CHAPTER 12

Surveillance systems and trauma care: what can be done in the emergency department?

Kate Vallance and Tim Stockwell

SUMMARY

Emergency departments (EDs) provide a useful window through which shifting substance use patterns can be observed as risk factors for injury, overdose, and poisoning across different communities. This chapter describes a methodology for systematic sampling of late-night ED presentations that has been used as one component of a comprehensive alcohol and other drug (AOD) monitoring system in two cities in Western Canada ("the ED Monitoring Study"). It also assesses the feasibility of combining self-report and objective tests in measuring AOD use, and outlines two different challenges that occurred with response rates during the course of the study. In the study, ED patients were interviewed between 9 p.m. and 4 a.m. on weekends at two sites in Victoria and Vancouver, British Columbia, Canada. Standardized survey instrument, breathalyzer, and saliva drug tests were administered. The survey assessed the reason for the ED visit as well as alcohol/drug use history (lifetime use, past 12 months, one month, and six hours before injury/illness). In Vancouver, where the larger of the two hospitals was located, a revised systematic sampling strategy was required to avoid missing potential patients. In addition, low patient participation in Vancouver led to implementation of incentives to increase the response rate. The use of self-report measures identified more alcohol use among attendees than the use of objective measures, although the reverse was true in the case of use of illicit drugs. The overall monitoring approach proved to be viable and achieved a satisfactory rate of participation. Among other indicators, the monitoring system identified an increasing trend in alcohol use and decreasing use of illicit drugs over the four years the surveillance study was conducted.[1]

INTRODUCTION

While the acute effects of risky alcohol use and other substance use contribute to the bulk of alcohol and drug-caused deaths in Canada, historically they have not been systematically monitored. Tracking the rates of serious harms related to alcohol and other drug (AOD) across time and location within the general population is necessary to implement widespread policies that can address them. Emergency departments (EDs) provide a window into emerging trends of risky patterns of alcohol use and other substance use and are useful venues for monitoring injury, illness, and other acute harms. A great proportion of trauma is found in EDs, where alcohol has been shown as a major risk factor for injury (*1, 2*) and the impact of alcohol consumption on acute conditions (e.g., injuries) is related to both volume and pattern of drinking (*3, 4*). Previous international studies have found injured patients more likely to be drinking before the event and to be heavier drinkers in general than non-injured patients presenting to the same ED at the same time (*5, 6*). Late-night and early-morning presentations

[1] More information on the ED surveillance study is available at: www.AODMonitoring.ca/EmergencyDepartments

have also been identified as especially likely to be related to substance use (*7*).

In an earlier examination of this topic, Stockwell, Macdonald, and Sturge (*8*) noted that national and international statistics on alcohol-related harms tend to emphasize estimates of total numbers of deaths (e.g., (*9*)) or total economic costs (e.g., (*10*)) but rarely report trends or variations across place and time. Monitoring such trends can be valuable as a means of guiding the development and evaluations of interventions at the national, regional, and local level (*11, 12*). While a single estimate of lives lost and economic impacts can raise awareness and build momentum toward new policy initiatives, the monitoring of trends using repeated measures provides a stronger emphasis on whether prevention and treatment policies are being well directed and are effective in practice. When monitoring is done on a continual basis or includes very frequent assessments, this is often termed "surveillance" (*13, 14*). Continuous monitoring or surveillance of alcohol use and other substance use in the ED has the potential to identify new and emerging patterns of risk for serious injury, overdose, and poisoning events in a timely way that may inform strategies aimed at preventing future occurrences.

In this chapter, an example of implementation of a surveillance system designed for ongoing monitoring in an ED setting in two cities (the "ED Monitoring Study") is presented. Also outlined are some of the initial challenges that arose as the monitoring study became established, and the ways in which those obstacles were subsequently overcome. The ED Monitoring Study is part of a broader AOD monitoring system in British Columbia (BC) (Canada) (the "BC Alcohol and Other Drug Monitoring Project") that collects comprehensive data on rates of alcohol-, tobacco- and illicit drug–caused hospitalizations and deaths (*15*); patterns of substance use in the general population, among school students, and among high-risk populations (*16*); province-wide data on alcohol sales (*17*); presentations to the addictions treatment system; and illicit drug seizures (*18*). The ED Monitoring Study component complemented these approaches by collecting data in two sentinel sites in downtown areas of two cities with substantial and very visible street-entrenched illicit drug using populations using survey items similar to those of other surveys conducted by the broader BC AOD Monitoring Project in terms of drug terms used, time periods considered, and related harms. One initial challenge to overcome when monitoring AOD-related trauma is the reliable identification of cases that are at least partially caused by substance use. Individuals presenting to EDs late at night and in the early hours of the morning on weekends are known to have a high rate of prior substance use contributing to their injury or illness (*7, 19*). The hours (9 p.m.–4 a.m.) and days (Friday and Saturday) of study were chosen because they were likely to capture the highest use of alcohol and other drugs among ED attendees, thereby providing a window through which emerging trends in substances being used separately and in combination could be observed.

