for hepatitis B and C: A systematic review of vaccination, screening, health promotion and linkage to care within higher income countries.* **Country**: Australia **Funding**: Not mentioned	No framework mentioned for systematic review *Three of the RCT studies used the Health Behavior Framework, Health Belief Model, and Social Cognitive Theory	**Design:** Systematic Review of Qualitative, Quantitative, or Mixed-Method Studies **Method:** Screened databases for qualitative, quantitative, or mixed-method articles that assessed HBV and HCV interventions on first and second-generation migrants (aged 15 years and older) who are from high endemic regions	**Sample:** N = 37 studies – 60% descriptive, 34% experimental (including RCTs, quasi-experimental, and pre-post studies), and 6% analytical studies **Demographics:** Primarily mixed-race target population with mean age range between 46 and 55 years. 41% of study participants belonged to low socio-economic strata, 30% were fluent English	**RQ1:** Effect of reported interventions on improving *awareness* of viral hepatitis among target migrant population **RQ2:** Effect of reported interventions on improving *testing and vaccination* of viral hepatitis among target migrant population **RQ3:** Effect of reported interventions on *identification and linkage to care* among target migrant population	**Data Collection:** Electronic Databases: PubMed, Embase, CINHAL, and gray literature. Did not include studies on general populations (non-immigrant) or high-risk subgroups, interventions developed in low or middle-income countries, that did not focus on knowledge, or if they carried out interventions in hepatitis A, E, D, and/or HIV.	**Type Used: Content Analysis** – MMAT-version 2011 used to assess and describe the methodological quality of qualitative, quantitative and mixed study designs. **Descriptive Studies:** 7 analyzed outcomes of comprehensive programs, 8 evaluated the prevalence of viral hepatitis	**Awareness:** (66) Using target population's language combined with support from influential community leaders helped increase awareness of viral hepatitis (but did not necessarily increase testing or linkage to care for positive individuals) **(2)** Education sessions/ community	**LoE**: III **Strengths**: Only studies relevant to specific target population, analyzed the impact of various interventions on multiple outcomes related to HBV/HCV, positive and negative relationships between certain research variables and improved hepatitis awareness, testing, and vaccination. **Weakness**: Low generalizability, few studies included F/U and linkage to care for individuals diagnosed with hepatitis.

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Sampling	Sample/Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/Themes	Level/Quality of Evidence; Application to practice; Generalization
Bias: No conflicting interests or bias mentioned		and settled in high-income, low endemicity countries. **Purpose:** Identify published literature on HBV and HCV interventions with a focus on increasing awareness, population screening and testing uptake, linkage to care and knowledge among migrants living in high income countries, as well as examine the reported challenges and limitations of the identified strategies employed.	speakers, 33% had completed high school. **Setting:** 26 studies conducted in the United States, 5 in the Netherlands, 3 in the United Kingdom, 2 in Canada, and 1 in Australia **Attrition:** None	**<u>Definitions:</u>** **Migrant:** an individual who has resided in a foreign country for more than one year irrespective of the causes or means used to migrate **High-Income Country:** those with a GNI per capita of $12,236 or more	**Data Dependability:** Review was performed using PRISMA guidelines for transparency and complete reporting. Validity of several studies was impacted by lack of clear eligibility criteria, low response rates, and self-reported data.	and provided education, 5 described testing and linkage to care, 1 evaluated knowledge gaps and challenges around HBV prevention, and 1 evaluated program efficacy through vaccination completion. **Interventional Studies:** Outcome measure was screening uptake for 5 studies, changes in knowledge for 5 studies, or both for 2 studies.	workshops increased viral hepatitis awareness among various ethnic minority groups, but single strategy/single setting efforts were less effective than those using multiple settings and partners **Testing & Vaccination:** (66) Recent interactions with healthcare providers is a strong independent predictor of intention to test **(2)** HBV screening interventions most successful with a participatory, multi-factor nature and flexibility (extended clinical hours, bilingual support)	**Feasibility**: Many successful programs relied on subsidized screening or external funding, could hinder longer-term sustainability. **Application**: Increased testing uptake and access to care requires a multi-strategy approach including community outreach, cultural health workers or navigators, strategic partnerships, culturally and linguistically oriented education, and educating healthcare providers. Reducing structural barriers to care and engaging community partners in all phases of program design
Citation		**Design/Method/**	**Sample/Setting**		**Measurement/**		**Findings/Themes**	

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

	Theoretical/ Conceptual Framework	Sampling		Major Themes Studied/ Definitions	Instrumentation	Data Analysis		Level/Quality of Evidence; Application to practice;
						Analytical Studies: All 3 investigated HBV/HVC prevalence and referral to care.	**Linkage to Care:** (66) Integration of free or affordable services for vaccination, diagnosis and treatment was most effective at increasing participation among hard-to reach communities **(2)** Partnerships with healthcare providers and patient navigators increased referral numbers, follow up and monitoring **(3)** Emphasis on lack of knowledge among PCPs on specific needs of migrants including those possibly at risk of viral hepatitis	**Generalization**

