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MEDICATION SAFETY AND OPIOID RISK SCREENING PROGRAM DELIVERED BY COMMUNITY PARAMEDICS

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ABSTRACT

Objective: To describe the program and associated outcomes of an innovative medication safety and opioid risk screening program delivered by community paramedics
Methods: The study was conducted within a health system community paramedic program in North America. Community paramedics employed a medication safety questionnaire and opioid risk assessment tool during home visits, offering tailored interventions based on individual patient risks. Data collection and analysis were facilitated through REDCap and the health system's electronic health record.
Results: Analysis of 435 patient screenings revealed notable findings. A meaningful portion of patients used opioids for pain management, with a subset identified at high risk for opioid misuse or overdose. While most patients stored medications safely, disposal practices varied, highlighting a need for education and intervention. Discrepancies in service provision between service areas identified multiple possible barriers and solutions.
Conclusion: This research underscores the importance of proactive medication safety measures within community paramedicine and provides an example of a community paramedic program designed around community-based need, stakeholder collaboration, and program evaluation. Future efforts should focus on improving data collection methods, and advocating for sustainable funding to support comprehensive intervention strategies aimed at enhancing patient safety and well-being.

INTRODUCTION

Medications stored in homes are one of the leading causes of poisonings and fatalities in the United States, accounting for nearly half of all reported substance exposures (Picture of America, n.d.). The 2022 Annual Report of the National Poison Data System by America's Poison Centers found that more than 90% of all reported poisoning exposures occurred within an individual's home. Notably, among the top twenty-five substances associated with reported fatalities, twenty-two were prescription or over-the-counter medication (Gummin et al., 2023). Simultaneously, rates of excess medication storage at home are presumed to be increasing, with medication oversupply reports of 30-47%,

heightening the risk of medication-related poisonings and fatalities at home (Stroupe et al., 2000; Thorpe et al., 2009).

Among both general and vulnerable populations, substances belonging to the analgesic medication class, particularly opioids, have the highest associated risk of fatalities among medications that are stored at home (webPOISONCONTROL Data Analysis Dashboard, n.d.). Education and low cost/free equipment have been found most effective to promote safe medication use and prevent poisonings (Achana et al., 2015). The encounter between paramedics and individuals who use drugs can significantly impact patient outcomes through the healthcare system (Bolster et al., 2023).

Over the past two decades, community paramedics have emerged as frontline healthcare workers who are well-positioned to improve patient health outcomes by bridging the gap between primary healthcare and emergency healthcare through the provision of primary health care, health promotion, disease management, clinical assessment, and needs-based interventions. Community paramedic programs have been shown to decrease financial and physical pressures on the rural healthcare sector and improve patient outcomes (Agarwal et al., 2018; Bennett et al., 2018; Bolster et al., 2023; Martin and O'Meara, 2020).

Community paramedic programs initially emerged to expand healthcare services related to chronic disease management in rural and under-served communities and have evolved in North America to provide services aligned with community needs (Bennett et al., 2018; O'Meara et al., 2015; Martin & O'Meara, 2019). Community paramedic programs should be designed around community-based need, stakeholder collaboration, and program evaluation. Community paramedics are well-positioned to mitigate in-home medication safety and little guidance exists relating to the implementation of medication safety programs by community paramedics (Shannon et al., 2023).

The Opioid and Naloxone Education Program, also known as the ONE Program, was developed in 2018 by pharmacy faculty at North Dakota State University, focusing on primary and secondary prevention of opioid use disorder and accidental overdose in North American pharmacies. Trained pharmacists involved in the program screen patients for the risk of opioid misuse and overdose, providing upstream harm-reduction interventions including counseling, community support service information, and medication disposal education. Many positive outcomes have resulted from the ONE Program, including positive patient perceptions of opioid risk screening, changes in pharmacist stigma related to opioid use disorder, and outcomes associated with initiation of an opioid risk program (Eukel et al., 2020; Skoy et al., 2020; Werremeyer, Frenzel, et al., 2022; Werremeyer, Strand, et al., 2022).

