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Prescription painkiller misuse and the perceived risk of harm from using heroin.

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Abstract

Background: Prescription opioid pain reliever misuse is associated with initiation of heroin use. The perceived risk of harm from substance use is a key factor in initiation. We hypothesized that prescription pain reliever misuse is associated with a lower perceived risk of harm from trying heroin and from regular use.

Methods: Using the 2015-6 National Survey on Drug Use and Health (NSDUH), we evaluated the perceived risk of trying and regularly using heroin among heroin never-users. We estimated logistic regressions to assess the association between past-year prescription pain reliever misuse with the perceived risk of heroin initiation and regular use, adjusting for potential confounders.

Results: The sample contained 84,312 adults and 27,814 adolescents. Four percent of adults and 3.7% of adolescents reported past-year prescription pain reliever misuse. 87.9% of adults and 65.9% of adolescents perceived trying heroin as a great risk. Pain reliever misuse was associated with a significantly lower odds of perceiving great risk of harm from trying heroin (adults: AOR=0.760, 95% CI 0.614-0.941, p=0.013; adolescents: AOR=0.817, 95% CI 0.672-0.993, p=0.042). Both age groups were more likely to report perceiving regular heroin use as a great risk of harm compared to trying heroin once or twice, but only adults showed significant association with of pain reliever misuse. (AOR=0.539 95% CI 0.390-0.744, p<0.001).

Conclusions: Past-year prescription pain reliever misuse was associated with lower perceived risk of harm from heroin initiation and regular use. Further understanding of risk perception and the association with heroin initiation might inform development of primary prevention interventions.

Contributors

Both authors contributed to the study. Dr. Kapadia conceptualized and designed the study, conducted the analysis, and drafted the manuscript. Dr. Bao guided the study design, interpreted results, helped draft and critically review the manuscript. Both authors approved of the final version.

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Conflicts of interests

No conflicts declared.

Keywords

heroin; National Survey on Drug Use and Health; prescription drug misuse; perceived risk; opioid analgesics

1. Introduction:

Misuse of prescription opioid pain relievers is associated with subsequent initiation of heroin use (Banerjee et al., 2016; Cerda et al., 2015; Jones, 2013; Muhuri et al., 2013; Palamar et al., 2016; Rajan et al., 2018). Several factors are thought to drive the transition from prescription opioid misuse to heroin use. As opioid tolerance increases, the high cost and limited supply of prescription pain relievers relative to heroin makes it difficult to maintain the dose increase necessary to achieve the desired effect and to avoid withdrawal (Cicero et al., 2014; Mateu-Gelabert et al., 2015; Monico and Mitchell, 2018; Syvertsen et al., 2017). This may facilitate the transition to heroin use, which is often cheaper and easier to obtain.

Heroin initiation may be facilitated by decreased perception of harm from heroin use. Individuals who misuse prescription pain relievers may be exposed to heroin through peers, which overcomes pre-existing negative perceptions about the drug (Harocopos et al., 2016; Mars et al., 2014). Cross-sectional studies have shown that individuals who use a particular substance may perceive that behavior as lower risk, compared to individuals who do not (Chomynova et al., 2009; Lipari et al., 2017; Pacek et al., 2015). One such study of people who used prescription pain relievers showed that those who had previously used heroin were much less likely to feel heroin use as being very risky, compared to those who had not used heroin (Votaw et al., 2017). Longitudinal studies have also explored this link, showing that the perceived harmfulness of a substance may be inversely associated with subsequent use. Perceived risk associated with a substance is likely weighed against the perceived benefits of a new sensation (Arria et al., 2008) and is also re-appraised over time as individuals gain exposure to substance use behaviors (Grevenstein et al., 2015).

We aimed to evaluate the perceived risk of heroin use among heroin never-users, comparing those who misuse prescription pain relievers to those who do not. We hypothesized that prescription pain reliever misuse would be independently associated with a lower perceived risk of harm from heroin use.

2. Methods:

2.1 Population:

We analyzed public use data files from the 2015-6 National Survey on Drug Use and Health (NSDUH) (Substance Abuse & Mental Health Data Archive, 2017). NSDUH is an annual survey of the United States civilian non-institutionalized population aged 12 and older, including individuals living in group quarters, such as homeless shelters. NSDUH utilizes an independent, multi-stage sampling design within each state and the District of Columbia and is conducted in English or Spanish. The public use data consists of a nationally representative sample; detailed geographic information such as state or county is not

provided (Center for Behavioral Health Statistics and Quality, 2016, 2017). We analyzed data from respondents who reported never having used heroin.