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework	Design/Method/ Sampling	Sample/Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/Themes	Level/Quality of Evidence; Application to practice; Generalization
Cooke et al., (2017). *Clinical, economic, and humanistic burden of needlestick injuries in healthcare workers.* **Country**: United States **Funding**: Pharmerit International received funding from Becton Dickinson to conduct this research **Bias**: Cooke was consultant to Pharmerit International during research, Stephens is an employee and	No framework mentioned for systematic review	**Design:** Systematic literature review **Method:** Literature search in PubMed and EMBASE databases, as well as Google and Google Scholar **Purpose:** To understand burden of NSI and assess the clinical, economic, and humanistic outcomes of NSI or active safety-engineered devices on HCWs	**N=** 69 articles **Demographics:** HCWs only **Setting:** Healthcare settings (hospitals, clinics, private offices, long-term care facilities, free-standing laboratories). Studies from various countries included **Attrition:** None	**RQ1:** Assess the clinical burden of NSIs **RQ21:** Evaluate impact of safety devices on NSI rates **RQ32:** Assess the risk of infection in HCWs from NSIs **RQ43:** Evaluate the humanistic burden of NSIs among HCWs **Definitions:** **NSI:** accidental percutaneous piercing wound caused by a contaminated sharp instrument, one of the most frequent routes of transmission in occupationally acquired blood-borne infections	**Data Collection:** Refined data search to only include English, human-based studies published within past 10 years. Included studies that reported policy or clinical, economic, or humanistic outcomes of NSI or safety injection devices on HCWs in healthcare settings. Excluded articles that did not include hypodermic injections. **Data Dependability:** Selected articles published to reliable databases (PubMed & EMBASE), did not include outdated research, followed	**Type Used: Content Analysis –** Analyzed research findings and data (if applicable) for health economic or budget impact studies, real-world observational studies, comparative effectiveness studies, clinical trials, and case reports.	**1:** Studies reported wide range of HCWs with NSIs (14.9% to 69.4%) and 3.2-24.7 NSIs per 100 occupied hospital beds. Hypodermic injections using disposable syringes and needles are most frequent cause of NSIs worldwide. **2.** Use of safety syringes/needles for hypodermic injection reduced risk of NSIs by 43.4%-100%. Recent systematic review found hypodermic safety injection devices have pooled relative risk of NSI of HCW of 0.54 (95% CI 0.41-0.71). **3:** Risk of infection with blood-borne virus	**LoE**: V **Strengths**: Effectively refined data search/article selection to assess reliable research directly related to NSIs among HCWs. Provided concise summary of all existing evidence related to associated clinical, economic, and humanistic outcomes **Weakness**: NSI rates may be underreported, estimated that half of sharp injuries in US go unreported. Existing research lacks a comprehensive assessment of psychological domains impacted in HCWs with NSI. **Feasibility**: Legislation increased use of safety-engineered devices, even when devices available prior to legislation.
Citation		**Design/Method/ Sampling**	**Sample/Setting**	**Major Themes Studied/**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/Themes**	

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

	Theoretical/ Conceptual Framework			**Definitions**				**Level/Quality of Evidence; Application to practice; Generalization**
stockholder of Pharmerit International				**Hypodermic:** intramuscular, subcutaneous, or intra-dermal **Active Safety Devices for Hypodermic Injection:** include a safety sliding shield needle, safety toppling shield needle, and a safety pivoting shield needle	strict inclusion/exclusion guidelines to narrow article selection from 982 to 69 articles.		after NSI highest for HBV (for every 1,000 NSIs from infected patient, 300 HCWs become infected), HCV (30 per 1,000 NSIs), and HIV (3 per 1,000 NSIs). Prevalence of HBV/HCV/HIV is higher among hospitalized patients, causes greater risk of NSI in this setting. **4:** After NSI, HCWs report range of psychological effects (depression, worry, stress, PTSD, anxiety, AD, crying spells, family tension). One study found that 80.2% of HCWs had anxiety post-NSI	Enforcement of legislation is necessary; implementation of safety-devices less significant without legislation enforcement. **Application**: The humanistic & economic burden of NSI could be reduced with implementation of safety needles for hypodermic injection (have reduced NSIs up to 100%), but legislation & its appropriate enforcement is necessary for success.
		Design/Method/ Sampling	**Sample/Setting**	**Major Themes Studied/**	**Measurement/**	**Data Analysis**	**Findings/Themes**	

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Citation	Theoretical/ Conceptual Framework			Definitions	Instrumentation			Level/Quality of Evidence; Application to practice;
							(66.4% mild/moderate, 13.8% persistent). Experiencing a NSI is significantly correlated with depressive symptoms (odds ratio 2.98) and PTSD (odds ratio 4.28). Psychological effects of NSI are linked to lost productivity and work time in US.	Generalization

Key: **A/A –** After Awareness; **AD** – Adjustment Disorder; **B/A –** Before Awareness; **BBP –** Bloodborne Pathogen; **BOE** – Body of Evidence; **CG** – Control Group; **CHB** – Chronic Hepatitis B; **CI –** Confidence Interval; **ED** – Emergency Department; **EG** – Experimental Group; **EMR** – Electronic Medical Records; **F/U** – Follow Up; **GMOs** – Genetically Modified Organisms; **GP** – General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HCM –** Health Care Model; **HCV** – Hepatitis C; **HCWs** – Healthcare Workers; **HepB –** Hepatitis B Vaccine; **HIV –** Human immunodeficiency Virus; **HSSs –** Health Science Students; **ICU** – Intensive Care Unit; **KAP –** Knowledge, Attitude, Practice; **LAI** – Laboratory-Acquired Infection; **LoE –** Level of Evidence; **MC** – Multiple Choice; **NSI** – Needlestick Injuries; **OR –** Odds Ratio; **O/R –** Operating Room; **PC** – Primary Care; **PCP** – Primary Care Provider; **PRISMA** – Preferred Reporting Items for Systematic Review; **PTSD** – Post-Traumatic Stress Disorder; **RCT** – Randomized Controlled Trial; **RF** – Risk Factor.

Table A3

Synthesis Table

Study Characteristics	Bijani et al.	Cooke et al.	Kazmi et al.	Makan et al.	Malik et al.	Naqid et al.	Ortiz et al.	Richmond et al.	Santoro et al.	Tonghui et al.
Year	2018	2017	2022	2023	2021	2023	2020	2018	2024	2023
Setting										
Country	Iran	United States	Pakistan	South Africa	India	Iraq	Australia	Australia	Italy	China
Location	Hospital	Any HC Setting	Educational Institution	Educational Institution	Educational Institution	Educational Institution	Any HC Setting	Primary Care Clinic	Educational Institution	Hospital
Design / Evidence										
Design LOE	QES III	SR&MA V	CSS VI	CSS VI	C IV	CSS VI	SR&MA III	CS IV	CSS VI	CSS VI
Method										
Survey	X		X	X	X	X				X
Testing of Antibody Levels									X	
Testing of Vaccination Status								X		
Review of Experimental Studies							X			
Review of Observational Studies		X					X			
Sample										
# of Studies (N)	-	69	-	-	-	-	37	-	-	-
# of Participants (n)	120	-	7,015	221	185	511	-	2,958	2,523	6,464
Population										
	Nurses	All HCWs	Students	Students	Students	Students	Patients	Physicians Patients Nurses	Students	All HCWs

