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Motivational Interviewing Intervention for COVID-19 Vaccination Hesitancy Within an Inpatient Setting

Daniel W. Zepp

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By

Daniel W. Zepp

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Abstract

BACKGROUND: Evidence shows that vaccinations lessen disease and death yet many people remain hesitant to receive the COVID-19 vaccination. PROBLEM: By some estimates, COVID-19 has resulted in $16 trillion in lost wages, healthcare costs, disruptions in the healthcare system, and the economic infrastructure of the country. METHOD: An exhaustive literature search was conducted resulting in 13 full-text articles. A quality improvement (QI) intervention was developed using the Health Belief Model as a framework and the Johns Hopkins Nursing Evidence-Based Practice for Nurses and Healthcare Professionals Model to translate evidence into practice. INTERVENTION: Patients from two medical-surgical units of a small community hospital were screened to identify unvaccinated patients. An evidence-based, personalized, motivational interviewing intervention was initiated to determine if a statistically significant decrease in vaccine hesitancy would result. The project leader used a pretest-posttest numerical rating scale (NRS) to measure vaccine hesitancy before and after the intervention. RESULTS: Results of the QI project showed intention to be vaccinated against COVID-19 was statistically significantly greater after the use of a motivational interviewing intervention than before motivational interviewing with a medium effect size (z = -2.69) indicating clinical significance, p = .007, r = 0.37. CONCLUSION: Despite the statistical and clinical significance found in this QI project of a decrease in vaccine-hesitancy, it was determined that there is a limited benefit for the use of motivational interviewing in this inpatient setting due to 97.6%, (n = 41) of those scoring less than 4 on the 1-10 scale showing no change in intention to be vaccinated. Those who scored less than 4 on the NRS were termed “vaccine-resistant.”

Keywords**:** COVID-19, SARS-CoV-2, vaccine hesitancy, motivational interviewing

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Background

After more than two years of COVID-19, the worldwide death toll attributed to the virus exceeded 6 million people (Johns Hopkins University, 2022). The societal healthcare costs, lost wages, and economic disruptions reached $16 trillion (Cutler & Summers, 2020). The COVID-19 pandemic has directly affected South-Central Pennsylvania within the project site location of Cumberland County, Pennsylvania, there have been over 50,700 confirmed cases of COVID-19 and over 874 deaths. Despite this, only 66.8% of eligible residents are fully vaccinated (Pennsylvania Department of Health, 2021). This translates to over 78,000 Cumberland County adult residents without full vaccination against COVID-19.

Evidence shows that fully vaccinated individuals have a reduced risk of serious illness (Scobie et al., 2021). The three vaccines available at the time of this project were 85%–96% effective in preventing hospitalization in fully vaccinated individuals (Moline et al., 2021). Despite the effectiveness of the vaccination, over 33% of eligible individuals have yet to receive their first dose. While this may be partially explained by procrastination or other non-hesitancy reasons, many unvaccinated individuals are hesitant to receive the vaccine.

Problem Statement

The World Health Organization (WHO) defines vaccine hesitancy as a “delay in acceptance or refusal of vaccines despite availability of vaccination services” (MacDonald, 2015, p. 2). COVID-19 vaccinations have been available to the general public since December 2020, yet many eligible people remain unvaccinated. The emergence of the Omicron variant has confounded the problem. Omicron is more contagious than earlier variants but has a lower

severity of symptoms (Iuliano et al., 2022). Those infected with COVID-19 without serious complications may believe that they no longer need the vaccination.

An evidence-based quality improvement DNP project was developed to address the problem of vaccine hesitancy. The following population, intervention, comparison, and outcome question guided the literature review: Among the adult COVID-19 vaccine-hesitant population in an inpatient setting, what is the impact of personalized vaccine education using motivational interview techniques compared to no intervention on COVID-19 vaccination hesitancy?

Needs Assessment

The project leader contacted the University of Pittsburgh Medical Center (UPMC) Carlisle Hospital for project implementation. UPMC's organizational practices, policies, and procedures regarding COVID-19 vaccine-hesitant patients were still evolving, which determined their need for the project. The administrative and departmental policies and procedures indicated that UPMC made every effort to keep up-to-date information about the COVID-19 vaccines on their website. Inpatients who had questions about the COVID-19 vaccine were often referred to the hospital website which included a "frequently asked questions" section. The answers, however, were almost exclusively about "who, what, where, and why" but did not address other questions vaccine-hesitant people may ask such as: "Does the vaccine cause COVID-19; was it developed too quickly; or did they use fetal tissue in the vaccines?"

There was also a gap in the procedure for discussing the vaccine once someone was identified as hesitant. Engaging the patient in a discussion on their hesitancy was at the discretion of the healthcare provider and was not standard practice. According to nurses, educators, and administrators at the hospital, time constraints and poor comfort levels in discussing vaccinations may hamper the engagement of the patient in a discussion.

The rationale for COVID-19 vaccine hesitance or resistance among inpatients is multifaceted. Suspicion of the government, lack of healthcare provider endorsement, perceived efficacy, perceived risk-reward, religious or philosophical reasons, availability of the vaccine, and having an external "health locus of control" may all impact vaccine hesitancy (Olagoke et al., 2021). The project leader explored possible causes of the underutilization of vaccines using an Ishikawa diagram (see Appendix A). King et al. (2021) found that COVID-19 vaccine hesitancy varied by demographics, beliefs, geography, political leanings, and behaviors. This finding suggests that interventions must be individualized to best fit a variety of groups. Jarrett et al. (2015) found that multi-focal and dialogue-based interventions were most effective.

A strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted (see Appendix B). Strengths of the site include leadership support from the chief nursing officer of the hospital, the willingness of the facility to participate, and having readily available participants. The weaknesses of the project site according to the chief nursing officer, include the reluctance of many healthcare providers to engage patients in vaccination discussions due to the highly emotional responses and the lack of time for providers to disseminate information and answer questions. As of the implementation of the project, the COVID-19 virus persists in Pennsylvania, and opportunities to implement this project are available but the healthcare community is without a consistent, organized plan to reduce vaccination hesitancy. Higher vaccination rates in a community reduce total cases of the disease, resulting in herd immunity. Herd immunity is indirect protection from a disease for unvaccinated individuals when enough others in a population are vaccinated. The threats encountered at the site included fear of confrontation or escalation when discussing this emotional topic and possible delays in accessing vaccinations if the patients agree to be vaccinated.

Aims, Objectives, Purpose Statement

The aim of this project was to decrease COVID-19 vaccination hesitancy at a local hospital's medical-surgical units. To accomplish this aim, several SMART objectives were used. The project leader would screen at least 95% of unvaccinated patients for participation during each day the project leader was present in the medical-surgical units of UPMC Carlisle Hospital during the 3-month intervention period using evidence-based motivational interviewing strategies and infographics to discuss COVID-19 vaccination benefits, the project leader would initiate the intervention with willing inpatients who meet the inclusion criteria on the two medical-surgical floors at UPMC Carlisle Hospital from January 10th, 2022–May 7th, 2022. To keep open communications, the project leader would meet with his project site mentor every two weeks by phone or Zoom. Lastly, the project leader would utilize a 1–10 "likelihood of being vaccinated" scale preintervention and postintervention to track changes in vaccination hesitancy. The purpose of this project was to implement a quality-improvement project using an evidence-based, personalized, motivational interview technique regarding the COVID-19 vaccination at a local inpatient hospital.

Review of Literature

Using the following terms to define the PICO question, A comprehensive review of the literature was started in June 2021. Search terms included "vaccine hesitancy AND [COVID-19 OR Coronavirus OR SARS-CoV-2] AND [strategies OR methods OR techniques OR interventions OR best practices]" using CINAHL Complete, Medline Complete, PubMed, and Cochrane, combined with a grey literature search on Google Scholar (see Appendix D). This search began only 6 months after the vaccine became available to the general public, thus only yielded 13 articles after screening for full-text English-language peer-reviewed studies published

in scholarly journals. The quality of these articles ranged from a single-blind, parallel-group randomized controlled trial (quality rated I A), to a scoping review of the scientific literature (quality rated V B) including one study quality rated I A, 2 studies rated II A, 2 studies rated II B, two studies rated III A, and 4 studies rated III B. Adding "motivational interviewing AND vaccine hesitancy" to the literature review yielded mainly editorial articles and one study (quality rated II A).

The project leader conducted an appraisal of the articles using the *Johns Hopkins Evidence-based Practice for Nurses and Healthcare Professionals: Model and Guidelines* (4th ed.; Dang et al., 2022; see Appendix C). The review identified several themes. Personalized, honest communication from a healthcare provider is more effective than not offering answers to patients' questions about vaccines (Bischof et al., 2021; Jones et al., 2015; Talmy et al., 2021). Paterson et al. (2016) found that healthcare providers who were hesitant about vaccinations were less likely to advocate for them. Freeman et al. (2021) and Merkley and Loewen (2021) found that emphasizing the personal benefits of vaccination, such as preventing death, was more effective than discussing the collective benefit to society. Rutten et al. (2020) found offering novel information such as "we are learning that COVID-19 infections can result in longer-lasting, debilitating health problems" (p. 702) was effective in increasing vaccination rates. Wermers et al. (2021) showed mixed results in their nonrandomized quasi-experimental evidence-based intervention of motivational interview and vaccination rates among college students. The Centers for Disease Control and Prevention (CDC, 2021) advocate for motivational interviewing techniques as an encouraging method to fight vaccine hesitancy and cite the Gagneur et al. (2018) quasi-experimental cohort study (quality rated II A). In a later study, Gagneur, (2020) outlined several components of motivational interviewing including open

questions to evoke responses, affirmation to encourage the individual and highlight their strengths, and reflective listening.

Pre-COVID-19 vaccination hesitancy studies were also assessed. Butler and MacDonald (2015) described the Tailoring Immunization Programs, developed through evidence-based literature, which used proven behavioral insight methods, social marketing, and "design evidence-informed responses to hesitancy appropriate to the subgroup setting, context and vaccine" (p. 2177). Although not specifically about COVID-19, their information on personalizing immunization programs may be generalizable to COVID-19 vaccine hesitancy.

Implementers of a 2018 regional pilot study (quality rated II A) in Quebec showed that motivational interview techniques led to a 15% increase in mothers' intention to vaccinate their infants (Gagneur, et al., 2020). Rotolo et al. (2021) used infographics to determine what questions about the COVID-19 vaccination were of the most interest to users of social media. There were 238,430 hits on 14 different infographics used to determine which infographics were most utilized. The infographics are not exhaustive of all possible vaccine questions that could be raised, for example, they do not address the difference between the mRNA vaccinations and the Johnson & Johnson adenovirus vector vaccine. This project uses the top four infographics with the permission of Rotolo (see Appendix M).