2.2 Outcome variables

Participants were asked to report perceived risk of harm from trying heroin, which was our main outcome: “How much do people risk harming themselves physically and in other ways when they try heroin once or twice?” They were also asked their perceived risk of harm from regular heroin use, defined as using once or twice per week, with the same format, which we analyzed as a secondary outcome. The responses were on a 4-point scale, labelled as “great risk,” “moderate risk,” “slight risk,” and “no risk.” We dichotomized responses into “great risk” and “less than great risk,” similarly to other studies of perceived risk using NSDUH (Lipari et al., 2017; Pacek et al., 2015; Votaw et al., 2017).

2.3 Predictor variables

Prescription pain reliever misuse was defined as use in any way not directed by a doctor in the past 12 months. This included using “without a prescription of your own;” “in greater amounts, more often, or longer than you were told to take it;” and “using in any other way a doctor did not direct you to use it.” The survey asks about use of prescription “pain relievers,” specifically instructs participants not to report use of over-the-counter medications, and asks the most recent specific medication that was used. We used the 12-month recall period because NSDUH documentation indicated that it was the most reliable measure, and also allowed sufficient sample-size for adjusted analyses (Center for Behavioral Health Statistics and Quality, 2016, 2017). We also conducted sensitivity analyses using lifetime pain reliever misuse, and past-year pain reliever abuse or dependence, to see if estimates changed based on the recency or severity of misuse. We also assessed associations of age, gender, race/ethnicity, education, and misuse of other substances use with perceived risk of heroin use. Other substances included prescription sedatives, tranquilizers, and stimulants, any use of cocaine, marijuana, inhalants, and hallucinogens, and any history of drug injection.

2.4. Analysis:

All analyses accounted for the NSDUH sampling design (Center for Behavioral Health Statistics and Quality, 2016, 2017). We stratified analyses between adolescents (age 12-17) and adults (age 18+) because of large differences in the outcome variable between these age groups. For each age group, we estimated a logistic regression to assess the association of prescription pain reliever misuse with perceived risk of trying heroin, adjusting for other covariates. We adjusted for education only in the adult models because there was little variation among adolescents. Model results are reported as odds ratios as well as incremental probabilities. Statistical analyses were conducted in Stata v15 (StataCorp, College Station, TX).

3. Results:

Our study sample contained 84,312 adults (75% of the entire sample) and 27,814 adolescents (25%). Four percent of adults and 3.7% of adolescents reported past-year

prescription pain reliever misuse. Of people with pain reliever misuse, 95.3% specifically identified misusing an opioid medication. In all, 83% of both adults and adolescents had no substance misuse in the past year, 12% misused a single substance, and 4% misused more than one substance.

Adults with pain reliever misuse were more likely to be of younger age, less likely to be female, and had lower educational attainment than those without (Table 1). Both adults and adolescents with pain reliever misuse had higher prevalence of using each of the other substances and of ever injecting drugs. When comparing adults and adolescents, adolescent respondents were less likely to be white. While adults were more likely to have past-year substance use in most categories, adolescents had higher past year use of inhalants (2.62% for adolescents vs 0.45% for adults).

In total, 87.9% of adults perceived a great risk of harm from trying heroin. Adults with pain reliever misuse were less likely to perceive a great risk: 82.4% for those with misuse compared to 88.1% for those without ($p < 0.0001$). Overall, 65.2% of adolescents perceived a great risk: 68.9% among those with pain reliever misuse compared to 65.1% of those without ($p = 0.024$).

In multivariate analysis (Table 2), among both age groups, pain reliever misuse was associated with a significantly lower odds of perceiving trying heroin as a great risk (adults: AOR = 0.760, 95% CI 0.614-0.941, $p = 0.013$) (adolescents: AOR = 0.817, 95% CI 0.672-0.993, $p = 0.042$). When interpreted as incremental probabilities, these differences were modest. Adults with pain reliever misuse had an 85% (95% CI 82.8%-88.1%) predicted probability of perceiving great risk, compared to 88% (88.1%-88.9%) for adults without pain reliever misuse. For adolescents, these probabilities were 60% (55.3%-64.2%) for those with pain reliever misuse compared to 64% (63.5%-65.4%) for those without. When the main predictor variable used was lifetime pain-reliever misuse, results were similar (adults: AOR: 0.7, 95% CI 0.59-0.83, $p < 0.0001$) (adolescents: AOR: 0.84, 95% CI 0.7-1.01, $p = 0.065$). When the main predictor was pain reliever abuse or dependence, the association was more pronounced for adults (AOR 0.48, 95% CI 0.24-0.99, $p = 0.048$) but not for adolescents (AOR 1.08, 95% CI 0.49-2.37, $p = 0.841$).

