UTILIZING EVIDENCE-BASED BEST PRACTICES IN REDUCING SECOND AND THIRDHAND SMOKING-RELATED MORBIDITY AND MORTALITY IN CHILDREN

A Scholarly Project Submitted in Partial Fulfillment of

The Requirements for the Degree of

Doctor of Nursing Practice

in

The Onanian School of Nursing

Rhode Island College

May 13, 2023

by

Gail Davis, MSN, RN, APPHN

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Abstract

Background: Exposure to environmental tobacco smoke is a leading cause of respiratory illness in children. Although evidence-based best practices to improve outcomes are well-documented, they are inconsistently implemented.

Purpose/Specific Aims: The purpose of this project was to improve provider implementation of evidence-based best practices in environmental tobacco smoke exposure reduction in children. The overarching aim was to reduce related morbidity and mortality. Specific aims included increased knowledge and skill related to best evidence-based practices, and fostering implementation in practice.

Methods: This project involved a quasi-experimental quality improvement design involving an educational intervention on the scope and nature of the problem, the potential for impact, and evidence-based strategies to enhance the feasibility of intervention in the office setting. Differences between pre and post-test outcomes were analzed. A second follow up post-test was implemented at 1-2 weeks post-intervention to assess improvement in practice.

Results: Of 56 eligible employees, 31(55.4%) attended the presentation. The average pre-test score of 4.31 out of a total of 5 demonstrates a strong baseline knowledge. The average post-test score was 4.67 demonstrating a significant improvement ($p < 0.01$).

Conclusion: The project's resulted in significant improvement in provder knowledge, and uptake of best practices in environmental tobacco smoke exposure reduction. This improvement was consistent regardless of role or area of practice. The average pre-test score of 4.31 out of a total of 5 demonstrated a strong baseline knowledge and was consistent with state-wide performance in smoking reduction. There was strong participation engagement with 55.4% of eligible employees attending.

Key Words: second and thirdhand smoke; evidence-based best practices; impact on children; ETS exposure mitigation

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UTILIZING EVIDENCE-BASED BEST PRACTICES IN REDUCING SECOND AND THIRDHAND SMOKING-RELATED MORBIDITY AND MORTALITY IN CHILDREN

Background and Significance

Environmental tobacco smoke (ETS), including second and thirdhand smoke, is a leading cause of respiratory illness among children (Cheraghi & Salvi, 2009). Over 30% of all children in the United States are exposed to secondhand smoke within their own homes, and each year more than 5,000 children die from tobacco exposure, which is triple the number who die from all childhood cancers combined (RIDOH, 2012). Although evidence-based practices to improve outcomes are well-documented in the literature, these practices are seldom implemented. Uptake of best practices in mitigating ETS exposure is essential to improving related morbidity and mortality among children.

Firsthand smoke refers to smoke that is inhaled by the smoker directly. Secondhand smoke exposure results from breathing ambient air containing toxic substances released from the combustion of tobacco products and smoke exhaled by the smoker. Thirdhand smoke is less well understood and involves contact with particles on surfaces resulting from the combustion of tobacco products (Puri, 2009).

Smoking is a leading social determinant of health (SDOH) affecting mortality and life expectancy (Heath, 2022). Just as smokers are exposed to known carcinogens and other toxic substances, passive smokers are exposed as well. Secondhand smoke is now considered a class A carcinogen (EPA, 2018). Thirdhand smoke is especially of danger to young children who may be crawling around on surfaces where thirdhand smoke

accumulates, making them more likely to ingest these particles than adults (Eldridge, 2020).

Second and thirdhand smoke can also affect fetuses through intrauterine exposure to maternal blood containing tobacco by-products resulting from first, second or thirdhand smoke exposure of the mother (USDHHS, 2004). Environmental tobacco smoke exposure while pregnant increases the risk of miscarriage (CDC, 2020), (Winickoff, et al., 2005), sudden infant death syndrome (SIDS), premature rupture of membranes, placenta previa, placental abruption, preterm delivery, and fetal growth restriction/low birth weight (USDHHS, 2004). Between 2005 and 2009, smoking during pregnancy resulted in an estimated 1,015 infant deaths annually (Hall, 2012).

Electronic nicotine delivery systems (ENDS) (often referred to as vaping) are an important contributor to ETS (CDC, 2014). Electronic nicotine delivery systems include e-cigarettes, e-hookahs, e-pipes, and e-cigars that deliver aerosolized nicotine, flavorings, and/or other chemicals. Chemicals emitted in ENDS aerosols can include carcinogens such as formaldehyde, polyaromatic hydrocarbons, and other chemicals, as well as various organic compounds that are irritating to the lung, and flavoring compounds (CDC, 2014). While initially marketed as being safer to traditional smoking, ENDS have more recently been associated with similar risks of first, second, and thirdhand exposure as traditional smoking (Grana, Benowitz, & Glantz, 2014).

In addition, ENDS often introduce higher levels of nicotine, thus increasing the risk of addiction among users (Grana, Benowitz, & Glantz, 2014). Use of ENDS, is rising among never-tobacco smokers and former or current tobacco smokers (National Health

Portal, 2021). In 2017, e-cigarettes were used by approximately 2.8% (6.9 million) of U.S. adults (Bossley, Osini, Gupta, & Harman, 2021).