Theoretical Model

This project used the Health Belief Model as a framework (Becker, 1974; see Appendix E). The model was useful for the topic of vaccination-hesitancy as it focuses on patient compliance and preventive health care practices, and it emphasizes moving patients toward health. The major tenets of this model are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Patients whose perceptions about

COVID-19 fail to match the evidence will be more likely to refuse the vaccination. Cues to action include the recognition of threats such as illness, loss of income, death, and increased education about the disease. The model allows for the organization of patients' perceived beliefs and complements the CDC's motivational interview technique to understand and address patient concerns.

Translation Model

The project used the Johns Hopkins Nursing Evidence-Based Practice for Nurses and Healthcare Professionals Model to translate evidence into practice (see Appendix F). The Practice question, evidence, translation (PET) process for evidence-based practice fit this project as the evolving COVID-19 pandemic necessitated constant reflection and adjustment to determine best practice (Dang et al., 2022). The evidence supports personalized education using the CDC's motivational interview techniques and emphasis on personal risks of the disease as the most effective way to reduce vaccine-hesitancy. Evaluation of outcomes include gathering data preintervention and postintervention to determine a change in vaccination hesitancy. The project leader continuously monitored the evidence translation process to assure evidence-based practice and evaluate outcomes. (Dang et al., 2022).

Methodology

Participants

Project participants consisted of a convenience sample of inpatients on the two medical-surgical floors of a local hospital who were unvaccinated against the COVID-19 virus during the intervention timeframe of the project. Exclusion criteria included those under the age of 18 years old, diagnosed with dementia or delirium, or had a mental illness that would hamper their understanding of the project. Further, patients who had developed COVID-19 in the past 90

days, had a Monoclonal Antibody infusion in the last 90 days, had severe vaccination reactions in the past, or who had autoimmune disorders were referred to their physicians to discuss the appropriateness of vaccination. Non-English-speaking patients were to be interviewed using the hospital's translation line however all project participants spoke English. Lastly, two incarcerated patients were also excluded due to the hospital's ethical and safety concerns.

Setting

Implementation of the project occurred within the two medical-surgical units at UPMC Carlisle Hospital in Carlisle, Pennsylvania. The hospital is a 165-bed facility in Cumberland County. The county is a mixture of suburban and rural areas and is approximately 88% Caucasian, 4.5% Black, 4.5% Latino, and 4.5% Asian (U.S. Census Bureau, 2021). The hospital has approximately 120 full and part-time nurses. Each medical-surgical unit has a capacity of 24 patients.

Tools

The tools utilized in this project included a 1–10 NRS of the likelihood of receiving a COVID-19 vaccine and 4 of the Rotolo, et al. infographics handouts. NRS scales are used in health care, are familiar to patients, and are easy and quick to use. This tool was modeled after the 0-10 pain scale commonly used in healthcare. The infographics were designed using the most asked questions about the COVID-19 vaccine asked of physicians, nurses, pharmacists, and online. Answers were then formulated from the information on the CDC, WHO, and HHS websites (Rotolo, et al.,2021).

The method of intervention was the motivational interviewing technique. A motivational interview is a subjective method of discussion that relies on the user's ability to utilize a nonconfrontational, motivational interview. First described by Miller and Rollnik (1995) in the

1980s it was used in their work with patients who had substance disorders as a non-confrontational approach. A recent meta-analysis by Bischof et al., (2021) concluded that this technique strengthens behavioral change and promotes treatment adherence. Gabarda and Butterworth (2021) discussed motivational interview for reducing defensiveness and increasing trust in the healthcare workers avoiding a confrontational argument about vaccinations.

Intervention

The QI intervention took place between February 4 and May 6 of 2022. The project leader used the electronic health record (EHR) to screen patients for COVID-19 vaccination status. The EHR often listed vaccination status as "unknown;" therefore, a direct patient inquiry was also used if COVID-19 vaccination status was unknown. If inclusion criteria were met, the project leader asked each patient if they wished to participate in a QI project in which the project leader, a Messiah University Doctor of Nursing Practice student, has partnered with the hospital to discuss the COVID-19 vaccine. The introduction of the project was scripted to assure accuracy and fidelity (see Appendix H). No patient refused to participate. The project leader asked patients to give their likelihood of getting the COVID-19 vaccination on a 1–10 scale (1 = *I'll never get the COVID-19 vaccination* and 10 = *I'll take the vaccine now*)." The patient was then given personalized, structured information specific to the personal benefits of the vaccine and reduced risk of death using the CDC motivational interview techniques (see Appendix G). Participants were also handed Four infographics by Rotolo et al. (2021; see Appendix I). Rotolo et al. found that the information was the most asked questions about the vaccine, and the project leader wished to leave the infographics to reinforce the questions discussed during the motivational interview.

All patients were asked after the intervention if they would be willing to be vaccinated

and 3 patients were willing. If the patient was willing to be vaccinated, the hospital pharmacy was contacted by the project leader. The hospital pharmacy supplied the vaccinations for all inpatients and facilitated contact with the patient's hospitalist or primary care provider to obtain an order to give the vaccine. With an order from the patient's PCP or hospitalist, the pharmacy initiated the vaccination process. When the interview was complete, the project leader asked a postintervention question about vaccination likelihood on a 1–10 scale. The project leader utilized a process map during the intervention (see Appendix J), and intervention fidelity was maintained throughout the intervention because the project leader was the only person offering the intervention and the introduction was scripted.

Data Collection

Data collection took place between February 4 and May 6 of 2022. Approximately 40% of the patients in the two medical-surgical units had "unknown COVID-19 vaccination status" listed on their electronic health record, which slowed the screening process. The project leader brought this missing vaccination status in the EHR to the unit managers of the medical-surgical floors, who investigated the discrepancy immediately. Demographic data, including age, race, sex, education level, and county of residence were collected. The project used the pretest and posttest answers to a 1–10 "likelihood of getting the COVID-19 vaccine" question during the intervention. A comparison was made between the pretest answer to "How likely are you to get the COVID-19 vaccine?" and the posttest answer. The project leader performed quantitative data analysis using IBM SPSS version 25.0 calculating measures of central tendency, mean, median, and frequency distribution on the pretest, and posttest scores of the sample.

Cost Analysis

The overall cost of implementing the project was minimal, under $1,000 (see Appendix K). It consisted of photocopying costs for infographics for each patient, IBM SPSS software, and fuel costs for the project leader. Costs to implement the project for a hospital would also include the time to train nurses in motivational interview, the time to implement with each patient, and extra staffing.

Timeline

Pre-implementation preparation including the project proposal, implementation site approval, UPMC and Messiah University Institutional Review Board exemptions, and preparation of materials for the project implementation all occurred in the fall of 2021. Implementation occurred from February through May 2022, and analysis of data for completeness and statistical results followed in the summer of 2022 (see Appendix L).

Ethics and Human Subject Protection

The project site IRB and Messiah University's IRB (#2021-040) confirmed that this project constituted Quality Improvement and was "exempt" under HHS rule 45 CFR 46.101(b). The project leader obtained a Protecting Human Research Participants training certificate online. Patient confidentiality was maintained using the Health Insurance Portability and Accountability Act of 1996 (HIPAA) standards which, among other guarantees, protects the privacy of patients' health information. No personal identifiers were collected for this project except room numbers and dates of intervention. These were stored via secured electronic storage and not removed from the facility. The project leader stored the data under a two-password security protocol and all data were scrubbed from the electronic storage after project completion. The risks of breaches in security or loss of personal information were no different from the risk of being a patient at the

hospital.

Patients were told that the project was an intervention related to COVID-19 vaccine hesitancy and asked if they would answer a few questions. No patient refused to participate in the intervention. The patients were told that participation was completely voluntary and they could refuse to answer any question or stop at any time. If visitors or hospital staff were present, the patients were asked if it was ok to proceed or if the patient wished the project leader to return later.

Results

Analysis and Evaluation

Data were assessed for accuracy and completeness; there were no missing data points. Data were analyzed using IBM SPSS (Version 25.0). Measures of central tendency, variability, and frequency distributions were used to describe demographic and outcome variables. The level of significance was set at $p < .05$. Pearson's chi-square was used to compare nominal and categorical variables. To assess change in intention to receive a COVID-19 vaccine, a paired-samples *t* test was warranted, but because the pretest-posttest difference scores were not normally distributed (skewness = 2.5, kurtosis = 5.0), the nonparametric Wilcoxon Signed-Rank test was conducted instead.

A total of 51 inpatients were included in the project. Participants ranged from 26–90 years of age ($M = 59.8$, $SD = 14.2$), and were predominately male (56.9%, $n = 29$), Caucasian (96.1%, $n = 49$), from Cumberland County (74.5%, $n = 38$), with a high school or less education level (86%, $n = 44$; see Appendix N).

The outcome variable consisted of pretest and posttest NRS scores with a possible range of 1 (*I'll never get the COVID-19 vaccination*) – 10 (*I'll take the vaccine now*). Pretest scores

ranged from 1–8 (*M* = 2.27, *SD* = 1.86; skewness = 1.2, kurtosis = 1.86) and posttest scores ranged from 1–10 (*M* = 2.90, *SD* = .42; skewness = 1.5, kurtosis = 1.1). The majority of pretest (60.8%, *n* = 31) and posttest scores (58.8%, *n* = 30) were rated as 1 (*I'll never get the COVID-19 vaccination*). For this project, vaccine resistance was defined as a NRS score of 4 or less (pretest = 78.4%, *n* = 40; posttest = 74.5%, *n* = 38). There were no statistically significant differences in age, gender, race, education level, or county of residence between patients who reported an increase in intention to receive a COVID-19 vaccine compared to those who did not have an increased intention to change (see Appendix O).

Difference scores (posttest – pretest score) ranged from 0–6 (*M* = .63, *SD* = 1.59; skewness = 2.52, kurtosis = 5.02). Intention to be vaccinated against COVID-19 was statistically significantly greater after use of a motivational interviewing EBP intervention (*Mdn* = 2.90) than before motivational interviewing (*Mdn* = 2.27) with a medium effect size indicating clinical significance, $z = -2.69$, $p = .007$, $r = 0.37$.

