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Eight Months and Counting

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Welcome to the latest issue of the *Ohio Journal of Public Health* (*OJPH*). Two years ago, we published our first issue of the Journal and I am thrilled that we continue to receive high-quality submissions on research, education, and practice from scholars, students, and public health practitioners from all over Ohio. This issue features an Op-Ed that promotes inclusive community needs assessments, two research articles and a brief on important public health issues in Ohio, two public health education papers that describe practices for public health students and professionals, and a public health practice paper that describes a rapid volunteer-based response to meet a critical need in the community.

The Journal makes me proud to be a public health researcher and teacher in Ohio, but at the same time I continue to feel sadness and uncertainty because of the COVID-19 pandemic. As I am writing this Editorial on October 24, we have experienced another record day for case reports in Ohio. Yesterday's count was the previous record, which surpassed the record that was set the day before. The trends are worrisome as we move into our ninth month since restrictions began to flatten the curve of coronavirus infections in Ohio. We have become accustomed to working, going to school, engaging with family and friends, and even exercising online. Unfortunately, given these recent trends in infections and the predictions that it will be months before we have a vaccine that is available for the public, we will continue to remain in this state of uncertainty.

While 2020 has brought unprecedented challenges to our field, we have seen many public health professionals rise to meet these challenges and work around the clock to keep us safe. In addition to public health workers, we have observed volunteers spring into action. As one example, I will highlight the public health practice paper in this issue by Snyder, Weisel and Chatfield that describes the organization called *People Protecting Each-other Sustainably (PPEs).* The PPEs organization was launched in March 2020 to meet the increasing need for face masks for first responders during the initial weeks of the pandemic. Due to their quick action, they were able to mobilize a large group of volunteers who donated fabric and their skills at cutting fabric and sewing. In the article, Snyder et al describe the many benefits that this type of program can have at the community level.

The current issue of the Journal also features two research articles and one research brief. In one paper, Evans and colleagues explore how pregnant women perceive conversations with providers during prenatal care visits. Results from this study could be used to improve patient-provider communication during these visits. In the second research article, Moussa and colleagues present the results of a retrospective analysis of data on opioid administration in the emergency department, with a goal on examining changes after the Ohio Opioid Prescribing Guidelines were created in April 2012. They report that in their health care system, all opioid prescriptions decreased in the emergency department over time, but morphine and fentanyl prescriptions increased in some age groups. Further work is suggested in order to meet the goals of the Guidelines. The research brief in this issue, by Orellana and colleagues, presents a novel and efficient sampling strategy to test ambulances for MRSA, a bacterium which poses an occupational risk to first

responders and a risk to people who are being transported. Their work has implications for testing not only MRSA but other contaminants as well.

Two public health education papers are included in this issue of the Journal. In one, Chatfield describes the process and outcomes of her work to incorporate qualitative research methods into the MPH curriculum at Kent State University. Through this novel approach, students learn how qualitative methods are used in six core areas of public health. The second public health education piece, by Kingsbury, Stefanak, and Slenkovich, describes the process that Kent State University used to develop continuing education content for members of local boards of health. The paper details the assessment that was conducted to determine the educational needs of the board members, provides an overview of the modules and how they will be delivered, and presents the plan for evaluation.

I would like to acknowledge our two new cover designers: Whitley Baxter and Gad Owusu. Whitney and Gad are undergraduate students in the Department of Design at The Ohio State University. Working under the direction of Professor Paul Nini, they created the beautiful cover image that features themes contained in several papers in this issue. Our former cover designer, Kevin Murray, graduated from the program in Design a couple of years ago. I appreciate the hard work Kevin put into the cover designs for our first four issues.

Let me close with a note about the upcoming special issue on *Racism as a Public Health Crisis*. As you know from my last editorial, we put out a call for papers for this special issue. The issue will appear by the end of December and it will contain important work from scholars and public health practitioners from all over Ohio.

It's Time to Mobilize in Support of *Inclusive* LGBTQ+ Community Needs Assessments

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An increasing number of individuals are openly identifying as lesbian, gay, bisexual, transgender, gender nonconforming, or queer (LGBTQ+), with Ohio patterning national trends.[1] Dr. Gary Gates, a forefront expert in LGBTQ+ demography, estimates that 4.5% of Ohio's total population self-identify somewhere on the LGBTQ+ spectrum.[1] Despite increasing numbers of LGBTQ+ Ohioans with very specific health and social service needs, few Ohio cities are engaging in LGBTQ+ specific community needs assessments, and even fewer rural areas engage in the practice at all. Capturing insight about the health status, strengths, and weaknesses in community services and resources designed for members of the LGBTQ+ communities in Ohio, *including its marginalized communities* (eg, rural, low income, people of color), would better inform key stakeholders to serve and support the LGBTQ+ community in all domains of life.

Traditionally, community needs assessments are geographically bound; however, this strategy is not sufficient for assessing LGBTQ+ community needs. Published literature documents a history of gentrification in gay districts and 'gayborhoods' as well as a painful history of exclusion and discrimination resulting in the diffusion of specific LGBTQ+ subgroups from these geographically bound built gay communities into surrounding neighborhoods.[2] Geographically binding LGBTQ+ specific community needs assessments to known gay districts and noninclusive gay community structures leads to the exclusion of marginalized LGBTQ+ individuals from engaging in the community needs assessment data collection process. Overlooking the importance of intentionally capturing inclusive data, caters to a predominately white upper-class and middle–class gay male demography, yielding a misrepresentation in the actual health status and needs of the entire population. This results in disproportionate distribution of resources to marginalized members of the LGBTQ+ community, specifically people of color and low-income communities.[3]

Obtaining *inclusive* community needs assessment data is possible in urban and rural settings of Ohio, although it is no easy task. With more individuals openly identifying as part of the LGBTQ+ community each year, there is a palpable LGBTQ+ presence in Ohio cities and increased need in the most rural areas. Expanding data collection outside of metronormative[4] gay spaces dominated by white, cisgender men who populate "gayborhoods"[5] to inclusive queer spaces that encompass diverse members of the LGBTQ+ community who may be underrepresented in traditional community needs assessments[6] is a necessary first step (eg, transgender and gender expansive communities, people of color, cisgendered women, low-income and rural populations).

Public health professionals within local health departments and hospital systems throughout the state of Ohio can provide resources and leadership to community organizations and stakeholders who otherwise do not have the expertise or funding to mobilize collaboratively in conducting *inclusive* community needs assessments that inform their support of and advocacy for the LGBTQ+ community on an ongoing basis. Approaching community needs assessment methodologies with the intentionality of inclusion is essential to secure the voices and needs of all members of the LGBTQ+ community. This approach results in a better-informed public health system and an improvement in the health and well-being of the LGBTQ+ community.

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RESEARCH ARTICLE

How My Provider Communicates: A Qualitative Exploration of Pregnant Women's Communicative Experiences When Receiving Prenatal Care in Ohio

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ABSTRACT

Background: Ohio disproportionately has one of the highest infant mortality rates in the United States. Failure to receive effective prenatal care can result in adverse pregnancy outcomes, specifically infant morbidity and mortality. Therefore, the purpose of this study is to gain a better understanding of pregnant women's communicative experiences when receiving prenatal care in Ohio.

Methods: We interviewed pregnant women (N=30) between the ages of 19 to 39 years who were in the second or third trimester of pregnancy residing in Ohio using semi-structured interviews. The data were analyzed using a two-stage inductive thematic analytic technique.

Results: Findings demonstrated that pregnant women's communicative experiences when receiving prenatal care in Ohio could be categorized into 4 overarching salient themes: (1) dialogue with the prenatal care provider, (2) time required for the prenatal care visit, (3) the prenatal care provider's interpersonal and personality characteristics, and (4) continuity of care.

Conclusion: Results identified pregnant women's communicative experiences when receiving prenatal care in Ohio. Findings may assist prenatal care providers in enhancing prenatal care outcomes in Ohio by promoting continuous dialogue, spending time with patients, displaying positive interpersonal and personality characteristics, and providing continuous prenatal care.

Keywords: Ohio; Patient-provider communication; Prenatal care; Qualitative

INTRODUCTION

Despite leading the world in health care advances for newborns, the United States has the highest infant mortality rate of any developed country in the world.[1] A closer examination of infant mortality rates in the United States revealed stark disparities between White and non-White infants.[2,3] For example, in the United States, African American infant mortality rates were 10.8 per 1 000 live births compared to 4.6 per 1 000 live births for Whites in 2018.[4]

Ohio has one of the highest infant mortality rates in the United States.[5] Rankings released by the Centers for Disease Control and Prevention revealed that Ohio ranked 10th in the nation in infant mortality rates in 2018 (the most recent data reported).[4] Specifically, the report noted that there were a total of 938 infant deaths, thus reflecting an infant mortality rate of 6.9 per 1 000 live births.[4] Further examination of Ohio infant mortality rates reveals that while African Americans comprise 12.4% of the population in Ohio and Whites make up 81.5% of the population in Ohio, African American infants were 3 times more likely to die than White infants.[6]

In light of these numbers, this study focused on gaining a better understanding of pregnant women's communicative experiences

when receiving prenatal care in Ohio. This paper presents a brief background on patient-provider communication and prenatal care, followed by our study methods and results, discussion, and public health implications.

Patient-Provider Communication

Patient-provider communication, which includes multiple aspects of communication such as verbal and nonverbal interactions between patients and providers,[7,8] is a vital provision of safe and high-quality health care.[9,10] Important aspects of patient-provider communication include enabling patient self-management, fostering healing relationships, making medical decisions, respect, trust, effective communication skills, and exchanging information.[11] Effective patient-provider communication affords patients the ability to engage in their health care, comprehend health information, and communicate with providers.

In the context of prenatal care, research suggests that patient-provider communication is important in determining pregnant women's prenatal care utilization rates.[12] However, although effective patient-provider communication plays an important role in influencing pregnant women's beliefs regarding prenatal care,[13] as many as 40% of pregnant women reported ineffective communication with their prenatal care provider.[14,15] Ineffective patient-provider communication is perceived as a barrier to prenatal care and impacts infant morbidity and mortality rates,[16] in part due to the prenatal care provider's negative attitudes and interpersonal characteristics, which decrease utilization rates of prenatal care services and facilities.[17]

A vast body of literature calls attention to commonly noted communication-related issues between providers and their racial and ethnic minority patients.[18] In short, racial and ethnic minorities are more likely to experience inadequate communication when interacting with their provider.[19] Previous studies also suggest that inadequate patient-provider communication can, in part, be explained by clinician biases, stereotypes,[19] and the pervasive notion that racial and ethnic minorities are noncompliant or less intelligent than their White counterparts.[20]

Therefore, 2 empirically validated factors may be useful concerning pregnant women's health outcomes.[20-22] First, the provider's use of culturally competent health care, which is the ability of health care providers to provide high-quality care to patients from diverse racial and ethnic backgrounds, is an important strategy in reducing racial and ethnic disparities in health care outcomes and in effective patient-provider communication, access to health care, and health care service utilization.[21] Second, social concordance, which includes shared characteristics such as race, age, gender, and education, between the provider and patient influences positive patient perceptions.[20] Further, when assessing racial concordance, which involves shared characteristics of race, findings from a comprehensive review of literature containing 27 studies revealed that provider and patient race concordance was associated with positive health outcomes, specifically for minorities.[19]

Patient-Provider Communication: A Conceptual Framework

The patient-provider communication framework is especially useful when examining one-on-one conversations between patients and their health care providers.[23,24] This framework has been previously used to examine patient-provider communication among cancer patients. Because the infant mortality rates in Ohio have been relatively high in the country, infant mortality and prenatal care are closely related, and poor communication between prenatal care provider and patient may lead to poor birth outcomes, we extended the patient-provider communication framework to focus on pregnant women's communicative experiences. The patient-provider communication framework encompasses 4 tenets: (1) the health care provider and patient interaction to establish goals; (2) the health care provider and patient's needs, values, beliefs, skills, and emotions used to address their goals; (3) the communication process, which encompasses verbal, nonverbal, or silent communication that focuses on conveying and receiving messages; and (4) the environment in which the communication occurs.[23,24] We aimed to explore the third tenant of prenatal care providers and pregnant women in this study.

We found that the insight gained from Feldman-Stewart and colleagues,[24] particularly the third tenet (ie, the communication process), is useful to assist prenatal care patients in receiving prenatal care while supporting prenatal care providers in providing prenatal care through effective communicative experiences. Therefore, the purpose of this study was to gain a better understanding of pregnant women's communicative experiences when receiving prenatal care in Ohio. The research question that guided this study is "How does your primary prenatal health care provider communicate with you?"

METHODS

Setting

All interviews were conducted face-to-face at a public library, a YMCA, or via phone based on the participant's preference. The decision to conduct interviews face-to-face or via telephone was mutually determined based on availability and geographical location of the interviewee.

Design

Semi-structured interviews, which are structured conversations using an interview script with pre-drafted questions, were conducted.[25] These interviews are beneficial because they allow interviewers the flexibility to modify questions within the interview script as needed to collect rich descriptive data.[25] The interview script was prepared in advance, yet interviews deviated from the script whenever necessary to gain more insight or understand the context of the discussion.[26]

Participants

The eligibility criteria for the study required women to be between the ages of 18 to 45 years, reside in Ohio, and be in their second or third trimester of pregnancy. As recommended by the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists, pregnant women should have one prenatal visit a month during weeks 4 to 28, two visits a month during weeks 28 through 36, and weekly visits beginning at 36 weeks of their pregnancy.[27] In reality, only about three-quarters of pregnant Ohio women with live birth started their prenatal care from the first trimester.[28] Therefore, women in their second or third trimester of pregnancy have a higher likelihood of experiencing recurrent visits with their prenatal care providers. Because patient provider communication may influence the quality and frequency of prenatal visits, focusing on Ohio pregnant women's communicative experiences may shed the light for future investigations on infant mortality.

Thirty women were recruited from health fairs, hospitals, neighborhood clinics, private medical offices, a county health department, and other community-based agencies located in Ohio using convenience sampling. Recruitment strategies included flyers posted at the various recruitment sites as well as referrals made by social workers and hospital, clinic, and health department staff.

Procedures

Study approval was obtained from the Institutional Review Board (IRB) of the first and second author's institution prior to the start of recruitment and data collection. Our colleagues reviewed the interview guide and made recommendations to help improve face validity. Further, the research team improved content validity by inviting an expert panel to review the interview guide to seek feedback on the wording of the interview questions.[29]

Pregnant women interested in participating in the study were directed to contact the first author to complete an eligibility screening. Participants deemed eligible and who agreed to participate were instructed to complete an informed consent and demographic questionnaire prior to their scheduled interview. Consent forms and demographic questionnaires were collected in person or via email prior to the start of the interviews.

The first author conducted all interviews. Each interview started with an explanation of the purpose of the study. All participants were given the opportunity to ask questions about study procedures, were reminded that interviews would be audio recorded for later transcription, and were told that their answers would not be shared with their provider or affect their current or future care. At the end of the interviews, the participants were thanked and given a pack of diapers in exchange for their time. The interviewer worked with a research assistant to transcribe each file. On average, each interview lasted from 20 to 30 minutes.

Instruments

This study used 2 instruments during data collection. For the first instrument, participants were provided a 12-item questionnaire to assess participants' demographic characteristics, including race, ethnicity, age, educational attainment, household income, type of prenatal health care provider, length of prenatal health care provider relationship, gender of prenatal health care provider, type of prenatal health care facility, type of insurance, trimester status, and current relationship status.