Key: **CS** – Case Study; **CSS** – Cross-Sectional Study; **DoH –** Department of Health; **ED –** Emergency Department; **F/U –** Follow Up; **GP –** General Practitioner; **HBsAg** – Hepatitis B Surface Antigen; **HBV** – Hepatitis B; **HC** – Healthcare; **HCW** – Healthcare Worker; **HepB** – Hepatitis B Vaccine; **HepB3 –** 3-Dose HBV Vaccine; **HSS –** Health Science Student; **KAP** – Knowledge, Attitude, Practice; **LoE –** Level of Evidence; **LoT –** Level of Training; **N/A –** Not Applicable; **NSI** – Needlestick Injury; **P/H –** Primary Hospital; **T/H –** Tertiary Hospital.; **QES** – Quasi-Experimental Study; **SR** – Systematic Review; **SR&MA** – Systematic Review & Meta-Analysis

Appendix B

Models and Framework

Figure B1:

A Health Belief Model

Table 2. Health Belief Model

Concept	Definition	Potential Change Strategies
Perceived susceptibility	Beliefs about the chances of getting a condition	• Define what populations(s) are at risk and their levels of risk • Tailor risk information based on an individual's characteristics or behaviors • Help the individual develop an accurate perception of his or her own risk
Perceived severity	Beliefs about the seriousness of a condition and its consequences	• Specify the consequences of a condition and recommended action
Perceived benefits	Beliefs about the effectiveness of taking action to reduce risk or seriousness	• Explain how, where, and when to take action and what the potential positive results will be
Perceived barriers	Beliefs about the material and psychological costs of taking action	• Offer reassurance, incentives, and assistance; correct misinformation
Cues to action	Factors that activate "readiness to change"	• Provide "how to" information, promote awareness, and employ reminder systems
Self-efficacy	Confidence in one's ability to take action	• Provide training and guidance in performing action • Use progressive goal setting • Give verbal reinforcement • Demonstrate desired behaviors

Rosenstock, I. M. (1990)

Figure B2:

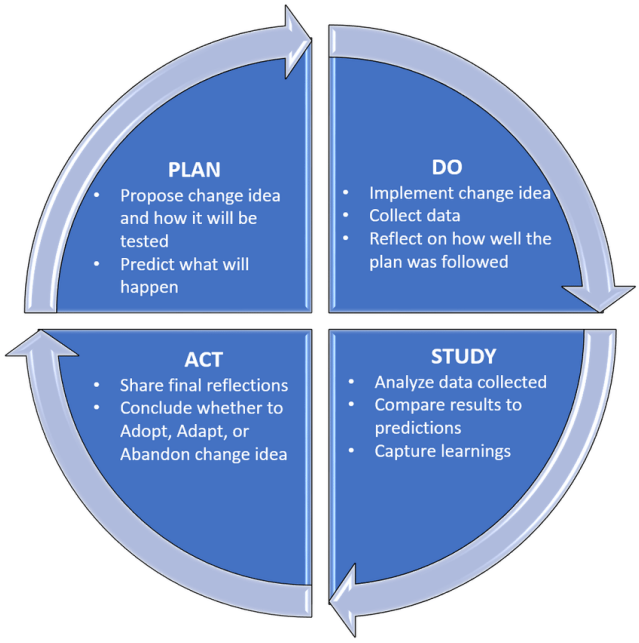
Applied Health Belief Model

Concept	Definition	Potential Change Strategies
Perceived susceptibility	Beliefs about the chances of getting Hepatitis B Virus (HBV)	Provide accurate HBV risk assessment for academic lab personnel. Provide HBV risk assessment and education on potential occupational exposure in lab.
Perceived severity	Beliefs about the seriousness of HBV and its consequences	Provide education on HBV infection, disease, vaccination, and treatment.
Perceived benefits	Beliefs about the effectiveness of taking action to reduce risk or seriousness	Provide academic researcher with information on HBV: 1) Vaccination and titers which may demonstrate immunity. 2) Location to obtain vaccination and or titers. 3) Provide immunity timeline.
Perceived barriers	Beliefs about the material and psychological costs of taking action	Education to correct misinformation about long term effects, side effects , and vaccine efficacy. Highly effective at preventing infection. Build a relationship of trust with the academic researcher.
Cues to action	Factors that activate "readiness to change"	Provide a HBV opt in/opt out form. Academic researcher HBV reminder system.
Self-efficacy	Confidence in one's ability to take action	Provide 1:1 HBV consultation. Provide verbal reinforcement such as follow up phone calls. Academic researcher opt in to protect one's self from infection and disease.

Rosenstock, I. M.(1990)

Figure B3:

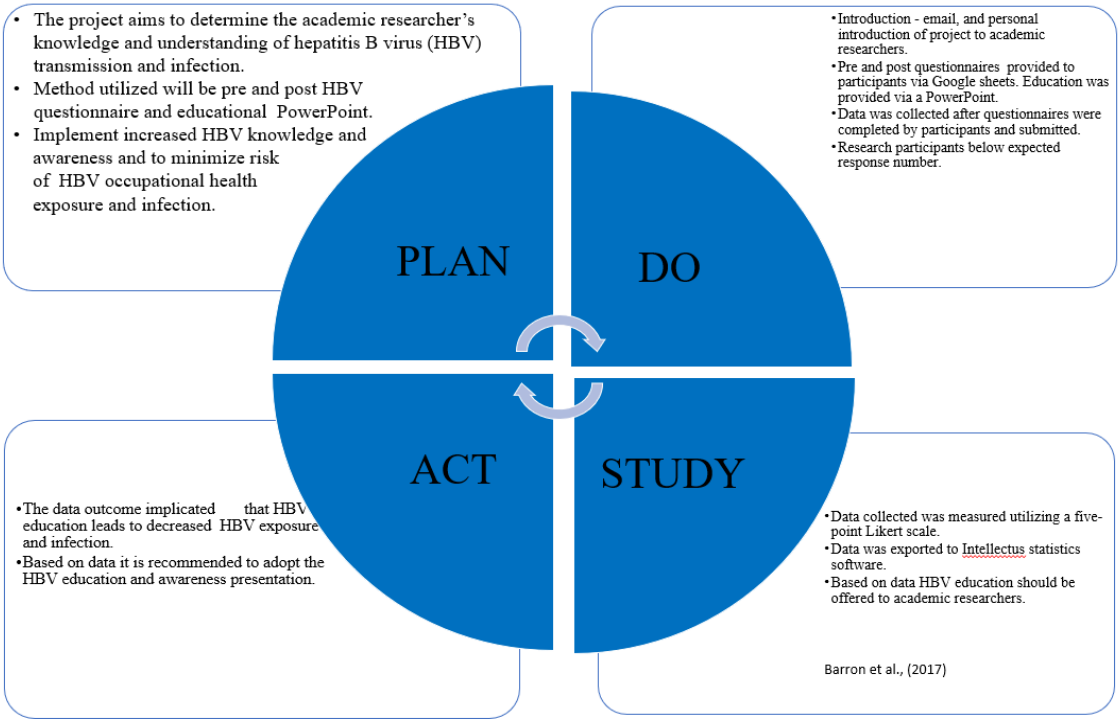
Plan-Do-Study-Act



Barron et al., (2017)