Four main opportunities for monitoring and surveillance (as described by Stockwell et al. (*8*)) were explored in this study: 1) survey of attendees presenting at high-risk times; 2) routine, objective testing of recent use of alcohol and other substances; 3) identification of cases with main reason for ED attendance being injury or illness known to have a high probability of involvement of alcohol or other substances; and 4) use of surrogate measures indicative of high involvement of alcohol and/or other substances (*8*). Evidence on surrogate measures for alcohol use was found in a large international study in which 74% of young, single males presenting at EDs with an injury during late-night and early-morning hours on weekends had recently consumed alcohol (*7*). The authors of that report recommended the application of similar data as surrogate measures of alcohol-related harm in the local community, for both evaluation and monitoring purposes.

METHODS

Data collection sites

Sampling was conducted among patients presenting at the EDs of Royal Jubilee Hospital (RJH) (Victoria, BC) and Vancouver General Hospital (VGH) (Vancou-

ver, BC). VGH is a specialist trauma center providing services in almost all medical specialties. RJH provides comprehensive acute care to the downtown population in Victoria. These two sites were chosen because their downtown catchment areas include entertainment districts and venues frequented by users of illicit drugs.

Subjects

Subjects were interviewed one Friday and one Saturday night per month (9 p.m.–4 a.m.) at both sites. Completed interviews were obtained from 1 277 subjects across both sites between April 2008 and September 2011. Patients were between 17 and 75 years of age, spoke English, and gave written consent. Patients who posed a safety risk, came to the ED with a police escort, or were unable to correctly answer comprehension questions about the study were excluded.

Interviewers

Two interviewers worked in tandem on each shift. The interviewers were generally graduate or undergraduate students, medical residents, or nurses who were carefully selected and given in-depth training in administering the questionnaire and conducting the two objective tests.

Sampling strategy

A systematic strategy was used to select subjects from patients presenting during the study period. Patients were approached once they had been registered in the Emergency Department Information System (EDIS), with the most recent being approached first until a new interview was secured. If the approached patient met the study inclusion criteria, the interviewer explained the study and obtained written informed consent. If the approached patient presented an exclusion criterion or refused to participate, he/she was excluded and the next person in the EDIS registry (based on chronological order of patient arrival) was approached.

A confidential exclusion log was kept to ensure the same person was not approached twice during the shift. Sex, age, presenting complaint, and reason for exclusion or refusal were recorded for all patients anonymously. Interviewers continued to approach all accessible, eligible, and consenting patients with this sampling strategy until the end of the shift.

Measures

Self-report survey. The ED Monitoring Study survey was developed based on similar monitoring surveys used in Australia (*20*) and Canada (*21*) and adapted from the one used in the Emergency Room Collaborative Alcohol Analysis Project (ERCAAP) data set (*22*). It was also designed to be comparable to other survey instruments in the overall BC AOD Monitoring Project so that its results could contribute to efforts to characterize substance use patterns and related harms among high-risk populations in the participating sites. The survey was piloted in January and February 2008 at both sites before beginning the full implementation phase in April 2008.

The survey assessed reason for the ED visit; alcohol and drug use history (lifetime use, past 12 months, one month, one week use, yesterday use, and use in six-hour period before injury/illness); and demographic profile. Interviews took place at the patient's bedside for stretcher-bound patients and in a private area for all others. The eight-item version of the World Health Organization (WHO) alcohol-screening instrument known as the Alcohol Use Disorders Identification Test (AUDIT) was used to obtain a standardized assessment of alcohol-related problems and dependence (*23*). The WHO instrument for assessing problems and dependence involving other substances, known as the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) (*24*), was used for eight substance categories: opioids (heroin, morphine); cocaine; tobacco; cannabis; amphetamines ("speed," diet pills, "ecstasy"); hallucinogens (LSD, "acid," "mushrooms"); inhalants (nitrous, glue, paint thinner); and sedatives or sleeping pills (Valium, Serepax). These two measures are discussed in more detail below.