Most patients did not indicate a willingness to change their intention to be vaccinated after the intervention (difference score = 0; 82.4%, *n* = 42). These 42 patients predominately scored 4 or less on the pretest NRS for intent to change (88.1%, *n* = 41), indicating a preexisting vaccine resistance compared to the patients who scored 5 or greater on the pretest NRS (66.7%, *n* = 6). Of the total sample, 17.6% (*n* = 9) reported an increased intention to receive a COVID-19 vaccination after motivational interviewing, with difference scores increasing by 1 to 6 points (*M* = 3.56, *Mdn* = 5.0, *SD* = 2.0). Although the majority of these 9 patients had less vaccine hesitancy before the intervention (pretest NRS $\geq$ 5: 66.7%, *n* = 6), two of the three patients who were vaccine-resistant before the intervention (pretest NRS $\leq$ 4) did indicate increased intention with posttest scores of 5 and 10. Three of the nine patients (33.3%) who showed less vaccine

hesitancy after the intervention allowed nursing staff to begin the process of vaccination immediately after the intervention.

Discussion

This project aimed to decrease COVID-19 vaccination hesitancy by using motivational interview and infographics with unvaccinated inpatients of a local hospital. Although the statistical and clinical significance of the data may appear promising, most patients did not verbalize any intent to change (82.4%, $n = 42$), and most of these 42 patients scored 4 or less on the NRS pretest (97.6%, $n = 41$), indicating preexisting vaccine resistance. Anecdotally, many of these patients verbalized to the project leader that there would be "nothing" that could cause them to accept the vaccine including the threat of job termination, incarceration, or loss of friends or family. Despite the fact this project focused on the vaccine-hesitant, by design it also included "vaccine-resistant" individuals. Peters (2022) differentiates "vaccine-hesitant" from "vaccine-resistant or anti-vax" pointing out that the WHO makes no distinction. For this project, vaccine-hesitant individuals were defined as somewhat open to getting vaccinated, and vaccine-resistant individuals stated that they would never get the vaccination. The term "vaccine-resistant" as used here should not be confused with a pathogen resistant to a vaccine.

Additionally, motivational interviewing is time-intensive, ranging from 10 to 25 minutes per patient, and staff would require extensive training in the technique before implementation. These obstacles negatively impact the feasibility of motivational interviewing in this setting. Freiser et al. (2022) recommended a COVID-19 vaccination nurse coordinate same-day vaccinations and talk with vaccine-hesitant individuals.

Some strengths of this QI project include the sampling of mostly older inpatients who would likely be at increased risk for COVID-19 complications and who could potentially have

rapid access to the vaccine before discharge. Motivational Interviewing technique entails investing time to understand and feel comfortable performing it. The project leader learned motivational interviewing during a post-graduate counseling class and had 20 years of experience using it in mental health and addictions counseling. The availability of the COVID-19 vaccine for over a year before the intervention is a strength due to the amount of time individuals had to receive the vaccine before this QI project, hence allowing for greater access to more vaccine-hesitant and resistant patients. Analytic strengths include the completeness of data and the use of appropriate statistical analyses as indicated by accurate assumption testing.

Limitations

The limitations of this project include the homogeneity of the sample for race/ethnicity and older age. Additionally, sparse research was available owing to COVID-19 vaccine production only 6 months earlier. A comparable search conducted in July 2022 yielded a significant increase in articles. Future QI projects may benefit from focusing on vaccine-hesitant patients only and having immediate access to a vaccination before hospital discharge. An interprofessional team would be beneficial for any future projects. Vaccination teams trained in motivational interview techniques and answering questions on vaccinations may facilitate the process. Further research is needed to fully address vaccination rate improvement among the vaccine-resistant population.

Significance to Advanced Practice Nursing

Due to the limited success with vaccine-resistant patients, the time involved in training advanced practice nurses to employ motivational interview may not be beneficial. Given a tool to screen out those who refuse vaccination before the motivational interview, and utilizing nursing teams who specialize in motivational interviewing, this intervention could successfully be used

by advanced practice nurses as patients look to their practitioner for health guidance. The amount of time needed to perform motivational interviewing during an outpatient visit may hinder advance practice nurses from doing motivational interviewing.

Conclusion

COVID-19 vaccine hesitation remains a problem as the disease persists. Addressing vaccination hesitancy is crucial in mitigating the spread of COVID-19. Although motivational interviewing did reduce vaccination hesitancy in some individuals, those who scored less than 4 showed almost no improvement. It remains unclear to what extent motivational interviewing may reduce vaccine hesitancy in the vaccine-resistant population. Despite the statistical and clinical significance found in this QI project to increase intent to receive the COVID-19 vaccine, there is a limited benefit for the use of motivational interviewing in this inpatient setting due to the minimal change in intention to be vaccinated among vaccine-resistant individuals and the multiple challenges with project feasibility.

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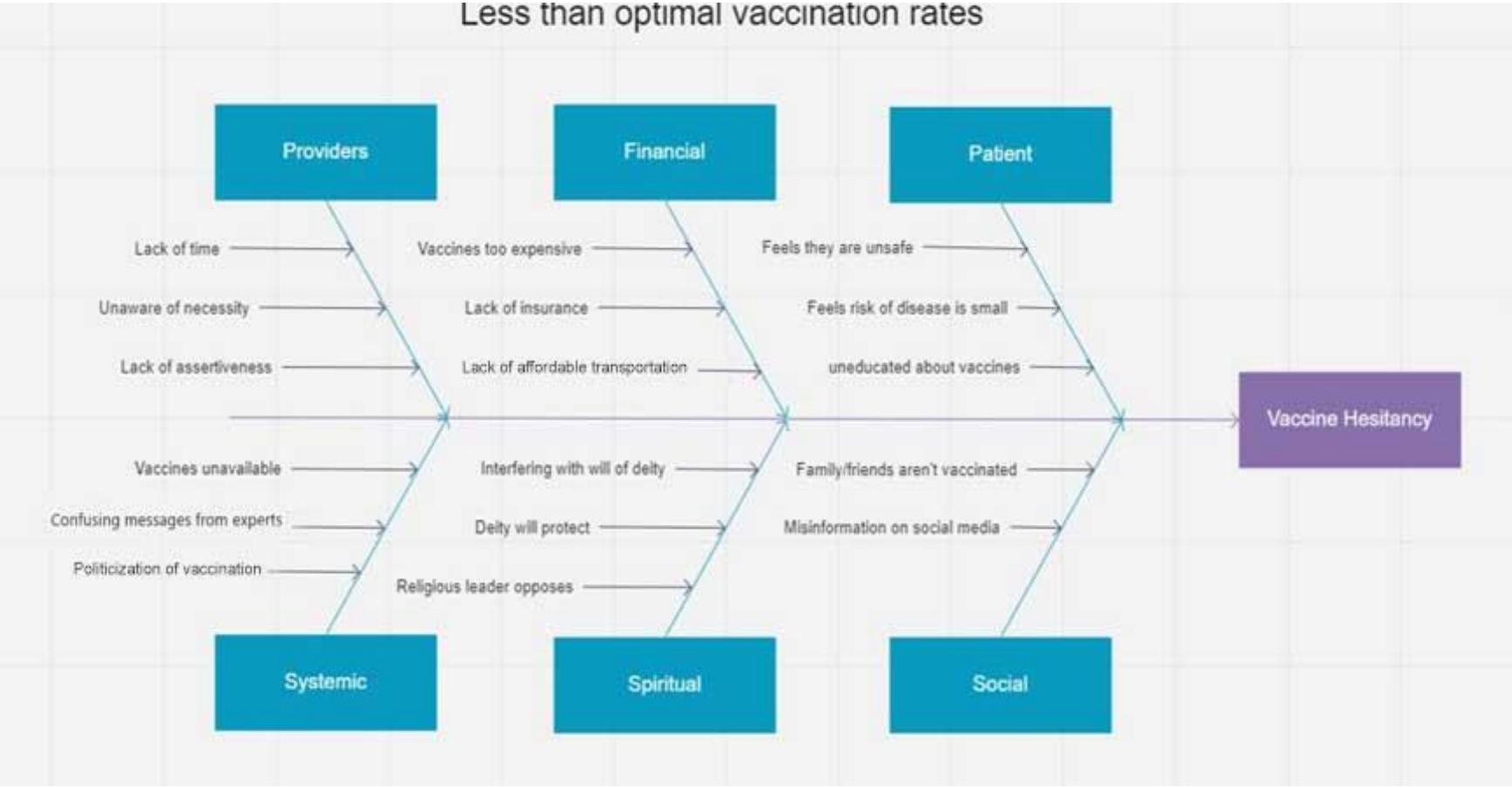
Appendix A

Ishikawa Root Cause Analysis



Appendix B

SWOT Analysis

Strengths • The site offers available access to unvaccinated patients • Inpatient providers are available to write COVID-19 vaccination orders • The site provides a convenient location to provide the educational intervention • The project leader can provide education without interrupting care at the site	**Opportunities** • The outcome of the project may help increase vaccination rates at the site • The medical community at the site has an interest in the outcome of the project
Weaknesses • There exists a possible lack of adequate staff to offer intervention • There may not be privacy with staff coming and going in patient rooms • A busy medical-surgical floor may not have time to assist the project leader • An immediate ability to schedule vaccinations may not be available if patients agree to vaccine	**Threats** • There may be a fear of confrontation or escalation when discussing this emotional topic