Figure B4:

Applied Plan-Do-Study-Act

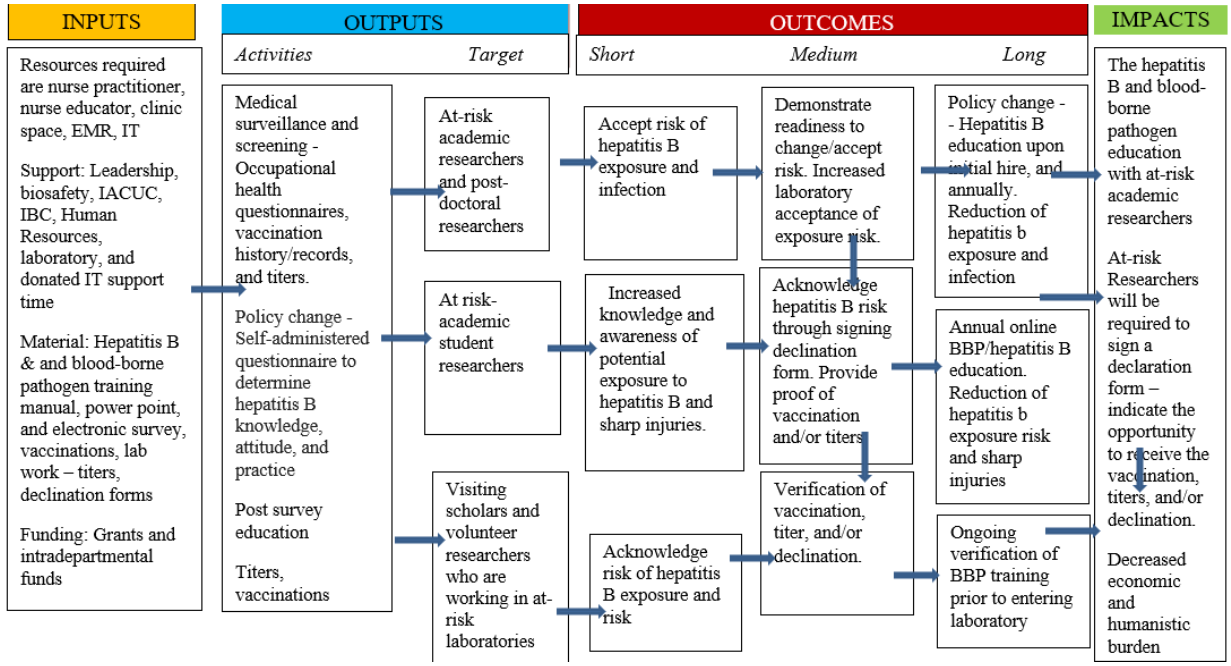


Appendix C

Methods

Figure C1:

Logic Model



Assumptions: Stakeholders will see value in implementation of EBP project. Researchers and stakeholders will be early adopters of change in policy. Hepatitis B, hepatitis C (HCV), and human immunodeficiency virus (HIV) account for the majority of occupationally-acquired infections and are associated with significant morbidity and mortality (Denault & Gardner, 2023). Post education, the researchers should demonstrate sufficient knowledge and awareness of HBV to minimize their risk of occupational health exposure and infection.

Figure C2:

Arizona State University, Institutional Review Board

ASU Knowledge Enterprise Development

EXEMPTION GRANTED

Heidi Sanborn
EDSON: RN BSN
602/496-6791
hsanborn@asu.edu

Dear Heidi Sanborn:

On 8/5/2024 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Hepatitis B Virus Awareness, Education, and Exposure Risk Among Academic Researchers
Investigator:	Heidi Sanborn
IRB ID:	STUDY00020503
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Appendix A - HBV Awareness pre-test questionnaire, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Appendix B - HBV Awareness post-test questionnaire, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Appendix C - Recruitment Flyer, Category: Recruitment Materials; • Appendix D - HBV Awareness Participation with Consent, Category: Consent Form; • Appendix E - Body of recruitment email , Category: Recruitment Materials; • CITI Training Dr. H. Sanborn, Category: Other; • CITI Training Stephanie Durst-Rael, Category: Other; • HBV Awareness Letter of Support, Category: Other; • HBV Awareness PowerPoint Outline, Category: Technical materials/diagrams; • Permission to utilize questionnaire, Category: Other; • SDR HBV Awareness IRB Protocol , Category: IRB Protocol;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2)(ii) Tests, surveys, interviews, or observation (low risk) on 8/5/2024.

In conducting this protocol, you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103). If any changes are made to the study, the IRB must be notified at research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.

IRB Administrator

cc: Stephanie Durst-Rael, Heidi Sanborn

Appendix D

Participation and Recruitment

Figure D1:

Recruitment email

Dear Participant,

I am a DNP graduate student under the direction of Professor Heidi Sanborn, in the Edson College of Nursing and Health Innovation at Arizona State University. I am conducting a Doctorate of Nursing Practice project which aims to determine the researcher's knowledge and understanding of hepatitis B (HBV) transmission and infection.

I am recruiting participants to take a self-administered administered 5-minute online pre-test, view a brief 15-minute HBV awareness PowerPoint presentation, and then complete a self-administered 5-minute online post-test. Once you complete the pre and post-test, your scores will be compared to determine the effectiveness of the education. Total participation time is 25 minutes.

To qualify you must be an ASU academic researcher or volunteer working in a high-risk laboratory with human derived materials (bloodborne pathogens (BBP), human cell lines, human tissue (unfixed), blood, body fluids, and waste water). You must be 18 years or older. You must be able to read, write, and understand English.

