

## Assessing a Medication Safety and Disposal Educational Program using the Health Belief Model

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### Abstract

**Background:** Self-medication practices continue to grow due to reclassification of prescription to OTC status and self-care information on the internet, however unintended injuries and inappropriate use of medications continue to challenge healthcare providers during the provision of patient care. Pharmacists have an integral role in pharmacovigilance and patient education activities to ensure safe medication use, storage, and disposal practices.

**Objectives:** The objective of this medication safety and disposal educational program was to provide comprehensive informational support to the community coupled with an assessment using the Health Belief Model (HBM) to gauge participants' perceived behavior change.

**Methods:** The HBM was selected to assess the understanding of the community members' benefits and barriers to safe medication practices. The HBM posits that health behaviors are influenced by perceptions of a disease's severity, perceived susceptibility, perceived barriers to health practices, perceived benefits of health practices, self-efficacy, and cues to action. An 8 item pre/post survey following the HBM constructs was developed which used a 5 point Likert scale.

**Results:** A total of 25 senior participants attended the educational program. Twenty-three pre/post surveys were completed (RR=92%). Five items revealed a statistically significant change from pre to post-educational content including understanding risk of herbal/OTC products ( $p=0.021$ ), improved awareness of medication disposal methods ( $p=0.044$ ), comprehension of OTC 'Drug Facts' information ( $p=0.004$ ), understanding OTC label information to prevent medication interactions and side effects ( $p=0.008$ ), and routinely reviewing expiration dates on medications and disposing of these properly ( $p=0.019$ ).

**Conclusion:** This study suggests a comprehensive approach which covers a wide range of medication safety topics and disposal practices can successfully improve the knowledge and skill of community participants and potentially improve medication harm reduction practices.

**Key Words:** Medication; Disposal; Safety; Patient Education

### Background:

Medications have transformed how diseases are treated and prevented; however side effects, adverse drug reactions, unintended injuries, and inappropriate use of medications continue to challenge healthcare providers during the provision of care for patients.<sup>1</sup> The increasing number of over-the-counter (OTC) medication advertisements, self-care information on the internet, and reclassification of prescription-only to OTC status has enabled continued growth of self-medication practices.<sup>2</sup> The risks of nonprescription misuse and safe medication practices are areas that require attention from healthcare professionals and also require interventions focused on harm reduction practices.<sup>2</sup> In addition, disposal of unused medications in US households has gained great attention due to implications regarding patient safety, environmental impact, and health outcomes. A US study revealed that over 40% of current household medications are unused and significant inconsistency and lack of proper disposal knowledge was observed in households.<sup>3</sup> Pharmacovigilance is defined as the 'science and activities relating to the detection,

assessment, understanding, and prevention of adverse effects related to medications'.<sup>4</sup> Numerous educational programs have a narrow scope in which topics are limited solely to self-medication safety content, proper medication storage, or medication disposal methods.<sup>5-7</sup> Pharmacists have an integral role in pharmacovigilance and patient education activities to ensure safe use of both prescription and non-prescription medications and medication disposal practices.<sup>3,8</sup>

### Objective:

The purpose of this educational program was to deliver a broad scope of topics with senior community members to potentiate harm reduction practices associated with medications and couple the education with an assessment using the Health Belief Model (HBM) to gauge participants' perceived behavior change.

### Methods:

North Dakota State University Department of Pharmacy Practice researchers were invited by a Community Senior Coalition to present a 1.5 hour oral educational presentation to community members residing in an urban area. The Senior Coalition consists of representatives from the regional Police Department, county Sheriff's Departments, and three senior volunteers that organize educational opportunities to improve

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the safety and well-being of the community. The Coalition educational programming occurs each month and consists of public health focused topics including but not limited to harm reduction, accident prevention, and financial decision-making. The Senior Coalition serves a geographical area primarily consisting of three adjacent urbanized areas (>200,000 total population) and rural outlying areas to a lesser extent within regional proximity. Two pharmacists and one pharmacy student constructed the content and delivery of the medication safety and disposal educational presentation building upon existing medication safety toolkits.<sup>9</sup> The Senior Coalition promoted the event through their social media channels and posters in senior centers.