Appendix C

Literature Review Table

#	Citation, Source, Date	Design or Evidence type	Sample Setting Size, Type	Study Findings that help answer PICO question	Observable Measures	Limitations	Evidence Rating Scale
1	Biswas, *Journal of Community Health (2021).*	The design was a scoping review of the scientific literature on COVID-19 vaccine hesitancy in HCW. The measures were comparative.	Scoping review and organization of reasons for vaccine hesitancy in HCWs from current 35 studies. **Inclusion criteria:** Scholarly articles using the keywords: "vaccine," "COVID-19," "hesitancy," "refusal," "vaccination," "coronavirus," "nurse," "doctor," "healthcare," "worker," "health," "professional" *N* = 76,741	Concerns about safety, efficacy, and side effects were the top three reasons for COVID-19 vaccination hesitancy among HCWs. Less cited reasons for COVID-19 vaccine-hesitancy included insufficient knowledge about the vaccines, disbelief that COVID-19 is a serious disease, development of vaccines done too quickly, politics, and confusion about its efficacy. Male gender and doctoral level education enabled vaccination acceptance	The findings indicate that 22.51% of 76,471 HCWs worldwide reported COVID-19 vaccination hesitancy. Direct patient contact, caring for COVID patients, or higher perceived risk and fear of being infected with COVID-19 were associated with lower COVID-19 vaccination hesitancy in more than half of the studies (20/3 5 = 57.1%)	Population validity: Worldwide results may not be generalizable to the United States. The time frames of the studies range from March 2020 to September 2020. This was early in the Pandemic and findings may have evolved since then. Generalizability to the population at large may not be accurate.	V B
2	Freeman, *The Lancet Public Health* (2021).	A single-blind, parallel-group randomized controlled trial.	A convenience sample of online respondents using multiple survey participant recruitment	Addressing speed of development directly or indirectly did not differ in the effect on vaccine hesitancy in any of the groups. In	Condition 5 (personal benefits) led to the greatest reduction in hesitancy among the strongly hesitant group. Information on	Expressed willingness to be vaccinated may not match actual vaccination behavior.	I A

			companies in the United Kingdom through the company Lucid. Lucid works with 250 survey companies. This reduces demographic homogeneity chances. **Exclusion criteria:** 2972 excluded 2769 did not consent, 66 <18 years of age, 132 speeders removed; 5 duplicate IP addresses removed. *N* = 18,855	those strongly hesitant, COVID-19 vaccine hesitancy was reduced, in comparison to the control condition, by offering personal benefit information as opposed to altruistic, societal benefit information. Surveys asked people's views on the upcoming approval of COVID-19 vaccines and people's views on their safety of them. They were also asked if they believed that they would choose to be vaccinated.	personal benefits reduces hesitancy to a greater extent than information on collective benefits. A breakdown of the degree of hesitancy shows: 12,463 (66.1%) of participants were classified as willing, 2,932 (15.6%) as doubtful, and 3,460 (18.4%) as strongly hesitant (they report that they will avoid being vaccinated for as long as possible or will never get vaccinated).	Unknown if the results will be valid as it was an online convenience sample	
3	Gagneur, *BMC Public Health* (2018)	Quasi-experimental cohort study using a static-group comparison design with multiple posttest measurements. An individual	1140 (Motivational interview) and 1249 (control) newborns were included *N* = 2389 **Exclusion criteria:** Mothers or newborns requiring acute care. Independent	Motivational interview increased vaccination rates. A sustained increase (from 3.2 to 7.3%) in vaccinations at 3, 5, and 7 months old was observed. There was no statistically	A significant increase in vaccinations of 3.2, 4.9, and 7.3% was observed at 3, 5, and 7 months of age (P < 0.05), respectively. The adjusted relative risk of the intervention's impact on vaccination status at 7 months of	Population validity: Results may not be generalizable to adult COVID-19 vaccination hesitancy. No mention of the mother's vaccination status. The study was focusing on parents vaccinating children.	II A

		educational information session (motivational interview) or control group	variables, such as mother's age, length of postpartum hospitalization, and cesarean birth were used to assess the comparability of groups and to control for potential confounding factors.	significant difference in the mothers' ages and the length of postpartum hospitalization between the experimental and control groups. statistically significant differences were observed for the following variables: "At least one another child in the family," "Cesarean birth," and "Newborn hospitalized in the neonatology ward during postpartum stay."	age was 1.08 (95% confidence interval: 1.03–1.14; P = 0.002).	This study did not mention infant vaccination reactions which may play a factor in vaccination hesitancy.	
4	Jarrett, *Vaccine* (2015).	A systematic review of peer-reviewed and grey literature using GRADE criteria.	Descriptive analysis of 166 peer-reviewed and 16 grey literature evaluation studies worldwide.	Multifocal and dialogue-based interventions were most effective. 1. Targeted unvaccinated,	Interventions associated with a less than 10% increase in uptake included those that focused on quality improvement at clinics. Only 14% of peer-	Population validity: Most studies focus on influenza and childhood vaccine hesitancy (generalizability.) Two reviewers assessed each paper for risk bias.	III B

			Inclusion criteria: contained research on vaccine hesitancy; included any of the keywords in the title or abstract described or evaluated an intervention addressing hesitancy and reported a measure of the primary outcome.	2. Increase knowledge and awareness. 3. Improve vaccine access 4. Targeted specific populations 5. Mandated vaccination. Most interventions were multi component. Most focused on raising knowledge and awareness.	reviewed and 25% of grey literature had strategies to address vaccine hesitancy.	Possibly subject to publication bias as studies with poor results may not have been published. Grey literature inclusion may dilute the robustness of results.	
5	King, *PLOS ONE* (2021)	Nonexperimental cross-sectional results of an online survey.	A convenience sample of online respondents using Facebook as a survey participant recruitment company. (N = 525,644) The Poisson regression model was used to estimate the risk ratios for vaccine-hesitancy for each variable.	The study found that vaccination-hesitancy decreased each month, with a decrease from 25.4% (95% CI) in January 2021 to 16.6% (95% CI) in May 2021. Further, demographics, political support, geography, and employment status were found to be statistically related to vaccine-hesitancy.	Observable measures include higher vaccine-hesitancy in those who were Trump supporters, having a history of a positive COVID-19 test result, not having a high-risk health problem, and living in a county with a lower COVID-19 death rate, black race, and high school or less education. Reasons given for vaccination-hesitancy	Self-report, possibility of social desirability bias. The study had a sample size of over half-a-million people which may transform small differences into statistically significant differences.	III A

			Exclusion criteria: "self-described gender" was excluded due to multiple discriminatory or absurd answers such as "Unicorn"		included fear of side effects (49.2% [95% CI, not trusting the vaccine (48.4% [95%CI, Over one-third reported waiting to see if safe, not trusting the government, or not needing the vaccine.		
6	Knight, *Public Health* (2021)	Analysis of existing survey data and development of an evidence-based motivational interview tool.	Analysis of existing vaccination-hesitancy data, literature review, and qualitative findings review from public workshops on COVID-19 vaccine-hesitancy. Collaborated with experts to develop a digital motivational intervention tool. (N = 762)	Findings included the top reasons for vaccine hesitancy as unknown long-term effects, potential side effects, insufficient testing, and concerns about the vaccine being "rushed." Top reasons for vaccine acceptance included protection for self, friends/family, ending the pandemic, protecting the population, and confidence in the vaccine.	Piloted with 18 people after completion for feedback on the interface and usability of the digital tool.	Data were from the U.K. and thus may not be fully generalizable to the U.S. A very small pilot group that only received feedback on the presentation, not its effectiveness. The final tool was not studied for reliability, fidelity, sensitivity, or specificity.	III C
7	Lemaitre, *Human vaccines &*	Quasi-experimental cohort study	Logistic regressions with repeated measures were performed to assess	The motivational interview (MI) technique led to a 15% increase in	A complete vaccination status during infancy was higher in children from the experimental	Population validity: Results may not be generalizable to adult	II A

	immunotherapeutics (2019)	(experimental and control group)	the intervention's impact. Participants were nonrandomly placed in the control or experimental group Participants were new mothers living in the Eastern Townships region of Quebec aged 18 or over, speaking French or English, and who gave birth at the CHUS. *n* = 2,389	vaccination intention compared to the control group. A 20-minute intervention based on MI techniques administered during postpartum seems to be an effective tool to address suboptimal vaccinations during infancy.	group (Relative Risk (95% CI) = 1.09 (1.05–1.13), p < .001) Multivariate analyses showed that the intervention is an independent factor that explains the increase in vaccinations	COVID-19 vaccination hesitancy. The group studied were mothers of infants and toddlers. Participants were not recruited randomly, as mothers were approached according to delivery chronology	
8	Merkley, *JAMA: The Journal of the American Medical Association : Open* (2021).	An online survey with a 2-by-2-by-2 factorial experiment	A nonprobability convenience sample of Canadian citizens aged 18 years or older using a quota-based sampling to approximate nationally representative samples. *n* = 2556	Respondents given the death prevention information had higher perceived vaccine effectiveness than those who were not. Those given information on the overall efficacy of their assigned vaccine showed lower perceived effectiveness compared with those who were not.	The self-reported likelihood of taking an assigned vaccine was higher for respondents given information about their assigned vaccine's effectiveness at preventing death from COVID-19 and lower among those given information about its overall effectiveness at preventing symptomatic transmission.	The study was conducted on an online nonprobability sample of Canadian adults. Questionable generalizability to the U.S. which has a different healthcare system.	III B

9	Nazlı, I*rish Journal of Medical Science* (2021).	A cross-sectional study was conducted during a COVID-19 outbreak through social media. Convenience sample between March and April 2021.	Online survey volunteer participants **Exclusion criteria:** Twenty-one participants were excluded from the analysis due to random marking and unreasonable filling times (< 10 min) *n* = 467	The aim was to Identify and understand COVID-19 vaccine hesitancy to aid future public health messaging. A positive correlation between the belief in conspiracy theories and vaccine hesitancy ($p < 0.05$). Also found that individuals with low fear of COVID-19 would hesitate about vaccination ($p < 0.05$). There was a statistically significant difference between participants' attitudes toward the COVID-19 vaccine in terms of a death of a first-degree relative or close friend due to COVID-19 ($p = 0.017$). Could not confirm the hypothesis that individuals who have a low tolerance	The relationship between the variables was evaluated by Spearman's correlation test. The correlation coefficient was considered "weak" between 0 and 0.30, "moderate" between 0.31 and 0.70, and "strong" between 0.71 and 1.00. The statistical significance level was considered $p < 0.05$. Intolerance of Uncertainty Scale (IUS-12)," "Conspiracy Mentality Scale (CMS)," and "COVID-19 Phobia Scale" and Vaccine conspiracy belief scale were tested using Cronbach's alpha coefficient, which shows internal consistency.	Self-report, possibility of social desirability bias The sample appears skewed to professionals especially physicians. 17.1% (*n* = 80) of participants included in the study had previously experienced COVID-19. This may have skewed the results. The mean age was 35.8 which may skew results as younger individuals may not fear disease as much. The exclusive use of social media may limit generalizability also.	III, B

				to uncertainty will have increased coronavirus vaccine hesitancy/rejection.			
10	Paterson, *Vaccine* (2016).	Systematic Literature Review	A systemic review of peer-reviewed articles which focused on HCW vaccine hesitancy. **Inclusion criteria:** HCPs, Peer-reviewed articles *n* =185 articles	Healthcare Providers (HCP) who knew about specific vaccines were more likely to recommend vaccinations and engage in conversations with patients about them. Providers who were vaccine hesitant were less likely to advocate for vaccinations.	HCW's vaccination behavior (*n* = 140) showed that HCWs were more likely to recommend vaccines if they were vaccinated.	"Healthcare provider" as a term was not searched in the literature review; therefore, some articles may have been missed. Possible publication bias: GlaxoSmithKline Biologicals was the funding source. No mention of the age of subjects. Would an age skew older/younger have caused data change?	III B
11	Rotolo, *Journal of the American Pharmacists Association* (2021).	Analytics study of responses to several infographics	Total "hits" on online platforms for each separate infographic about COVID-19 vaccination hesitancy *n* = 238,430	Analysis of each infographic was done to determine the greatest reach. *n* = 41,980: How the messenger RNA vaccines were developed. *n* = 27,783: mRNA COVID-19 vaccines	Analytics for each infographic were retrieved from Twitter, Instagram, and Facebook to determine overall reach, impressions, and engagement on each platform. Impressions refer to the total views an infographic	Limited ability to calculate outreach, individuals may have shared infographics with their networks skewing the results. Limited internet access may have left out a significant sampling of people. No way to determine population validity	III A