Unfortunately, the COVID-19 pandemic has had a harmful effect on smoking among parents. During the first years of the Covid-19 pandemic, two thirds of parents smoked at least the same amount if not more, leaving children forced to stay at home due to school closures at increased risk of second-and thirdhand smoke exposure. Bossley, et al., (2021), interviewed fifty parents or care givers who had previously attended a smoking cessation program. They found that approximately one third of parents smoked as much during the lockdown as before, while another third smoked more, leaving an average of 2.5 children per household exposed to parental smoke. The national lockdown increased children's secondhand and thirdhand smoke exposure in families that smoke, whereas previously, children would have spent much more time at school and outside, while family members "who used to smoke at their workplace were now smoking at home" (Bossley, Osini, Gupta, & Harman, 2021).

Clinicians in the pediatric and obstetric settings have a unique opportunity to implement evidence-based strategies to reduce smoking and ETS exposure among children and pregnant people. Obstetric providers are directly focused on the health of the mother and developing fetus. The pediatrician's office is an ideal setting to address tobacco use at the family level, as many parents visit their child's doctor more often than their own. Evidence-based strategies for ETS reduction including screening for risk, assessing motivation for change, creating a safe environment for open dialogue, prescribing nicotine replacement therapy (NRT) and adjunctive medications, referring to telephone counseling, working with families, and adapting evidence-based tobacco

cessation counseling strategies focused on families during visits in the pediatric setting (Hall, Hipple, Friebely, Ossip, & Winickoff, 2009).

Studies have shown that interventions as brief as three minutes significantly increase adult cessation rates and can be easily incorporated into the pediatric visit (CDC, Protocol for Identifying and Treating Patients Who Use Tobacco, 2016). These interventions are recommended by the U.S. Public Health Service and the American Medical Association. If a parent or child indicates that the child lives with someone who uses tobacco, the clinician should respectfully discuss the family member's smoking by asking about their readiness to quit and interest in assistance. Key questions about tobacco use can be added to a health history form, which would become part of the child's permanent record. This topic can then be addressed at subsequent visits to assess progress.

A common barrier to implementation of best practices to mitigate ETS exposure is a lack of time and efficient systems to support this work in addition to other aspects of care. The Clinical Effort Against Secondhand Smoke Exposure (CEASE) program is one model designed specifically to train providers in the pediatric setting to develop systems that better facilitate the routine implementation of ETS mitigation strategies in their practice (Winickoff, et.al., 2008).

Helping just one family member quit smoking reduces the entire family's exposure to tobacco toxins so that all adults and children can live longer, healthier lives, with children less likely to start smoking as adolescents. By providing evidence-based assistance at a crucial moment, a child health care clinician can have a powerful, positive impact on an entire family's future (Hall, Hipple, Friebely, Ossip, & Winickoff, 2009).

There is strong and growing evidence on best practices that includes some very practical, feasible strategies. Improvement of outcomes related to ETS exposure among children depends first on the meaningful and sustainable implementation of these strategies in practice.

Problem Statement and Study Question

Environmental tobacco smoke exposure is a common and preventable cause of respiratory illnesses and related morbidity and mortality among children. Despite the availability of evidence-based practices to reduce ETS exposure among children, these practices are seldom implemented. Strategies to support the effective implementation of these practices and evaluation of related outcomes at the patient, provider and system levels are needed.

Local Context

This project was conducted at an urban community health center in the northeast region. The health center includes nine locations, providing services including Family Practice, Internal Medicine, Pediatrics, Obstetrics, Gynecology, Behavioral Health, Optometry, Dental Care, and Express Care (urgent care) in addition to other specialty services (Providence Community Health Centers, 2022). The health center provides care to approximately 60,000 patients annually and provides care regardless of ability to pay (Providence Community Health Centers, 2022).

Rhode Island's adult smoking rate has seen a dramatic reduction from 23% in 2001 to 17.4% in 2012, to 15.2% in 2023 (RI BRFSS 2000, 2012). On June 29, 2004, Rhode Island became the seventh state in the nation to pass into law a bill that prohibits smoking in public places and workplaces in Rhode Island with the Smoke-free Workplace Law.

Health insurers also now cover cessation services. In August of 2009, The Office of the Health Insurance Commissioner's Regulation 14 has required health insurers to offer broader coverage of smoking cessation services. Despite these improvements, provider knowledge and implementation of best practices in reducing ETS exposure among children at the local practice setting is unknown, and the literature has consistently identified opportunities for improvement in this area.

Purpose Statement and Specific Aims

The purpose of this project is to empower providers with knowledge and skills to deliver best evidence-based practices to mitigate first, second, and thirdhand tobacco smoke exposure. The specific aims include:

1. Implement an educational program among an audience of pediatric and obstetric providers.
2. Increase provider knowledge and skills in best evidence-based practices for reducing childhood ETS exposure.
3. Facilitate the uptake of evidence-based practices.