Recently, the ONE Program translated its success into the home health setting by collaborating with home health providers to create and implement a new initiative to provide nurse-administered medication safety screenings at home health visits. The program focused on medication safety and opioid misuse and overdose prevention screening to further enhance the health of patients receiving care in their homes. The program showed increased rates of safe medication storage and disposal after the implementation of a medication safety program (Eukel et al., 2023).

Based on the success of this program and community-based need, the ONE Program was approached by a health system to collaborate to translate the home health medication screening initiative into community paramedicine home visits. The objective of this manuscript is to describe and evaluate the implementation of a medication safety and opioid risk screening program that aims at mitigating these risks through targeted education and interventions by community paramedics.

METHODS

The community paramedic program is part of an integrated health system in the upper Midwest in North America. The Community Paramedic Program has five central locations spanning three states, each serving a 45-mile radius. Each of the five community paramedic locations has the capacity to see between 25-30 patients per week, depending on the referral reason, complexity of the patient, and location of the patient.

Providers may refer a patient to the community paramedic program if they have home safety concerns, feel the patient is nonadherent, needs disease state education, frequent emergency department visits or hospitalizations, uncontrolled blood pressure, wound care, peripherally inserted central catheter (PICC) line care management, or intravenous (IV) medication administration. Patients are seen in their homes 1-3 times per week for a month or more depending on the patient needs. The goal is to help the patient improve health, reduce readmissions to the hospital or emergency department, and improve adherence with medications.

The year prior to this program, a medication safety and opioid risk assessment program was designed and implemented with home health services offered by local public health units (Eukel et al., 2023). Based on the positive outcomes of the home health work, the program was translated to community paramedics.

With this improvement pilot project, community paramedics completed a 50-minute training delivered online asynchronously. Training content included use of the program tools, patient education on safe medication storage and disposal, and opioid safety including risks for overdose and misuse and naloxone education. A toolkit provided program forms and tools, patient education materials, and frequently asked questions (Essentia Health, n.d.).

Community paramedics evaluated each newly-admitted patient using a medication safety questionnaire and corresponding outcomes worksheet as key tools for data collection on patient medication safety practices (Appendix A). These tools were designed to assess critical aspects of medication management in home settings. The questionnaire included targeted questions such as, “How is the patient storing his or her medications?”, “How has the patient been disposing of unused or expired medications?”, “Does the patient forget to take medications?”, and “Does the patient take medication for pain?” These inquiries enabled a comprehensive evaluation of four main areas: medication storage, medication disposal practices, medication adherence, and use of pain medications.

The community paramedic completed an evidence-based opioid risk assessment for patients taking an opioid medication to determine risk of opioid misuse and/or accidental opioid overdose. Risk for opioid misuse is based on the Opioid Risk Tool, which provides a numeric risk evaluation. Patients at high risk for opioid misuse score with an ORT >7

(Webster & Webster, 2005). The opioid risk screening has been used by the research team in various practice settings across North Dakota (Appendix B) (Skoy et al., 2020; Strand et al., 2022). All interventions provided were tracked using the outcomes worksheet (Appendix A).

A Triage Tool (Figure 1) helped to guide the community paramedics to determine which interventions to provide based on individual patient screening results. Interventions included provision of education and/or products based on patient need:

1. Education on medication storage, disposal, and adherence
2. Medication disposal product (Deterra®)
3. Daily pill organizers
4. Naloxone discussion
5. Risks of chronic use of opioids
6. Nasal naloxone distribution
7. Medication lockbox

The program was funded by the state's Department of Human Services through State Opioid Response funding. Funding supported the purchase of intervention supplies including daily pill organizers, medication lock boxes, medication disposal devices, and nasal naloxone. For patients outside of the grant funding service area, the health system provided pill organizers and identified alternative resources for the community paramedic to provide other supplies, including naloxone, through resources in their service area, such as a local pharmacy or public health department.

All screening form information and interventions provided collected from January 2022 to December 2022 were documented in REDCap (Research Electronic Data Capture), a secure, web-based application designed to support data capture for research studies (Harris et al., 2009). In January 2023 screening forms and data collection were built into the health system electronic health record.