BAC testing. In addition to the self-reported use of alcohol, blood alcohol concentration (BAC) was estimated indirectly by measuring the amount of alcohol in the subject's breath using the Alco-Sensor IV

breathalyser (Intoximeters Inc, St. Louis, MO, USA). The instruments were calibrated once a month using a water-based alcohol solution of 0.1% to ensure accuracy of readings. The breathalyzer test requires the subject to blow into a sterile disposable mouthpiece for 5–8 seconds after which the machine provides an electronic BAC reading.

These breathalyzer units were chosen for the project for their ease of use, portability, and unobtrusiveness. Similar devices are used by law enforcement officers for roadside breath testing and in various other venues such as workplace testing, EDs, occupational health centers, and drug and alcohol treatment centers. Previous ED studies (e.g., (*19, 25*) have confirmed that BAC tests correlate well with self-reported alcohol consumption, especially when the delay between last drink and a breath test is accounted for. Delays of longer than two hours, however, will generate increasing numbers of false negative results when using BAC data alone.

Saliva testing. A saliva drug test manufactured by Securetec Detektions-Systeme AG (Neubiberg, Germany) was administered to consenting subjects. The product, known as DrugWipe®5S, is a four-drug sensing test strip. The test indicates the presence of metabolites of drugs (amphetamine-like substances, including amphetamine, methamphetamine, and "ecstasy"; cocaine; opiates, including heroin and morphine; and cannabis) via the development of colored lines in the strip's detection zone.

Traditionally, urine testing has been the standard method for detecting the presence of commonly used illicit substances (cocaine, cannabis, opiates/opioids, benzodiazepines, barbiturates, amphetamines, and methamphetamine). However, based on previous research on drug testing methods, oral fluid testing was chosen for the ED Monitoring Study over urinalysis for a number of reasons. The most important advantages for the context of this study were that oral fluid testing is less invasive, capable of producing results quickly, and designed to be sensitive to recent substance use (*26–28*). Compared to urinalysis, oral fluid testing has proven to be as accurate, with 91%–99% sensitivity for opiates, 98% for cocaine, and 86% for methamphetamine (*29–31*). Although some tests can detect drugs in urine and hair for weeks (*26, 32*), the current study focused on recent rather than historical use. As oral fluid testing detects drug use within 12–14 hours, and is a better indicator than urinalysis of recent drug use, it was considered the best choice for the ED Monitoring Study.

It was also decided to use disposable saliva strips in a point-of-collection device (POC) rather than laboratory devices that would have required that the samples be sent to a laboratory for analysis (which normally takes 24–72 hours). POC devices fit the objectives of this study as they are inexpensive, give instant results, and have generally been shown to have good sensitivity and specificity (*33*).

The DrugWipe® 5S (DW5S) was chosen over other, similar POC devices for its ease of use, availability to the Canadian market, unobtrusiveness for sample collection, instantaneous results, and reasonable pricing. This device is also being used in Australia by the police for roadside testing, and has shown a specificity of 99% (*34*). Other POC saliva-test devices require that the collection pad be held in the mouth for up to 3 minutes, whereas saliva collection with the DW5S only requires the tongue to be wiped 4–6 times. Results appear within 3–5 minutes, and disappear after 10 minutes (which helps mitigate any concerns about privacy of results). In addition, the DW5S functioned comparatively well for the four drugs of primary interest for this project, whereas other POC devices have tested poorly (*35*). Each DW5S strip cost the project approximately US$ 20 per administration.

AUDIT and ASSIST. AUDIT is a brief screening instrument developed by WHO for identifying hazardous and harmful patterns of alcohol consumption (*23*). The ED Monitoring Study uses AUDIT scores as a measure of risky alcohol use among ED attendees. Low AUDIT scores (ranging from 1–7) are associated with low-risk consumption of alcohol. Moderate scores (ranging from 8–15) indicate alcohol use in excess of low-risk guidelines and moderate-risk of harm, while high scores (16+) are indicative of harmful and hazardous drinking (i.e., high-risk). Extreme scores on the AUDIT (20+) are particularly indicative of dependence. Risk levels for consumption of other substances were generated using the ASSIST, a brief

screening questionnaire developed by WHO and an international team of substance use researchers for assessing use of psychoactive substances. Low-risk scores (ranging from 1 to 3) suggest low risk of health and other problems from current pattern use, while moderate-risk scores (ranging from 4 to 26) indicate an increased risk. High-risk scores (27+) indicate that the individual is at risk of experiencing severe problems (health, social, financial, legal, and relationship) and is likely to be dependent on one or more substances (*24*).