Conceptual/Theoretical Framework

This project was supported by two models including the Health Promotion Model (Butts & Rich, 2018) and Lewin's Change Theory (Butts & Rich, 2018). The Health Promotion Model provided the framework for understanding motivators for health related behavior changes that can be used to guide interventions to more effectively support health promoting behaviors (George, 2014). This theory can be readily adapted to ETS screening and mitigation. Lewin's Change Theory describes a three step process for

facilitating organizational change. These stages include unfreezing, changing and refreezing (Kaminski, 2011). Unfreezing involves fostering engagement and motiviation among stakeholders to let go of old patterns, changing involves adopting new thoughts, feelings and behaviors, as new processes are adopted, and refreezing involves establishing the new way of being so it is solidified in practice (Kaminski, 2011). While the Health Promtion Model provided the structure to support the content and focus of the educational intervention, Lewin's Change Theory provided the framework to support the overarching quality improvement process for this project.

Methods

This project aimed to foster uptake of evidence-based best practices among pediatric and OB providers related to reducing ETS exposure among children. The overarching goal was to reduce related morbidity and mortality. This project involved an educational intervention on the scope and nature of ETS associated morbidity and mortality, the potential impact of pediatric and OB providers in reducing ETS exposure, and evidence-based strategies to enhance the feasibility of intervention in the office setting.

Setting

This project was conducted at an urban community health center in the northeast region. The health center includes nine locations, providing services including "Family Practice, Internal Medicine, Pediatrics, Obstetrics, Gynecology, Behavioral Health, Optometry, Dental Care and Express Care (urgent care) alongside with selected specialty services" (Providence Community Health Centers, 2022). The health center provides care to approximately 60,000 patients annually and provides care regardless of ability to pay

(Providence Community Health Centers, 2022). The project was completed at pediatric and obstetric offices within two locations that are part of the health center.

Participants

Eligibility criteria included licensed clinicians in one of the following roles: nurses, case managers, nurse practitioners, physicians, physician assistants, and medical assistants. All participants were 18 years or older, and willing to participate in the project. All eligible clinicians employed in the project setting were invited to participate. An e-mail invitation describing the project, purpose, eligibility criteria, requirements, a link to the pre-intervention survey and the location and time of educational sessions was sent to eligible participants.

Intervention

The educational session was presented by the student investigator to eligible participants at the designated locations. Flyers were placed in the two locations in advance of the presentation dates to spark interest. In addition, email invitations were sent to eligible staff as described above.

Prior to the education, participants were asked to complete a pre-intervention survey. A link to the survey was included with the e-mail invitation sent to potential participants. Initial survey questions included information on, and acknowledgement of, informed consent and confirmation of eligibility as described above. Only participants who acknowledge their consent were taken to the remainder of the survey questions.

The pre-intervention survey included questions regarding demographics such as age, level of education, years of experience, and role. In addition, the survey included questions related to knowledge about the prevalence and impact of ETS among the pediatric population, knowledge about, and incorporation of evidence-based screening and ETS reduction strategies in practice, and perceptions of the feasibility and barriers to incorporating these strategies in practice. Following completion of the pre-survey, participants were taken to a separate survey to register for one of the available information sessions. Registration data was not linked to survey responses, ensuring anonymity of survey data.

Following completion of informed consent and the pre-survey, participants were invited to attend an educational session. The educational session was held at each of the two locations, at times that were determined convenient for participants, and organized in coordination with the site directors. Pizza and bottled water were provided as an incentive for participation. In addition, participants who complete all portions of the project were invited to participate in a raffle for one of two $25 Amazon gift cards.

Participants were asked to complete a sign-in sheet prior to the educational session. Any participant who had not completed the pre-survey was invited to do so prior to the session. There were no restrictions to participating in the educational session; however, only participants who completed the pre-survey, and attended the education session were eligible to complete the post-surveys.

The educational session was designed to elicit engagement related to the scope and relevance of the problem, increase knowledge regarding evidence-based strategies to

effectively screen and reduce ETS exposure, increase awareness of available resources, and explore strategies to increase the feasibility of interventions in the office setting. Specific evidence-based strategies for screening and ETS exposure reduction included those associated with smoking cessation, and reduction of SHS and THS respectively, as well as broader approaches, such as motivational interviewing. This project was designed to improve uptake of best evidenced-based strategies by clinicians during routine encounters with patients and parents.

Following the educational session, a post-survey was sent to participants. E-mail addresses collected on the electronic registration from completed at the end of the pre-survey was compared with the education session sign in sheet to confirm participation in the educational session. E-mail address for participants who hd completed the pre-survey and education session was used to distribute the post-survey. The post survey included comparable questions regarding demographics, knowledge about the incidence and impact of ETS among pediatric patients, knowledge about, and incorporation of evidence-based screening and ETS reduction strategies in practice, and perceptions of the feasibility and barriers to incorporating these strategies in practice. Upon completion of the post-survey participants were asked about their willingness to complete a 1-2 week post-intervention follow us survey. Those who agree were asked to provide the e-mail address on a separate electronic survey to ensure anonymity of post-education survey responses. A final post intervention follow-up survey was sent to agreeing participants to assess implementation of EBP in ETS reduction and changes in perceptions regarding barriers and facilitators. Upon completion of the follow up survey participants were invited to participate in a raffle for one of two $25 Amazon gift cards. Those wishing to

participate were asked to provide their contact information in a separate survey to ensure that personal identifiers cannot be connected to survey responses.