De-identified patient information from REDCap and the health system electronic health record from January 2022 to July 2023 was cross-walked and combined into one secure Excel spreadsheet containing 636 patients. Review of data resulted in removal of 201 cases due to incomplete data. The final sample size was 435. The final sample was separated into a grant-funded and non-grant funded populations, 185 and 250, respectively, as differences in the availability of certain supplies resulting from the funding differences previously discussed. Excel was used for descriptive data analysis of the final data set. This study used the SQUIRE 2.0 framework to showcase a pilot care delivery innovation and program performance (SQUIRE 2.0 Guidelines, n.d.). The evaluation of this program was approved by the North Dakota State University IRB.

RESULTS

The median age of the 435 patients was 76 years old. A majority were female (60%). A total of 214 patients (50.1%) who had a home visit with a community paramedic used a prescription medication to manage their pain. Pain was managed with a prescription medication for 214 (50.1%). A total of 67 patients (15.4%) had their pain managed with an opioid. Of those who are using an opioid, 18 screened at high risk of opioid overdose and/or opioid misuse (26.9%) (Table 1).

Characteristic	Grant-funded Group[1] (N=185)	Non-grant Funded Group[2] (N=250)	Total (N=435)
Median Age (years)	77	75	76
Gender Female	125 (67.6)	137 (54.8)	262 (60)
Pain managed with prescription medication	106 (57.3)	108 (43.2)	214 (50.1)
Pain medication is an opioid	23 (12.4)	44 (17.6)	67 (15.4%)
If taking opioid, at high risk of opioid overdose or misuse	9 (39.1)	9 (20.5)	18 (26.9)

* All reported numbers are N (%)

[1] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost directly from the community paramedic.

[2] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost from available community resources, as suggested by the community paramedic.

Table 1. Patient demographics.

More than 80% of all patients served by community paramedics were storing their medications in a designated safe area. Over 13% of patients were storing their medications in an unsafe or undesignated area. Only 2.8% of these patients were actively storing their medications in a locked medication box (Table 2).

Medication Storage Method	Grant-funded Group[1] (N=185)	Non-grant Funded Group[2] (N=250)	Total (N=435)
Locked Box	6 (3.2)	6 (2.4)	12 (2.8)
Safe Designated Storage	157 (84.9)	207 (82.8)	364 (83.5)
Unsafe Designated Storage	19 (10.3)	19 (7.6)	38 (8.7)
Undesignated Area	5 (2.7)	17 (6.8)	22 (5)

* All reported numbers are N (%)

[1] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost directly from the community paramedic.

[2] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost from available community resources, as suggested by the community paramedic.

Table 2. Medication storage characteristics.

Of the 435 patients, 39.5% were disposing their unused medications using an approved method such as a medication disposal bag, providing ample opportunity for community paramedics education and intervention. A meaningful number of patients (42.5%) were not disposing their unused medications at all, and 17.9% of patients were disposing their medications in the trash (Table 3).

Medication Disposal Method	Grant-funded Group[1] (N=185)	Non-grant Funded Group[2] (N=250)	Total (N=435)
Not Disposing of Unused Medication	69 (37.3)	116 (46.4)	185 (42.5)
Disposing Medication in Trash	36 (19.5)	42 (16.8)	78 (17.9)
Disposing Medication Using Approved Measure	80 (48.5)	92 (36.8)	172 (39.5)

* All reported numbers are N (%)

[1] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost directly from the community paramedic.

[2] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost from available community resources, as suggested by the community paramedic.

Table 3. Medication disposal characteristics.

A total of 808 interventions were provided to the 435 patients. The most commonly provided interventions were medication adherence education (45.9% of patients), medication storage education (43.9% of patients), and medication disposal education (42.7% of patients). Grant-funded patients comprised 42.5% of total screenings but were provided with 63.7% of total interventions compared to 36.3% of interventions provided to non-grant funded participants while comprising 57.5% of total screenings. More than 60% of the grant-funded group received education on medication storage, medication disposal, and medication adherence, compared to around 30% of the non-grant funded group. The grant-funded group received all interventions at over twice the rate of the non-grant funded group. Over 50% of patients in the grant-funded group received a medication disposal device (Deterra) compared to 23% for the non-grant funded group (Table 4).