Older age among the adults was associated with higher odds of reporting a great risk. The association with gender varied between the age groups: for adults, female gender was associated with higher odds of reporting great risk (AOR 1.359, 95% CI 1.285-1.438, $p < 0.001$) whereas for adolescents it was associated with lower odds (AOR 0.854, 95% CI 0.790-0.923, $p < 0.001$).

Both adults and adolescents were more likely to perceive a great risk of harm from regular heroin use compared to trying heroin once or twice (Table 1). For this outcome, the association with pain reliever misuse was only statistically significant among adults. For adults, the overall probability of perceiving great risk of regular heroin use was 95.1%. The odds ratio associated with prescription painkiller misuse was 0.539 (0.390-0.744, $p < 0.001$). For adolescents, the overall probability was 83.0%, and the odds ratio was 0.873

(0.623-1.223, $p=0.422$). The full regression model results for this outcome are shown in the appendix.

4. Discussion:

In this analysis of data from a national survey, consistent with our hypothesis, we found that prescription pain reliever misuse in the past year was associated with a lower perceived risk of harm from trying heroin. This association remained after adjusting for demographic factors and other substance use. When we analyzed the risk of using heroin regularly, we found a similar association. A larger proportion of individuals in either age group perceived great risk of harm from using regularly than of trying, although the association with prescription pain reliever misuse was only significant for adults.

Despite the statistically significant association, the incremental probability of reporting great risk associated with pain reliever misuse was modest in both age groups. This suggests that targeting individuals who misuse pain relievers with risk education interventions may have limited value. However, understanding the change to risk perception during a given individual's substance use trajectory may provide important insight for targeting such interventions to those most likely to be affected. Heroin initiation among people who misuse prescription pain relievers may be preceded by several key turning points: use of multiple opioid drugs, transitioning from oral to intranasal use, and the development of physical dependence (Guarino et al., 2018; Harocopos et al., 2016). Additionally, heroin use within an individual's peer group may quickly normalize what was previously considered a taboo behavior (Harocopos et al., 2016; Mars et al., 2014). The dynamics of perceived risk in the context of these events likely vary from person to person and are not well-addressed in this cross-sectional study.

The association between other substances and the perceived risk of harm varied in the direction of association and was non-significant for most substances. Inhalant use was significantly associated with lower perceived risk in both age groups, but the interpretation of this finding is difficult in isolation, as many individuals who use inhalants may also be using other substances. (Johnson et al., 1995; Storr et al., 2005; Wu et al., 2008).

There were substantial differences among demographic groups in their perception of risk from heroin use. Adolescents were much less likely to perceive a great risk of harm from either heroin use outcome. Even within adults, young adults were less likely than older adults to perceive a great risk. The impact of gender on perceived risk varied between the age groups, with female gender being associated with a lower perceived risk among adolescents and a greater perceived risk among adults. Women are more likely than men to be prescribed opioids and are increasingly affected by the current opioid epidemic (Campbell et al., 2010; Cicero et al., 2014). The age-gender patterns of risk perception that we observe in this study may inform target populations for further research and for risk-modification interventions.

This study has several limitations. As discussed, the cross-sectional survey limits longitudinal assessment of risk perception and a nuanced assessment of substance use

trajectories. Also, the questions regarding risk perception may have been interpreted differently by different individuals. Responses to these questions are not likely to indicate individuals' intention to start, or likelihood of starting, heroin. However, they can shed light on their perceptions regarding this behavior, which is critical for informing primary prevention strategies. The subset of people who misuse pain relievers for relief of chronic pain may have different perceptions about heroin use, but these are not identified well in this survey. NSDUH categorizes people who use fentanyl within the pain reliever group. This group may be different from those misusing other pain relievers, given the rising importance of fentanyl as an illicit "street" drug, but this heterogeneity is not likely to be characterized well in this analysis.

Our findings show an association between pain reliever misuse with the perceived risk of trying and using heroin in people who have never used heroin. Further understanding of risk perception among people who misuse pain relievers, and its association with transition to heroin, might inform development of primary prevention interventions during the current opioid epidemic.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Adults are more likely than adolescents to perceive great risk of harm from heroin.
- Prescription pain reliever misuse is associated with a lower perceived risk of harm.
- Other substance use had varying effects on perceived risk.