The second instrument was a semi-structured interview guide developed by the research team to conduct the individual interviews. The semi-structured interview guide focused on patient-provider communication practices during prenatal care. All interview questions were drafted with the intent to capture pregnant women's communicative experiences while receiving prenatal care. Because pregnant women may have encounters with multiple providers during prenatal care, participants were directed to discuss the provider they interacted with the most.

Data Analysis

Researchers applied a thematic analysis approach to analyze the data. Thematic analysis is a multistep process that guides researchers through the process of identifying recurring patterns within the data that can be categorized into themes.[30] Consequently, themes are the outcome of patterned responses most relevant to our research questions.[31]

We followed the two-staged thematic analytic technique to conduct data analysis.[32] The first stage, open coding, consisted of line-by-line coding of each individual transcript in order to develop codebooks. To enhance the validity of our findings, the first and second authors independently coded during the open coding phase of data analysis. The authors then discussed each code until consensus was reached among the authors. Data were then compared and categorized in order to create a master codebook that represented all interview data.[33] In the second stage of analysis, axial coding was employed. In this stage, transcripts were reviewed, and recurrent themes and specific quotes within each theme were extracted and categorized.[32,34]

All data were analyzed inductively using NVivo version 12 data analysis software (QSR International).[35] NVivo 12 data analysis software allows researchers the ability to browse text, link ideas, search and explore patterns during coding, and annotate responses.[36,37] Further, NVIVO 12 data analysis software is designed to reduce divisions between data and the researchers' interpretation.

Data saturation was reached through our interviews with 30 pregnant women. Data saturation is an exhaustive process of continuing to collect data until no new data are discovered. The research team was also mindful to ask each participant interview question in the same manner.[31,38]

RESULTS

Participant demographics are shown in Table 1. The final sample consisted of 30 pregnant women between the ages of 19 to 39 years. The vast majority was aged 19 to 30 years. Only 3 participants were between the ages of 34 to 39. The majority of participants self-identified as African American women with an education of high school/GED or less. Most participants utilized governmental health insurance (Medicaid/Medicare), earned less than $20 000, were not married, and saw a female midwife in a clinic. It is also important to note that 10 participants were in their second trimester of pregnancy and 20 were in their third trimester of pregnancy during data collection.

Qualitative findings suggest that pregnant women's communicative experiences receiving prenatal care are based on 4 overarch-

Table 1. Demographic Characteristics of Participants (N= 30)

Characteristics	n (%)
Race	
African American	20 (66.7%)
White	6 (20.0%)
Multiple	3 (10.0%)
Other	1 (3.3%)
Age	
19-20 years old	5 (16.7%)
21-25 years old	8 (26.7%)
26-30 years old	14 (46.6%)
31-40 years old	3 (10.0%)
Level of education	
Some high school	2 (6.7%)
High school/GED	12 (40.0%)
Some college or technical school	11 (36.6%)
Bachelor's degree or master's degree	5 (16.7%)
Annual household income	
Less than $9,999	15 (50.0%)
$10,000 to less than $14,999	3 (10.0%)
$15,000 to less than $19,999	3 (10.0%)
$20,000 to less than $49,999	3 (10.0%)
$50,000 or higher	5 (16.7%)
Length of primary prenatal care provider relationship	
Less than 2 months	7 (23.3%)
2-4 months	4 (13.3%)
5-7 months	9 (30.0%)
8-10 months	5 (16.7%)
Was already provider	5 (16.7%)
Type of primary prenatal care provider	
Medical doctor or physician assistant	10 (33.3%)
Midwife	18 (60.0%)
Multiple providers	2 (6.7%)
Gender of primary prenatal care provider	
Male	3 (10.0%)
Female	27 (90.0%)
Location of care received	
Hospital	2 (6.7%)
Clinic	24 (80.0%)
Private Office	3 (10.0%)
Other	1 (3.3%)
Type of insurance	
Medicaid/Medicare	24 (80.0%)
Health insurance (from work/spouse)	5 (16.7%)
Trimester status	
2nd	10 (33.3%)
3rd	20 (66.7%)
Relationship status	
Married	8 (26.7%)
Single	15 (50.0%)
Unmarried, in committed relationship	7 (23.3%)

ing salient themes: (1) dialogue with the prenatal care provider, (2) time required for the prenatal care visit, (3) the prenatal care provider's interpersonal and personality characteristics, and (4) continuity of care. A description and frequency of participant themes are shown in Table 2. These results are organized by theme names and definitions and frequencies for each theme, and include supporting quotes. As such, the most salient themes are discussed first.

Theme One: Dialogue with Prenatal Care Provider

A total of 90% (27) of the participants' communicative experiences were classified as "dialogue with prenatal care provider." Interview data coded in this category indicated words or phrases that highlighted women's experiences asking questions, getting their questions answered, receiving explanations from providers, and/or conversing with prenatal care providers. Overall, participants valued dialogue with their prenatal care provider and considered it an important aspect of the communication process.

For instance, a 22-year-old African American participant stated, *"She [the provider] just basically explains everything that is going on in my pregnancy and if there is anything wrong she explains everything. . . . She breaks down what I need to be doing or how I need to be doing it."*

Similarly, a 39-year-old African American participant stated, *"She [the provider] tries to explain things clearly, and she will ask, like, 'Are you sure that we discussed this?' or 'Do we need to discuss this again? Did we discuss this?'"*

Likewise, a 27-year-old White participant mentioned, *"She normally comes in first, asks me if I have any questions or concerns, before she kind of talks about whatever she needs to discuss."*

The majority of participants valued the opportunity to communicate with their prenatal care providers and felt positively about their communicative experience. This result signified the importance of the dialogue between prenatal care providers and pregnant women. Pregnant women are more favorable of an interactive communicative experience when the prenatal care provider stays patient and receptive, converses with patients in a warm, caring, supportive attitude, and listens and answers their questions.

Theme Two: Time Required for Prenatal Visit

Half of the participants' communicative experiences were around "time required for prenatal visit." This theme coded from the interview data indicated words or phrases that highlighted time with the prenatal care provider and wait time. Participants spoke negatively of feeling rushed or long wait times and saw this as an important aspect of the communicative process.

For instance, a 29-year-old African American participant stated, *"I mean, sometimes it feels like it might be a little rushed or whatnot. Usually, I have to wait a while once I'm actually back there, and then when she [the provider] does come in, but it's super quick, and usually I have to tell her, like, 'I have a question too' because she's already about to go out the door."*

Table 2. Description and Frequency of Themes that Emerged from Interviews

Theme	Description	Example Quote	Frequency N (%)
Dialogue with prenatal care provider	Words or phrases that highlighted women's experiences regarding asking questions, getting their questions answered, receiving explanations from providers, and/or conversing with prenatal care providers.	A 20-year-old mixed race woman stated, *"She [the provider] will answer it [my questions]. She will sit there and listen. She's really good, you know, being able to listen and answer the questions without acting like I'm dumb."*	27 (90%)
Time required for prenatal visit	Words or phrases that highlighted time with prenatal care provider and wait time.	A 29-year-old African American woman noted, *"I'm not asking you to stay for like 10 minutes or something, but just at least for a few minutes to see if there is anything else going on that I may need."*	15 (50%)
Prenatal care provider's interpersonal and personality characteristics	Words or phrases that highlighted patient's perceptions of their prenatal care provider's personality traits	A 39-year-old African American participant explained, *"She is very respectful."*	12 (40%)
Continuity of care	Words or phrases that highlighted concerns with receiving quality of care over time with one provider or communication between providers when specialists are required to join a patient's care team	A 20-year-old African American participant explained, *"So I didn't really like that [seeing multiple providers], and that is also what turned me off."*	7 (23%)

A 27-year-old African American participant shared a similar perspective:

"I mean . . . she [the provider] kind of made me feel rushed and stuff like . . . kind of like I was a customer at a store."

A 27-year-old White participant mentioned,

"He doesn't spend much time with you. It is pretty quick, in and out."

Further, wait times to see the prenatal provider were also identified as an important aspect of a participant's communicative experiences.

A 30-year-old African American participant described the following:

"Sometimes I'm in the office waiting a long time, [which] is the only thing that I do have an issue with. I might be there for 45 minutes to an hour before she comes to the door."

A 29-year-old African American participant shared a similar perspective:

"Sometimes it's like 30 minutes of just sitting in the back [in the exam room] after I already sat in the waiting room."

Similarly, a 30-year old White participant stated,

"She normally comes in first, asks me if I have any questions or concerns before she kind of talks about whatever she needs."

Long time spent waiting for and short time conversing with the provider appeared a concern among half of the participants when the voicing women's age tend to be older (27+) without obvious difference in their race or gender of the providers. Pregnant women felt the 30 minute to one hour waiting time in the examination room before the providers showed up was too long without mentioning the time in the waiting room.

Theme Three: Prenatal Care Provider's Interpersonal and Personality Characteristics

More than one-third of the participants' communicative experiences were related to "prenatal care provider's interpersonal and personality characteristics." Interview data coded in this theme indicated words or phrases that highlighted patients' perceptions of their prenatal care provider's personality traits, including but not limited to being "nice" or "respectful." Several participants noted that their interactions with their provider were positive, particularly in cases where they were pleased with their provider's interpersonal skills or personality.

A 25-year-old African American participant provided a similar perspective:

"She treats me with respect. You know, she is real nice."

A 20-year-old mixed race patient said,

"They are doing pretty well. They were respectful, like if I have questions, if it's a weird or stupid question, she doesn't look at me like I'm dumb.

Similarly, a 30-year-old White participant shared,

"She was really nice."

This theme showed individual differences among prenatal care providers. Pregnant women (without similar age or race) felt positive about their communicative experiences when the provider's personality traits are nice and respectful. However, only under half of the pregnant women perceived their providers being nice and respectful. The finding from Theme Two (long wait time and short contact time) may contribute to participants' perception about providers being nice or respectful.

Theme Four: Continuity of Care

Close to a quarter of the participants' communicative experiences exhibited the fourth theme, continuity of care.[39] Interview data coded in this theme indicated words or phrases that highlighted concerns receiving quality care over time with one provider or within a health care facility. Some participants explained the negative communicative experiences, such as seeing a different doctor for each visit or having to switch health care facilities, resulted in poor patient-provider communication.

For example, a 27-year-old African American participant stated,

"I wish that I saw one doctor. I just see too many new people."

A 20-year-old African American participant stated,

"I switched over because [the hospital] wasn't doing what they [the provider] were supposed to do, and they had me very backed up on the things I was supposed to be getting."

The Continuity of Care theme reflected participants' intentional or unintentional switches of prenatal care providers, exhibiting lower satisfaction in their prenatal care and interruption in their communicative experiences. While African American women tended to report the lack of continuity of care, a larger and representative sample is required to examine this hypothesis.

DISCUSSION

Our findings provide insight into pregnant women's communicative experiences receiving prenatal care in Ohio. Participants' experiences were made up of 4 salient themes related to how they described patient-provider communication during their prenatal care visits. We list these themes in the order of significance: (1) dialogue with the prenatal care provider, (2) time required for the prenatal care visit, (3) the prenatal care provider's interpersonal and personality characteristics, and (4) continuity of care. Ultimately, these communicative experiences reveal not only what the women experienced but also what they value during their interactions with their prenatal care provider.

According to participants in this study, 90% of the participants stated that dialogue with a prenatal care provider was the most important component of communicative experiences, thus indicating that it was the most relevant theme. Consistent with previous findings, dialogue with prenatal care providers may improve pre-

natal care communicative experiences.[40,41] Further, Handler et al[42] revealed that participants' satisfaction increased when their prenatal care provider explained procedures, asked questions, and answered their questions. These findings suggest that pregnant women value their interactions with prenatal care providers.

Conversely, dissatisfaction was most commonly attributed to time required for the prenatal care visit, specifically the wait time and time with the prenatal care provider. Fifty percent of participants stated that time required for prenatal visits impacted their visits. Participants frequently noted that ineffective communication from prenatal care providers resulted in long wait times or in them feeling rushed during their encounter. Long wait times to see a prenatal care provider were noted by participants as a factor that impacted their communicative experiences. Consistent with the literature, it was reported that wait times were the most common complaint for prenatal care patients.[43] When examining time spent with the prenatal care provider, similar to findings by Handler et al,[42] our study determined that participants encountered more favorable communicative experiences when their prenatal care providers spent more time with them. Health care systems should address wait times and the lack of time spent with prenatal care patients in order to provide effective communicative experiences.

Forty percent of participants stated that the prenatal care provider's interpersonal and personality characteristics influenced their prenatal care outcomes, which is consistent with previous research.[44] For example, Korenbrot et al[11] reported that a provider's interpersonal style and personality characteristics, which included friendliness, courteousness, respectfulness, the provision of emotional support, and a lack of perceived discrimination, were found to positively influence patient-provider communication. When patient patient-provider communication practices and interpersonal skills are improved, providers are able to offer patients with increased support, prevent medical crises and expensive interventions, and detect problems earlier.[45]

In terms of continuity of care, 23% (7) of participants experienced negative experiences with continuity of care, and it was found to negatively influence communicative experiences. Dissatisfaction most often resulted from being seen by multiple providers rather than by a single provider across the participant's pregnancy. Although there has been limited assessment of the role that continuity of care plays in prenatal care, there is a large body of literature to suggest that continuity of care plays a role in a patient's satisfaction in other contexts.[41,46] For example, Lori et al[46] found that women stressed the importance of being able to see the same prenatal care provider at each prenatal visit.

We expanded implementation of the patient-provider communication framework outside the cancer context to better understand patient-provider communication among pregnant women in Ohio. This conceptual framework may assist with patient-provider communication during prenatal care. Feldman and colleagues[22,23] noted that the patient-provider communication framework assists

health care providers in promoting discussion and influencing patient engagement, thereby enhancing prenatal care patient outcomes. By implementing the patient-provider communication framework, we can determine how inadequate communication during prenatal care visits may be improved.[23] Additionally, by focusing on the third tenet, the communication process, we can identify outcomes that can be used in evaluating the effectiveness of prenatal care during communicative experiences.

This study provides additional insight into gaining a better understanding of pregnant women's communicative experiences receiving prenatal care in Ohio. Many of the results are consistent with findings from previous investigations and, therefore, help confirm some of what is known about the importance of patient-provider communication within the context of prenatal care. However, our study focused on pregnant women in Ohio; therefore, data revealed information that has not, to our knowledge, been reported previously in the research literature, thus adding new insights.

We would like to acknowledge study limitations, especially from sample composition due to geographic region, sample size, demographics of participants, and unmatched race/age composition. First, because we opted to have in-depth discussions with pregnant women receiving prenatal care in Ohio to better understand their experiences, the sample was drawn from a particular region in Ohio. Thus, our findings may not be representative of pregnant women's experiences outside of our study context. Second, our analysis reached saturation at the sample size of 30. We acknowledged a potential in which new theme may not be included. Additionally, while we attempted to recruit a diverse sample, our sample was composed mostly of African American women (20 out of 30), Medicaid recipients (24 out of 30), females earning less than $20 000 per year (21 out of 30), and females having low-risk pregnancies, who therefore used a midwife (18 out of 30). Furthermore, we did not account for ethnic or age differences in the recruitment of participants. Such a convenient sample may present voices without matching the racial or age composition of the pregnant women in the Ohio population. We acknowledge that the women are not homogenous and that experiences vary across ages and race and ethnicity.