This educational presentation provided an overarching approach to guide community residents in safe medication practice knowledge and harm reduction skills. The topics were chosen by the researchers and then reviewed and modified after consultation with the Senior Coalition which included but are not limited to; education and risk of medication misuse, strategies to understand OTC label content, medication storage, reviewing of medication expiration dates, self-advocacy when communicating with healthcare providers, consequences of 'prescribing cascades', proper medication disposal methods, and strategies to improve medication adherence (Appendix 1 provides detailed overview of educational content). A lecture demonstration and visual-aid slideshow was used for the majority of the program, however interactive question/answer activities were incorporated to improve audience engagement. Medication safety related educational materials and take away products including medication organizers and DisposeRx were made available free of charge to attendees.

The HBM was selected to assess the understanding of the community members benefits and barriers to safe medication practices and disposal knowledge.<sup>10</sup> The HBM has been used for assessing medication-taking behaviors and disposal practices initiatives in diverse populations.<sup>11,12</sup> The HBM posits that health behaviors are influenced by perceptions of a diseases' (or actions') severity, perceived susceptibility, perceived barriers to health practices, perceived benefits of health practices, self-efficacy, and cues to action.<sup>13</sup> The survey instrument was developed to represent each of the constructs with a 5 point Likert scale; (1=strongly disagree, 2=agree, 3=neutral, 4=agree and 5 = strongly agree). The instrument consisted of only the eight item assessment and no demographic information was requested.

Pharmacists and public health professionals were involved in ensuring content validity by including appropriate items on the questionnaire to align with theoretical constructs to assess behavioral dispositions of the participants regarding medication safety. To ensure face validity, the survey instrument was reviewed by the Senior Coalition committee to

confirm the items aligned with educational objectives and were relevant in gauging the participants knowledge and skill development. In addition, the Senior Coalition provided input to ensure clarity and brevity for the assessment items. Participants were provided an opportunity to voluntarily complete the paper-copy pre-survey instrument prior to the educational presentation and the post-survey after the conclusion of the presentation. Inclusion criteria consisted of a fully completed pre-survey and post-survey; any incomplete assessments were excluded from the analysis. Excel (Microsoft 2019) and Statistical Package for Social Sciences (IBM SPSS version 28.0) were used to compile and analyze collected data. Shapiro-Wilk test was used to analyze data distribution and Wilcoxon Signed Rank test was chosen to compare pre/post item results (Table 1). North Dakota State University IRB reviewed and approved this research.

### Results:

A total of 25 senior community participants attended the medication safety and disposal educational presentation. Participants voluntarily received the survey instrument and were provided instructions prior to the educational seminar. Two participants were excluded due to the post survey not being fully completed which resulted in 23 participants meeting inclusion criteria resulting in a response rate of 92%. Shapiro-Wilk test resulted in non-normal data distribution. Cronbach alpha was conducted and resulted in 0.635 for the pre-survey and 0.731 for the post-survey, indicating adequate internal consistency and reliability.

All but one survey item increased in average value from pre-survey to post-survey. Item number one assessing perceived susceptibility of misuse of unused medications decreased modestly and did not reveal any statistically significant change ( $p=0.763$ ). Items two and three assessed perceived severity seeking to understand the beliefs of potential harm with OTC medications and risks of expired medications in the household; item two indicated statistically significant improvement after the educational program ( $p=0.021$ ) and item three with modest improvement without statistically significant results ( $p=0.454$ ). Items four and five assessed the perceived barriers associated with medication disposal options and comprehension of the 'Drug Facts' information on OTC products. Both items improved after the educational program revealing statistically significant change in both awareness of disposal options ( $p=0.044$ ) and comprehension of OTC label information ( $p=0.004$ ).

Item six assessed the perceived benefits of improving knowledge and understanding of OTC label information to prevent adverse effects and resulted in a statistically significant improvement in the benefits of this skill ( $p=0.008$ ). The average score of item seven improved from pre to post-survey in evaluating the self-efficacy of communication with healthcare

providers to improve medication knowledge, however the result was not statistically significant ( $p=0.124$ ).

Item eight assessed the confidence to review expiration dates of medications in the household and also a cue to action to properly dispose of them. This item resulted in a statistically significant difference between pre and post survey ( $p=0.019$ ).