Measures

Pre- and post-intervention surveys were analyzed to evaluate the success of the intervention. The pre-survey queried the current practice patterns of the attendees related to conversations surrounding ETS exposure. The immediate post-presentation survey asked about partipants intention to make changes in their practice pattern. The second post-survey conducted one-two weeks post intervention asked if any of the proposed changes have been instituted in their practices.

Data Analysis

Demographic data was collected using Qualtrics and analyzed utilizing descriptive statistics. Collection of personal identifiers were kept separate from survey data, and there was no way to connect individual responses with a personal identifier. Personal identifiers were used only to distribute post- and follow-up surveys, and support raffle participation. Differences between pre, post, and follow-up intervention outcomes were analyzed using the Mann-Whitney U Test.

Ethical Considerations

Participation in the presentation was voluntary. Personal identifiers will be used only as described above and will not be able to be connected to survey responses. Data was secured on a password protected drive. Data was analyzed at the aggregate level only.

Results

Of the fifty-six eligible employees invited, thirty-one (55.4%) participated in the educational intervention. Twenty six participants completed the pre-survey, twenty two completed the post survey, and ten completed the one-two week follow up post survey. Improvement was consistent regardless of role or area of practice. The majority of participants were between 30 and 40 years of age. Participants represented a wide range of roles (see Table 1). On the pre-test survey, participants rated the importance of screening, and implementing smoking and ETS mitigation strategies highest; however, areas such as having the time, knowledge and skill to implement best practices were rated lower (Figure 1). Overall post test scores improved from 4.31 to 4.67 ($p < 0.01$) with consistent improvement across roles (Table 2). The results demonstrate an improvement in provider knowledge and skill as well as improvement in intention to apply evidence-based practices. Results on the 1-2 week follow up post-test demonstrated sustained improvement from pre-test responses, and provider perception of improved implementation of best evidence-based strategies in practice (Figure 2 and Table 3).

Table 1. Demographics

	Pre-test n=(%)	Post-test n=(%)	Post-test 2 N=(%)
Age			
18-24	1 (3.85%)	2 (9.09%)	1 (10.00%)
25-30	5 (19.23%)	6 (27.27%)	3 (30.00%)
31-40	8 (30.77%)	4 (18.18%)	4 (40.00%)
41-50	6 (23.08%)	7 (31.82%)	2 (20.00%)
51-60	5 (19.23%)	3 (13.64%)	0 (0.00%)
61-65	1 (3.85%)	0 (0.00%)	0 (0.00%)
65+	0 (0.00%)	0 (0.00%)	0 (0.00%)
Role			
MD	4 (14.81%)	5 (17.24%)	2 (20.00%)
NP/PA	0 (0.00%)	1 (3.45%)	0 (0.00%)
RN	6 (22.22%)	7 (24.14%)	4 (40.00%)
MA	10 (37.04%)	9 (31.03%)	3 (30.00%)
Other	7 (25.93%)	7 (24.14%)	1 (10.00%)
Practice Area			
Obstetrics	5 (20.00%)	3 (11.11%)	1 (10.00%)
Pediatrics	8 (32.00%)	8 (29.63%)	2 (20.00%)
Other	12 (48.00%)	16 (59.26%)	7 (70.00%)
Level of Education			
High School	3 (11.54%)	2 (9.09%)	1 (10.00%)
Diploma	8 (30.77%)	5 (22.73%)	1 (10.00%)
Associate's Degree	2 (7.69%)	1 (4.55%)	1 (10.00%)
Bachelor's Degree	5 (19.23%)	6 (27.27%)	3 (30.00%)
Master's Degree	2 (7.69%)	1 (4.55%)	1 (10.00%)
Doctoral Degree	6 (23.08)	7 (31.82%)	3 (30.00%)
Years of Experience			
<1	1 (3.85%)	1 (4.55%)	1 (10.00%)
1-2	8 (30.77%)	7 (31.82%)	4 (40.00%)
3-5	4 (15.38%)	4 (18.18%)	1 (10.00%)
6-10	3 (11.54%)	3 (13.64%)	3 (30.00%)
11-15	3 (11.54%)	3 (13.64%)	1 (10.00%)
>15	7 (26.92%)	4 (18.18%)	0 (0.00%)