PUBLIC HEALTH IMPLICATIONS

Recent statistics revealed that approximately 1 in 6 infants in Ohio is born to a woman who did not receive adequate prenatal care during pregnancy.[47] A closer look at these statistics highlight stark racial and ethnic disparities among the women who receive inadequate prenatal care. From 2016-2018, 25.6% of African American women received inadequate prenatal care in Ohio compared to 13.4% of White women.[47] Likewise, infant mortality rates by race and ethnicity in Ohio follow this same pattern. Between 2015-2017, the average infant mortality rate (per 1 000 live births) was highest among African American infants (14.6 per 1 000 live births) and then Whites (5.7 per 1 000 live births).[47]

To increase effective patient-provider communication to reduce infant mortality rates in Ohio, we suggest that attention be paid to increasing societal awareness on how the health care systems and prenatal care providers impact infant health outcomes, specifically for pregnant African American women residing in Ohio. Conversations are needed to dismantle the structural inequalities that exist at the micro- and macro-levels to counter systemic barriers to prenatal care that ultimately impact infant mortality rates in Ohio.

Prenatal care providers should work to offer culturally competent prenatal care to their patients. Providing culturally competent health care may be a key strategy and initiative to reduce racial and ethnic disparities during prenatal care.[21] Therefore, cultural competency trainings may be beneficial to increase effective patient-provider communication by increasing health care providers' awareness.[22]

We suggest that future studies examine the communicative experiences of at-risk pregnant women, such as African American women receiving prenatal care in Ohio. Doing so will aid in better understanding patient-provider communication experiences during prenatal care among groups that are disproportionately impacted. Additionally, future research should consider exploring how our findings influence infant mortality, preterm birth, and low birth weight metrics to determine how prenatal appointments can be used to improve health outcomes.

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RESEARCH ARTICLE

Opioid Dispensing Practices in the Acute Care Setting: A Retrospective Study

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ABSTRACT

Background: Ohio remains one of the most afflicted states nationally with 46.3 per 100 000 deaths due to drug overdose. Opioids are commonly administered in emergency departments for the management of pain. Given the high volume of patients presenting with pain, emergency clinicians must be cognizant of responsible opioid dispensing practices. Ohio established guidelines in April 2012 to provide a general approach for responsible opioid prescribing practices in the emergency setting. The purpose of this study assesses clinician opioid dispensing before and after the implementation of the Ohio Opioid Prescribing Guidelines.

Methods: The study design used retrospective data analysis of opioid medications ordered by emergency clinicians to be administered in the emergency room between January 1, 2007, to December 31, 2017, at the University of Toledo Medical Center. A segmented regression analysis with an interrupted time series was used to determine impact.

Results: All opioid medication usage showed a significant decrease after guideline implementation except for morphine and fentanyl which showed statistically significant increases in administration over time ($P < 0.05$).

Conclusion: There was a significant decrease in the use of opioids since the implementation of the Ohio Opioid Prescribing Guidelines, yet morphine and fentanyl use has generally increased across all age groups. Age demographics frequently receiving opioids in the emergency room have seemed to shift over time as well as specific opioid drugs dispensed for the management of pain in certain age groups. Further study is needed to evaluate the use of opioids prescribed by emergency physicians after discharge from the emergency department.

Keywords: Opioid; Emergency; Acute; Dispense; Ohio

INTRODUCTION

The illicit use of prescription opioids has been rising nationally and continues to be a major public health crisis representing a leading cause of morbidity and mortality in the United States.[1] Despite the ongoing prevention efforts such as health screenings and policy reforms, opioid abuse remains accountable for the loss of many lives. From 1999 to 2015 alone, over 180 000 people in the United States died from prescription opioid related overdoses.[2-4] According to the Centers for Disease Control and Prevention, opioid overdoses were responsible for the deaths of over 47 000 Americans in 2017, and two-thirds of overdoses in 2018 involved an opioid.[5-7] Common uses of opioid drugs can be linked to treatment for pain. Patients seek relief after experiencing pain whether it be acute or chronic. This leads to the involvement of health care professionals, especially providers in the emergency department (ED) who are readily accessible to a large and diverse patient population and offer immediate medical care. Emergency medicine physicians are trained in appropriate pain management, so it is not surprising to see patients list pain as one of the most common chief complaints.[8-9]

Pain relief often coincides with the use of potent opioid medications due to the severity and nature of cases presented to the ED. Emergency medicine providers treat high volumes of patients daily, often lacking a pre-established patient-provider relationship due to the nature of the emergency medicine specialty.[10-14] Therefore, although clinicians are

aware of the importance of balancing patient safety and quality care, there is growing hesitation among the emergency medicine community as providers attempt to discern the role of opioid drugs in managing pain and weighing the risks of under-treatment versus opioid over-use.[15] This issue is especially prevalent in Northwest Ohio which has one of the greatest amounts of prescription opioid overdoses in the state. In 2015, Lucas County had the eighth highest number of fentanyl-related overdoses in the state with 41 deaths.[16] This national issue is relevant to the Toledo area as many residents, families, and providers in the community are continually combating the struggles of opioid addiction. The patient demographics of Toledo can be extrapolated to represent major urban centers found across the state.

In April 2012, the Ohio Governor's Cabinet Opioid Action Team instituted opioid prescribing guidelines for emergency health care providers in order to provide a general approach for responsibly prescribing opioids and other controlled substances. These guidelines were not intended to take the place of clinical judgement but, rather, assist emergency providers when assessing the need for opioids in the ED. The guidelines address several facets of opioid prescribing practices and their application in the acute emergency setting including management of chronic pain issues, replacement of past opioid prescriptions, utilization of the Ohio Automated Rx Reporting System (OARRS) database, patient-physician pain management agreements, and discussion with patients about the risks and benefits of using opioids for pain management.[17] This study aims to analyze the effects of the 2012 prescribing guidelines on opioid dispensing in the emergency room.

METHODS

Setting

The University of Toledo Medical Center Emergency Department is an academic urban level 1 trauma center with an annual census of approximately 36 000 patients.

Design

The design was a retrospective chart review analysis of opioid prescriptions written by ED physicians between January 1, 2007, to December 31, 2017, at the University of Toledo Medical Center.

Participants

Subjects included in the study were ED patients greater than 18 years of age who received opioid orders (N = 9 598) in the ED for treatment of pain. Participants were administered at least one opioid medication at the University of Toledo Medical Center prior to discharge from the emergency room. The study excluded children, prisoners, pregnant women, mentally incapacitated, and palliative care/hospice patients due to risk factors associated with those populations.

Procedures

This study was approved by the University of Toledo Institutional Review Board. Medications dispensed in the ED were obtained from the University of Toledo Medical Center drug dispensing databank. The records contain dispense level, limited data set that include patient ID, gender, race, birth date, date the medication was dispensed, quantity dispensed, and drug name.

Measures

The primary study outcome evaluates the existence of positive or negative change in opioid dispensing practices at the University of Toledo emergency room using the implementation of the 2012 Ohio Opioid Prescribing Guidelines as a time reference for comparison. The overall opioid dispense rate in addition to specific opioid medications were analyzed. Additional measures were included to evaluate the relationship between patient demographics and opioid dispensing behaviors.

Statistical Analysis

Descriptive statistics were used to characterize opioid dispenses by demographic variables.

The data points for the time-series were aggregated per month. The rate of opioid administrations in the ED per month was calculated before (January 2006 to April 2012) and after (until December 2017) the new regulations were released. The time periods were divided into monthly intervals versus yearly intervals to observe drug dispensing acute and chronic progression before and after guideline implementation. The rate of other commonly administered drugs per month was also determined for comparison with the corresponding opioid data.

An interrupted time series analysis was utilized to compare the monthly number of opioid dispense orders in the ED in the pre- and post-guideline time periods.[18] To determine the impact of the intervention, a segmented regression analysis with an interrupted time series design was used.[19] The difference in monthly ED administered opioids orders between the pre-intervention and post-intervention periods can be interpreted as a microcosm that demonstrates the impact of state opioid-regulating legislation.

The analyses were stratified by gender, race, and age group. Age stratification was performed to compare populations of interest and accommodate for generational influences between young adults versus early/middle-aged versus older adults. In addition to studying the impact of the rules on all opioids, we individually assessed the most commonly administered opioids: hydrocodone, oxycodone, morphine, fentanyl, and hydromorphone. Three other non-opioid drugs (albuterol, azithromycin, and ondansetron) were used for comparison as they are commonly prescribed in the ED, especially for conditions associated with chief complaints regarding pain.

Opioid prescription doses for pre-intervention and post-intervention were described as mean dosage in milligrams (mg) of opioid dispenses per month with standard deviation and median dosage in mg of opioid dispenses per month (interquartile range) and compared using Mann-Whitney U test. All analyses were performed using SAS version 9.4 (SAS Institute Inc.) and R statistical software version 3.4.1 (R Foundation for Statistical Computing). Statistical significance was evaluated at $\alpha = 0.05$ and all testing were 2-sided.

RESULTS

The annual number of ED opioid dispenses ranged from a high of 4 784 in 2011 to a low of 2 332 in 2017. The percentage of opioids dispensed in the ED based on age was found to be statistically significant with the youngest age group (48.8%) less likely to receive opioids compared to older age groups. The highest percentage of dispensed opioids was among the age group 30 to 49 years (60.2%). The percentage of opioid dispenses for males (57.5%) was significantly higher than that for females (53.2%). With re-gard to race/ethnicity, Hispanic patients had the highest percent-age of opioid dispenses (65.5%) compared to White (55.5%), Black (55.2%), and Other (52.2%) patients. Patient characteristics by opioid dispenses are summarized in Table 1.

Following the Ohio Opioid Prescribing Guidelines, from May 2012 until December 2017, there were sustained reductions in monthly prescription narcotic use from March 2012 (83 dispenses per month) to December 2017 (53 dispenses per month) (Figure 1).

Table1. Frequency of Emergency Department Opioid Utilization by Demographic Variables Between 2007-2017

	Opioid dispenses[a]	All dispenses[b]	% Opioid	P value[**]
Age group				
18-29	249	510	48.8	0.00001
30-49	15,986	26,554	60.2	
50-64	16,794	30,798	54.5	
65+	8286	16,869	49.1	
Gender				
Male	20,861	36,286	57.5	0.0001
Female	20,454	38,445	53.2	
Race/Ethnicity				
White	21,256	38,294	55.5	0.0001
Black	12,137	21,980	55.2	
Hispanic	1831	2795	65.5	
Other[*]	6091	11,662	52.2	

[a]Morphine, hydrocodone, hydromorphone, and oxycodone, other (tramadol, methadone, propoxyphene, buprenorphine, pentazocine, sufentanil, opium alkaloids)
[b]Encompasses all non-opioid drug dispenses administered in the University of Toledo Medical Center Emergency Department during this time frame
[**]P value < 0.05 is significant
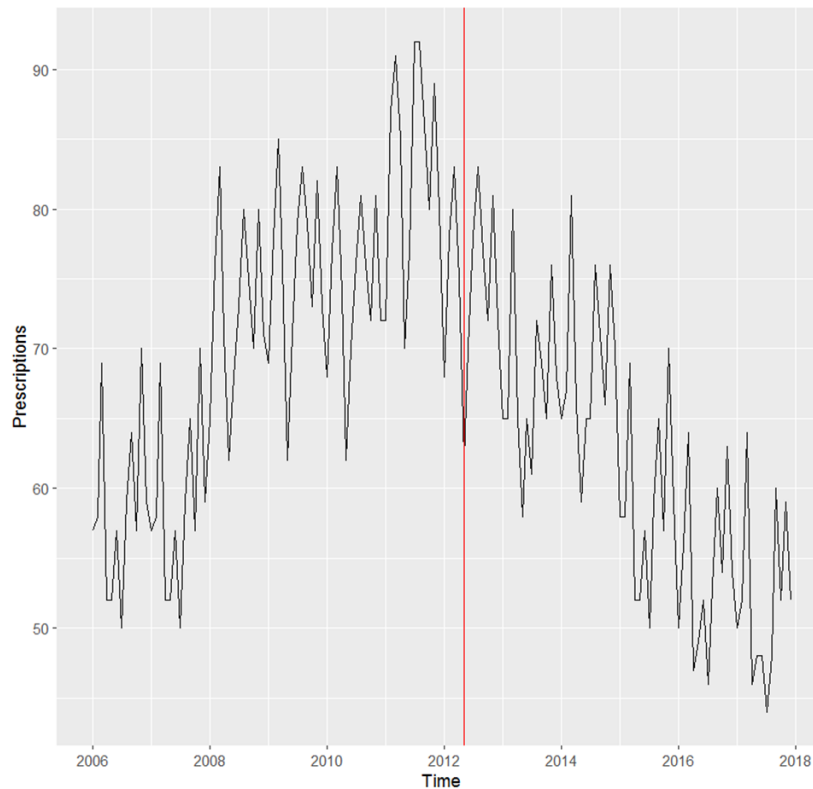[*]Includes missing values for race

Figure 1. Interrupted Time Series Analysis Evaluating Number of Opioid[a] Dispenses Ordered per Month in Emergency Department Before and After Ohio Opioid Prescribing Guidelines

[a]Morphine, hydrocodone, hydromorphone, and oxycodone, other (tramadol, methadone, propoxyphene, buprenorphine, pentazocine, sufentanil, opium alkaloids)

Table 2 presents opioid dosing (in mg) before and after the Ohio Opioid Prescribing Guidelines stratified by demographic variables. Non-significant reduction in ED opioid dosing was observed among the age groups 30 to 49 years (-1.30 mg) and 50 to 64 years (-1.51 mg). A significant increase was observed in the age group 65 and over (+0.73mg). Both genders exhibited non-significant reductions in dispensing doses when comparing doses before and after guideline implementation (males -1.16 mg, females -0.96 mg). With regard to race/ethnicity, the reduction in dispensing dose was borderline significant only for Whites (-1.31 mg).

Dispensing doses for selected opioid drugs before and after the Ohio Opioid Prescribing Guidelines are presented in Table 3. There were significant increases in the average dose for morphine (+0.3 mg) and fentanyl (+0.04 mg). Conversely, there were significant decreases in the average doses for hydrocodone (-0.41 mg), hydromorphone (-0.29 mg), and oxycodone (-1.38 mg). There were significant increases in overall dispense dose for albuterol (+1.09 mg) and azithromycin (+101.2 mg). On the other hand, overall dispense dose for ondansetron was found to be significantly lower (-0.52 mg).

DISCUSSION

There has been a significant decrease in the orders of dispenses and doses of various opioids since the implementation of the Ohio Opioid Prescribing Guidelines, yet the dose of morphine and fentanyl has continued to increase. There could be several reasons as to why the use of morphine in emergency settings has increased including but not limited to its ease of administration, quick onset of action, and demonstrated safety profile. Fentanyl is also a short acting analgesic agent with a better hemodynamic safety profile. A significant decrease in total opioid dispenses is further demonstrated by comparing opioid dispenses to total ED prescriptions including non-narcotics. The frequency of narcotics dispensed in the ED was also found to have significantly decreased which may be argued to represent less overall addiction potential, although this finding may indicate that clinicians are not dispensing proper doses of pain medication. Further analysis of patient pain relief would be required to elucidate the impact of opioid dispensing frequency with regard to patient pain control in the ED.