Table 1:

Characteristics of the Adult and Adolescent Samples

	Adults (n=84,312)			Adolescents (n=27,814)		
	All adults	No pain reliever misuse (n=81,203)	Pain reliever misuse (n=4,983)	All adolescents	No pain reliever misuse (n=26,807)	Pain reliever misuse (n=1,050)
Age (adults only)						
18-25 years old	14.31%	13.86%	25.25%			
26-34 years old	15.69%	15.33%	24.51%			
35+ years old	70.00%	70.81%	50.24%			
Female gender	52.16%	52.41%	46.11%	49.05%	48.93%	52.14%
Race/Ethnicity:						
Non-Hispanic White	64.43%	64.33%	66.71%	53.46%	53.54%	51.53%
Non-Hispanic Black	11.79%	11.83%	10.79%	13.79%	13.73%	15.46%
Non-Hispanic Native American/Alaskan	0.54%	0.54%	0.66%	0.60%	0.61%	0.42%
Non-Hispanic Native Hawaiian/Pacific Islander	0.36%	0.35%	0.47%	0.45%	0.46%	0.16%
Non-Hispanic Asian	5.51%	5.65%	2.03%	5.23%	5.32%	2.80%
Non-Hispanic More than one race	1.63%	1.58%	2.69%	3.19%	3.14%	4.52%
Hispanic Ethnicity	15.75%	15.71%	16.66%	23.28%	23.21%	25.11%
Education (adults only)						
Less than high school	13.4%	13.34%	14.81%			
Completed high school/GED	25.23%	25.19%	26.03%			
Some College	21.31%	21.14%	25.53%			
College degree	40.06%	40.33%	33.64%			
Prescription sedative misuse	0.55%	0.35%	5.91%	0.37%	0.18%	5.41%
Prescription tranquilizer misuse	2.06%	1.21%	23.83%	1.66%	0.83%	23.91%
Prescription stimulant misuse	1.95%	1.44%	15%	1.77%	1.08%	20.33%
Marijuana use	19.58%	17.68%	66.19%	12.65%	11.12%	53.24%
Cocaine use	1.87%	1.4%	16.08%	0.56%	0.26%	8.62%
Inhalant use	0.45%	0.36%	3.45%	2.62%	2.26%	13.45%
Hallucinogen use	1.88%	1.43%	16.71%	1.97%	1.32%	19.78%
Ever injected drugs	0.76%	0.66%	3.25%	0.08%	0.04%	1.21%

	Adults (n=84,312)			Adolescents (n=27,814)			p-Value *
	All adults	No pain reliever misuse (n=81,203)	Pain reliever misuse (n=4,983)	All adolescents	No pain reliever misuse (n=26,807)	Pain reliever misuse (n=1,050)	
Perceived 'great risk' of:							
Trying Heroin	87.85%	88.08%	82.39%	65.19%	65.05%	68.94%	0.0239
Regular heroin use	95.38%	95.47%	93.2%	83.04%	83.01%	84.01%	0.5367

* p-value for categorical variable comparisons between "No pain reliever misuse" and "Pain reliever misuse" groups, using Chi-square testing

Table 2:

Logistic regression models for reporting a great risk of harm from trying heroin.

	Adults (n=47,811)				Adolescents (n=24,167)**			
	AOR	95% C.I.	p-Value		AOR	95% C.I.	p-Value	
Prescription pain reliever misuse	0.760	0.614-0.941	0.013		0.817	0.672-0.993	0.042	
Prescription sedative misuse	0.890	0.486-1.628	0.700		2.032	0.969-4.261	0.060	
Prescription tranquilizer misuse	1.117	0.822-1.518	0.472		1.219	0.802-1.852	0.909	
Prescription stimulant misuse	1.203	0.946-1.531	0.129		1.691	1.135-2.519	0.011	
Marijuana use	1.063	0.939-1.204	0.329		2.214	1.929-2.542	0.152	
Cocaine use	0.793	0.566-1.109	0.171		0.906	0.522-1.571	0.719	
Inhalant use	0.470	0.317-0.697	<0.001		0.532	0.414-0.683	<0.001	
Hallucinogen use	0.730	0.538-0.989	0.043		1.127	0.808-1.571	0.474	
Ever injected drugs	1.240	0.499-3.079	0.637		0.334	0.079-1.405	0.132	
Female gender	1.359	1.285-1.438	<0.001		0.854	0.790-0.923	<0.001	
Age Group (ref 18-25y)								
26-34 years	1.261	1.116-1.425	<0.001					
35+ years	2.064	1.887-2.259	<0.001					

* Adjusted for race/ethnicity, education.

** Adjusted for race/ethnicity.