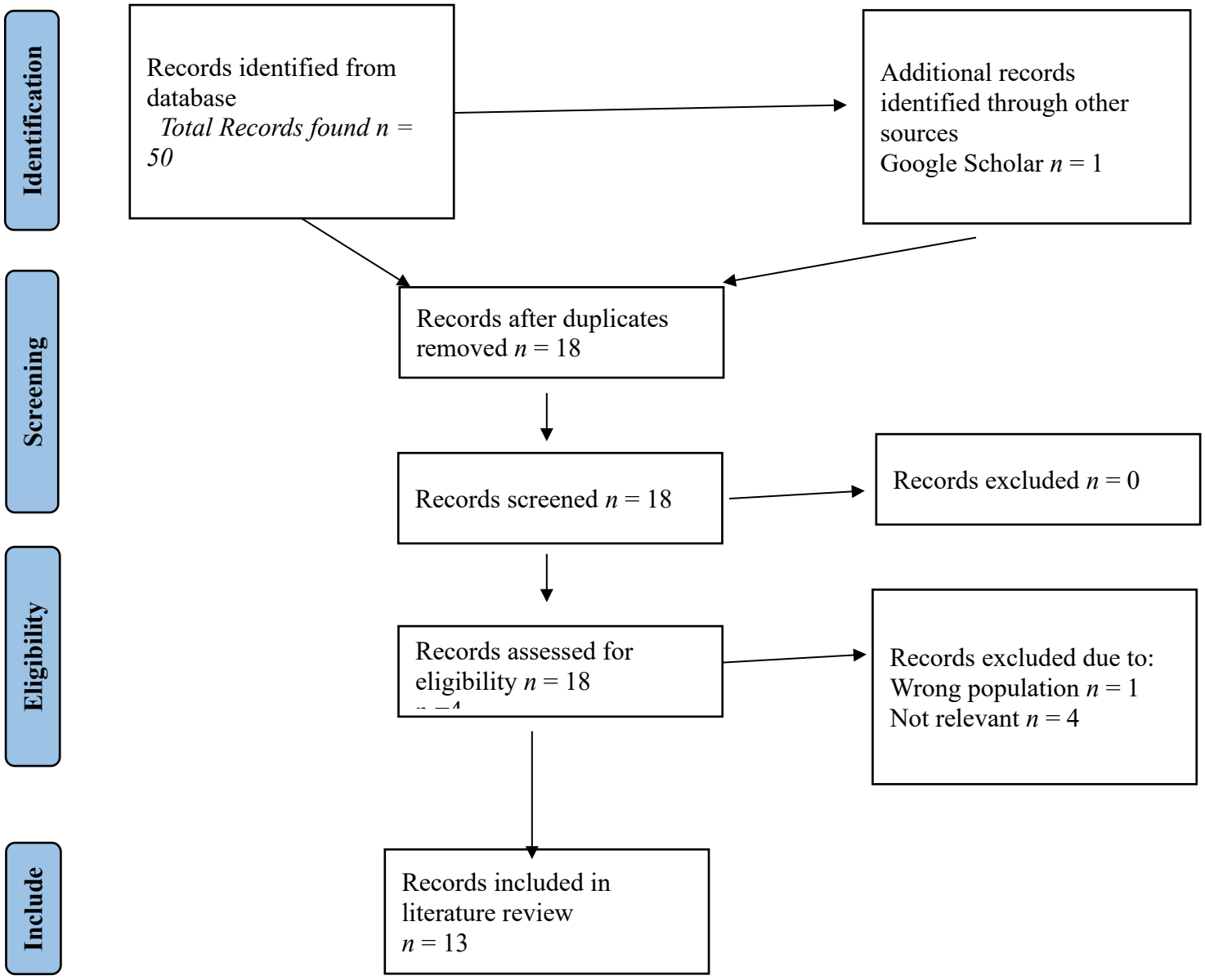
				are NOT associated with infertility *n* = 16,732: What is the difference between the current COVID-19 vaccines? The infographic with the greatest total reach was about how the messenger RNA vaccines were developed.	received. Outreach refers to the number of unique individuals or accounts a post has reached.		
12	Talmy, *Journal of Community Health* (2021).	Nonrandomized, community intervention study with real-world vaccination data. An anonymous online survey to determine vaccine hesitancy was performed before any action.	The population consisted of soldiers serving in an IDF unit before vaccine rollout in the Israeli Army. *n* = 511 Soldiers were included in the study, 325 (63.6%) males, 186 (36.4%) females with a mean age of 21.5 years (± 3.6). 293 soldiers (57.3%) were from combat platoons and 186 (42.75%) were from noncombat platoons.	On-site consultations and primary care office visits increased vaccination rates in IDF units receiving an allotment of the COVID-19 vaccines in contrast to attending a lecture.	The 511 soldiers included in the study, were divided into groups. 359 (70.3%) attended a group lecture, 33 (6.5%) had an on-site physician consultation and 19 (3.7%) attended primary care clinic visits. 90 soldiers stated upon questioning that they do not intend to receive a COVID-19 vaccine. 54 (60.0%) attended the group lectures, 28 (31.1%) had an on-site consultation, and 15	Risk of selection bias Generalizability to the U.S. may be weak as these were Israeli soldiers. These were all soldiers which limits the generalizability as soldiers often feel an implied need to "follow orders" even in a voluntary situation. A possible limitation is that female was less than 50% and their age was young 21.5 years. Both female sex and young age were associated with	II B

			Exclusion criteria: Soldiers who had previously tested positive or had a contraindication for vaccination were excluded.		(16.7%) had primary care visits to discuss their motives and concerns for vaccination. 38 (42.2%) 0f the 90 soldiers who did not intend to receive a vaccine, decided to receive a vaccine. 18 (47.4%) of the 28 soldiers not intending to vaccinate and arriving for on-site physician consultation proceeded to vaccinate. There were 36.4% of females with a mean age of 21.5 years	increased vaccination hesitancy in other studies.	
13	Wermers, *Journal of the American Association of Nurse Practitioners*. (2021)	Nonrandomized quasi-experimental evidence-based intervention	19 clinical staff members participated in the initial education (*n* = 19) session. Nine nurse practitioners, seven physicians, and three registered nurses	The use of Motivational interview techniques on three types of vaccinations: Influenza vaccination rates improved, but HPV vaccine rates remained stable, and MenB vaccine rates decreased compared with the previous year. Clinicians	The number of influenza vaccines given increased by 19.71% from the fall of 2017 to the fall of 2018. Influenza vaccines given to College students increased by 22.74%. The number of HPV vaccines decreased by 2.84% during this time frame. Meningitis B vaccines given to	Population validity: Results may not be generalizable to adult COVID-19 vaccination hesitancy. The population studied were college students exclusively and the vaccines were not COVID-19. Such a large decrease in Meningitis B vaccines points to either a confounder or a very small sample size. The	II B

				demonstrated a significant increase in knowledge of Motivational interview techniques after a targeted educational intervention. Clinicians demonstrated improvements in Motivational interview knowledge after an education session that was reinforced during 4 months. Repeat measures indicate the potential for sustained improvement when ongoing reinforcement is provided.	students or staff decreased by 67.23% in 2018 as compared with 2017.	sample size was less than 200 compared to nearly 5,000 influenza vaccines. Because of a severe influenza season in 2017–2018, patients may have been more likely to request the flu vaccine.	