Males showed an increased number of narcotic dose dispenses compared to females in the population studied. While this could possibly reflect differences in pain tolerances and health care provider perception on the significance of patients' clinical pain, further study would be necessary to validate this claim. Variations in chief complaints could also influence provider decision making on the appropriateness of opioid dispensing in the ED. For example, abdominal pain complaints in females may not be perceived by physicians as requiring immediate administration of narcotics due to confounding differential diagnosis considerations such as pregnancy or menstruation pain. Trends suggest an overall increase in opioid dispensing dose in Hispanics compared to other groups. The data presented in Table 2 suggests that opioid dispensing practices to Hispanic patients have become more standardized and less variable (Mean 4.99 mg, SD 8.2 mg) when compared to dispensing dose practices before the implementation of the Ohio Opioid Prescribing Guidelines (Mean 4.56 mg, SD 9.4 mg). While the Ohio Opioid Prescribing Guidelines serve as a general framework with the goal of promoting safe opioid dispensing practices, further analysis would be required to determine the impact of various other modifiers affecting physician opioid dispensing and dosage practices such as pain management of non-English speaking patients or managing pain in patients that cannot communicate with the provider due to pre-existing conditions such as dementia or MRDD (mental retardation developmental delay).

Table 2. Dosage of Emergency Department Opioids Before and After Ohio Opioid Prescribing Guidelines

	Pre-intervention		Post-intervention		Difference In Means in mg	P value[**]
	Median dose in mg (IQR)	Mean dose in mg (SD)	Median dose in mg (IQR)	Mean dose in mg (SD)		
Age group						
18-29	5 (19)	11.34 (14.4)	10 (25)	17.8 (20.3)	+6.46	0.4676
30-49	2 (9)	6.88 (14.3)	4 (4)	5.58 (10.6)	-1.3	0.4781
50-64	2 (4)	6.90 (13)	4 (4)	5.39 (10.5)	-1.51	0.5576
65+	2 (4)	4.80 (10.6)	4 (4)	5.53 (10.4)	+0.73	0.0001
Gender						
Male	2 (4)	6.10 (11.9)	4 (4)	4.94 (9.5)	-1.16	0.1190
Female	2 (9)	7.03 (14.5)	4 (4)	6.07 (11.5)	-0.96	0.3343
Race						
White	2 (4)	6.39 (14.0)	4 (4)	5.08 (9.6)	-1.31	0.0566
Black	2 (9)	6.95 (12.7)	4 (4)	6.10 (11.58)	-0.85	0.6597
Hispanic	2 (3)	4.56 (9.4)	4 (3)	4.99 (8.2)	+0.43	0.0005
Other[b]	2 (3)	6.98 (12.9)	4 (4)	5.85 (11.8)	-1.13	0.2357

Abbreviations: IQR, interquartile range; SD, standard deviation
[**]P value < 0.05 is significant
[*]Includes missing values for race/ethnicity

Table 3. Opioid and Non-opioid Medication Dispense Doses Before and After Ohio Opioid Prescribing Guidelines

	Pre-intervention			Post-intervention			Difference in Means	P value**
	Total number of dispenses	Median dose in mg (IQR)	Mean dose in mg (SD)	Total number of dispenses	Median dose in mg (IQR)	Mean dose in mg (SD)		
Opioids								
Oxycodone	446	5 (5)	7.89 (7.42)	773	5 (5)	6.51 (3.67)	-1.38	0.0001
Hydrocodone	289	5 (5)	6.38 (2.24)	350	5 (0)	5.97 (1.95)	-0.41	0.0200
Hydromorphone	1051	1 (0)	1.38 (0.93)	696	1 (0)	1.09 (0.44)	-0.29	0.0001
Morphine	1248	2 (2)	3.3 (3.4)	1484	4 (2)	3.6 (2.7)	+0.3	0.0001
Fentanyl	713	0.05 (0.05)	0.09 (0.12)	638	0.1 (0)	0.13 (0.15)	+0.04	0.0001
Non-opioids								
Albuterol	1288	2.5 (0)	2.87 (1.94)	435	2.5 (0)	3.96 (3.49)	+1.09	0.0001
Azithromycin	275	500 (250)	545 (278)	287	500 (500)	646 (254)	+101	0.0001
Ondansetron	1985	4 (0)	4.79 (1.81)	2430	4(0)	4.27 (1.39)	-0.52	0.0001

Abbreviations: IQR, interquartile range; SD, standard deviation
**P value < 0.05 is significant

Age demographics of patients receiving opioids in the ED appear to have shifted over time along with the most frequently administered opioid drugs dispensed for specific age groups. The implementation of the 2012 Ohio Opioid Prescribing Guidelines showed statistically non-significant decreases in ED opioid dispensing doses among middle-aged patients (age 30 to 64). These trends, although statistically nonsignificant, represent particular importance as middle-aged individuals encompass a key demographic being affected by the national opioid epidemic. By increasing awareness of the national opioid epidemic and implementing guidelines to address opioid dispensing practices, physicians can be more cognizant of the addiction potential when considering options for pain management in these vulnerable patient populations.

This retrospective analysis has some limitations. The population used in this study included patients that frequented a moderate-sized, academic level 1 emergency room in urban, inner-city Toledo. There exists intrinsic limitation in this research study's scope and extrapolation of data and conclusions when applied to rural or suburban settings, which represent key demographics affected by the opioid epidemic. Since this study evaluated opioid dispensing practices in an acute care setting, further study is required to analyze the impact of opioid prescribing practices upon patient discharge from the ED. Furthermore, the study did not control for individuals who may have received multiple opioid dispenses during the study period. In addition, this study does not incorporate patient chief complaints into the analysis of opioid dispensing behavior nor does it distinguish between the management of

acute versus chronic pain in the ED. Further subset analysis of specific opioids dispensed stratified by age group would add value to this research study. This study may raise concern for bias regarding opioid dispenses before and after guideline implementations due to missing racial/ethnic groups categorized as "Other" in Tables 1 and 2. Finally, this study aims to demonstrate the impact of the 2012 Ohio Opioid Prescribing Guidelines on the opioid dispensing practices in the ED setting, but acknowledges that the opioid crisis response has been multifactorial and this study's data cannot be entirely attributed to the implementation of these specific guidelines.

PUBLIC HEALTH IMPLICATIONS

This study aimed to explore the change in emergency physician opioid dispensing habits after the implementation of a statewide guideline initiative in 2012. The results indicate that the prescribing guidelines had a positive effect on opioid dispensing practices, in the context of less overall opiates being dispensed in the ED, specifically in the Toledo inner-city setting. Based on the results of this study, opioid dispensing practices in the ED can be influenced by statewide legislation and policies aimed at increasing public awareness and implementing guidelines to promote responsible and practical opioid prescribing practices.

The design of this study can potentially be applied to the analysis of opioid dispensing practices on other state and national levels, such as, but not limited to, the CDC guidelines for Opioid Use released in 2016 as well as mandatory OARRS reporting implemented in 2015. These guidelines could influence drug seeking

behavior as national and state databases provide increased safeguards for providers to monitor for these types of patient behavior patterns. Future studies can also assess prescribing and dispensing practices of pain medication alternatives used in the acute care setting such as nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, gabapentin, topical lidocaine, muscle relaxers, or capsaicin creams in addition to nonpharmacological treatments such as acupuncture, massage therapy, and physical therapy. The 2012 Ohio Opioid Prescribing Guidelines produced an initial impact on opioid prescribing rates in the acute care setting and served as a foundation for further interventions to combat the national opioid crisis on a state level.

ACKNOWLEDGMENTS

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Detecting Environmental Contamination of MRSA in Ambulances: A Novel and Efficient Sampling Methodology

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ABSTRACT

Background: Methicillin-resistant *Staphylococcus aureus* (MRSA) can be found in emergency medical services (EMS) ambulances. This poses an occupational risk and patient safety hazard. Screening for environmental contamination is often not performed due to limited resources and logistical challenges. This study's objective was to compare traditional screening of individual surfaces versus "pooled sampling" to efficiently identify contamination.

Methods: A cross-sectional study, conducted among 145 Ohio EMS ambulances from 84 agencies, tested a novel pooled sampling methodology to detect MRSA contaminated ambulances. For ambulances screened using pooled sampling, 3 samples were collected within each ambulance. Pool One included cabinets, doorways, and ceiling bar. Pool Two included cot, seats, and backboard. Pool Three included steering wheel, kits, and clipboard. For ambulances screened with the traditional detection technique, each of the 9 aforementioned surfaces were sampled individually. Descriptive statistics and unadjusted and adjusted odds ratios (OR) were calculated to compare the 2 methods.

Results: Forty-seven of 145 ambulances (32.4%) had at least 1 of the 9 locations contaminated with MRSA. When comparing the 2 screening methodologies, no significant difference was observed regarding the overall detection of MRSA contaminated ambulances (24/60 [40%] versus 23/85 [27.6%], *P* value: 0.1000). This indicates that pooled sampling appears as an efficient method for identification of MRSA contaminated ambulances.

Conclusion: One-third of Ohio ambulances had MRSA contamination in this study. Therefore, an efficient methodology to identify contaminated ambulances with hazardous pathogens is incredibly valuable. Pooling can help save resources and simplify sampling logistics, all which could positively impact infection control practices in emergency medical services.

Keywords: Methicillin-resistant *Staphylococcus aureus*; MRSA; Emergency medical services; Infection control; Environmental sampling

INTRODUCTION

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a Gram-positive bacteria capable of causing various infections which are difficult to treat with several groups of antibiotics.[1] Methicillin-resistant *Staphylococcus aureus* can be found in 7% to 49% of ambulances.[2–4] In these studies, MRSA contamination was found in patient care and non-patient care areas. A major concern for MRSA found in any health care environment is that it is an occupational and patient safety hazard for those who come in contact with contaminated surfaces.[5]

Higher MRSA environmental contamination within the health care setting have correlated with increased human carriage.[6] These findings likely explain why MRSA rates in emergency medical services (EMS) providers have been reported higher than the general population.[7] High MRSA contamination rates within ambulances and MRSA carriage among EMS providers suggest a threat to infection control.[6,7] Reducing MRSA from the environment may reduce MRSA carriage in health care providers or in the patients utilizing EMS services.

Unfortunately, no well-established protocols exist to efficiently screen for MRSA environmental contamination in the EMS setting. A method to use electrostatic wipes has been suggested as a more efficient environmental surface sampling approach.[8] The use of electrostatic wipes for environmental MRSA contamination remains uncommon and no known studies have been performed in ambulances. Furthermore, most of the screening methods reported are heavily focused on individual surface sampling, which significantly increase the logistics and cost of screening ambulances to determine their contamination status and the need for deep cleaning and disinfection.[2–4]

The study's objective was to compare 2 environmental sampling methodologies to identify MRSA contaminated ambulances. The first was to sample each surface individually (traditional method). The second approach sampled several surfaces using a single electrostatic wipe, hereafter referred to as "pooled sampling." Pooled sampling may reduce the burden of sample collection resources (ie, time, personnel, and cost). Knowledge gained from this study could aid future infection control practices and guidelines by facilitating the screening of emergency vehicles.

METHODS

Setting

Between March 2009 and March 2010, Ohio had 1 338 EMS agencies registered in 10 EMS regions. The dates as to when these data were collected is irrelevant since the purpose of the study was to compare the sampling techniques. Agencies were located throughout Ohio in both rural and urban settings. For the study duration, every agency had at least 1 functioning ambulance.

Design

This was a cross-sectional sample of ambulances from 84 randomly selected Ohio EMS departments. To obtain state-wide representation, agencies were sampled from each of Ohio's 10 EMS regions and from urban and rural locations within each region. Within these selected agencies, up to 2 ambulances were screened for MRSA.

Participants

Samples were collected from 145 different ambulances. Ambulance types eligible for environmental surface sampling included small ad hoc vehicles, vans, custom made heavy trucks, and heavy trucks. No ambulances were excluded after enrollment. For each sampled ambulance, data regarding agency, personnel, and vehicle

characteristics were collected. Model year refers to the year that the vehicle was manufactured. Agency setting refers to whether or not the ambulance was housed at a rural or urban agency.

Procedures

Because the ambulance screening was performed in conjunction with human sample collection,[7] approval for the use of human subjects was granted from the Office of Responsible Research Practices Institutional Review Board at The Ohio State University. Multiple samples from within ambulances were collected via an electrostatic cloth (Swiffer®). In ambulances with surfaces individually sampled, 9 separate samples were collected from the ambulance cot, bench seats, cabinet doors/handles, doorways, backboard, steering wheel, ceiling bar, kit handles/straps, and clipboard/Mobile Data Terminal (MDT). For the ambulances with pooled sampling, 3 pooled samples were collected. Pool One included the cabinet doors/handles, doorways, and ceiling bar. Pool Two included ambulance cot, bench seats, and long backboard. Pool Three included steering wheel, kit handles, and clipboard/MDT. The researchers selected the 3 pooled sites based on suspected population hazard: paramedic and patient hazard (Pool One), primarily patient hazard (Pool Two), and primarily paramedic hazard (Pool Three).

Measures

All samples were initially pre-enriched for 24 hours in buffered peptone water media followed by culturing and selection on mannitol salt agar plates supplemented with 2 µg/mL of oxacillin. After incubation, 3 suspected MRSA colonies were plated on blood agar and confirmatory testing was completed according to standard protocols as previously published.[7] Final MRSA phenotypic confirmation was performed on oxacillin screen agar plates supplemented with 4% sodium chloride and oxacillin (6 µ/mL) incubated at 35 °C for 24 hours. A surface or pooled sample was considered contaminated with MRSA if there was at least one MRSA colony identified.

Statistical Analysis

Summary statistics to describe ambulance characteristics are reported and the MRSA contamination frequency for all ambulances was measured. Individual and pooled samples were compared using Student t test and Pearson's chi-square or Fisher exact test. Odds ratios (OR) were calculated to compare pooled versus individually sampled surfaces for MRSA contamination. All statistical procedures were performed in SAS (version 9.3; SAS Institute, Inc. Cary NC). Values were determined statistically significant if the P value was <0.05.

RESULTS

Data regarding ambulance and agency characteristics for the 2 populations of ambulances (individual versus pooled) were similarly distributed (Table 1). In this study, custom made heavy trucks were the most commonly contaminated ambulance type

overall (78/118, 66.1%), as well as within individually sampled ambulances (29/41, 70.7%) and pooled sampled ambulances (49/77, 63.6%) (χ^2 P value: 0.5729). Mean model year was 2002 (SD: 4.4 years) for ambulances individually sampled, and was 2003 (SD: 4.3 years) for pooled sampled ambulances (t test P value: 0.4088). A higher proportion of ambulances serving urban areas was seen among both the individually sampled group (43/60, 71.7%) and pooled sample ambulances (51/85, 60.0%) (P value: 0.1735). Finally, the mean number of staff at agencies with ambulances that had surfaces individually sampled was 30.1 (SD: 11.7) and agencies with ambulances that had pooled surface sampling was 35.1 (SD: 22.4) (P value: 0.1232). No significant differences were seen in the baseline characteristics between individually sampled and pooled ambulances which allowed us to compare the 2 groups.