Exclusions of participation include minors under the age of 18 years. Adults who are unable to consent. Adults who cannot read, write, or understand English. Academic researchers who self-identify as not being at risk for HBV. No vulnerable or protected population.

Your participation in this project is voluntary. If you have any questions concerning the project study, please call me at (561) 302-5021.

Thank you,

Stephanie E. Durst-Rael, MSN, RN, FNP-BC, ENP-C, COHN-S, RNFA
Post-Master's Innovation Leadership Student
Doctor of Nursing Practice Program
Edson College of Nursing and Health Innovation
Arizona State University
Cell: 561-302-5021
Email: Stephanie.durst-rael@asu.edu

Figure D2:

Participant Email Attachment with Consent

Dear Participant,

I am a graduate student under the direction of Dr. Heidi Sanborn, DNP in the Edson College of Nursing and Health Innovation, at Arizona State University. I am conducting an evidence-based project to determine if process improvement methods will improve hepatitis B virus (HBV) awareness and education throughout the academic researcher setting. In order to participate, you must be an ASU academic researcher or volunteer working in a high-risk laboratory with human derived materials. You must be 18 years or older.

I am requesting your participation which will consist of a self-administered 5-minute online pre-test, viewing a brief 15-minute HBV awareness PowerPoint presentation, and then completing a self- administered 5-minute online post-test. Once you complete the pre and post-test, your scores will be compared to determine the effectiveness of the education. You have the right to not answer any question and stop your participation at any time during the tests. If you do not complete the pre and post-test questionnaires, your results will not be analyzed.

Your personal information and responses will be identified only by a participant generated anonymized alpha numeric code. The data collected as a part of this project may be used in presentations, future research purposes, or reports as aggregate data only. The de-identified aggregate data will be shared with the stakeholders of the project (ASU Employee Health, ASU Employee Health Associate Director, EHS VP) by co-Investigator Stephanie Durst-Rael, DNP student.

Participation in this project, and the completion of the pre and posttest is completely voluntary. If you choose not to participate or to stop participation in the study, there will be no penalty. There is no payment for participating in the study.

The potential benefits of this project are an increased awareness, and education of HBV, thus decreasing HV occupational exposures, infections, and economic burden.

The potential risks, discomforts, and inconveniences related to the participation in these questionnaires have been minimized through the de-identifying, participant generated alpha numeric code. The de-identified participants are anonymous even to the investigators.

If you have any questions concerning the project, please contact the project team: Stephanie Durst-Rael, ASU Graduate Student, stephanie.durst-rael@asu.edu (primary contact) or Dr. Heidi Sanborn, hsanborn@asu.edu.

If you have any questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (480) 965-6788.

By signing below, you are providing your consent to be part of the project. **Please return this completed consent form to Stephanie Durst-Rael, DNP student @ stephanie.durst- rael@asu.edu**

Name: _____

Electronic Signature: _____ Date: _____

Email:

Thank you for your participation,

Stephanie Durst-Rael, DNP student & Dr. Heidi Sanborn

Figure D3:

Recruitment Flyer

Academic Researchers and Hepatitis B Virus

Are you aware of your Risk?

Are you an academic researcher working in an ASU academic laboratory (ASU academic researchers include Principle Investigators, post-doctoral researchers, lab managers, research technicians, student researchers, and volunteer researchers)? Do you have contact with human derived materials (blood, body fluid, tissue, and human cell lines)? Are you an academic researcher who is required to meet the Occupational Health and Safety Administration (OSHA) HBV medical compliance guidelines? If so, do you know you have an increased risk for bloodborne pathogen (BBP) exposure and acquiring hepatitis B virus (HBV)? Do you know your hepatitis B vaccination status? Have you had a hepatitis B titer that demonstrates immunity?

If you are feeling overwhelmed by these questions, fear not. I'd like to decrease your worry and increase your hepatitis B education. This study is free, and will prove to be an invaluable asset and offer peace of mind to you as you proceed with your laboratory research.

The project will only require you to complete a 5-minute pre-test, view a brief 15-minute hepatitis B awareness PowerPoint presentation, and then complete a 5-minute post-test. This project will be completed on line and your participation is voluntary.

Project Inclusion criteria:
- ASU academic researchers at high-risk for HBV exposure working with human derived materials
- Participant should be able to read, write, and understand English
- Academic researchers who are required to meet the OSHA HBV medical compliance guidelines
- Participants must be 18 years old or older

Please contact me for any questions or concerns. Thank you!

Stephanie Durst-Rael, DNP Student
Edson College of Nursing, Arizona State University
stephanie.durst-rael@asu.edu
C:561-302-5021

Appendix E

Figure E1:

Hepatitis B Assessment Tool – pre and post-educational intervention questionnaire