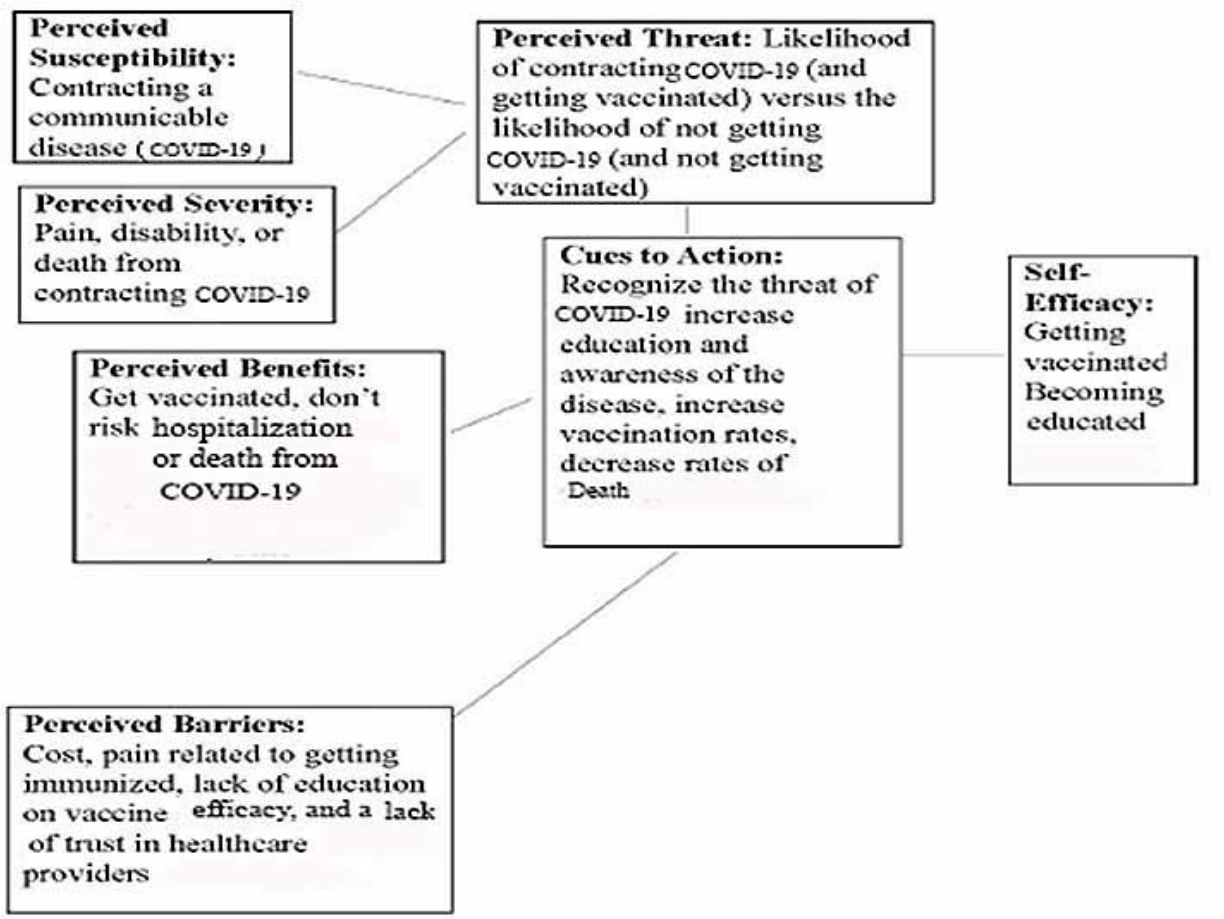
Appendix D

PRISMA Diagram: Vaccine Hesitancy AND COVID-19 AND [Intervention OR strategy OR best practice]



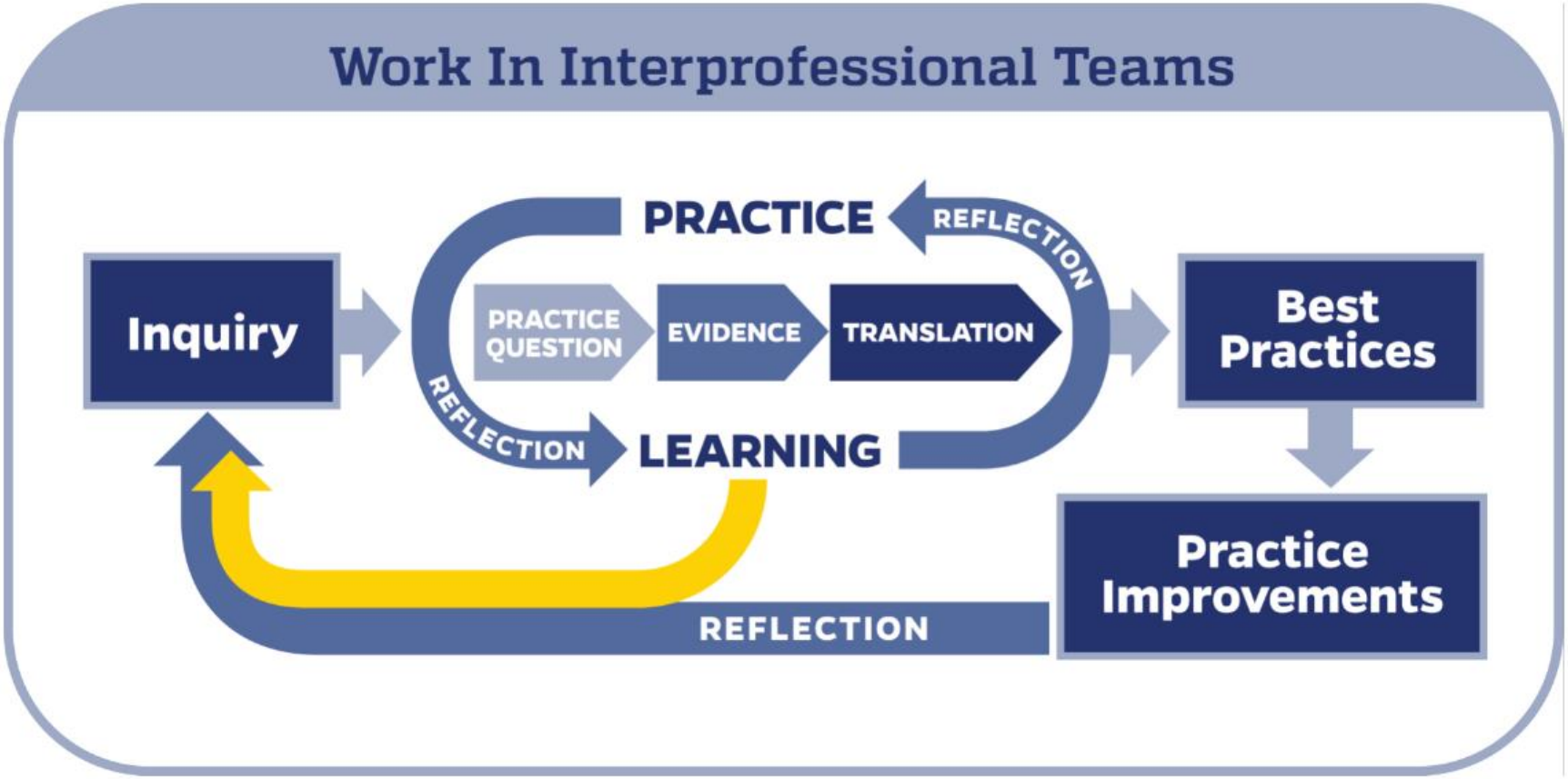
Appendix E

Health belief model (Becker, 1974)



Appendix F

Johns Hopkins Evidence-Based Practice for Nurses and Healthcare Professionals Model (Dang et al., 2022)



Appendix G

CDC motivational interview techniques

Step 1: Embrace an attitude of empathy and collaboration

- Be compassionate, show empathy, and be genuinely curious about the reasons why the patient feels the way they do.
- Be sensitive to culture, family dynamics, and circumstances that may influence how patients view vaccines.
- Remember: Arguing and debating do not work. Taking a strong initial stand may also backfire, especially with people who have concerns about vaccines.

Step 2: Ask permission to discuss vaccines

Start by asking permission to discuss vaccines. Say something like, *"If it is okay with you, I would like to spend a few minutes talking about COVID-19 vaccines and your family."*

- **If the patient says no**, respect that.
    - **Option 1:** Move on and say, *"I respect that, and because I care about your overall health, maybe we could talk about the vaccines at a future time."*
    - **Option 2:** Based on the patient's demonstrated emotions and your assessment of the patient's worldview and values, you could spend several minutes curiously exploring why the patient doesn't want to talk about it. The goal is to understand, not to change their mind.

Remember: These conversations may take time, and they may continue over multiple visits.

- **If the patient says yes** to talking about the vaccines, move to Step 3.
- **If the patient asks a question** about COVID-19 vaccine safety, vaccine risks, or their health or mental health, see potential responses in Step 4.

Step 3: Motivational interviewing

Ask the patient a scaled question. For example, *"On a scale of 1 to 10, how likely are you to get a COVID-19 vaccine?"* (1 = never; 10 = already have an appointment to get vaccinated). Then explore both sides of whatever number is given.

- **Example:** Let's assume someone says 4. This is where curiosity comes in. You can say, *"Okay, why 4? And why not a lower number?"* Let them answer, and ask a follow-up question like, *"What would help you move to a 5 or 6?"*

The goal is to help the patient become more open to moving toward higher numbers—in other words, getting vaccinated.

- You want them to **talk about this out loud** because talking changes how they process their choices and can develop forward momentum.
- People hesitant about vaccines usually have more practice explaining why they haven't gotten vaccinated, so it's good to reverse that. Ask them to express their vaccination benefits out loud.
- Be compassionate and curious about the patient's mixed feelings, both the part of them that wants to trust that getting a vaccine is important and safe and the other part that feels

hesitant. It is important to show support for the patient to incorporate their personal values and the health needs of their family and community as they make their decision.

Step 4: Respond to questions about vaccines, health, or mental health

If a patient asks a question about vaccine safety, vaccine risks, or their health or mental health, respond within the boundaries of your competence, ethics, and scope of practice.

- **If you feel competent and aware of how to answer the patient's question**, respond with empathy and provide scientific information as needed. Refer the patient to resources on the CDC website, which are listed below.
- **If the patient's question is outside of your competence or awareness**, recommend that they speak with their medical or mental health provider or an expert, as needed.