Figure 1. Pre-Test Scores

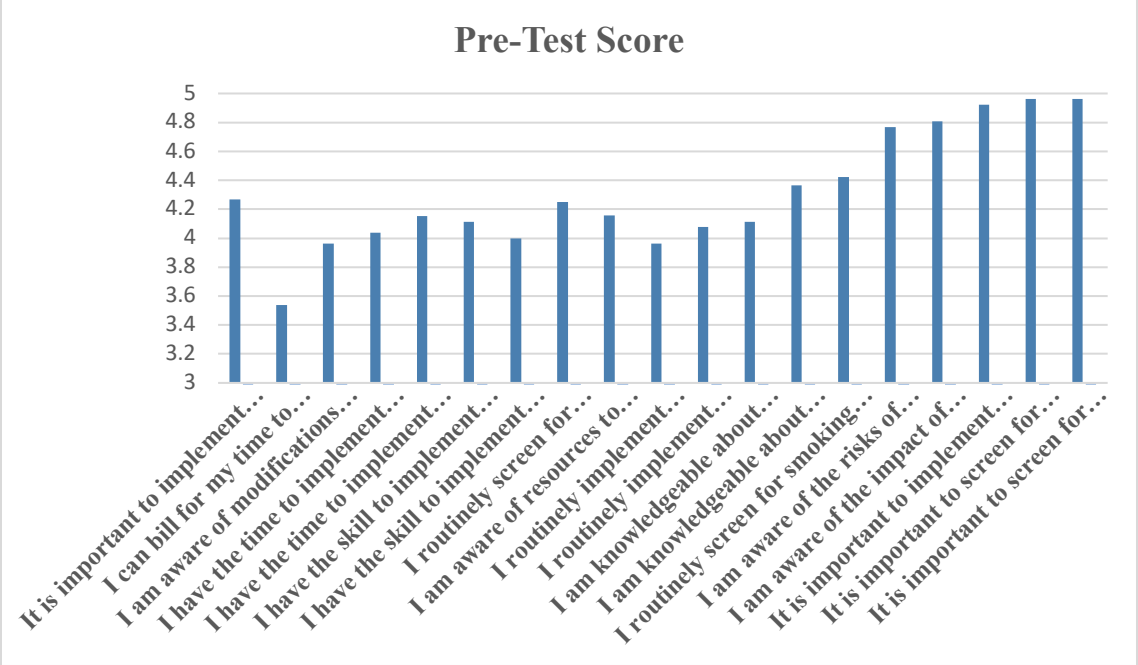

Table 2. Analysis of Pre- and Post-Test Average Scores

	Pre-test Average Score (n=)	**Post-test Average score (n=)**	**p=**
All Participants	4.31 (26)	4.67 (22)	<0.01
MD	4.30 (4)	4.77 (4)	0.02
RN	4.08 (6)	4.54 (6)	0.01
MA	4.59 (10)	4.73 (9)	0.04
Other	4.04 (6)	4.55 (3)	<0.01

Analyzed via Mann-Whitney U Test

Figure 2. Post Test # 2 Comparative Results

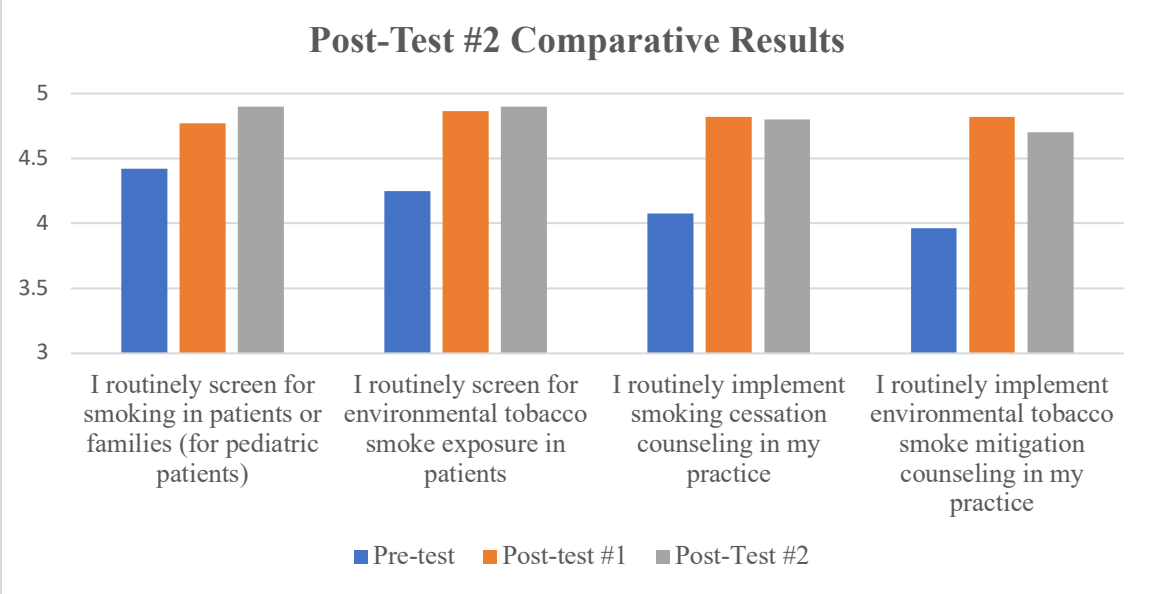

Table 3. Analysis of Pre and Post-Test # 2 Scores

	Pre-test Average Score (n=)	**Post-test Average score (n=)**	**Post-Test #2 Average Score (n=)**	**p=**
All Participants	4.18 (26)	4.82 (n=22)	4.83 (n=10)	<0.01

Analyzed via Mann-Whitney U Test

**includes questions related to routine screening for smoking, and ETS exposure, and implementation of smoking cessation, and ETS mitigation strategies*

***p= based on analysis of pre-test to post-test #2 results*

Discussion

The project's purpose was achieved as evidenced by improvement in provider knowledge and skill, and improvement in intention to apply evidence-based best practices. This improvement was consistent regardless of role or area of practice. The average pre-test score of 4.31 out of 5 demonstrated a strong baseline knowledge and was consistent with state-wide performance in smoking reduction. There was strong

participation engagement. Of the 56 eligible employees invited, 31 (55.4%) attended. The commitment of senior organizational leadership in facilitating awareness of this project, assisting with logistical planning, and being physically present, likely raised the perceived importance among staff of this project. Reducing ETS related illnesses was also identified as a top priority by the organization, thus this project was well aligned with organizational goals. These factors likely contributed to robust response and participant engagement. In addition, the inclusion of realistic and practical strategies likely supported the perceived improvement in knowledge, skill and implementation of evidence-based practices for ETS screening and reduction.