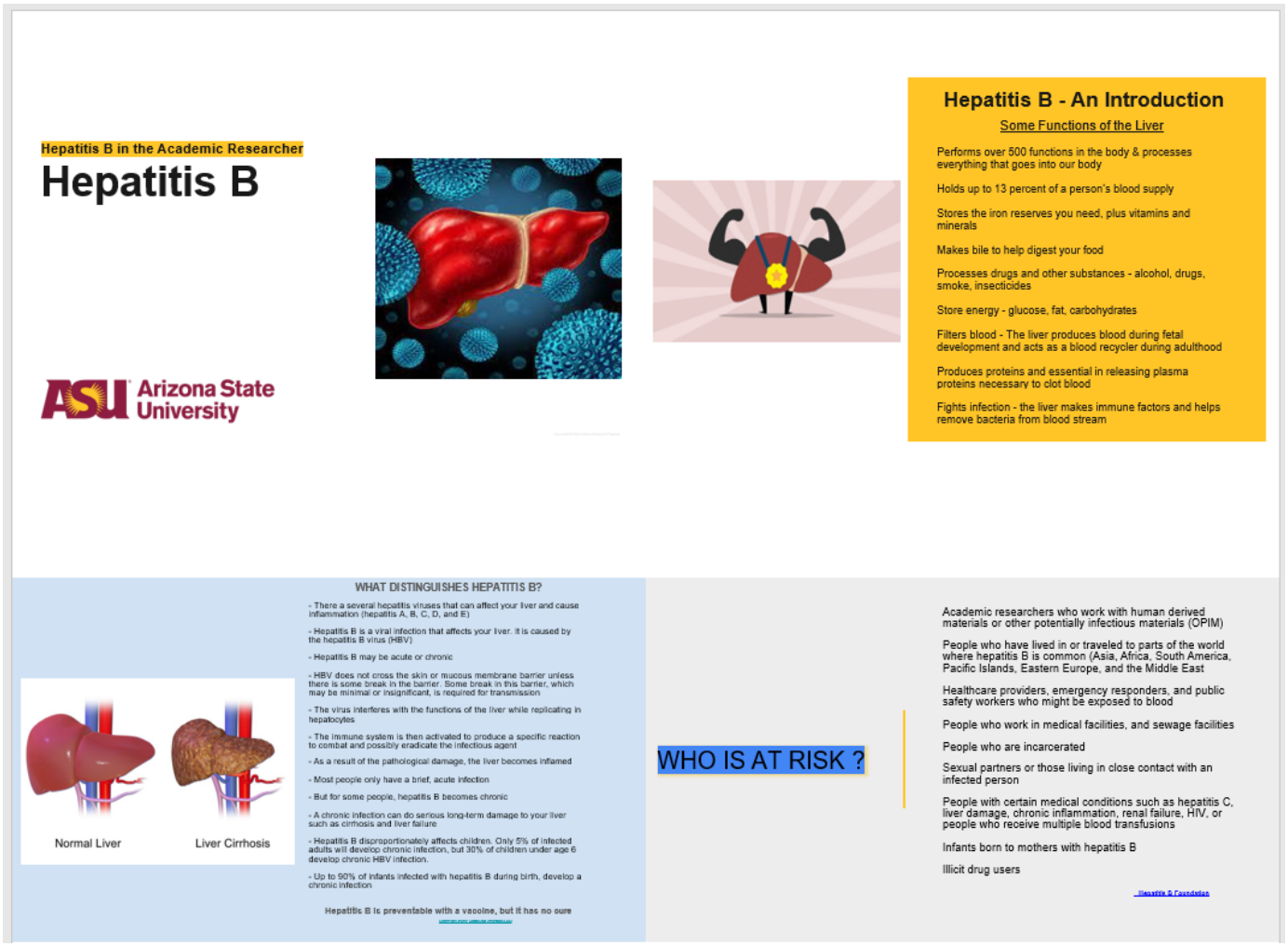
Questions for response					
	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
Assessment of Knowledge Related to Hepatitis B					
1. Hepatitis B is caused by a virus.					
2. Hepatitis B can be transmitted by: a. An infected mother					
2. b. Contaminated blood and body fluids					
2. c. Unprotected sex					
2. d. Casual contact (hand shaking)					
2. e. Unsterilized syringes/needles					
2. f. Coughing/sneezing					
2. g. Contaminated food/water					
3. Hepatitis B can cause liver cancer					
4. Academic researchers are at increased risk of getting hepatitis B than the general population					
5. Hepatitis B can be prevented by: a. Vaccination					
5. b. Antivirals					
5. c. Avoid sharp needle/syringe injury					
5. d. Avoiding contaminated food/water					
5. e. Using gloves when handling body fluids					
Assessment of Attitude towards Hepatitis B					
6. I feel uncomfortable sitting with a hepatitis B infected person.					
7. I don't mind shaking hands/hugging with a hepatitis B infected person.					
8. I believe the hepatitis B vaccine is safe and effective.					
9. I believe healthcare workers should receive hepatitis B vaccination .					
10. I don't need hepatitis B vaccination because I am not at risk					
Assessment of Practice towards Hepatitis B					
11. I ask/use a new blade for specimen cutting.					
12. I ask for a new syringe before injection/aspiration.					
13. I always report for needle prick /sharp injuries.					
14. I attend hepatitis B related awareness programs.					

Shrestha et al. (2020) https://doi.org/10.1371/journal.pone.0242658

Figure E2:

Intervention – PowerPoint Presentation

Hepatitis B PowerPoint



ACUTE VERSUS CHRONIC HEPATITIS B

Acute hepatitis B

- Short-term illness
- Fever, fatigue, loss of appetite
- Abdominal pain, nausea, vomiting
- Jaundice (yellow skin or eyes, dark urine, clay-colored bowel movements)
- Muscle aches and joint pain

Chronic hepatitis B

- Long-term illness - occurs when hepatitis B virus is not eliminated from the body
- Most people who go on to develop chronic hepatitis B do not have symptoms
- Very serious and may lead to liver damage (cirrhosis, liver cancer, and death)
- May spread hepatitis B to others

Centers for Disease Control and Prevention (CDC)

HBV Modes of transmission

– Percutaneous or parenteral contact (needlesticks or other sharp instruments) with infected human derived blood or body fluids

– Sexual contact: Unprotected sexual intercourse with an infected partner

– Sharing needles, syringes, or other drug-injection equipment

– Sharing items such as razors, toothbrushes, or nail clippers with an infected person

– Direct contact with the blood or open sores of an infected person

– Human bites

– Birth: An infected mother can pass the virus to her infant during birth

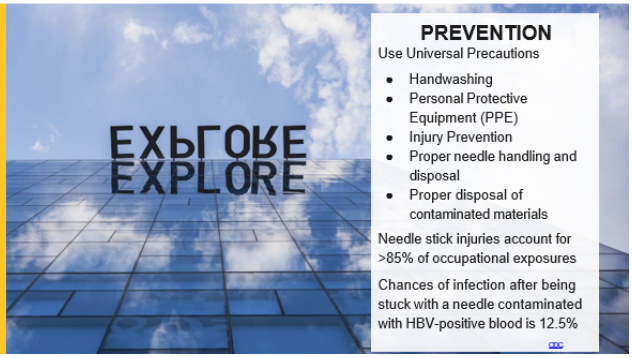
****HBV is not transmitted by casual contact - hand holding, coughing, shaking hands****

EMIC
ARCHERS
T RISK:

Due to the frequency of exposure to human cell lines or human blood products

Due to potential sharps and needlestick injury

Due to potential blood borne pathogen percutaneous and mucosal exposures



PREVENTION

Use Universal Precautions

- Handwashing
- Personal Protective Equipment (PPE)
- Injury Prevention
- Proper needle handling and disposal
- Proper disposal of contaminated materials

Needle stick injuries account for >85% of occupational exposures

Chances of infection after being stuck with a needle contaminated with HBV-positive blood is 12.5%

cdc

NEXT STEP: HOW DO YOU KNOW IF YOU ARE PROTECTED?