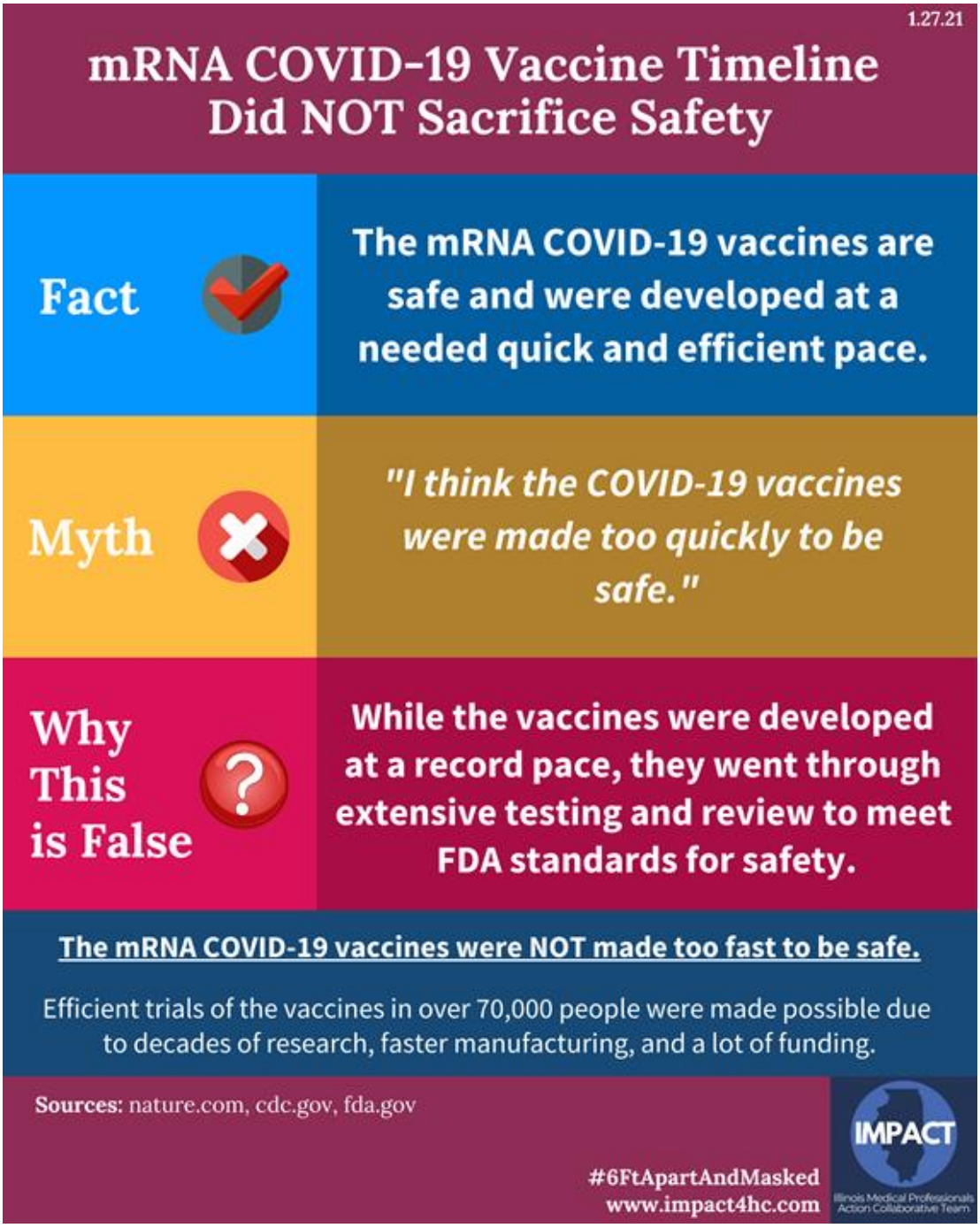
Appendix H

Script for Introduction

“Hello, my name is Daniel Zepp and I am a doctoral student from Messiah University collaborating with UPMC Carlisle Hospital to discuss COVID-19 vaccinations. I see from your chart that you haven’t received a vaccine yet and would like to learn more about why. Would you allow me to discuss this with you today? Everything we discuss will be kept confidential.”

Appendix I

Infographics



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Frequently Asked COVID-19 Vaccine Questions

cdc.gov
5/14/21

What are the side effects of the COVID-19 vaccine?

Side effects may include pain, redness, and swelling in the arm where you received the shot; tiredness; headache; muscle pain; chills, fever; and nausea.

***If you develop rare side effects: severe headache, blurred vision, shortness of breath, chest pain, leg swelling, abdominal pain, easy bruising, or tiny blood spots under the skin after the Johnson & Johnson vaccine, seek medical attention immediately.**

How many doses of the vaccine do I need to take?

- If Pfizer, two vaccine doses 21 days apart
- If Moderna, two vaccine doses 28 days apart
- If Johnson & Johnson, only one dose (it is a single-dose vaccine)

What does fully vaccinated mean?

You are not adequately protected until you are **fully vaccinated**, which is:

- 2 weeks after the second dose of the Pfizer or Moderna vaccines, or
- 2 weeks after the single dose of the Johnson & Johnson vaccine

***Continue masking and all other mitigation measures until you are fully vaccinated.**

What can I do fully vaccinated?

If you are fully vaccinated, there are activities you can safely begin to do again.

For up-to-date details, visit: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated.html

How long am I protected?

We don't know yet how long protection lasts with the vaccine. But it is safer than COVID-19 *infection*, which can cause serious illness and death.

Can the vaccine cause infertility?

If you are trying to become pregnant or (someday) want to become pregnant, you can get the COVID-19 vaccine.

There is no evidence that the COVID-19 vaccines affect fertility.

Who is paying for this vaccine?

The COVID-19 vaccines are being provided for free by the federal government for all those living in the United States, regardless of immigration or health insurance status.

IMPACT

We are a coalition of healthcare workers who amplify, advise, and advocate for science-based solutions to improve health and healthcare of Illinoisans.

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Illinois Medical Professionals Action Collaborative Team

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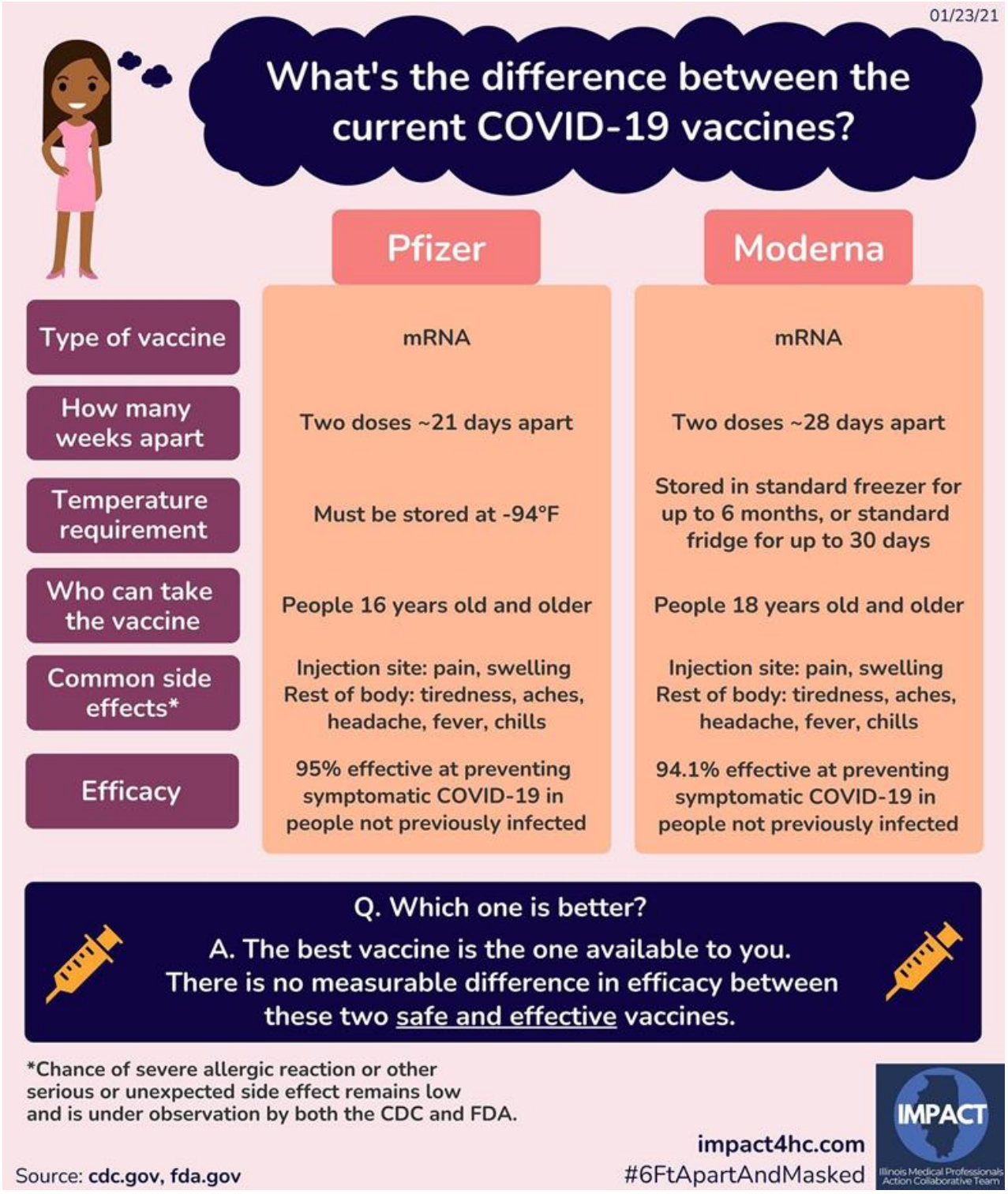

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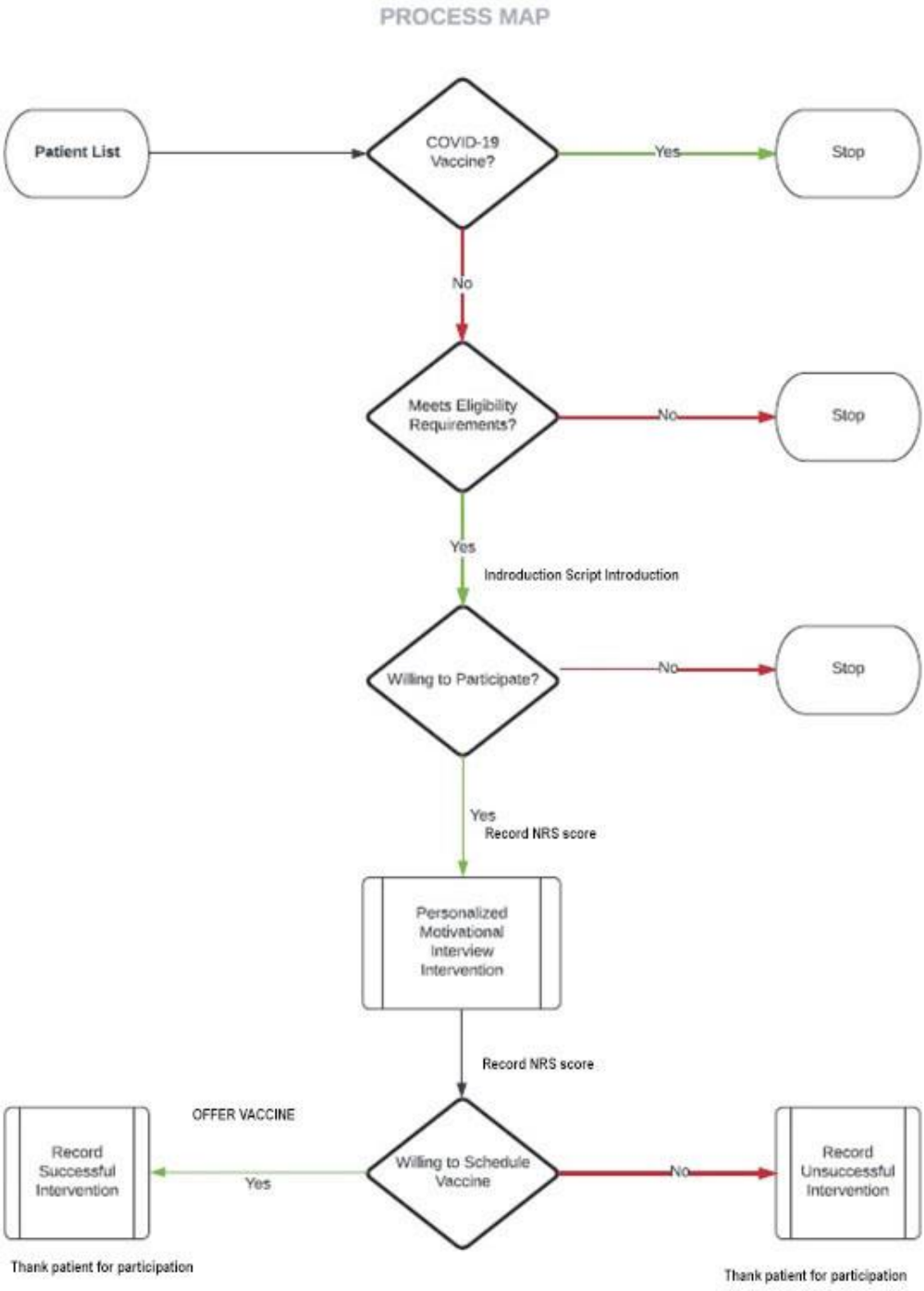
Appendix J