Intervention	Grant-funded Group[1] (N=185)	Non-grant Funded Group[2] (N=250)	Total (N=435)
Medication Storage Education	119 (64.3)	72 (28.8)	191 (43.9)
Medication Disposal Education	118 (63.7)	68 (27.2)	186 (42.7)
Medication Adherence Education	120 (64.8)	80 (32)	200 (45.9)
Received Deterra Bag	102 (55.1)	58 (23.2)	160 (36.8)
Received Pill Organizer	45 (24.3)	15 (6)	60 (13.8)
Received Medication Lockbox	10 (5.4)	1 (0.4)	11 (2.5)

* All reported numbers are N (%)

[1] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost directly from the community paramedic.

[2] Received medication disposal product, daily pill organizer, and nasal naloxone at no cost from available community resources, as suggested by the community paramedic.

Table 4. Services provided by community paramedic (N = 435 patients).

A total of 18 patients (4.14%) were at high risk for opioid misuse or opioid overdose with 9 patients in the grant-funded group and 9 patients in the non-grant funded group. A total of 100% of the grant-funded population received naloxone and 22% received naloxone in the non-grant funded group (Table 5).

Opioid Screening Result	Grant-funded Group[1]	Non-grant Funded Group[2]	Total (N=435)
At High Risk of Opioid Misuse or Overdose	9	9	18
Received Nasal Naloxone	9 (100)	2 (22.2)	11 (61.1)

* All reported numbers are N (%)

[1] Received nasal naloxone at no cost directly from the community paramedic.

[2] Received nasal naloxone at no cost from available community resources, as suggested by the community paramedic.

Table 5. Naloxone provision (N = 18).

DISCUSSION

This evaluation assesses the effectiveness and implications of integrating medication safety and opioid risk screening initiatives into the practice of community paramedicine home visits (Shannon et al., 2023). Partnerships with community paramedics and phar-

macists or pharmacy-based programs, like the ONE Program, have shown to be a valuable (Crockett et al., 2017).

Community paramedics are well-positioned to create positive impact on patient care and population health. Provision of care in the home provides added benefits for many health-centered topics including medication safety and opioid harm reduction (Shannon et al., 2022, 2023). The success of the ONE Program's previous research provided a unique opportunity to bring an evidence-based medication safety program to community paramedic care provision (Eukel et al., 2023). Patients are referred to the community paramedic services due to high risk of frequent hospitalizations, frequent emergency department visits, medication adherence concerns, and needs for disease state education, making this population ideally positioned to gain positive value from this type of program.

The findings of this study underscore the ability of community paramedics as frontline healthcare providers to support medication safety. Through the utilization of screening tools and tailored interventions, community paramedics were able to identify patients at risk, deliver targeted education, and provide necessary resources such as medication disposal products and naloxone. These efforts are particularly crucial given the high prevalence of opioid use among patients receiving community paramedic care and the associated risks of misuse and overdose compared to the general population (Hales et al., 2020).

Through risk stratification, community paramedics successfully delivered education and interventions based on individual patient needs. For example, according to the triage tool, if patients were at high risk for opioid misuse or opioid overdose, they were to receive education on naloxone and offered nasal naloxone. A total of 18 patients were at high risk of opioid overdose or misuse, with 11 accepting naloxone. A 61% naloxone acceptance rate is significantly higher than other ONE Program intervention, with 5.81% in community pharmacies, 29% in local public health home health, and 6.9% in Medicare certified home health (Eukel et al., 2023; Skoy et al., 2021). Notably, 100% of patients in the grant-funded group were at risk of opioid overdose or opioid misuse accepted naloxone. These results can be further extrapolated to the findings of Hideo et al that leave behind naloxone led to more patients having naloxone administered prior to ambulance arrival which increased the chance of discharging the patients at the scene (Tohira, 2024).