Thirty-two percent (47/145) of all ambulances had at least 1 MRSA contaminated surface (Table 1). When comparing the 2 sampling methods, no significant difference was observed regarding the overall MRSA contamination in individually sampled ambulances (24/60, 40%) versus the pooled ambulances (23/83, 27.6%) (P value: 0.1000). Examining by surface location, Pool Two (primarily patient contact surfaces) had the highest MRSA con-

tamination prevalence in both the individually sampled (17/60, 28.3%) and pooled groups (17/85, 20.0%). Pool Three (primarily paramedic contact surfaces) had a MRSA prevalence of 18.3% (11/60) and 15.3% (13/85) for individually sampled and pooled sampled ambulances, respectively (P value: 0.6277).

Only Pool One had a MRSA contamination rate that was significantly different for individually sampled ambulances (11/60, 18.3%), and for pooled sampled ambulances (5/85, 5.9%) (P value: 0.0184) (Table 1). However, after adjusting for relevant ambulance and agency characteristics, the odds ratio of MRSA detection is not significantly different for Pool One (Table 2). Consistent with the unadjusted findings, the odds ratios of MRSA detection were not significantly different between those ambulances that had surfaces pooled and those that did not overall or for Pools Two and Three (Table 2).

DISCUSSION

The study's objective was to compare 2 methods for detecting MRSA contamination within an emergency health care setting. Although individually sampled surfaces provided more positive MRSA results, the overall ambulance contamination rate (ie, an ambulance tests MRSA positive at any location) was not statistical-

Table 1. Prescreening Comparison of Ambulance and Agency Characteristics and MRSA Positive Sites Stratified by Sampling Methodology

	Ambulances with surfaces individually sampled (n=60)	Ambulances with pooled surfaces sampled (n=85)	Total (N=145)	P value
Ambulance characteristics Vehicle type, frequency[†] (%)				0.5729
Small *ad hoc* vehicles	1 (2.4)	3 (3.9)	4 (3.4)	
Van	0 (0.0)	3 (3.9)	3 (2.5)	
Custom made heavy truck	29 (70.7)	49 (63.6)	78 (66.1)	
Heavy truck	11 (26.8)	22 (28.6)	33 (28.0)	
Model year, mean (SD)	2002 (4.4)	2003 (4.3)	2002 (4.3)	0.4088
Urban, frequency (%)	43 (71.7)	51 (60.0)	94 (64.8)	0.1735
Total personnel, mean (SD)	30.1 (11.7)	35.1 (22.4)	33.0 (18.9)	0.1232
MRSA frequency (%) MRSA contaminated ambulances	24 (40.0)	23 (27.1)	47 (32.4)	0.1000
Pool One, frequency (%)	11 (18.3)*	5 (5.9)	16 (11.0)	0.0184
Cabinet doors/handles	3 (5.5)	---		
Doorways	8 (14.6)	---		
Ceiling bar	3 (5.5)	---		
Pool Two, frequency (%)	17 (28.3)*	17 (20.0)	34 (23.5)	0.2434
Ambulance cot	9 (16.4)	---		
Bench seats	11 (20.0)	---		
Long backboard	3 (5.6)	---		
Pool Three, frequency (%)	11 (18.3)*	13 (15.3)	24 (16.6)	0.6277
Steering wheel	4 (7.3)	---		
Kit handles/straps	7 (12.7)	---		
Clipboard/MDT	0 (0.0)	---		

Abbreviations: MDT, Mobile Data Terminal; MRSA, methicillin-resistant *Staphylococcus aureus*; %, percentage of sample;
[†]Frequency values do not add to total number of ambulance sampled due to missing data
*Artificial pooling of the 3 individual locations

Table 2. Odds Ratios for MRSA Contamination Comparing Pooled Versus Individually Sampled Surfaces

	Unadjusted analysis OR (95% CI)	Adjusted analysis* OR (95% CI)
MRSA contaminated ambulances	0.56 (0.28 – 1.13)	0.18 (0.03 – 1.03)
Pool One	0.28 (0.09 – 0.85)	0.36 (0.02 – 6.85)
Pool Two	0.63 (0.29 – 1.37)	0.18 (0.03 – 1.21)
Pool Three	0.80 (0.33 – 1.94)	0.17 (0.03 – 1.14)

Abbreviations: MRSA, methicillin-resistant Staphylococcus aureus; OR, odds ratio; CI, confidence interval
*Multivariable analysis adjusted for model year, agency setting (urban vs. rural), and number of agency staff using ambulance

ly different from ambulances that were screened using a pooled sampling approach. While these findings are from a small study, pooled sampling as here described poses a more efficient method for pathogen detection and identification of contaminated ambulances. Methods that requires less resources and less logistics (ie, requires less than half of the time) needed for collection and testing can efficiently identify contaminated ambulances. Regardless of when these data were collected, the findings remain relevant.

Previous studies sampled a relatively small and homogeneous fleet of ambulances which may not be generalizable. However, this study found that surfaces associated with high touch areas for patients have a contamination rate of 23.5% which falls into the range of those studies.[2-4,9,10] This study and others show that MRSA was found on surfaces that patients were more likely to have direct contact.[4,11,12] Infected individuals are known to directly contaminate their surrounding environment,[13,14] and non-infected EMS patients are at risk of MRSA acquisition.[6] These results continue to emphasize that sampling and decontamination efforts should prioritize surfaces that patients most frequently contact in contrast to surfaces only accessible to EMS staff.

Currently, there are no required active surveillance recommendations for MRSA environmental contamination in the EMS setting.[15] Ideally, active surveillance would initially allow for baseline measurement and then be used to follow trends over time. Pooled sampling may make statewide surveillance achievable at one-third of the cost. However, a more pragmatic approach might be for agencies to bear the onus of routine environmental surveillance that may elicit a Hawthorne effect of EMS personnel cleaning habits. An alternate use for the pooled technique could be to provide guidance for which ambulances would benefit from lengthy terminal disinfection techniques like ultraviolet germicidal irradiation (UVGI).[16] Methods like UVGI require upwards of 16 hours when the ambulance must be decommissioned for cleaning.[16] Performing UVGI on all ambulances is not currently feasible but sampling ambulances efficiently using the pooling technique could identify a subset of contaminated ambulances that could benefit from UVGI.

There are several limitations in this study. First, no statewide registry of ambulances exist so there is no method to confirm that

the ambulances measured in this study are representative of the entire state of Ohio. Furthermore, we did not collect location of ambulance routes or time of sampling. Agencies enrolled in this study, however, were randomly selected and representative of the state. Ambulances selected from those agencies were not determined by agency staff to reduce selection bias. Future research may determine how ambulance routes or timing of sampling may impact MRSA sample collection. Second, using the same electrostatic cloth to collect pathogens from a larger surface area might decrease the sensitivity to detect MRSA. Future studies should carefully consider the maximum surface area allowable for a single electrostatic cloth to work reliably. Finally, the pooled method may not be generalizable for the environmental sampling of other pathogens. Depending on the microbiology properties of other organisms, other collection techniques may be required. However, the detection of MRSA is frequently used as a marker of environmental contamination.

Data outlined in this brief report strongly suggest the need for EMS infection prevention programs that focus on environmental cleaning of ambulances. The number of contaminated surfaces was high but not uncommon and presented a threat to infection control. Culture-based screening methods represent the most accurate and reliable method of determining the adequacy of cleaning. Culture-based methods, however, that require extended time for sampling and large number of samples will likely not be employed beyond research purposes. Limiting the number of required samples by pooling may be appealing for routine environmental sampling and ambulance screening. Furthermore, microbiologic cultures expend agency resources so limiting the total number of cultures needed is also highly favorable. Therefore, for circumstances requiring targeted environmental surveillance (ie, outbreak investigation or quality improvement), pooled sampling provides an efficient method to detect MRSA contaminated ambulances. Performing environmental screening will also help to determine the locations within ambulances that are consistently contaminated and will guide effective decontamination processes ultimately reducing MRSA acquisition for both patients and paramedics.

PUBLIC HEALTH IMPLICATIONS

A gap in environmental infection control of MRSA in ambulances for over a decade suggests that little progress has been made to protect both patients they serve and the providers who service them. Emergency medical services agencies have historically not conducted active surveillance as a part of infection control.[15] Failure to perform active surveillance has been attributed to time and resource limitations.[7] The overall findings of this report support the use of a novel pooled sampling methodology to detect MRSA contaminated ambulances that is efficient and may be cost-effective compared to traditional methods. This methodology could also be used to implement active or routine surveillance for infectious agents like MRSA. Thorough disinfection techniques, like UVGI, often require ambulances to be decommissioned for extended periods.[16] Pooled sampling to detect heavily contaminated ambulances may be a practical alternative to identify which ambulances within a fleet require more rigorous cleaning and disinfection.[16,17]

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PUBLIC HEALTH PRACTICE

Mobilizing Communities to Sustainably Produce Face Masks: Public Health Practice in the Time of COVID-19

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ABSTRACT

Background: Face mask shortages in health care and use recommendations and requirements in a variety of community and professional contexts associated with the coronavirus disease 2019 (COVID-19) pandemic in the United States created initial and ongoing demand for face masks. In March 2020, the US Centers for Disease Control and Prevention (CDC) provided guidelines for use of cotton masks for individuals in health care settings and in public. Community volunteers provide a potential workforce to rapidly and flexibly address critical needs in emergent circumstances.

Methods: People Protecting Each-other Sustainably (PPEs) was developed to recruit and manage over 100 Northeast Ohio volunteers. People Protecting Each-other Sustainably used the social media platform Facebook to facilitate material donations, volunteer recruitment and training, and to function as an ongoing central communications hub. Leaders used an assembly line process with zero contact pick up and drop off at multiple stages of production to allow safe assembly and distribution of face masks.

Results: A total of 7 695 handmade face masks were created to distribute to local frontline responders in 10 weeks. Use of upsourced and donated materials allowed this project to reduce potential landfill waste and made a zero cost project possible. Volunteers had positive responses to the project and reported benefits from their participation.

Conclusion: This model has been successfully recreated by a smaller group in Geauga County, Ohio, with similarly successful results. Clearly this model of community mobilization has the potential to be replicated in other state of emergency crises and emergency response situations to produce lifesaving or necessary equipment when industry standard equipment is not readily available.

Keywords: COVID-19; PPE; Community volunteers; Sustainability

INTRODUCTION

Emergent community volunteers potentially provide essential services during times of crisis. Although much prior research about community volunteers has considered their impact following natural disasters,[1-3] the circumstances following the emergence of the coronavirus disease 2019 (COVID-19) pandemic have provided unique opportunities for lay individuals as well as public health and health care professionals to contribute in multiple ways. In particular, initial shortages of N95 ventilator face masks,[4] led to US Centers for Disease Control and Prevention (CDC) recom-

mendations for use of cotton face masks as a "last resort" for health care workers.[5] Later CDC guidelines recommended use of cloth face coverings for any individual (other than children under 2 years of age or those for whom mask wearing presents special risk) going outside of their home.[6] As a result of these recommendations, multiple grassroots and community-based efforts emerged to mobilize volunteers to contribute to construction and distribution of fabric face masks. The purpose of this report is to describe how a group of community leaders, People Protecting Each-other Sustainably (PPEs), collaborated to facilitate sustainable creation of 7 695 hand sewn masks in a period of 10 weeks,

beginning March 23, 2020, for the benefit of under-resourced first responders. This report aims to provide a model of community-based public health practice that might be applied in other contexts or toward other goals.

Face Masks for Infection Prevention

Face masks for protection against transmission of COVID-19 are, at present, broadly recommended by the CDC and also recommended for nonprofessionals in some instances by the World Health Organization (WHO).[7] Masks are potentially beneficial for both source control (ie, preventing people who are infected from infecting others) and as a means of personal protection for those who are not infected.[8] Although there have been no results of randomized controlled trials reported to date on use of various face masks in public settings to reduce spread of COVID-19, prior research on face masks indicates some protection in shared living situations such as households or university dorms.[9] Research has suggested handmade 100% cotton masks with no filtering material offer about one-third as much protection as a medical grade N-95.[7] However, in comparative assessments of filtration efficiency, a measure of the ability of a mask to block aerosol particles, higher thread count cottons and some fabric blends that included cotton had performance comparable to N-95 masks.[10] Additional advantages of widespread mask use include reduction of stigma directed toward those wearing masks and additional protection provided in instances of individuals who are asymptomatic or have mild cases of COVID-19.[7-9,11]

Emergent Volunteers

Community-based emergent volunteers have played a role in natural disasters and the aftermath of violence associated with terrorist attacks.[1,12] Volunteers are often one of the true first responders in an emergency. Advantages that facilitate their quick response include residing in a locality, having local knowledge, and not needing to navigate organizational infrastructure prior to decision-making.[1,3] Many volunteers find their experiences are empowering and rewarding and result in improvements in confidence and sense of self-worth[2,13] and increase social capital.[3] Difficulties can occur when formal aid organizations arrive after the initial efforts made by emergent community-based helpers.[3] Fortunately in remote or home-based work, such as the project described here, there is substantial potential and need for volunteer contribution with minimal potential for conflicts to occur between professional and lay helpers.[3] Even when not working in physical proximity, it is possible to retain a sense of group unity, another advantage of emergent volunteerism[11] that occurs when individuals are focused toward a common goal.

METHODS

Setting

This project, originally based in Kent, Ohio, aimed to address an identified shortage of face masks in the area with particular focus on first responders. Due to its location in Portage County proximate to the Summit County line, both counties were included as the target geographic area. Because of the dual aims of providing personal protective equipment and using sustainable practices, the organization was titled: People Protecting Each-other Sustainably (PPEs). Three individuals, including the first and second author, had overall project leadership roles. From this leadership team, each county was assigned a leadership champion to coordinate the donations, volunteer recruitment and training, distribution of materials, and distribution of completed face masks to first responders, essential employees, nonprofit organizations, and local businesses. The third leadership champion was recruited as the project expanded to support each counties' designated leadership champion to alleviate strain and fatigue.

Volunteer Recruitment

A Facebook page was developed on March 23, 2020, and served as the central virtual hub for the project to coordinate volunteer recruitment, training, and communication beginning on March 25, 2020. Administrative access to the Facebook page was limited to the 3 leaders to ensure project needs and milestones were clearly disseminated to the entire group as production efforts increased. In addition to Facebook, collaborative partnerships with existing community groups such as a local time bank and a sustainable sewing group were established to increase volunteer participation.

Volunteers were organized into categories based on their skills/abilities and the amount of time and resources they could contribute to the project: material donors (n = 27), material cutters (n = 26), sewists who were required to have a sewing machine (n = 54), and/or distributors (n = 3). The majority of sewists were already members of the Socially Responsible Sweatshop of Kent (SRS) or experienced professional sewists. As the project gained momentum in the community, several additional sewists joined from outside these partnerships. Other volunteers, primarily members of the Kent Community Timebank, donated fabric, T-shirts, and thread; laundered fabric and T-shirts; cut fabric into rectangles and T-shirts into tarn (T shirt fabric cut to make a long, continuous strip that can be woven or used in place of stretch cord or elastic); and helped with deliveries as stay-at-home orders relaxed.

Procedures

Training. A handbook was developed in a publicly viewable Google document, based on a mask pattern identified by SRS for its simple and effective design 2 days after initiating the project on March 25, 2020. The hyperlink to this document is included in the Appendix. The handbook includes links to YouTube videos for the mask pattern and instructions to make tarn, which comprised the ear straps. The handbook was pinned in a post at the top of the PPEs Facebook page. Phone training by professional sewists was made available for any volunteers who had questions. Volunteers who had extra shears, needles, or thread donated those to volun-

teers who needed additional supplies. A Google sheet was created by leaders to track donors, volunteers, sewists, supplies, requests for masks, and distributions.