PROCESS MAP
Patient List
COVID-19 Vaccine?
Yes
Stop
No
Meets Eligibility Requirements?
No
Stop
Yes
Indroduction Script Introduction
Willing to Participate?
No
Stop
Yes
Record NRS score
Personalized Motivational Interview Intervention
Record NRS score
OFFER VACCINE
Record Successful Intervention
Yes
Willing to Schedule Vaccine
No
Record Unsuccessful Intervention
Thank patient for participation
Thank patient for participation

Appendix K

Budget

PROGRAM EXPENSES	PROJECTED COST	ACTUAL COST
IT consultant (if needed)	$100	Not needed
Photocopy handouts $.15/page for	$60	$15
Poster/display supplies	$20	Not needed
Electronic tablet for information storage	$150	Not used
IBM SPSS software	$99.99	$99.99
Mileage for project manager @ $.50/mile	$100	$150
Utilities	$0	donated
Physical workspace	$0	donated
TOTALS	$629.99	$264.99

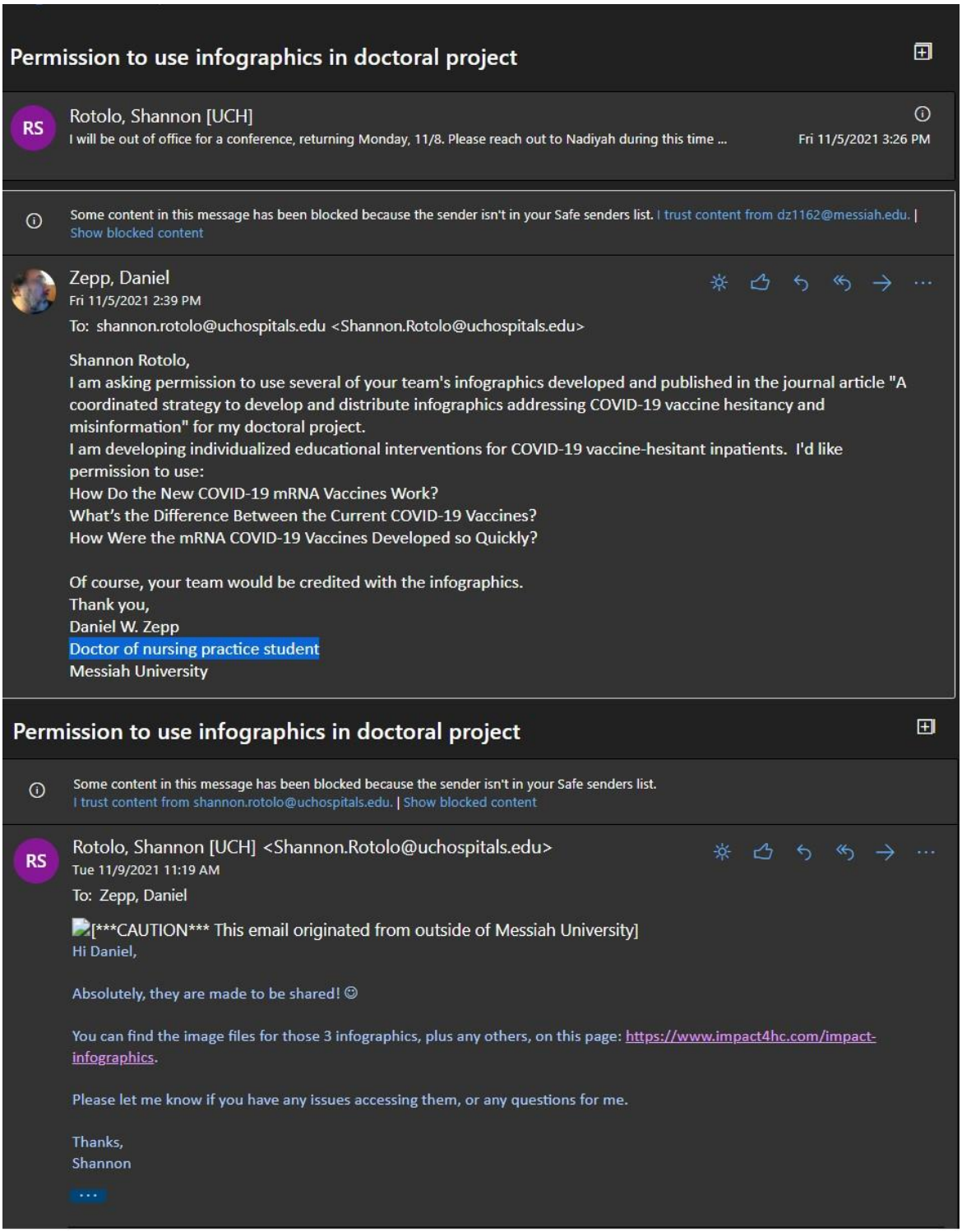
Appendix L

GANTT Chart

	July, August 2021	September, October 2021	November, December 2021	January, February 2022	March, April 2022	May, June 2022	July, August 2022
Planning							
Research							
Design							
Implementation							
Follow-up							
Completion of Paper							

Appendix M

Permission to use Infographics



Permission to use infographics in doctoral project

RS Rotolo, Shannon [UCH]
I will be out of office for a conference, returning Monday, 11/8. Please reach out to Nadiyah during this time ... Fri 11/5/2021 3:26 PM

Some content in this message has been blocked because the sender isn't in your Safe senders list. I trust content from dz1162@messiah.edu. | Show blocked content

Zepp, Daniel
Fri 11/5/2021 2:39 PM
To: shannon.rotolo@uchospitals.edu <Shannon.Rotolo@uchospitals.edu>

Shannon Rotolo,
I am asking permission to use several of your team's infographics developed and published in the journal article "A coordinated strategy to develop and distribute infographics addressing COVID-19 vaccine hesitancy and misinformation" for my doctoral project.
I am developing individualized educational interventions for COVID-19 vaccine-hesitant inpatients. I'd like permission to use:
How Do the New COVID-19 mRNA Vaccines Work?
What's the Difference Between the Current COVID-19 Vaccines?
How Were the mRNA COVID-19 Vaccines Developed so Quickly?

Of course, your team would be credited with the infographics.
Thank you,
Daniel W. Zepp
Doctor of nursing practice student
Messiah University

Permission to use infographics in doctoral project

Some content in this message has been blocked because the sender isn't in your Safe senders list.
I trust content from shannon.rotolo@uchospitals.edu. | Show blocked content

RS Rotolo, Shannon [UCH] <Shannon.Rotolo@uchospitals.edu>
Tue 11/9/2021 11:19 AM
To: Zepp, Daniel

[***CAUTION*** This email originated from outside of Messiah University]
Hi Daniel,

Absolutely, they are made to be shared! ☺

You can find the image files for those 3 infographics, plus any others, on this page: https://www.impact4hc.com/impact-infographics.

Please let me know if you have any issues accessing them, or any questions for me.

Thanks,
Shannon

Appendix N

Difference Score (postintervention score – preintervention score)

Difference	Frequency	Percent
0	42	82.4%
1	2	3.9%
2	2	3.9%
5	4	7.8%
6	1	2.0%
Total	51	100.0%

Demographics of Sample

Statistics

Age

N	Valid	51
	Missing	0
Mean		59.82
Median		58.00
Mode		53
Std. Deviation		14.219
Minimum		26
Maximum		90

Sex

Female	43.1% (22)
Male	56.9% (29)
Total	100.0% (51)

Race

Caucasian	96.1% (49)
Hispanic	3.9% (2)
Total	100.0% (51)

Education

Less HS	27.5% (14)
HS	58.8% (30)
Some College	7.8% (4)
College	2.0% (1)
Grad School	3.9% (2)
Total	100.0% (51)

County

Cumb.	74.5% (38)
Dauphin	2.0% (1)
York	2.0% (1)
Adams	3.9% (2)
Perry	11.8% (6)
Fulton	3.9% (2)
Other	2.0% (1)
Total	100.0% (51)

Appendix O

Demographics and Change in Intent to Vaccinate

Variable		**Total Sample (*N* = 51)**	**No Change in Intent (*n* = 42)**	**Change in Intent (*n* = 9)**	***p*-value**
Age in yrs	Range	26 – 90	26 – 90	46 – 82	.42*
	Mean (SD)	59.8 (14.2)	59.1 (14.7)	63.3 (11.8)	
		% (*n* =)	**% (*n* =)**	**% (*n* =)**	
Sex	Female	43.1% (22)	35.3% (18)	7.8% (4)	.93**
	Male	56.9% (29)	47.1% (24)	9.8% (5)	
Race	Caucasian	96.1% (49)	78.4% (40)	17.6% (9)	.50**
	Hispanic	3.9% (2)	3.9% (2)	0% (0)	
Education Level	HS or less	86.3% (44)	70.6% (36)	15.7% (8)	.80**
	Some college or more	13.6% (7)	11.8% (6)	2% (1)	
County	Cumberland	74.5% (38)	60.8% 31)	13.7% (7)	.99**
	Perry	11.8% (6)	9.8% (5)	2% (1)	
	Other	13.7% (7)	11.8% (6)	2% (1)	

*Independent samples *t* test

**Chi-square