#### **Discussion:**

The HBM was used to assess the changes in attitudes and behaviors in medication safety and disposal beliefs by community members relating to this educational seminar. This model revealed an improvement in most of the theoretical framework constructs, with perceived severity, perceived barriers, perceived benefits, and cues to action all containing item(s) that revealed statistically significant improvement from pre to post-survey.

The assessment revealed that education focusing on perceived susceptibility of medication misuse with unused medications was an area which had no improvement. This item resulted in the highest average on the pre-survey (4.52) suggesting that a majority of participants agreed with this item with a result of a high level of perceived susceptibility prior to the educational program possibly leading to limited influence from the content. Significant change occurred with item two relating to perceived severity, which suggests that OTC and herbal information targeting adverse effects and medication interactions elevated the awareness of potential severe harms associated with non-prescription therapies. This area of improvement is extremely important as non-prescription medications account for more than 50% of all medications used worldwide and nearly one-half of individuals use these medications inappropriately, which potentiates the increase for morbidity and mortality.<sup>14</sup>

Research has identified perceived barriers as a significant predictor to behavior with recommendations for researchers to focus on perceived barriers to promote successful behavior change interventions.<sup>15</sup> The results from this educational program indicated significant improvement in overcoming barriers to medication disposal and also comprehension of 'Drug Facts' information on OTC medication products. The provision of informational support to the participants and results from the survey suggest an inclination to overcome perceived barriers in safe medication practices. Item five in the perceived barriers construct resulted in a statistically significant change suggesting that the educational content was beneficial, unfortunately the average represented the lowest post-survey score (mean=3.65) leading the researchers to conclude that further time spent on this topic may continue improve the skill level in confidently understanding the 'Drug Facts' information for OTCs.

The assessment item associated with perceived benefits of the educational program revealed improvement in the perception of understanding OTC label information leading to avoidance of

medication interactions and side effects. This result suggests that providing knowledge development opportunities with effective pharmacist and patient communication has the potential to promote appropriate medication selection, medication utilization, and OTC risk awareness for senior community members.<sup>16</sup>

The last domain assessed changes in self-efficacy and cues to action related to the medication safety education. The confidence in community members to seek out medication knowledge from their healthcare provider improved from pre to post-survey, however this was not statistically significant. The last item examined 'cues to action' the participants would seek in the future to both identify expired medications and also dispose of them properly. An often overlooked educational opportunity is appropriate medication disposal to prevent injuries and misuse by reducing stockpiling and future non-medical medication utilization.<sup>17</sup> One study reported that more than 80% of patients had not received proper medication disposal information and over 30% of participants reported keeping medications from prior therapy for use in the future if needed.<sup>18</sup> A statistically significant improvement resulted from the educational program in that participants indicated a strong inclination to review expiration dates of medications and follow-up with the use of proper medication disposal methods. State and county public health departments shared disposal products (Deterra and DisposeRx) for the researchers to distribute to community members, which may suggest that a two-pronged approach entailing education on disposal options and also instrumentally providing participants with disposal products for at-home use may improve the confidence and action steps to behavior change.

#### **Limitations:**

Limitations of this research includes a small sample size ( $n=23$ ). Assessment of long-term knowledge/skill retention and future behavior change is also a limitation in that this study only assessed pre vs post survey and did not incorporate a delayed-post assessment to reveal the realization of behavior change. In addition, the researchers and Community Senior Coalition were cognizant of constructing a brief and easily navigable survey instrument to improve response rate and alleviate time burden; however, inclusion of further items in each theoretical construct may have acquired additional information related to perceived medication safety and disposal beliefs. Additional limitations include unknown factors that relate to patient specific medication safety and disposal methods that may influence assessment responses; these include participants ability to independently transport to medication disposal locations, visual/literacy impairments in comprehending medication label information, and if participants self-managed their medication regimen or if a caregiver was the primary medication coordinator.

#### **Conclusion:**

Appropriate comprehension of OTC label information, self-medication practices, and proper disposal methods continue to be challenging public health issues. Informational support focusing on medication safety and disposal through community engagement efforts have the potential to elevate harm reduction practices and reduce negative outcomes. The assessment using the HBM demonstrated positive impacts in participants recognizing the severity of potential adverse effects from OTC medications, reduction in barriers to properly dispose of medications, and benefits of OTC label comprehension to prevent medication interactions and side effects. Many community focused educational initiatives have a limited scope of informational topics; however, this study suggests a more comprehensive approach which covers a wide range of medication safety topics and disposal practices can successfully improve the perceived knowledge and skill of community participants and potentially improve medication harm reduction practices.

