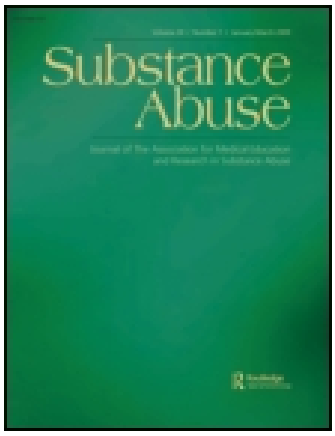

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# The Prevalence of Positive Drug and Alcohol Screens in Elderly Trauma Patients

Akpofure Peter Ekeh, MD, MPH,[1] Priti P. Parikh, PhD,[1] Mbaga Walusimbi, MD,[1] Randy J. Woods, MD,[1] Andrew Hawk, MD,[2] and Mary C. McCarthy, MD[1]



**ABSTRACT.** *Background:* Alcohol and drug abuse are recognized to be significantly prevalent in trauma patients, and are frequent harbingers of injury. The incidence of substance abuse in elderly trauma patients has, however, been limitedly examined. The authors sought to identify the spectrum of positive alcohol and drug toxicology screens in patients ≥65 years admitted to a Level I trauma center. *Methods:* Patients ≥65 years old admitted to an American College of Surgeons (ACS) Level I trauma center over a 60–month period were identified from the trauma registry. Demographic data, blood alcohol content (BAC), and urine drug screen (UDS) results at admission were obtained and analyzed. The positive results were compared with individuals below 65 years in different substance categories using Fisher's exact test. *Results:* In the 5-year period studied, of the 4139 patients ≥65 years, 1302 (31.5%) underwent toxicological substance screening. A positive BAC was present in 11.1% of these patients and a positive UDS in 48.3%. The mean BAC level in those tested was 163 mg/dL and 69% of patients had a level >80 mg/dL. *Conclusions:* These data show that alcohol and drug abuse are an issue in patients ≥65 years in our institution, though not as pervasive a problem as in younger populations. Admission toxicology screens, however, are important as an aid to identify geriatric individuals who may require intervention.

***Keywords:*** Alcohol abuse, drug abuse, elderly, geriatric, trauma

## INTRODUCTION

Drug and alcohol abuse has been recognized to be significantly prevalent in trauma patients and play an important role in traumatic injuries—in both blunt and penetrating situations.[1,2] Alcohol and drug abuse are recognized to be significantly prevalent in trauma patients and are frequent harbingers of injury. The recognition of the dangers of drunk driving has spearheaded successful public safety campaigns in the United States and other nations, targeted at addressing this issue.[3] Legislation pertaining to this hazard has been successfully enacted and is aggressively enforced in the United States and most of the Western World.[4,5] The problem, however, extends far beyond just vehicle operators, to individuals involved in different mechanisms of injuries that may have been at a higher risk for injury due to their alcohol use. The influence of illicit drug use on injuries, though studied, has received less attention.[6,7] Several studies have shown the prevalence of substance abuse ranging from 46.5%[8] to 71%[9] in patients admitted for traumatic injuries. Thus, in the last few years, the American College of Surgeons (ACS) Verification Review Committee has mandated that Level 1 trauma centers have alcohol-screening programs in place to identify the patients who are at risk.[10]

Traditionally, substance abuse in elderly populations has been largely under diagnosed and undertreated resulting in the underappreciation of an invisible epidemic.[11,12] Most studies thus far have focused on the general population, younger patients, and specific subgroups, such as penetrating trauma patients or victims of motor vehicle crashes.[13,14] With the rising life expectancy, the elderly population in the United States is increasing. Between 2010 and 2050, the United States is projected to experience rapid growth in its older population. In 2050, the number of Americans aged 65 and older is projected to be 88.5 million, more than double its projected population of 40.2 million in 2010.[15] The increase in the elderly population may increase their exposure to the threats of injury and consequently increase the number of geriatric trauma patients. Furthermore, alcohol or drug abuse in older populations may also increase the geriatric trauma incidents. Previous studies have shown that substance abuse in elderly patients increases the risk of motor vehicle crashes[1] and readmission of new trauma.[16] The influence of alcohol and illicit drug use on trauma injuries, though studied, has received less attention.[6,7] We therefore sought to identify the spectrum of

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positive alcohol and drug toxicology screens in patients older than 65 years, at a level 1 trauma center, with the goal of identifying the prevalence in this population and comparison with their younger cohorts.