Production and Distribution. Volunteers laundered fabric donations which were delivered to cutters. When cutting was complete, cutters contacted project leaders via message, email, or text. Cut supplies were packaged into individual mask-making kits which included tarn and fabric rectangles. Sewists received between 50 and 100 kits at a time. After masks were assembled, sewists contacted project leaders who then picked up completed masks, compiled totals, and determined delivery location for each batch. All transfer of supplies and products was conducted in a zero contact manner (ie, day and time was arranged and the leadership champion for that county would drop off materials or pick up finished masks from the volunteers' porches without coming into contact with each other directly). Following recommendations from local hospitals, only donations of 100% tightly woven cotton material without compromise to its integrity were used in the production of face masks. Unusable fabric/clothing donations were delivered to the Save the World yellow drop boxes as most brick and mortar donation centers were closed. Scraps from cutting were saved to be used in a special project by the SRS. Using this model, we were able to produce and deliver our first donation of 300 masks only 5 days after our recruitment efforts began.

As a preventative measure to detour material and resource waste, we gauged the skill level of all sewists with a small sample of 20 to 25 sewing material kits. Upon completion of the initial sample, sewists who produced quality masks were scaled up and those with skill levels that did not meet quality standards were deferred to other material preparation jobs such as laundering or cutting. All finished face masks were screened for quality prior to donation into the community. Very few masks were not able to be distributed because of this quality control protocol. Any masks found to be unusable were donated to the SRS to be repurposed in other projects.

Expansion. An overwhelming sense of need for personal protective equipment (PPE) was expressed by local first responders and other organizations responding to the threats of community spread. This, coupled with individual stressors and emotional impacts related to coping with the presence of a novel virus, comprised another factor which contributed to the need to expand the scale of the project. Encouraging volunteers not to overextend their individual contributions, investing in time to practice self-care, and continuously recruiting more volunteers to help bear the workload to accomplish the projects' objectives through expansion relieved not only the burden of workload but also reduced emotional distress for new and existing volunteers. Most volunteers reported a sense of empowerment and self-worth throughout and concluding the project.

As hospitals developed their own mask plans and patterns, and as more sewists joined our project, there were many suggestions of alternate patterns. After review of alternatives, the leaders announced that sewists could select alternative patterns, and have their masks included in PPEs distribution, but these alternative designs could not be fully supported by the PPEs assembly line or supply chain. Several sewists agreed to supply their own materials and take advantage of PPEs's offer to distribute their masks.

The methods employed in the PPEs model including standardized production, zero contact pick up and drop off, and production tracking sheets were replicated with small changes by other community groups with similar goals. A group in Geauga County consisting of 16 volunteers (9 sewists and 7 material donors) followed the PPEs model with some adjustments. This group used a less structured production process which decreased the total number of masks they were able to produce, but still enabled them to achieve a meaningful impact on their local PPE shortage.

Measures/Outcomes

The primary measures of interest included total number of face masks produced and distributed, estimate of positive environmental impacts from sustainable production practices, and aspects of volunteer involvement including effort and perceptions of experience.

RESULTS

Initial multiple-delivery recipients included hospitals in Summit and Portage Counties and one-time recipients including senior centers, skilled nursing facilities, and social service providers. As availability and priorities shifted within Ohio, PPEs stopped delivering to hospitals and expanded to immigrant farm workers and meat packers, additional skilled nursing facilities, mental health facilities, friends and family, and others who lacked resources to procure face masks for personal or community use.

Donations made to the community were welcomed with much enthusiasm. People Protecting Each-other Sustainably was among many local efforts to address the shortage of PPE. We did not require those who accepted donations to track their use or reuse as we felt it would burden local responders as they struggled to meet the dynamic changes in service demands amid COVID-19 disruptions.

People Protecting Each-other Sustainably was able to detour approximately 570 yards of cotton material and 150 T-shirts from potentially ending up in landfills. This reduces municipality waste disposal needs, contributes to reductions in greenhouse gases, landfill space, insecticides and water usage.[14] Another benefit of repurposing cotton material was improved comfort of masks. Health care workers praised the use of tarn rather than elastic. According to individuals who had to wear masks for long periods of time, tarn compared favorably to elastic; its softer texture was associated with decreased pulling, rubbing, or chaffing.

Volunteers appreciated having the opportunity to contribute to the health of others. One stated, "I was gratified to be part of a

project that was doing something so worthwhile to assist during the shutdown. At first, I felt I might not be of any use because I don't sew, but I soon found out there were other tasks that I could do." Another volunteer described, "Participation in this project has given us the opportunity to feel like we are helping others in this time of need. It's nice to be part of something that helps so many in our community and beyond."

Volunteers also found the work therapeutic. According to one volunteer, "There were days when the time I spent sewing was a mental health lifeline for me." This volunteer echoed key benefits of emergent volunteerism, "This project is a fantastic example of how communities can mobilize, organize, and help during times of need. It really warms my heart that we were able to help."

DISCUSSION

In this report, we described how community volunteers were rapidly mobilized to sustainably produce a large number of face masks provided to first responders and others during the early weeks of the COVID-19 pandemic in Ohio. Development of assembly line style supply preparation and distribution facilitated consistent and quick production. Zero contact supply and mask delivery decreased risk for volunteers, leaders, and recipients. As noted by other researchers,[2,12] volunteers found having the opportunity to help others rewarding.

Given limited consensus in published literature for a standard mask pattern to inform an evidence-based decision in the selection of the face mask pattern at the time of production, we turned to our expert sewists in the SRS. We asked that they consider the recommendations of the local hospitals who had published patterns for individuals willing to sew face masks for donation, the skill level of community volunteer sewists, the ability to secure ample materials for production, as well as the limitations of the assembly line production methods the group planned to employ. Under the recommendation of the SRS, a face mask pattern was adapted from local hospital recommendations that would require minimal cutting, maintained two layers of cloth protection, and would be able to be replicated using upsourced donated materials. The largest adaptation made from hospital recommendations was the choice not to use elastic for ear loops. This practice was not supported by our sustainable values and elastic was in low supply due to an increased demand. Elastic was, therefore, replaced with tarn, an upsourced material made from T-shirts.

One unanticipated consequence for project leaders was dealing with the emotional impact of requests for face masks from organizations outside of the original priority recipients (health care first responders). Due to widespread shortages of face masks, organizations employing essential workers, ie, those who continued to work regardless of government stay-at-home orders, struggled to ensure a safe environment for their employees. Balancing our project aim with desire to help others in need was challenging for the project leaders. Fortunately, over time, due to changing circum-

stances and availability, it became easier for PPEs to accommodate a larger range of organizations.

In addition, the initial leadership team consisted of just the first and second author of this article. At times, responding to organizational and logistical demands, while navigating personal challenges associated with COVID-19, was exhausting. Although burnout and frustration are noted as risks for emergent volunteers,[2,11] it may be that those in coordinator or leadership positions are yet more vulnerable, as volunteers may rely on organizers as role models for stress management and a calm demeanor. To help alleviate leadership fatigue, as the project expanded, a third leadership position was created. Fortunately, as stay-at-home health orders began to relax, some tasks that were initially assigned to the leadership team were delegated to trusted volunteers to ensure the demands of the project and volunteers' needs could be efficiently met.

Given the first and second authors' experience, we recommend those who are motivated to take on volunteer leadership positions for crisis or disaster response, be self-aware about their own abilities and limitations, and ensure that leaders, as well as volunteers, have ample support to prevent burnout and emotional exhaustion.

PUBLIC HEALTH IMPLICATIONS

Emergent volunteerism is a practice that can provide rapid, beneficial assistance during disasters, or disruptions, including pandemic. Additionally, some emergent community volunteers find their initial experience is a gateway that leads to further social service endeavors,[3] potentially increasing the pool of public health practitioners. Participating in a meaningful activity with overt goals and tangible outcomes may help counter social isolation associated with the COVID-19 pandemic, that for many resulted in loss of typical work and leisure opportunities. Although there can be challenges in collaborations between formal organizations and emergent volunteers, including those related to liability and risk management,[15] public health practitioners stand to benefit from the contributions of motivated individuals with local knowledge. Organizations should consider ensuring processes and policies are flexible enough to accommodate emergent volunteers.

Practically speaking, during the remainder of 2020 it is likely there will be additional need for face masks as these are recommended and, at times, required for attendance or participation in some activities or events. It is essential that convenient, reusable, comfortable masks are made available to all individuals and, in particular, those at higher risk including older adults and those who have limited financial resources. The process used by PPEs to sustainably and safely produce and distribute face masks provides a model for other organizations and motivated individuals.

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Please contact Andrew Snyder (asnyde20@kent.edu) for information to facilitate adaptation of this process in your community.

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APPENDIX

People Protecting Each-other Sustainably– PPEs

Google Document Hyperlink:
https://drive.google.com/file/d/1DQSWJ0hOAbbeVU3cf1aXwz5tm1Dzj88U/view?fbclid=IwAR1_s8l7OVW9YYMhttDCFw9puYX_Tn0ZBfQ6YZUK__JGQfph12WuDJRx2Qg

PUBLIC HEALTH EDUCATION

Strategies to Enhance Qualitative and Mixed Methods Research Instruction to Prepare MPH Students for Public Health Practice

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ABSTRACT

Background: The 2016 Council on Education for Public Health (CEPH) accreditation guidelines for Master of Public Health (MPH) programs describe skills, including qualitative and quantitative research skills while removing the requirement to structure programs around 5 designated core areas. These revised guidelines provide an opportunity to integrate qualitative and mixed methods instruction in multiple courses. The purpose of this paper is to describe process and outcomes of a project aimed at integrating qualitative and mixed methods content into core courses within the Kent State University MPH program.

Methods: Content development work was conducted from May through October 2019. The work consisted of content analysis of current core course content, research texts, practicum presentations, and feedback from alumni working in public health practice. Five key qualitative processes that support CEPH competencies and reflect current public health practice in Ohio were articulated to form a framework for new course content.

Results: New content was developed for each of the 6 current core MPH courses to address CEPH competencies, incorporate the identified 5 key processes, and to emphasize cross-methodological comparison and the complementary nature of qualitative and quantitative approaches to research questions or practice issues. Initial student responses to content were positive; further evaluation efforts are planned.

Conclusion: New content provides MPH students with skills practice associated with qualitative and mixed methods approaches to research and applied public health. To address complex public health challenges, current and future public health professionals will benefit from being able to flexibly move across methodological boundaries.

Keywords: Mixed methods; Qualitative; Public health accreditation; Master of Public Health; Research instruction

INTRODUCTION

Public health has a tradition of affiliation with epidemiologic and quantitatively analyzed research designs, often used with the aim of identifying causal relationships[1] to address a variety of concerns ranging from illness and injury to neighborhood patterns of violence.[2] Evidence-based practice is a related concept in that preferred evidence tends to be associated with conventionally quantitative designs such as randomized controlled trials,[3] while case studies and other uncontrolled designs that typify qualitative inquiry are depicted as less desirable, and by implication, less useful.

Similarly, public health graduate education in some institutions may emphasize quantitative research instruction. The 2011 Council on Education in Public Health (CEPH) guidelines for Master of Public Health (MPH) degree programs[4] allowed academic programs to identify their own competencies. However, the requirement to structure the MPH program around 5 designated core areas resulted in use of these core areas both as emphasis areas and to inform competencies. Two of the 5 core areas, epidemiology and biostatistics, are often, although not exclusively, associated with quantitative research education. The CEPH guidelines from 2011 described biostatistics education as including "health-related surveys and experiments; and concepts and practice of statistical data analysis."[4(p14)] The 2011 CEPH guidelines did not require that program competencies associated with these or the remaining 3 core areas (social and behavioral sciences, health services administration, environmental health) refer to provision or assessment of qualitative research skills. The extent to which qualitative

research instruction balanced quantitative coursework was determined at program level, and most likely was associated with faculty skills and interests.

In contrast, the 2016 CEPH update, which reflects the most profound adjustment to guidelines for public health curricula since the 1940s,[5] includes increased emphasis on qualitative and mixed methods research in public health education. Mixed methods typically refer to a combination of qualitative and quantitative data streams to address a common issue.[6] The evolution of CEPH guidelines is consistent with interest in and appreciation of qualitative inquiry which has grown steadily in the social sciences and other fields from the 1980s into the first decades of the 2000s.[7,8]

In the 2016 guidelines for MPH degrees, CEPH eliminated the 5 core areas and replaced these with a list of 22 described competencies. Two of 4 competencies associated with "Evidence-based approaches to public health"[9] include explicit mention of qualitative research:

- Select quantitative and qualitative data collection methods appropriate for a given public health context
- Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate.[9(p17)]

An additional competency specifies students must "interpret results"[9(p17)] which qualitative research methods yield.

The stated goals of the updated CEPH guidelines were to better prepare students for practice and to prepare them to empower communities to achieve improvements in public health.[5] Specific aims of the 2016 update included providing students with an integrated education, granting programs greater flexibility in curricula, and substituting focus on enhancing practice skills in place of presenting topical knowledge.[5]

Although it is likely the CEPH 2016 guidelines resulted in the need for modifications to many accredited MPH degree programs, a literature search suggests few scholars have disseminated reports describing their efforts. Published research about CEPH accredited programs tends to describe development and success of novel concentrations or emphases,[10,11] or to compare academic program accreditation with other credentialing,[12,13] or to describe the role of field placement requirements.[14,15] Authors of one paper provided recommendations for development of competency-based public health education although the work pre-dates the 2016 CEPH guidelines.[16] These recommendations are still relevant and include advice to develop courses to meet competencies, rather than to match competencies to pre-existing courses.[16]

At Kent State University, the MPH degree has traditionally emphasized statistical and mathematical reasoning within courses and their associated competencies, consistent with the 2011 CEPH guidelines.[4] The original 5 MPH concentration areas (presently reduced to 4 reflecting suspension of the environmental health

concentration) tracked with CEPH's 5 prescribed core areas. The quantitative focus also reflected the expertise of faculty recruited for development of this now 10-year-old college. In summary, neither core nor concentration requirements of the Kent State University MPH include a dedicated qualitative or mixed methods course, as neither of these was an essential component of instruction in the 5 core knowledge areas.

In response to the 2016 guidelines, content was integrated into one of the core courses, *Community Health Needs Assessment*, to ensure Kent State University MPH students were provided with adequate resources and ample skills practice opportunities to meet the "and qualitative" portions of the 2016 competencies, described above. While this content ensured the MPH was compliant with CEPH guidelines, research methods instruction across the concentrations continued to be relatively segregated and emphasized quantitative methods. Students were not provided with extensive opportunities within their courses for comparison or blending of qualitative and quantitative methodologies.

There are several reasons to encourage an inclusive approach to qualitative and quantitative research methods education. First, a joint presentation facilitates comparison of the strengths, weaknesses, and applicability of each approach, so that students are more likely to select the most appropriate and not just most familiar methods when they enter public health professional practice. Another important reason is that quantitative and qualitative knowledge in combination provide more complete information. Quantitative data might identify the scope of a problem, whereas qualitative data might contribute to understanding the complex reasons underlying a problem encountered in public health practice.[1] In clinical trials and other experimental designs, qualitative inquiry can enhance and clarify quantitative results by facilitating in-depth exploration of dropout, noncompliance, and other inconsistencies in data or results.[17,18] Qualitative data is also useful for practitioners when implementing previously developed programs to a new context, to ensure processes are refined as appropriate.[19]

The desire to make better use of the flexibility provided by CEPH 2016 guidelines by developing inclusive research methods instruction motivated an MPH curriculum review and development of recommendations for content refinement across the 6 courses required for all concentrations, that at the time of the review emphasized quantitative methods and examples. The purpose of this report is to describe results of an internally funded project undertaken to identify ways to integrate qualitative and mixed methods educational content into the 6 MPH core courses at Kent State University.