#### Acknowledgements:

The authors would like to thank North Dakota Department of Health and Human Services for their support and providing medication disposal products to distribute to the participants. The authors would also like to thank Valley Triad (Senior Community Coalition) for their support and invitation to share educational content for this community engagement project.

**Disclaimer:** The statements, opinions, and data contained in all publications are those of the author(s).

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Table 1: Pre/Post Survey Results from Medication Safety and Disposal Education

Health Belief Model Construct:	Survey Items:	Pre Survey Mean <sup>1</sup>	95% CI	Post Survey Mean <sup>1</sup>	95% CI	p-value
Perceived Susceptibility	1. Routinely disposing of unused medications can prevent medication misuse in my household.	4.52	[4.31,4.73]	4.48	[4.24,4.72]	0.763
Perceived Severity	2. OTC medications and herbal supplements are generally safe and have little potential for adverse effects. <sup>2</sup>	3.95	[3.59,4.31]	4.35	[4.01,4.69]	<b>0.021</b>
	3. I understand the potential harms of unused and/or expired medications in my household.	4.22	[3.87,4.57]	4.35	[4.03,4.67]	0.454
Perceived Barriers	4. I am aware of proper disposal locations and methods to discard unused medications.	4.04	[3.66,4.42]	4.52	[4.15,4.89]	<b>0.044</b>
	5. I always understand the 'Drug Facts' section of OTC medications.	2.83	[2.35,3.31]	3.65	[3.29,4.01]	<b>0.004</b>
Perceived Benefits	6. Understanding the information on OTC labels can prevent medication interactions and side effects.	3.87	[3.52,4.22]	4.43	[4.19,4.67]	<b>0.008</b>
Self-Efficacy / Cues to Action	7. If I have medication questions, I feel confident that I can communicate with my physician/pharmacist to improve my knowledge on a medication.	4.26	[3.98,4.54]	4.52	[4.28,4.76]	0.124
	8. I can routinely review the expiration dates of my medications and dispose of them properly.	4.04	[3.68,4.4]	4.52	[4.28,4.76]	<b>0.019</b>

1) Likert Scale: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

2) Negatively phrased/reverse coded

3) Wilcoxon Signed Rank significant value  $p \leq 0.05$

## Appendix 1: Senior Coalition Medication Safety and Disposal Education Agenda

- Proper Medication Storage
  - Importance of storing medications in original container
  - Securing/safe-guarding medications with abuse potential and avoiding access by individuals that are not prescribed the medication
- Expiration Dates for Rx and OTC
  - When to dispose of Rx medications
  - When to dispose of OTC medications
- Medication Disposal
  - Where to dispose of unused medications (DEA Take-Back, Pharmacy)
  - How to dispose of unused medications (i.e. Deterra, DisposeRx, coffee grounds, cat litter)
- Importance of taking medication as 'per prescribed directions'
  - Consequences of underutilizing medications (non-adherence)
  - Consequences of overutilizing medications (i.e. misuse leading to addiction/abuse)
  - Avoiding extended prescription analgesic therapy and timely discontinuation
- OTC medication review
  - Comprehension of 'how, where, and why' on OTC 'Drug Facts' labeling information
  - OTC/Rx drug interactions, duplications, warnings, and precautions
  - Risks of OTCs containing multiple-medications cough/cold preparation
- Herbal therapy concerns
  - Herbals do not always = safe
  - What to know and who to ask before initiating herbal therapies
- Awareness of medication metabolism/clearance changes in the geriatric population
- Pharmacy considerations
  - Avoiding multiple pharmacy locations
  - Establishing a relationship with pharmacy staff and value of informational support for medication questions
- Strategies to avoid 'Polypharmacy' and 'Prescribing Cascades'
  - Importance of a current medication list
  - What questions to ask providers to reduce the occurrence of 'Prescribing Cascades'
  - Strategies to empower patients to 'ask the question' to providers