## METHODS

All trauma patients admitted to Miami Valley Hospital, Dayton, Ohio—an American College of Surgeons–verified Level I trauma center—between January 2006 and December 2010, who underwent alcohol and/or drug screening were identified from the trauma registry. During this period, blood alcohol content (BAC) as well as urine drug screens (UDS) were routinely performed on trauma patients, particularly on those who were trauma alerts and presented through the trauma notification system. Any detectable level of alcohol was considered to be a positive screen. The substances tested in the UDS were amphetamines, barbiturates, benzodiazepines, cocaine, opiates, phencyclidine, tetrahydrocannabinol (marijuana), and tricyclic antidepressants. These were recorded as either "Present" or "None detected."

Some of the patients were transferred from other institutions and thus may have received certain medications, such as opiates or benzodiazepines prior to, or during, their transfer to our institution. These medications may have also been administered by emergency medical personal en route to the hospital. This information was not readily available to us.

Demographic data on these patients, including their age, gender, specific injuries, injury severity score (ISS), length of stay, mechanism of injury, and outcome, were obtained by chart review. The statistical analysis was performed using Student *t* test and Fisher's exact test for analysis of the continuous and categorical variables. The institutional review board of Miami Valley Hospital, Dayton, Ohio, approved the study.

## RESULTS

In the 60-month period studied, 4139 elderly patients (≥65 years) were admitted to our Level I trauma center, out of which 1302 patients (31.5%) were screened for substance abuse; that is, presence of alcohol and/or drugs. Overall, 353 (27.1%) of those tested for substance abuse had a positive screen. A summary of the demographic details of the overall group is presented in Table 1. The mechanisms of injury are represented in Figure 1. Falls was the most frequent etiology. The breakdown of those positive for alcohol or drugs in this population over 65 years is represented by different mechanisms in Table 2.

TABLE 1
Characteristics of Trauma Patients Based on Their Age Group

| Age group | Substance abuse | Gender | | Mean age | Mean ISS |
|---|---|---|---|---|---|
| | | Male | Female | | |
| ≥65 years | Yes | 60.9% | 39.1% | 74.9 ± 7.6 | 12.8 ± 8.8 |
| | No | 54.1% | 45.9% | 77.7 ± 7.9 | 14.3 ± 9.2 |
| <65 years | Yes | 77.5% | 22.5% | 36.4 ± 12.8 | 11.8 ± 9.4 |
| | No | 66.5% | 33.5% | 37.5 ± 15.7 | 13.6 ± 10.9 |

TABLE 2
Common Mechanisms of Injury and Percent of Patients Positive for Drugs and Alcohol

| Mechanism | % Positive for alcohol | % Positive for drugs |
|---|---|---|
| Falls | 13.3% | 46.2% |
| Motor vehicle crash | 7.9% | 45.3% |
| Pedestrian struck | 10.8% | 53.3% |
| Penetrating injury | 10.5% | 66% |

### Toxicological Screening

Table 3 discusses the prevalence of substance abuse in trauma patients. As shown in the Table 3, a total of 145 (11.1%) of the elderly patients tested for alcohol had positive screens. Moreover, a total of 499 patients were screened for drug and 241 (48.3%) had positive UDS. Figures 2 and 3 show the age distribution of these patients based on their substance abuse. Opiates were found to be the most common drug in elderly (92.9%) as well as younger (62.5%) trauma patients. In elderly patients, opiates were followed by cocaine (3.3%), marijuana (2.5%), and amphetamines (1.2%) (Table 3). Comparing the elderly population with patients less than 65 years of age, positive alcohol and drug screens were significantly more prevalent in the younger population (Table 3).