Unused medications stored in the home can result in diversion, misuse, abuse, and accidental poisonings (Duvivier et al., 2017). Drug disposal products are an effective and convenient way for patients to dispose of unused medication (Cooper et al., 2021). A large proportion (43.5%) of program participants were not disposing of their unused medications, likely keeping a supply at home to use in the future at their own discretion. Community paramedics providing education on safe medication disposal to 43.9% of patients and a medication disposal product to 36.8% helps close this gap in improper medication disposal.

Differences were identified between the provision of interventions to a grant-funded and non-grant-funded populations. Interventions were provided to patients in the grant-funded group at over twice the rate as patients in the non-grant funded group

(Table 4). There are multiple possible explanations for these variations. While there is insufficient data to determine the exact cause, it is likely a combination of these factors.

One possible cause is differences in patient characteristics between the two populations. Patients in the grant-funded group consisted of a higher proportion of females (67.6% vs 54.8%) and those taking a prescription medication for pain (57.3% vs 43.2%). Those taking an opioid prescription were lower in the grant-funded group, but the risk of opioid overdose or misuse was higher. Extensive comparison of additional demographics of these populations was not completed due to IRB restrictions.

A likely major contributor to this difference in intervention provision is the accessibility of program supplies. Grant funding was available for patients in the grant-funded service area to receive free supplies such as medication disposal products and nasal naloxone directly from community paramedics. Community paramedics in non-grant funded locations had to utilize other sources that created additional burden to provide these supplies such coordinating with a local pharmacy to pick up and deliver the naloxone to the patient. These possible discrepancies highlight the importance of sustainable funding and resource allocation to support comprehensive medication safety initiatives, especially in regions with limited access to healthcare resources, consistent with other research (Achana et al., 2015).

This study has limitations. The study revealed challenges and opportunities for improvement in data collection and reporting within the community paramedicine setting. Limitations in data completeness and generalizability were noted with 435 of 636 entries (68.4%) being complete. The number of screenings with complete data resulted in smaller cohorts for many subsets such as patients taking an opioid who are at high risk of misuse or overdose, reducing data analysis to descriptive statistics. Efforts to streamline data entry processes and enhance collaboration between researchers and community paramedics are essential for optimizing future research efforts and ensuring the accuracy and reliability of findings.

This program focused on patients within one health system community paramedic program in the upper Midwest region. While this limited data collection, we believe its implications extend beyond one system. The successful integration of medication safety and opioid risk screening initiatives into community paramedicine and past integration with home health services underscores the potential for broader adoption and adaptation in diverse healthcare disciplines and locations (Eukel et al., 2023). Future research including additional community paramedic services in multiple health systems would improve assessment of program outcomes.

The pilot nature of this research assessed the impact of an innovative program led by community paramedics. Expanded implications and uptake of this program throughout other areas of the health system and/or other community paramedic programs will rely on these initial pilot results.

These findings emphasize the importance of interdisciplinary collaboration between healthcare providers, researchers, and community paramedicine in addressing complex public health challenges such as medication safety. Future research should focus on refining intervention strategies, expanding access to resources, and evaluating long-term impacts to further enhance the effectiveness and sustainability of medication safety pro-

grams within community paramedicine. This manuscripts answers the call from 7 countries to increase research and evaluation of community paramedicine programs with an emphasis on sharing best practices, data, and program evaluation (Shannon, et al., 2023).

CONCLUSIONS

This manuscript highlights the pivotal role of community paramedics in addressing medication safety and opioid-related risks within home settings. By integrating evidence-based screening tools and tailored interventions, community paramedics demonstrated their capacity to identify, educate, and support patients at risk of medication-related harm and advance safe medication use.

The effectiveness of proactive medication safety initiatives delivered by community paramedics is evidenced by improvements in medication storage and disposal practices and high naloxone acceptance rates. Moreover, the successful adaptation of the ONE Program's principles into community paramedicine emphasizes the value of interdisciplinary collaboration and knowledge translation in advancing public health objectives. Community paramedics can effectively identify and address medication-related risks, ultimately improving patient outcomes and advancing population health initiatives.