METHODS

Setting and Program Description

At the time this project was undertaken, there were approximately 225 students enrolled in the Kent State University MPH program.

This included students in 4 concentration areas: Biostatistics; Epidemiology; Health Policy and Management; Social and Behavioral Sciences, and included full-time and part-time, fully online, and traditional students. Students do not take all courses in the same sequence, and there are few courses that are designated as a specific prerequisite for another course. These circumstances mandated that content in a given course must be complete enough and focused enough to offer a meaningful learning experience without requiring courses be taken in a specific sequence. There are presently 6 core courses required for all MPH students.

Content Development

The project activities took place primarily between mid-May and the end of October 2019. Content development consisted of integration of information derived from content analysis of several sources. These included existing core course syllabi, multiple qualitative and mixed methods textbooks,[20-23] reports from culminating experience/practicum projects, and information informally solicited from 6 former students and a similar number of others working in public health practice. The overall goal of the content analysis was to develop a specific list of subskills that contributed to the CEPH competencies and could be used to inform specific course content.

Additional focused aims were associated with content analysis of each information source. Information taken from syllabi included course catalog description, specific learning outcomes, and current course assessments that focused on research processes such as design, data processing, and analysis. Other aims of this segment of content analysis were to identify current quantitatively-focused course assessments that might be modified to include an associated qualitative component, and to identify course-specific outcomes that suggested qualitative inquiry, such as an assignment to consider context-specific adaptations to programs. Qualitative and mixed methods research texts were consulted for definitions, examples, and directions for data processing and analysis. Other aims of this segment of content analysis included identification of high-quality resources for use as reading and instructional content in courses. Culminating experience or practicum reports that reflected qualitative or mixed methods designs were consulted to determine methods used to gather and analyze data and to identify typical questions and methods used for field placement research on behalf of agencies. After initial integration of information from content analysis, alumni, current students, adjuncts, and others who currently or formerly worked in public health practice were informally surveyed regarding common skills used in jobs, to identify skills beyond those used for field placement in a variety of public health settings.

All content analysis was conducted primarily by the author. Doctoral students additionally assisted with review of syllabi and practicum reports and provided feedback at various stages that informed development of the final list. Content of interest was extracted from course syllabi and practicum reports on an individual basis and then combined in order to develop a master list of subskills. The initial list was discussed informally with alumni and others who had public health practice experience, and this information facilitated further refinement of the list. Lastly the developed list was compared with text content to check availability of instructional resources and to identify what additional information needed to be located or created. This initial content assembly and review took approximately 6 weeks and resulted in development of the following list of 5 key processes: (1) Preparing data and conducting qualitative coding for data analysis, (2) *Quantitizing* qualitative data (compiling unstructured/qualitative data into categorical or count data), (3) Developing questions or prompts to elicit useful information in qualitative interviews, (4) Describing one or more ways to use mixed methods to address a single purpose, and (5) Using qualitative evaluation methods to identify unintended consequences of public health programs.

Following identification of these processes, current syllabi, assessments, and course readings were reviewed again in greater detail to ensure coherence between content to be developed and the tone of each course. Draft versions of new content, including assessments and readings, were reviewed for fit, consistency, and comprehensiveness of information by a doctoral student who possessed extensive experience in instruction, content development, and qualitative inquiry. Recommendations from this content review, which included ways to improve clarity of instructions and identification of supplemental resources, were incorporated into the recommended version of developed content.

Content development for each of 6 core courses took roughly 2 weeks per course, with another several days to one week for the review and revision process. Preliminary recommendations were presented twice: once for public health faculty and once at a university teaching and learning event. The project funding provided 10 weeks of full-time (40 hours/week) support for the author. The remainder of the work was completed using a portion of assigned teaching hours. Graduate student participation was provided through a combination of voluntary and college-supported time.

Notably these processes, with the possible exception of the first item, are not exact duplicates of CEPH competencies. However, process 4 is consistent enough with the "select methods" competency that both aims could be met in a single course. Process 3 goes beyond CEPH competencies by providing instruction in gathering data, which is not included in CEPH MPH competencies with respect to qualitative or quantitative research but is an important skill in public health practice.

RESULTS

Table 1 shows courses, 2016 CEPH competencies addressed by new content, a brief description of new content, and a sample course learning outcome. This content was developed to address

Table 1. Core Courses, Competencies, Content, Skills and Outcomes

Core course	Materials and assessments	Skill	CEPH competency[a]	Key process[b]	Course Learning Outcome
Biostatistics	A set of narrative case notes describing similar health concerns used to derive categorical and count variables. Derived variables are used in statistical or mathematical calculations to describe trends in the sample.	Quantitizing qualitative data	3,4	2	Apply basic content analysis techniques to unstructured or text-based data, to create categorical variables that may be analyzed using mathematical or statistical calculations.
Epidemiology	Case study describing an outbreak; options show varying range and number of resources available for investigation and contact tracing	Efficient use of qualitative methods with epidemiological data to gain comprehensive understanding	4	4	Describe how different methods may be used to enhance or clarify results from observational (epidemiological) studies.
Environmental Health	Case studies that describe historical environmental health crises; planning data collection to assess a variety of responses and impacts	Identifying quantitative and qualitative methods to gather various types of information	2	4	Identify appropriate data collection methods to address specific aspects of a provided case
Social Determinants of Health	Case studies describing individuals and families and reflecting a range of contextual details; open access interviews are provided to show examples of semi-structured interview questions and prompts	Developing questions and prompts to elicit useful information	2	3	Demonstrate the ability to develop a semi-structured interview guide to address a given set of circumstances
Community Health Needs Assessment	Fictional interview transcript of community members discussing priorities for public health; code list for a priori coding	Formatting data for analysis. Conduct first cycle open coding using descriptive and in vivo methods; conduct theoretical coding to associate excerpts with a priori codes	3	1	Given sample data, demonstrate the ability to perform qualitative open and theoretical coding
Public Health Administration	Case studies describing new public health initiatives and a range of consequences; focus is on context- and culturally specific perceptions of outcomes	Use results from program evaluation to identify unanticipated outcomes	4	5	Identify advantages in use of mixed methods to public health practice with diverse populations

[a]Competency 2: Select quantitative and qualitative data collection methods appropriate for a given public health context. Competency 3: Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate. Competency 4: Interpret results of data analysis for public health research, policy, or practice
[b]Key process 1: Preparing data and conducting qualitative coding for data analysis. 2: Quantitizing qualitative data. 3: Develop questions or prompts to elicit useful information. 4: Describe ways to use mixed methods. 5: Identify unintended consequences of public health programs.

the 5 processes while emphasizing cross-methodological comparison, and ways to take advantage of the complementary nature of qualitative and quantitative approaches to research questions or practice issues. All content reflects an addition to existing course content. Additional content detail is available by contacting the author.

The constructivist nature of qualitative research, meaning that researchers and practitioners respect the role of each individual's perceptions and values in shaping his or her view of the world[21] is an important attribute of qualitative research and therefore discussed within developed course content. That said, the focus of

much instructional content was more closely aligned with the pragmatic paradigm,[7,24] that specifies that researchers prioritize use of methods and designs most likely to address the purpose of a given research project, over other considerations including philosophical orientation. Because integration of qualitative and quantitative results is an advanced research skill, emphasis was on identifying uses of mixed methods rather than on instruction in fully integrated analyses.

To date, students have been given opportunities to complete online and in person modules that provide opportunities to learn about and practice basic qualitative data analysis, all within a sin-

gle course. New content was originally intended to be incorporated into all existing core courses in association with the scheduled, staggered course revision schedule. Traditionally, this has followed a 3-year timeline between major course revisions, although challenges associated with alternative content delivery for Fall 2020 will most likely impact the major revision schedule. Under normal circumstances, the span to incorporate content would run from Fall 2020 to Spring 2023.

Initial student assessments are primarily positive, with some students, including working professionals, enthusiastically recognizing clear applicability of qualitative or mixed methods approaches in their current public health practice. Instructor assessment of student work suggests the need for further refinement of content to emphasize the value of nuance in transcripts and other practice data. For example, some students have demonstrated a tendency to assign broad concrete codes (eg, "environmental issues") rather than being attuned to context-specific aspects of concerns presented in the data (eg, "poor air quality exacerbates asthma").

Of 52 students surveyed who received in person qualitative content, just over half (n = 26 or 54%) indicated the information was "very useful," with another 40% (n = 21) indicating the information was "somewhat useful." Open response student comments were not extensive but included positive statements (eg, "I enjoyed learning about this."). Additionally, 2 students reached out to course instructors shortly after completing qualitative assignments to begin to plan qualitative practicum projects. Similar data were not initially gathered from the slightly larger number of online students as cohort evaluation is planned at a later date, as described below. Additional planned evaluation processes include the following:

- Survey of students on sufficiency of research training on the initial MPH exit survey. Survey items track with the CEPH competencies and include both a quantitative/rating and qualitative/commenting component. This process is intended to begin when the first cohort who completed qualitative content graduates in Spring Semester 2021.
- Survey of instructors regarding new content. This will be given at the end of the academic year when a given course has been revised, so will reflect experiences from at least one and up to 4 sections of a given course. Items assess quality and clarity of content, ease of assessing, and student feedback.
- Tracking proportion of practicum projects with qualitative data streams, alone or in combination with quantitative data streams.

DISCUSSION

This public health education paper described content modifications developed for the Kent State University MPH program. These modifications were aimed to exceed 2016 accreditation guidelines related to qualitative and quantitative research processes. Aspects of this content will allow students to begin to explore integration

of qualitative and quantitative methods and results and to strive toward mixed methods approaches to inquiry in their professional practice. Importantly, the focus of this work has not been to de-emphasize quantitative methods in favor of qualitative inquiry, but rather to train student researchers to understand and appreciate the role and value added by both flavors of inquiry. It is important to acknowledge the role of the Kent State University Teaching Council and College of Public Health administration for their support for this work. Institutional and academic unit support not only makes the work possible but also demonstrates to students and faculty the institution's commitment to ongoing enhancement of qualitative research instruction.

Scholar/educators have recommended developing courses to fit competencies, rather than fitting competencies to courses.[16] With this project, an alternative to either of these approaches was used. In essence, 3 competencies were reinterpreted in various ways across 6 courses with different emphases. This is meant to create a learning experience consistent with the theory that expertise is gained not through theoretical knowledge but through participating in and processing multiple context-specific experiences.[25] It is hoped that this new content resonates more deeply with students by presenting related ideas in different ways rather than by repeatedly reinforcing the same idea. This also points to a strength and efficiency of this process which is revision and refinement of existing content rather than creation of new courses. An associated advantage is that refinements developed through this process were not substantial enough to require curriculum action, instead these are easily processed as information items. Additionally, use of existing assessments as a starting place for revisions means that new content is more likely to seamlessly integrate with existing content.

Incorporating these or similar content modifications presents opportunities to contribute to student knowledge but is associated with multiple challenges. These include that fewer faculty in some public health degree programs are well versed in both qualitative and mixed methods research when compared to those with proficiency in epidemiology or biostatistics; many programs and associated faculty reflect the priorities from the 2011 and prior CEPH guidelines.[4] This is a key challenge for this specific program as the majority of faculty have little to no qualitative research experience or training. For fully online courses, this is partially navigable by blending content from multiple faculty and developing comprehensive instructor guides to assist faculty in grading assessments. Realistically, in any accredited public health program, faculty skills and unit-specific workload expectations may facilitate or limit integration of additional qualitative content into existing courses.

Limitations of the described processes include that informal feedback provided by alumni and practitioners was not solicited systematically, and the completion of this project during a compressed time frame prevented contact with some individuals who might have provided different views or recommendations. The

staggered course revision schedule extends the timing of content evaluation, and there is a chance that different needs may emerge between the time of content development and scheduled revisions for a given course, necessitating revision of the revision(s), prior to integration.

There is an additional challenge associated with assessing the actual impact on public health practice. Professionals working in public health and other fields have engaged in qualitative and mixed methods research when necessary to do so, sometimes with extensive and sometimes with little to no academic training. It is difficult to support the assertion that MPH graduates who were exposed to additional content are more capable or confident researchers. The best approach to assess outcomes is most likely a mixed methods evaluation to assess research productivity, whether via publications, evaluations, or other outputs associated with practice in combination with self-assessment of research skills. This evaluation would be enhanced by including feedback from alumni, collaborators, and other colleagues and might potentially be incorporated into current information gathering required for accreditation.

One area that warrants further exploration is development or refinement of directed elective course offerings to facilitate students' ability to dive more deeply into integration of qualitative and quantitative methods to address their particular research or practice interests. To this end, 2 doctoral level public health qualitative research courses were approved through the Kent State University curriculum process for modified delivery as 7-week online electives in the MPH program. These courses will be offered for the first time for MPH students during the 2020-2021 academic year. Further 1-hour dedicated content modules, to be offered online as 5-week courses, are approved or in the process of approval, and are planned to be made available for doctoral or MPH students. While some students will be motivated to explore the philosophy and myriad alternatives associated with qualitative inquiry, for other students acquisition of basic skills in interviewing, transcribing, and coding data via single credit-hour courses might meet their current needs.

PUBLIC HEALTH EDUCATION IMPLICATIONS

Prior to the 2016 guidelines, MPH programs had more flexibility to develop competencies although curriculum was limited by the need to structure around 5 designated core areas. The CEPH 2016 accreditation guidelines provide opportunities to meet competencies related to qualitative and quantitative research across multiple courses. To address increasingly complex issues, future public health professionals will benefit from improving appreciation and understanding of qualitative, quantitative, and mixed methods approaches.

The current coronavirus disease 2019 (COVID-19) crisis illustrates a good example of a health concern that is communicated largely in quantitative means (numbers, rates, and trends) while virus spread is related to individual and behavioral processes, and investigated through contact tracing, that relies largely on qualitative interviews. Optimally prepared public health professionals understand the strengths and weaknesses of each approach and can visualize how qualitative and quantitative methods can be used in complementary ways.

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PUBLIC HEALTH EDUCATION

Developing Continuing Education for Ohio's Local Boards of Health

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ABSTRACT

Background: Public health functions at the county level and city level through the work of local health departments (LHDs). Local boards of health (LBoHs) work closely with LHDs as an administrative oversight body. In 2013, legislation was passed in the state of Ohio pertaining to the accreditation of LHDs, which included a provision requiring that Ohio's LBoH members engage in 2 hours of continuing education (CE) per year. To assist LBoHs in fulfilling these requirements, a partnership was developed between the Ohio Association of Boards of Health (OABH) and the Kent State University College of Public Health (KSU-CPH) to deliver CE content.

Methods: The process for developing the CE modules encompasses 3 steps: (1) needs assessment, (2) module development and delivery, and (3) evaluation. Feedback was solicited from Ohio's LBoH members to determine topics of interest for CE modules. Taking this feedback, a curated set of 8 modules will be developed. Module content will be derived from graduate courses within KSU-CPH as well as from subject matter experts. The modules will be delivered online to LBoH members during their regularly scheduled meetings.