The small sample size was a limit to the generalizability of findings, as was the use of a single organization. However, these factors enhances the ability to adapt the project to the needs of the local practice setting, likely contributing to the projects success. Although generalizability was limited, this project is transferrable and can likely be adapted to other settings. This project also assessed provider self-perceptioon related to knowledge, skill and practice. Although responses indicated a perceived increased implementation of best-practices, changes in actual process or outcomes at the patient or system level were not assessed. Future research is needed to evaluate these outcomes more directly.

This project informs the opportunity for providers to improve evidence-based strategies to reduce childhood environmental tobacco smoke (ETS) exposure. Although regulations allow for provider billing for tobacco screening and smoking cessation intervention, organizational processes limited implementation without in-depth research

and potential policy changes. Providers and organizations should collectively explore opportunities to better facilitate the ability to bill for these services.

Conclusion

Environmental tobacco smoke exposure is a major contributor to morbidity and mortality among children. As with many current practice problems, there is a strong body of research demonstrating this relationship, as well as strong research to support best practices to reduce ETS exposure; however, these practices are inconsistently implemented leading to poor outcomes. The Doctor of Nursing Practice is prepared with strong skills in systems leadership and practice scholarship necessary to close the knowledge-practice gap and improve outcomes at the patient and organizational levels. This project demonstrated a signficnant improvement in provider practices around ETS screening and mitigation in the local practice setting and may serve as a model for other practice settings allowing a greater reach of the project benefits.

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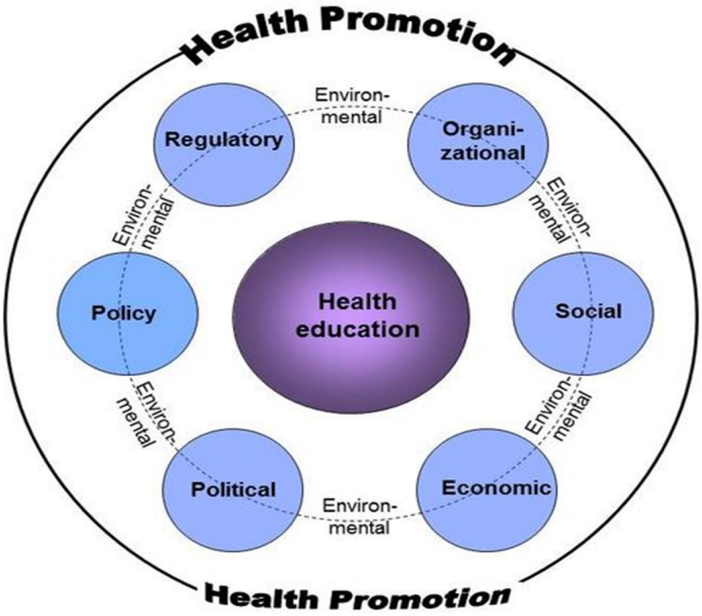
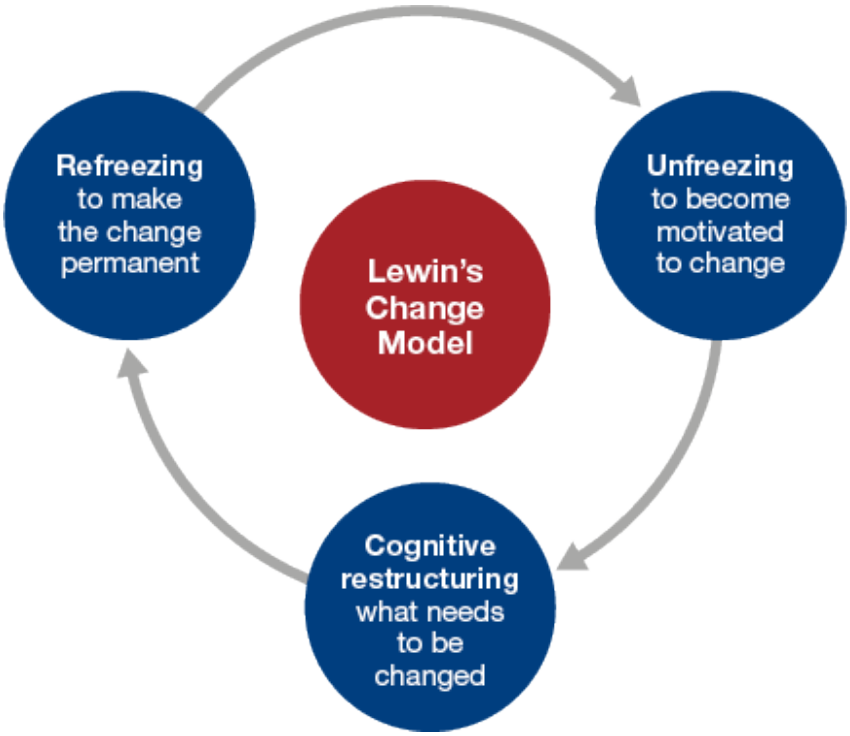
Appendices