RESULTS

Consent and response rates

Across both sites, 1 277 subjects (RJH = 572, VGH = 705) were recruited with a combined response rate of 76.4%. Response rates were similar among patients approached in Victoria (76.3%) and Vancouver (78%). Reasons for non-response were refusal (20%); age (34%); medical reasons (6%); intoxication (4%); "left before completing the interview" (7%); insufficient consciousness (10%); language barriers (6%); and other reasons (13%).

Initially, between April and October 2008, the response rate at VGH was only 59.4%. The research team subsequently implemented two different strategies to increase the proportion of patients who consented to participate in the study, thereby improving the response rate. As an initial measure, in November 2008, a US$ 10 gift card was offered to those who agreed to participate in the study at the Vancouver site. That incentive had the desired effect, with the response rate increasing more than 7%, eventually reaching 66.4%, by December 2008. To further improve the response rate, in January 2009, the sampling strategy was revised so that interviewers approached sampled patients immediately after they were registered in the EDIS system. Interviewers were also trained to wait up to 45 minutes if the patient was unavailable at the initial time of approach. If the patient was not going to become available within that waiting period, as indicated by health care staff, the interviewer would place the patient on the backlog list and approach the next chronological patient in the EDIS system that fit the inclusion criteria for the study. The initial patient would then be re-approached later during the shift. This second initiative also proved successful, and between January and September 2011, the response rate at VGH increased another 11.6%, reaching 78%. The difference between the response rates at VGH before (April–October 2008) and after (November 2008–September 2011) the introduction of the US$ 10 gift cards and the more streamlined sampling strategy for approaching selected patients (January 2009) was significant ($P < 0.001$, two proportions test (*36*)). The lower patient volume at the Victoria site made the introduction of the revised sampling strategy used in Vancouver unecessary, but the US$ 10 gift cards were introduced as incentives to maintain consistency across the two study locations. The response rate in Victoria was not significantly affected by the addition of the gift cards.

Compliance with alcohol and drug tests. The majority of patients consented to the breathalyzer test (87.5%) as well as the saliva drug test (88.7%) (data not shown). Those who did not consent were not significantly different from those who did provide consent.

Demographic characteristics

Across both sites, patients were evenly split between males (51%) and females (49%), with a mean age of 38 years (range 17–75 years). Most identified themselves as Caucasian (70.6%) and worked either full or part time (53%) with 17% reporting currently being unemployed. Close to 20% were students. Close to one-third were married or in a marriage-like relationship ("co-habitating") while half were currently single (Table 1).

Measures

Self-report survey. As noted above, 25% of patients attending the ED on a late weekend night in Vancouver and Victoria during the study period reported using alcohol in the six hours before the onset of their injury or illness, whereas 6% reported using cannabis, 14% used pharmaceutical drugs, and 3% used other illicit drugs (Table 2).

TABLE 1. Characteristics of combined patient sample from two emergency departments (*n* = 1 277), Victoria and Vancouver, British Columbia, Canada, April 2008–September 2011

Characteristic	%[a]
Gender	
Male	50.9
Female	49
Age group (years)	
< 25	28
25–44	40.6
≥ 45	31.3
Ethnicity	
White	70.6
Aboriginal	5.6
Chinese	7.6
Other	16.2
Marital status	
Married / co-habitating	30.7
Single / never married	50.5
Other	14.9
Employment status	
Full-time paid work	39.2
Part-time paid work	13.9
Unemployed	16.5
Retired	9
Current student	18.9
Other	2.5

[a] Percentages may not sum to 100% due to missing values.

TABLE 2. Use of alcohol and other substances in six-hour period preceding injury or illness, and substance use in past 30 days, based on self-report among emergency department patient sample (*n* = 1 277), Victoria and Vancouver, British Columbia, Canada, April 2008–September 2011[a]

Substance	Period used	
	Six-hours preceding injury or illness	Past 30 days
	(%)	
Alcohol	24.7	75.3
Cannabis	5.8	24.3
Tobacco	22.6	38.4
Pharmaceuticals	13.5	–[b]
Other illicit drugs	2.5	13.2

[a] Percentages may not sum to 100% due to missing values.[b] Missing data.

Over the seven waves of data collection in both cities, linear-by-linear trend analysis showed that self-reported use of alcohol in the past 30 days increased significantly (P < 0.001) between 2008 and 2011, while past-30-day use of illicit drugs decreased during this period (P < 0.05) (Figure 1).