Since Injury Severity Score (ISS) correlates well with mortality,[17] we calculated mortality based on the substance abuse and ISS (Table 4). Generally, ISS more than 15 is considered sever

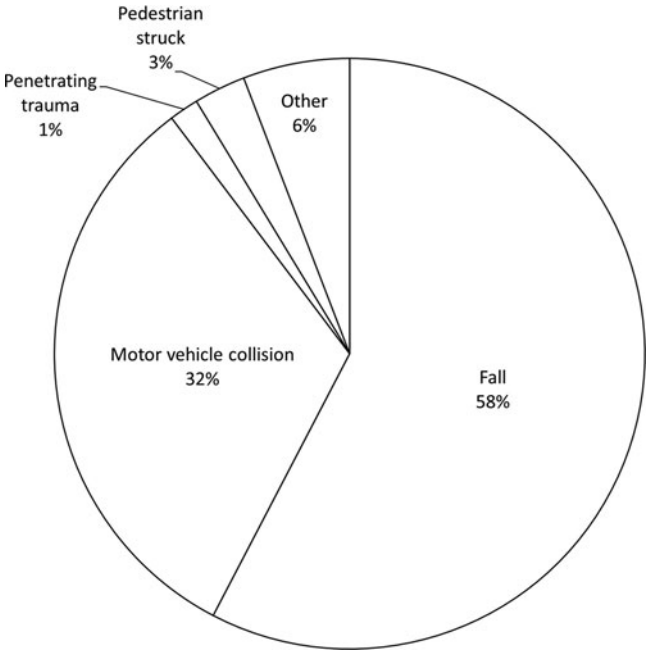


FIGURE 1 Mechanisms of trauma in elderly patients tested for alcohol and drugs.

TABLE 3
Prevalence of Substance Abuse in Trauma Patients

| Substance abuse | | Total patients screened (*N*) | | Total patients tested positive | |
|---|---|---|---|---|---|
| | | ≥65 years | <65 years | ≥65 years | <65 years |
| Alcohol | Positive | 1302 | 7598 | 145(11.1%) | 3200(42.1%) |
| | >80 mg/dL | 1302 | 7598 | 100 (69%) | 2637(82.4%) |
| Drugs | Positive | 499 | 4049 | 241(48.3%) | 2954 (73%) |
| | Opiates | 499 | 4049 | 224(92.9%) | 1845(62.5%) |
| | Marijuana | 499 | 4049 | 6(2.5%) | 601(20.3%) |
| | Cocaine | 499 | 4049 | 8(3.3%) | 430(14.6%) |
| | Amphetamines | 499 | 4049 | 3(1.2%) | 78(2.6%) |

TABLE 4
Mortality of Trauma Patients Based on Their Age Group

| Age group | Substance abuse | Mortality (%) | | Overall | |
|---|---|---|---|---|---|
| | | Low ISS* | High ISS* | Mortality (%) | *P* value |
| ≥65 years | Yes | 4.5 | 15.7 | 12.2 | .58 |
| | No | 3.6 | 26.0 | 13.4 | |
| <65 years | Yes | 0.5 | 11.4 | 3.7 | <.0001 |
| | No | 2.0 | 18.1 | 8.3 | |

*Low ISS is ISS ≤15 and High ISS is ISS >15.

injury and so we divided our data in 2 groups of high (>15) and low (≤15) ISS. Our results show that high ISS (i.e., ISS >15) is associated with high mortality; however, substance abuse had no effect on mortality or length of stay (LOS) in older patients (Tables 4 and 5).

Comparing mortality in the elderly patients group, the mortality rate in those with negative substance screens was 3.6 and 26.0 for low and high ISS, respectively. On the other hand, the mortality for substance abused elderly patients was 4.5 and 15.7 for low and high ISS, respectively. The overall mortality for older patients with substance abuse was 12.2 and 13.4 with no substance abuse, which was not significantly different ($P > .05$). However, in younger patients, mortality of substance abuse patients was significantly lower than nonabuse patients ($P < .0001$). The mean length of stay in older patients with negative screens was 7.7 days, versus 8.1 days in those with positive screens. This was not statistically significant ($P > .05$).

## DISCUSSION

Testing for alcohol and drugs in trauma patients has been reported to be inconsistent. National Trauma Data Bank (NTDB) data between 1998 and 2003 revealed that only half of patients admitted with injuries were tested for alcohol use, and half of these patients have positive test results. Even fewer (36.3%) were tested for drug use.[8] Our results confirm these facts, as out of 4139 older patients (≥65 years) admitted to our level I trauma center, only 1302 (31.5%) and 499 (12.1%) were screened for alcohol and drug, respectively. The recent mandate by the American College of Surgeons (ACS) Verification Review Committee requiring trauma centers to perform brief interventions for alcohol use is likely to enhance more consistent testing for alcohol in spite of these laws. Testing for the presence of alcohol is one tool among others that could help identify individuals who may need intervention. Our results, however, showed that 69% elderly patients that tested positive for alcohol