Vaccination Status

If you have a written or electronic record of your vaccinations, you can check it to see if you've been vaccinated against Hepatitis B.

You can also take a digital photo of your record to show to healthcare providers.

Titers

If you're unsure about your immunity status and have proof of vaccination, you can get a blood test to check your antibody titers.

A positiver HB surface antibody test result greater than 10 mIU/mL indicates that you are protected.

Hepatitis B Vaccination

If you're unsure about your vaccination status or have no proof of vaccination status, you may choose to receive the vaccination.

Heplisav is a vaccination for Hepatitis B. It is a series of two vaccinations (day 0, day 28).

HELPFUL RESOURCES

ASU Employee Health

ASU Environmental Health and Safety

Hepatitis B Foundation

Centers for Disease Control and Prevention

Occupational Health and Safety Administration

CONCLUSION

Thank you for taking taking the time to review this presentation.

Please click on the link below to proceed to the Hepatitis B Post-Test Questionnaire.

Hepatitis B Post-Test

Appendix F

Statistical Results

Table 1:

Included Variables:
Gender, Race/Ethnicity, and Level of Education

Sample Size (n=38):

Summary Statistics: Frequency Table for Nominal Variables

Variable	n	%
Gender		
Male	20	52.632
Female	18	47.368
Race - Ethnicity		
White or Caucasian	29	76.316
Hispanic or Latino	6	15.789
Black and White	1	2.632
Asian American or Asian	2	5.263
Level of Education		
Doctorate	12	31.579
Master's Degree	4	10.526
Bachelor's Degree	18	47.368
Some College	4	10.526
Master's Degree	4	10.526

Table 2:

Included Variables:
Age

Summary Statistics: Scale – For Interval and Ration Variables

Variable	M	SD	n	95% CI	Min	Max	Mdn
Age	38.632	12.813	38	[34.420, 42.843]	21.000	74.000	36.000

Table 3:

Included Variables:
Pre-HBV Awareness and Education and Post HBV Awareness and Education

Sample Size (n=38):

Summary Statistics: Scale

Variable	M	SD	n	95% CI	Min	Max	Mdn
Pre-HBV Awareness and Education	89.053	7.059	38	[86.732, 91.373]	76.000	100.000	88.000
Post-HBV Awareness and Education	92.868	6.444	38	[90.750, 94.986]	79.000	103.000	94.500

Table 4:

Included Variables:
Pre-HBV Awareness (A) and Education (E) Knowledge, Attitude, and Practice
Post-HBV Awareness (A) and Education (E) Knowledge, Attitude, and Practice

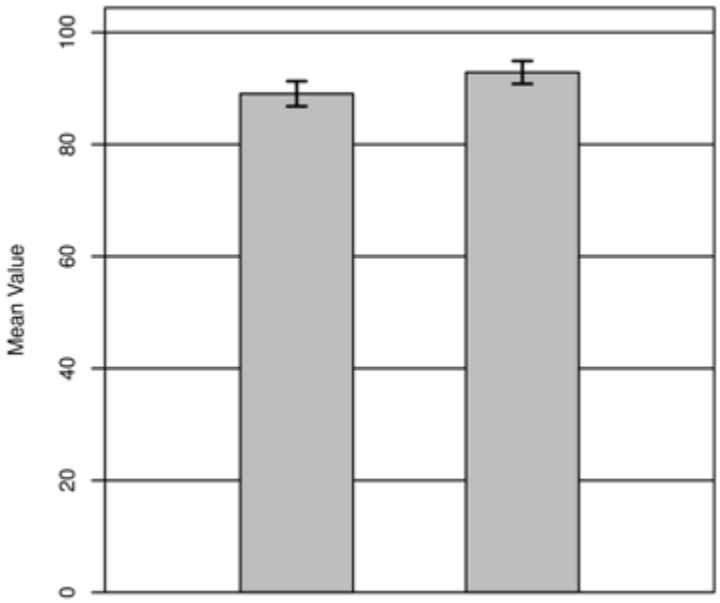
Sample Size (Complete Cases):
N = 38

Summary Statistics: Scale

Variable	M	SD	n	95% CI	Min	Max	Mdn
Pre-HBV A & E Knowledge	59.500	5.451	38	[57.708, 61.292]	49.000	68.000	60.000
Post-HBV A & E Knowledge	64.105	3.733	38	[62.878, 65.332]	56.000	70.000	65.000
Pre-HBV A & E Attitude	13.474	1.538	38	[12.968, 13.979]	10.000	17.000	13.000
Post-HBV A & E Attitude	12.368	1.951	38	[11.727, 13.010]	5.000	17.000	13.000
Pre-HBV A & E Practice	16.079	3.872	38	[14.806, 17.352]	6.000	20.000	17.000
Post-HBV A & E Practice	16.395	3.746	38	[15.164, 17.626]	8.000	20.000	17.500

Figure F1:

The means of Pre-HBV Awareness and Education and Post-HBV Awareness and Education with 95.00% CI Error Bars

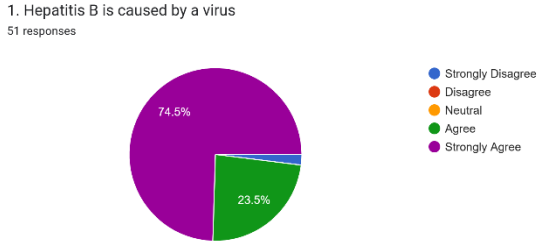


Appendix G

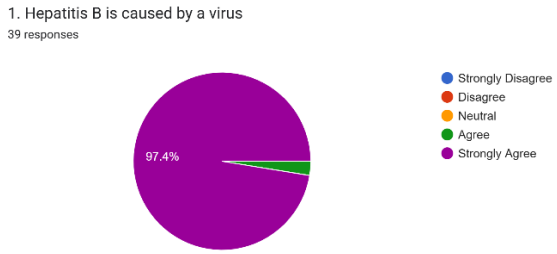
HBV Awareness and Education Assessment Questions