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APPENDIX A. MEDICATION SAFETY QUESTIONNAIRE AND OUTCOMES WORK-SHEET

Screening tool and tool to collect outcomes/interventions provided; used for each patient serviced by community paramedics.

How is the patient storing his or her medications?

- ☐ Medication is stored in locked box
- ☐ Medication is stored in safe designated area
- ☐ Medication is stored in unsafe designated area
- ☐ Medication storage not designated

Prior to today's interventions, how is the patient disposing of unused or expired medications?

- ☐ Medication not discarded
- ☐ Medication discarded in trash
- ☐ Medication disposal with approved measures:
  - ☐ Pharmacy MedSafe
  - ☐ Local public health unit
  - ☐ Police station
  - ☐ Kitty litter, coffee grounds, or other
  - ☐ Medication disposal product (Deterra, DisposeRx, etc.)
  - ☐ Other: _____

Does the patient forget to take medications?

- ☐ Never
- ☐ Occasionally
- ☐ Frequently

Does the patient take medication(s) for pain?

- ☐ No, not taking medication for pain
- ☐ Yes, taking medication for pain
  - ☐ Taking non-opioid for pain (Celebrex, NSAID, etc.)
  - ☐ Taking opioid for pain (oxycodone, OxyContin, fentanyl, hydrocodone, morphine, hydromorphone, methadone, codeine)

If yes, proceed to opioid screening

For **all patients**:			
Yes	No		Education about **medication storage** was provided to the patient
Yes	No		Education about **medication disposal** was provided to the patient
Yes	No		Education about **medication adherence** was provided to the patient
Yes	No		Patient was provided a Deterra bag for medication disposal
Yes	No		Patient was provided a pill organizer to assist with medication adherence
For patients **taking an opioid:**			
Yes	No		Patient was identified as at risk for **accidental opioid overdose** based on current disease states, current medications, or age *If yes, this was discussed with the client*
Yes	No		Today, client was identified with potential for **opioid misuse** *If yes, this was discussed with the client*
Yes	No	Not indicated for this patient	Naloxone was provided to the patient
Yes	No	Not indicated for this patient	1 in 4 brochure was provided for this patient
Yes	No	Not indicated for this patient	A medication lock box was provided for this patient

APPENDIX B. OPIOID RISK ASSESSMENT

Opioid risk assessment screening administered to all patients who are using an opioid.

ONE Rx
Opioid and Naloxone Education

Opioid Risk Assessment

Patient age:_____

YES NO Has the patient taken this or other opioid medications in the last 60 days?
Examples: Duragesic® (fentanyl), Oxycontin® (oxycodone), Vicodin® (hydrocodone), morphine

Opioid Misuse Risk Assessment

Put a check in the box next to those items which apply to the patient.

	Yes	F	M
Family history of substance abuse			
Alcohol		1	3
Illegal drugs		2	3
Prescription medication misuse		4	4
Personal history of substance abuse			
Alcohol		3	3
Illegal drugs		4	4
Prescription medication misuse		5	5
Age between 16 - 45 years		1	1
History of preadolescent sexual abuse		3	0
Psychological disease			
Examples: attention deficit disorder (ADD), obsessive compulsive disorder (OCD), bipolar		2	2
Depression		1	1

Total Score: _____

Accidental Overdose Risk Assessment

Circle the age the patient is in: 16-25 26-44 45-64 **Greater than 64**

Medical history: Circle all those which apply to the patient.

asthma depression anxiety COPD emphysema sleep apnea liver disease kidney disease

While using this medication is there a chance the patient may consume any of the following?

YES NO Medication used to treat anxiety
Examples: Xanax® (alprazolam), Ativan® (lorazepam), Valium® (diazepam) Klonopin® (clonazepam)

YES NO Medication used to treat depression

YES NO Medication known as a muscle relaxer
Examples: Flexeril® (cyclobenzaprine), Skelaxin® (metaxalone)

YES NO Medication used to aid in sleep (prescription or over the counter)

YES NO Cough or cold medication

YES NO Alcohol

YES NO Are you currently taking other opioid medications?
Examples: Duragesic (fentanyl), Oxycontin (oxycodone), Vicodin (hydrocodone), morphine