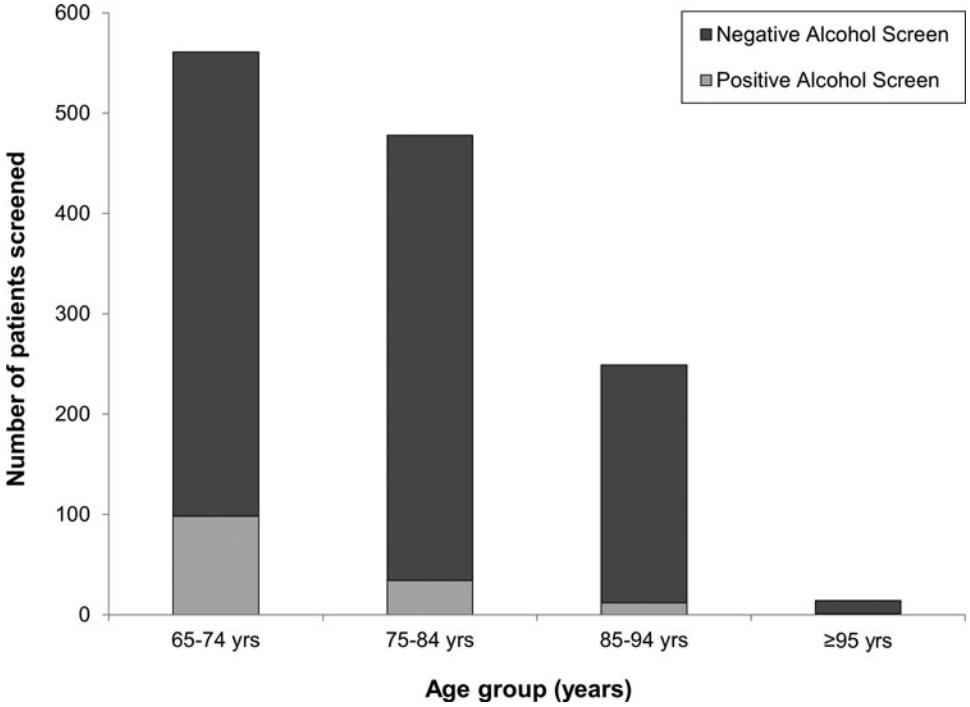


FIGURE 2 Age distribution in elderly patients screened for alcohol.

TABLE 5
Length of Stay of Trauma Patients Based on Their Age Group

| Age group | abuse Substance | Mean length of stay (days) Low ISS | Mean length of stay (days) High ISS | Overall Mean length of stay (days) | *P* value |
|---|---|---|---|---|---|
| ≥65 years | Yes | 7.3 ± 10.5 | 9.8 ± 9.1 | 8.1 ±1 0.1 | .52 |
| | No | 6.5 ± 8.2 | 9.2 ± 10.3 | 7.7 ± 9.3 | |
| <65 years | Yes | 3.9 ± 6.1 | 10.5 ± 12.1 | 8.6 ± 11.1 | .18 |
| | No | 4.2 ± 6.0 | 13.7 ± 26.5 | 7.8 ± 17.2 | |

had blood alcohol content (BAC) above 80 mg/dL. These results are consistent with a prior study.[12]

An interesting but unexplainable observation in our study is the lower mortality rate in individuals with positive alcohol screens. Similar findings have been observed in prior studies—particularly after motor vehicle crashes and following traumatic brain injuries.[18–20] The in vivo experiments in a rat model showed some protective mechanisms of alcohol for enhanced survival rate. These mechanisms are anti-inflammatory effects, increased vasodilatation, decreased platelet aggregation, and enhanced tissue oxygenation, mechanisms that may support increased survival.[21] The neuroprotective effect of low to moderate doses of alcohol in elderly has also been documented and may play a role.[22] This area, however, requires further research and no conclusions can be drawn from these observations.