Figure G1: Knowledge Assessment

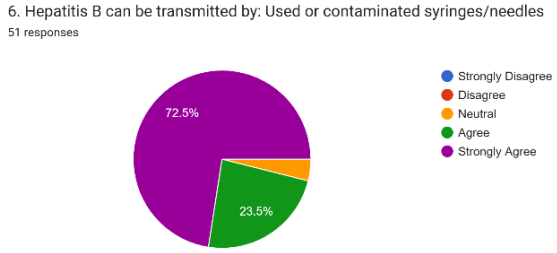
Pre-Intervention Response



Post-Intervention Response



Pre-Intervention Response



Post-Intervention Response

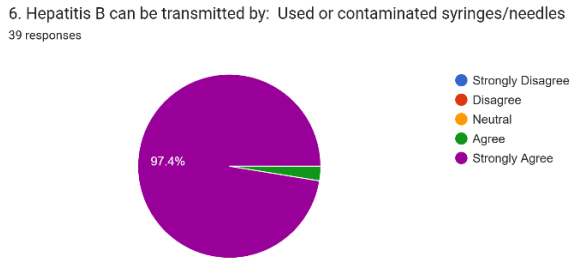
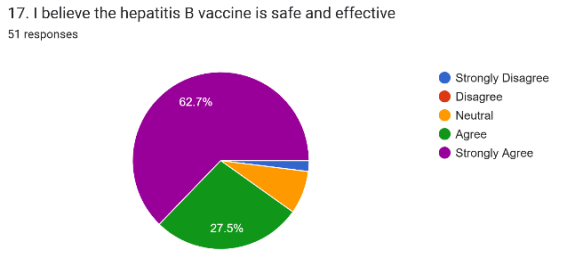
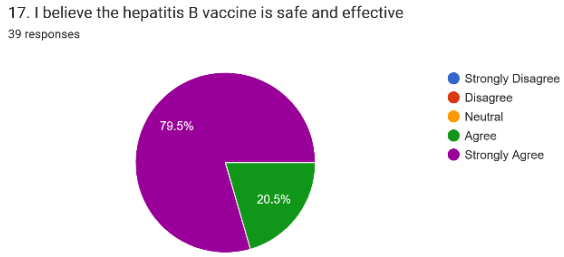


Figure G2: Attitude Assessment

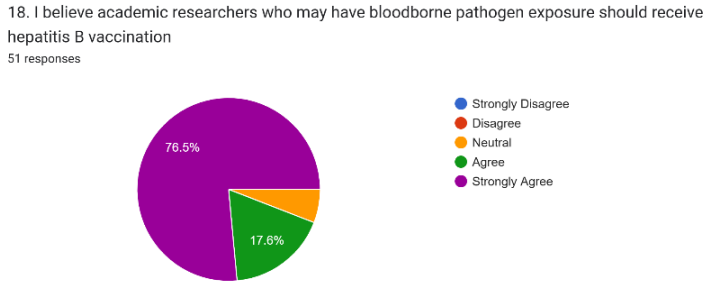
Pre-Intervention Response



Post-Intervention Response



Pre-Intervention Response



Post-Intervention Response

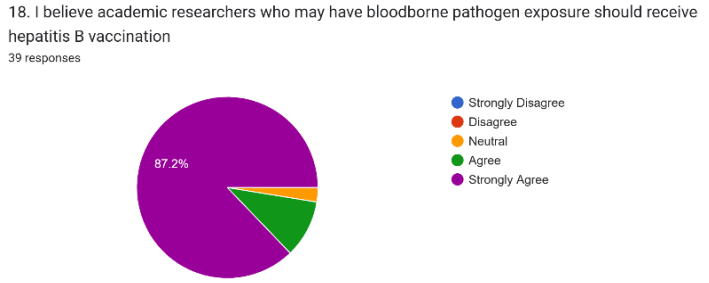
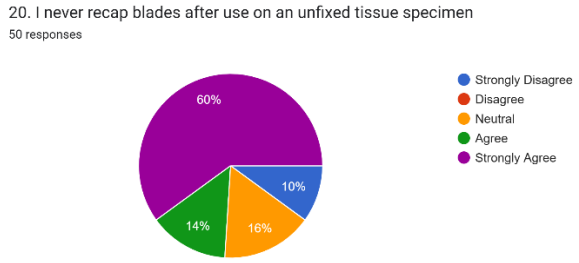
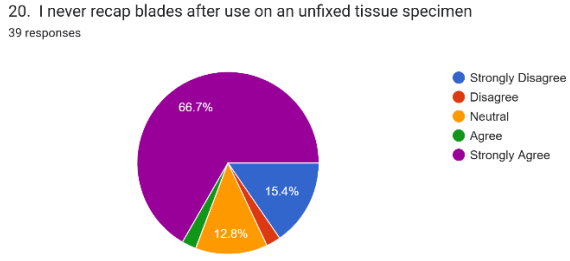


Figure G3: Practice Assessment

Pre-Intervention Response



Post-Intervention Response



Appendix H

DNP Project Budget

Phase	Activities	Cost	subtotal	Total
Preparation	Consent via email/Google Forms	Free		
	Design Pretest questionnaire on Google Forms for potential researchers	Free		
	Design Posttest Hepatitis B Assessment Questionnaire	Free		
	Create Hepatitis B Education video/PowerPoint	Free		
	DNP student time (indirect cost - 25 hrs. @ $78/hr.)	$1950		
	Design and print advertising flyer (direct cost 25 @ $0.50 per page - DNP student funded)	$12.50	$1962.50	
Delivery	Delivery of flyers to labs (parking and 1-hour DNP student time @ $78/hr.)	$87		
	Delivery of emailed questionnaires and intervention (indirect cost – 50 @ $ 0.50 each)	$25		
	DNP student time (indirect cost- 2 hrs @ $78/hr)	$156	$268	
Intervention	Hepatitis B Educational Intervention	Free		
	Researcher participant time (indirect cost – estimate 30 min for each participant @ $50/hr.)	$25 Per researcher (estimate 50 researchers)	$1250	
Evaluation	Email thank you notes to researchers for their participation time (indirect cost – 50 participants @ $ 0.50 each)	$25		
	Review and analysis of results – DNP student time (indirect cost- 12 hrs. @ $78/hr.)	$936	$961	$4441