Appendix A: Conceptual/Theoretical Frameworks

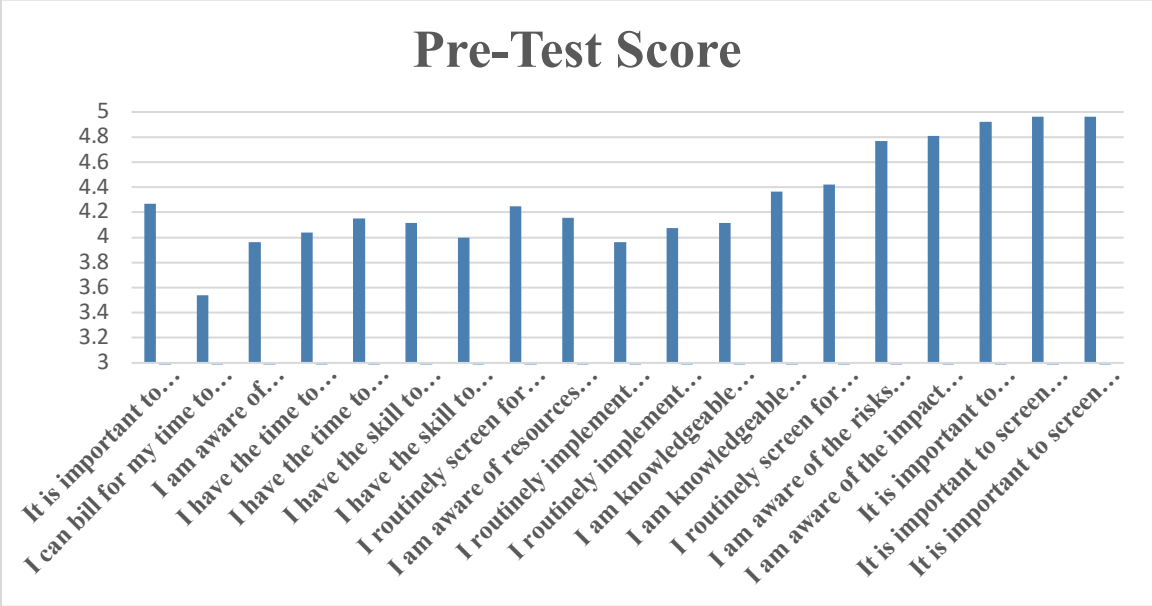
The Health Promotion Model

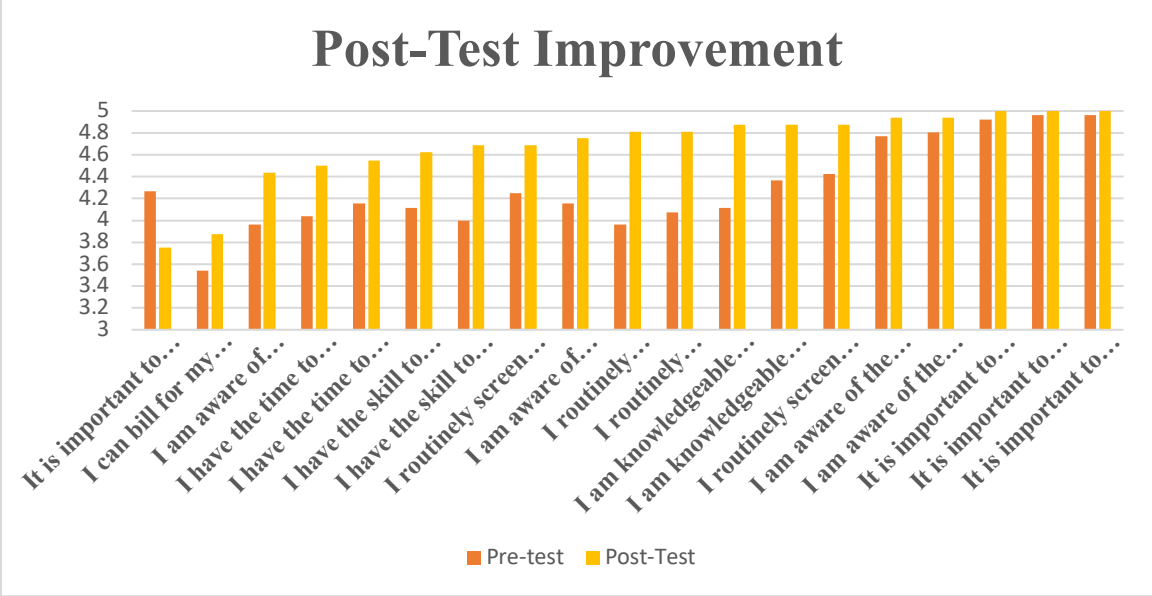


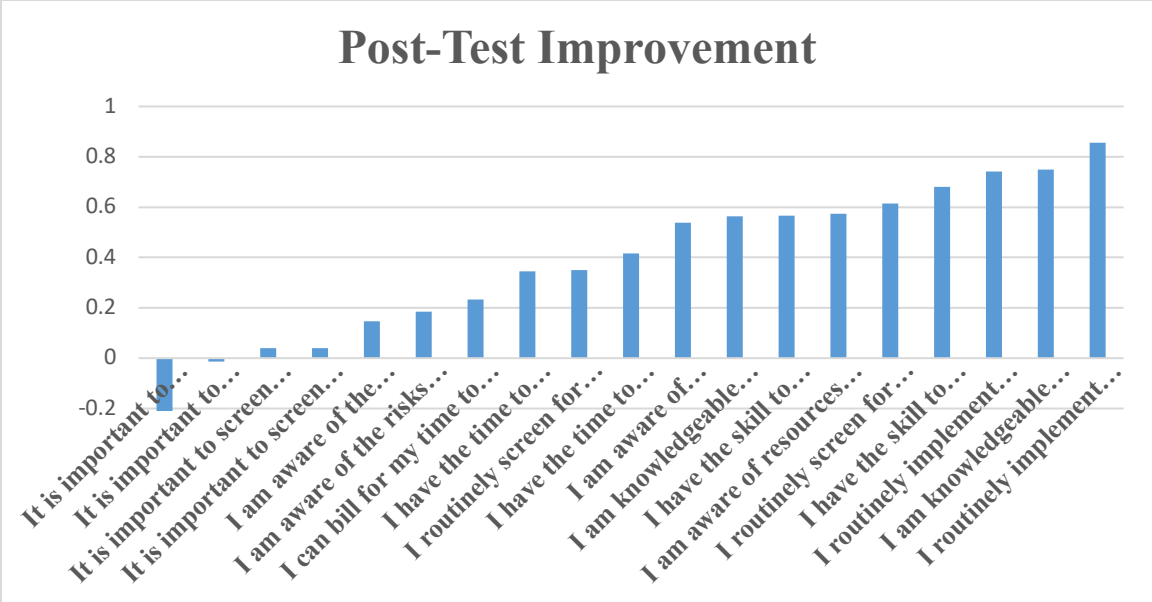
Lewin's Change Theory



Appendix B: Project Results

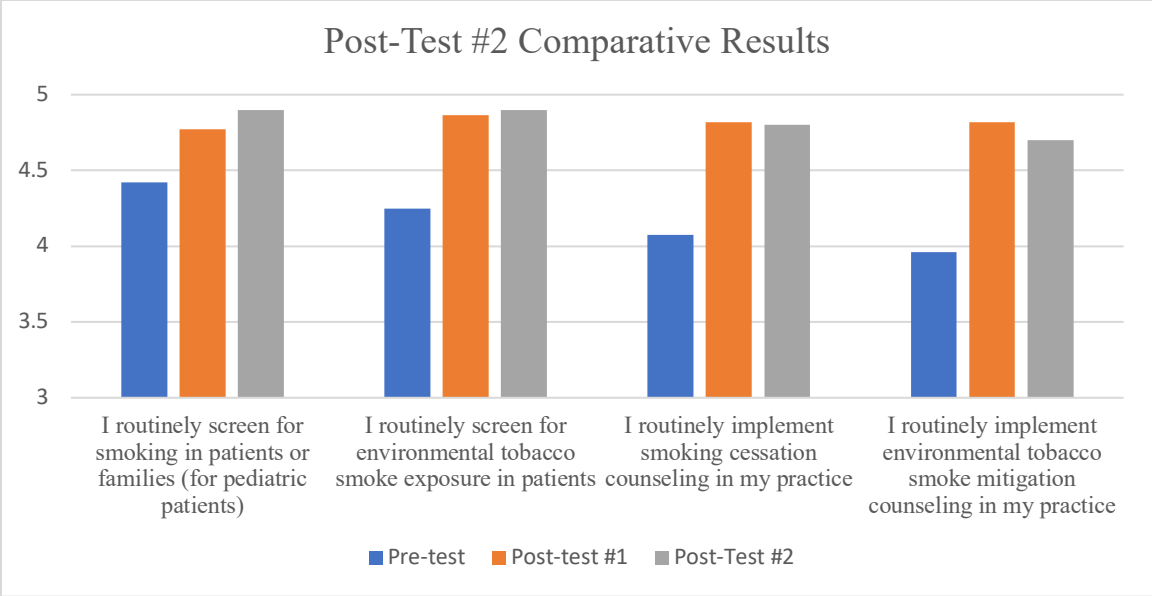






Analysis of Pre- and Post-Test Average Scores

	Pre-test Average Score (n=)	Post-test Average score (n=)	p=
All Participants	4.31 (26)	4.67 (22)	<0.01
MD	4.30 (4)	4.77 (4)	0.02
RN	4.08 (6)	4.54 (6)	0.01
MA	4.59 (10)	4.73 (9)	0.04
Other	4.04 (6)	4.55 (3)	<0.01



	Pre-test Average Score (n=)	**Post-test Average score (n=)**	**Post-Test #2 Average Score (n=)**	**p=**
All Participants	4.18 (26)	4.82 (n=22)	4.83 (n=10)	<0.01