A recent study from France demonstrated that patients on prescription medicines—particularly psychoactive medications—were at a higher risk of having motor vehicle crashes.[23,24] Along the same lines, benzodiazepines use has also been specifically linked to an increase risk of motor vehicle crashes.[25] One study in fact examined prescription benzodiazepine and opiod use in the elderly, demonstrating the increased risks of injuries.[26]

Only a third of these elderly trauma patients (31.5%) underwent substance abuse testing. There are no specific requirements by the ACS for brief intervention for drug abuse. At our institution, typically only the patients who present as "trauma alerts"—who typically tend to be the more seriously injured individuals—routinely receive toxicology screenings. Trauma consults, that is, injured patients who present to the emergency department without "alerts," do not normally receive this workup.

## Study Limitations

Our data are from a single site and thus may not necessarily accurately reflect other trauma centers nationwide. Additionally, we were unable to determine if some of the drugs identified (particularly opiods and benzodiazepines) on the UDS were administered at a transferring institution, during transportation to the hospital by emergency personnel, legitimately prescribed medications being taken prior to the injuries, or prescription medications being abused by the patents. This gap information may confound results and potentially overestimate prescription and street drug abuse. Moreover, it could not be confirmed if drug abuse was an etiological factor in the traumatic incident.

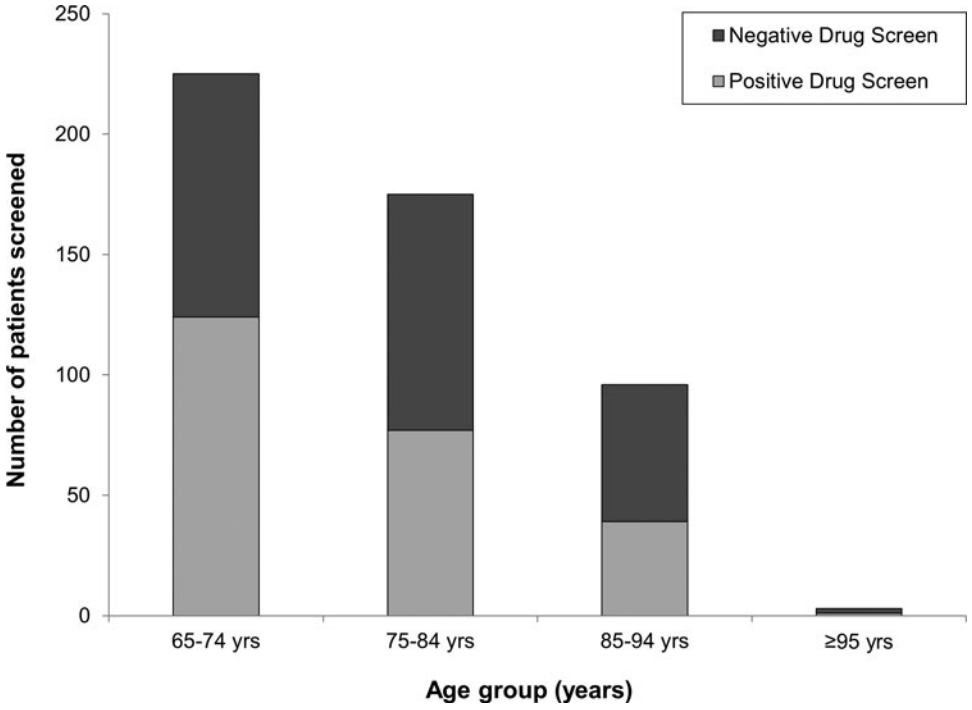


FIGURE 3 Age distribution in elderly patients screened for drugs.

## Conclusions

In summary, this work makes a significant contribution in the literature by studying the prevalence and role of substance abuse in elderly trauma patients that have been limitedly examined. At our Level I trauma center, we found that alcohol and drug abuse could be an issue of great importance in trauma patients—affecting elderly populations, though not as pervasive a problem as in younger patients. Our findings emphasize that the prevention of withdrawal, delirium tremens, and the identification of addicted individuals are relevant processes that must be considered strongly in elderly populations.[27] Therefore, admission toxicology screens are important as an aid to identify geriatric individuals who may require intervention and thus should be routinely performed in this population. Further studies including prospective evaluation of the incidence of substance abuse geriatric trauma populations and effect of alcohol on lower mortality are needed.

## AUTHOR CONTRIBUTIONS

Concept Design, Manuscript writing, Data analysis – A. Peter Ekeh. Manuscript Writing, Editing, and Data Analysis – Priti P. Parikh. Data Collection – Mbaga Walusimbi. Manuscript Review – Randy Woods, Andrew Hawk, and Mary McCarthy.

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