Results: This program proposes to fulfill state requirements that LBoH members regularly engage in CE. Partnering with KSU-CPH allows for the use of academic content in these trainings.

Conclusion: An adequately trained public health workforce is essential for a well-functioning public health system, which includes governing entities like LBoHs. There is limited understanding of how workforce development can be targeted specifically to LBoHs. This CE program contributes to current efforts to promote workforce development within the field of public health.

Keywords: Workforce development; Continuing education; Boards of health; Local public health; Public health governance

INTRODUCTION

In the United States, the public health system functions at the county level and city level through the work of local health departments (LHDs). Tasked with controlling the spread of disease, protecting against environmental hazards, preparing for and responding to emergencies, and promoting healthy behaviors within locally defined jurisdictions, LHDs are an important point of contact for protecting and improving the health of the communities they serve.[1] Local boards of health (LBoHs) work closely with LHDs as an administrative oversight body.[2] They assist in ensuring LHDs have the resources and capacity to respond to population health needs within their jurisdiction. Local boards of health are considered the "most common type of public health governing entity"[3] and are essential for ensuring the public health system functions effectively at the local level. Boards of health members are appointed or elected and undertake a variety of activities, including budget approval, creating and administering public health rules, setting fees for local public health services, and serving as an adjudicatory body within their city or county of jurisdiction, among others.[4]

More than three-fourths (77%) of LHDs across the United States (US) have an LBoH.[5] Within the state of Ohio, there are 112 LBoHs that work with LHDs in 5 defined regions across the state: central, northeast, northwest, southeast, and southwest. Each LBoH is comprised of at least 5 appointed members. As stated previously, LBoHs play an important role within the work of LHDs and the

training and education that LBoH members are equipped with are essential for fulling their duties. Public health governance is broadly defined as 6 distinct functions: (1) policy development, (2) resource stewardship, (3) legal authority, (4) partner engagement, (5) continuous improvement, and (6) oversight.[3] A seventh domain pertaining specifically to LBoHs was identified by Shah et al[6] which includes the individual characteristics and strengths of each board and their ability to respond to community needs. The capacity of LBoHs to provide oversight to LHDs is dependent in part on the board's ability to respond effectively, and ensuring LBoH members are adequately trained (ie, equipped with a working knowledge of their role and its responsibilities therein) is an important component of this.[7] It has been noted by Newman and Leep[5] that while many LBoHs across the US are comprised of health care professionals, fewer than 20% have had formal public health training prior to their appointment and that educational programs are necessary in order to assist them in fulfilling their roles. Indeed, the 2015 "Local Board of Health National Profile" conducted by the National Association of County and City Health Officials (NACCHO) identified that only 1 in 5 LHDs report having a formal, ongoing training program for LBoH members and that only one-third train members on governance-related topics. This report also acknowledged that LBoH members may not take on their roles with a full understanding of their duties and functions.[1] There is a recognized need for comprehensive training pertaining to governance and public health concepts.

Workforce development is an important aspect of many professions, including public health. Within the field, public health workforce development plays a crucial role in not only enhancing the skills and performance of public health workers at all levels but also ultimately improving health outcomes.[8] Evidence of the need for an adequately trained and responsive public health workforce has never been more apparent than in the response to the coronavirus pandemic at the local, state, and national level.[9] Efforts to train public health workers incorporate many different modalities, including in-person trainings, virtual modules, webinars, hybrid trainings, and hands-on skill building, offered through many different organizations and agencies.[10] The purpose of continuing education (CE) is to "update and reinforce knowledge" and the goal is to ensure public health professionals have the appropriate knowledge and skills to guide or govern public health practice.[11] The public health workforce encompasses a variety of different types of professionals including administrators, educators, clinicians, and scientists, among others.[12] As a key oversight body for LHDs and due to the acknowledged need for training[5], LBoHs are another potential target for workforce development and CE. Due to the responsibilities of LBoHs in overseeing the work of LHDs, adequately training boards of health members is important to ensure that local public health system functions effectively.

Recognizing the need to assure that volunteer boards of health members were competent to exercise their policymaking and oversight responsibilities, the Ohio General Assembly enacted House Bill (HB) 59 in 2013. This legislation and the administrative rules adopted after its passage[13] set forth a series of directives to guide the work of LHDs. Section 3701-36-03 of the Ohio Administrative Code (OAC) establishes a set of "minimum standards" LHDs need to meet in order to receive state subsidy funds. Included among these standards are a requirement that each member of Ohio's boards of health complete 2 hours of CE each year. Specific guidance on overarching topic areas that should be covered by CE modules are specified in OAC 3701-36-03 and include ethics, public health principles, and boards of health member responsibilities. These standards have been in place since 2016. To fulfill this directive, an annual planning committee of LBoH members and LHD health commissioners convened by AOHC selected CE topics and recruited subject matter experts (SMEs) based on topics or issues identified through a survey of OABH and AOHC members. Continuing education content was delivered through recorded lectures of approximately 15 minutes in length by SMEs provided to OABH member LHDs in compact disc (CD) format.

In 2019, the agreement between OABH and AOHC ended and a partnership between OABH and the Kent State University College of Public Health (KSU-CPH) was established to develop and deliver these CE modules in a new way (ie, utilizing online learning platforms). This work describes the process. Workforce development and CE play an important role in ensuring public health workers and leadership are poised to respond effectively to the population's health needs. There is currently limited understanding of how workforce development and CE may be implemented within LBoHs. The aim of this paper is to describe the development of a series of CE modules to be delivered to Ohio's LBOH members to fulfill the requirements established in OAC 3701-36-03.

METHODS

The process for developing the CE modules encompasses 3 steps: (1) needs assessment, (2) module development and delivery, and (3) evaluation. Each step will be undertaken by the research team (MS, KS, and DK) in consultation with OABH and SMEs. The CE modules include materials that were developed within graduate courses in the KSU-CPH, as well as additional content designed by experts in the field. As the modules are developed over the next year, they will be hosted by the KSU-CPH and disseminated to LBoHs. The process for developing the modules is described below.

Setting

With the growing use of online learning in multiple educational settings, many fields, including health-related fields, have opted to deliver CE through online formats.[14] Offering CE online allows for greater flexibility in accessing courses for participants and is a cost-effective way to deliver content.[15] The CE modules described in this program will be delivered online at LBoH meetings. This will allow board members to complete the modules as a group.

The modules will be delivered through guest accounts that enable access to the Blackboard Learn™ learning management system, the platform used for online learning at Kent State University. The modules will be delivered and hosted by the KSU-CPH. Each participating LBoH will have the opportunity to determine when the modules will be accessed during their meetings.

Educational Program Description

As previously mentioned, OAC 3701-36-03 requires that LBoH members complete 2 hours of CE each year, encompassing 3 broad topic areas: ethics, public health principles, and board of health member responsibilities. This program fulfills these requirements by delivering CE content to LBoH members. The online nature of the course delivery will allow for increased flexibility in completing the content and meeting OAC 3701-36-03 requirements. This online platform is also an advantageous method for delivering CE content from the previous use of CDs as it allows LBoH members the opportunity to complete modules at their pace, view them as a group during their meetings, and, given the recent environment of remote work and virtual meetings, enables easier access to the modules that would not be possible with hard copy materials. Additionally, the online format allows for greater flexibility on the part of SMEs who have the opportunity to record, as well as easily update, their material while also working remotely/virtually.

RESULTS

The process for developing CE modules follows 3 steps: (1) needs assessment, (2) module development and delivery, and (3) evaluation. These steps are displayed in Figure 1 and described in the following section.

Needs Assessment

To determine the areas and topics of interest for CE modules, the authors solicited feedback electronically from LBoH members through the OABH and AOHC in winter 2020. Local boards of health members were given a list of possible module topics under the 3 overarching topic areas outlined in OAC 3701-36-03 (ethics, public health principles, and board of health member responsibilities). Members were asked to select each of the topics they were most interested in learning through CE, in addition to sharing other potential module topics not listed. Table 1 presents the poten-

tial topics presented to LBoH members. These potential topics were based on past CE modules presented to LBoH members, as well as input from OABH. Local boards of health members were asked to identity the region of the state they represented (based on Ohio Department of Health's 5 districts) as well as the cities/counties their LHD serves. Respondents serve a variety of communities—urban, rural, and suburban. Future module development beyond this pilot year may take into consideration the differing needs LBoH members may have based on the communities they serve. For this pilot year, the topic areas identified by the majority of respondents were highlighted for module development.

Other topics that members reported an interest in included: foundational public health services, human resources, core competencies, crisis communication, isolation and quarantine, and networking/interfacing with local government. The results of the needs assessment were compiled to guide module development. In this pilot year, a curated set of 8 modules will be developed, with the intent to launch new modules each year based on feedback from LBoH members.

Module Development and Delivery

Based on the feedback provided by LBoH members and institutional knowledge from SMEs about workforce development, potential module topics were conceptualized. The following topics were selected for initial module development: Introduction to Ohio's Sunshine Laws, Introduction to Ohio's Revolving Door Laws, Financial Management, and Public Health Ethics. Additional modules identified as relevant to LBoH members include: Grant writing, Overview of Community Health Assessments (CHAs) and Community Health Needs Assessments (CHNAs), Health Disparities/Social Determinants of Health, and Performance Management. In cases where there is no existing material available within the KSU-CPH, modules will be developed by SMEs from within the college, as well as from a broader network of academics and public health practitioners locally and statewide. Subject matter experts from outside the state of Ohio may also be invited to present modules when appropriate. The modules will consist of recorded lectures about the content area and will include a brief evaluation at the end to assess whether learning objectives were met and the degree to which new knowledge was gained from viewing the
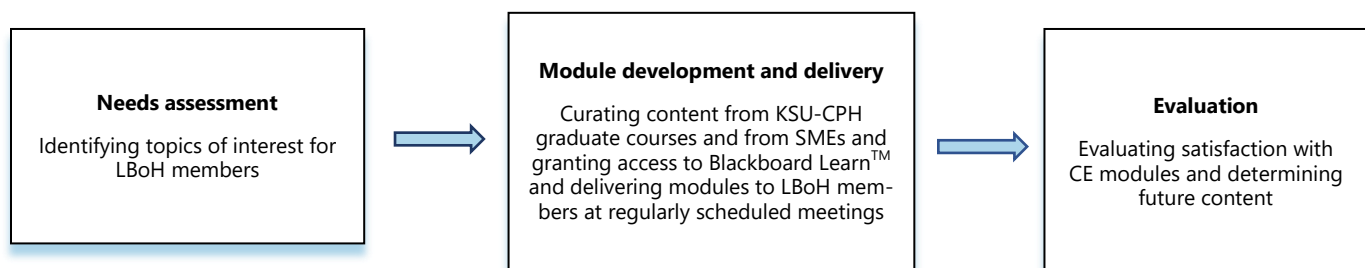

Figure 1. Process for Developing CE Modules

Needs assessment	Module development and delivery	Evaluation
Identifying topics of interest for LBoH members	Curating content from KSU-CPH graduate courses and from SMEs and granting access to Blackboard Learn™ and delivering modules to LBoH members at regularly scheduled meetings	Evaluating satisfaction with CE modules and determining future content

Table 1. Potential Model Topic Areas Presented to LBoH Members for Feedback

Public health ethics	Introduction to public health ethics
	Frequently occurring ethical issues in LHDs
	Addressing unethical behavior within LHDs
Public health principles	Introduction to Ohio's Sunshine Laws
	Introduction to Ohio's Revolving Door Laws
	HIPAA and LHDs
	Interfacing with state public health agencies
	Social determinants of health/health disparities
	Ten essential services
	Health equity in all policies (HEiAP)
Board of health member responsibilities	Board of health overview
	Financial statements/financial management
	Public health accreditation board (PHAB) accreditation
	General rules for establishing fees
	Governance functions
	Performance management
	Communications

module. Because the state requirement is for LBoH members to engage in 2 hours of CE per year, a set of 8 modules (15 minutes each) will be delivered over the course of the year. The brief duration of each module is to ensure LBoH members have the opportunity to complete the CE during regularly scheduled meetings and as a group. The modules will be hosted by KSU-CPH using Blackboard Learn™, an online learning platform.[16] Local boards of health members will be granted guest accounts to access the content. The online format allows for flexibility in how the content is accessed and also provides LBoHs the opportunity to learn from SMEs without needing to schedule an in-person lesson. At the end of each lesson, SMEs will provide their contact information to allow LBoH members to reach out with further questions and to network with instructors. Following this pilot year, additional supplemental materials may be included with each module to ensure LBoH members have the information they need in the absence of in-person instruction.

Modules can be structured in different ways but will likely follow similar formats. As an example, a Public Health Ethics module that will be delivered through this new partnership begins with a set of learning objectives that introduce learners to the purpose and expectations for the CE session which include "Identify the principles of ethical practice in public health" and "Apply an ethical framework for the analysis of ethical issues to decision making in the local health department." In the narrated lecture, learners are also introduced to the differences between clinical ethics and public health ethics, the principles of ethical practice in public health, the complementary roles of law and ethics, ethical frameworks for decision making, and examples of ethical issues that LHDs may confront. These topics are pertinent to the functioning of LHDs, and relevant to the role of LBoHs as governing entities. Additional modules featuring new content that cover other topics would be structured in a similar way, where the content would be focused on the needs of LBoHs as oversight bodies for LDHs.

Evaluation

In order to assess the program's ability to effectively deliver CE content, as well as informing future module topics, an evaluation will be conducted at the beginning and end of the program, as well as after each module. At the start of the program, LBoH members will be asked to rank their current understanding of the content areas, as well as at the end, to measure the effectiveness of the training. Additionally, following each module, LBoH members will be asked to comment on the module's content in order to understand the effectiveness of each individual module.

DISCUSSION

Ohio has taken a proactive approach in assuring that its LBoH members develop the skills necessary for effective governance of LHDs. Effectively delivering this skill-building training through high-quality continuing education content may pave the way for other boards of health across the US to extend similar requirements to their members. Expanding CE requirements and opportunities for more LBoHs is consistent with the model of Six Functions of Public Health Governance developed in 2012 by the National Association of Local Boards of Health (NALBOH). Among these 6 functions is *continuous improvement*, in which boards of health are called upon to support a culture of quality improvement within the governing body and at the public health agency; hold

governing body members and the health director/health officer to high performance standards and evaluating their effectiveness; and provide orientation and ongoing professional development for governing body members.[17] By drawing upon academic content tailored to the needs of LBoH members, the relevance of subject matter to the end users is assured. There is currently limited understanding about the workforce development and CE needs of LBoH members. This educational program fills the gap in Ohio and introduces a potential area of growth for other LBoHs across the US. Of additional note, while this work is grounded in Ohio's requirement that LBoH members engage in CE, there is value in considering CE needs of LBoHs nationwide. Similar assessments of training needs and the subsequent development of educational materials may enhance the work of LBoHs across states.

PUBLIC HEALTH EDUCATION IMPLICATIONS

According to Caron et al,[18] an unexplored area of collaboration is between LBoHs and academic institutions, particularly in terms of workforce development. The CE program described in this paper highlights a unique opportunity for an academic institution to fulfill and sponsor the CE needs of Ohio's LBoHs, in addition to establishing a relationship that may create future public health workforce training opportunities. This partnership ensures that state requirements are fulfilled, while also leveraging existing, tailored content to meet the training needs of LBoH members.

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