Of those who reported that medication, alcohol, or other drugs they had been taking recently contributed to the injury bringing them to the ED (*n* = 77), the two most frequent types of injury were falls (31.2%) and blunt assault (22%), with 39% reporting their injury was due to some "other" reason (data not shown). The most common substance reported as contributing to the injury was alcohol.

BAC testing. Among those breathalyzed, 25% reported using alcohol in the six hours before their injury or illness while 20% were positive on the breathalyzer (Table 3). Sensitivity of the breathalyzer was 68% and specificity 97% for those who provided self-report data with a maximum of six hours between time of injury or onset of illness and time of interview.

Saliva testing. Among those saliva-tested, 20.4% reported drug use (cannabis, pharmaceuticals, or other illicit drugs) within the six hours before their presenting illness or injury, compared to 7.8% who tested positive for at least one substance on the saliva test (data not shown). Sensitivity and specificity of the saliva drug swab varied by drug: cannabis, sensitivity: 21.1% and specificity: 97.9%,; cocaine, sensitivity: 50% and specificity: 97.9%; amphetamines (including "ecstasy," amphetamines, and crystal methamphetamine), sensitivity: 57.1% and specificity: 98.7% (*37*).

AUDIT and ASSIST. Of the patients attending the ED on a late weekend night, 37% had scores indicating either a moderate or high level of problematic alcohol use as assessed by the AUDIT measure. The ASSIST measure assessed 20% of ED attendees interviewed as having moderate or severe problems from their use of cannabis, 8% from use of cocaine, 5% from use of opiates, and 4% from use of amphetamines (Table 3). Linear-by-linear trend analysis showed no significances changes in AUDIT or

FIGURE 1. Substance use in past 30 days based on self-report among emergency department patient sample (*n* = 1 277), Victoria and Vancouver, British Columbia, Canada, April 2008–September 2011[a]

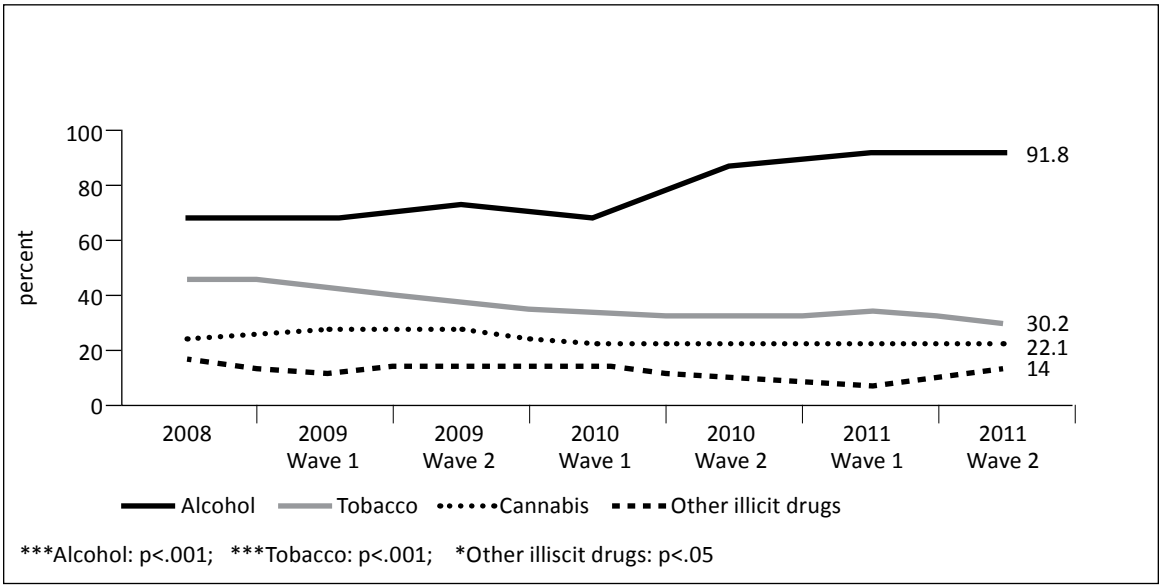

TABLE 3. Indicators for use of alcohol and/or illicit drugs based on self-report and various tests (blood alcohol level, saliva, and two standard screening measures) among patient sample at two emergency departments (*n* = 1 277), Victoria and Vancouver, British Columbia, Canada, April 2008–September 2011

Indicator	%[a]
Use of alcohol	
Self-report (six-hour period preceding ED visit)	24.7
Positive blood alcohol concentration (BAC)	20.2
AUDIT–Alcohol score (moderate or high-risk)	37.1
Use of cannabis, pharmaceuticals, and other illicit drugs	
Self-report (six-hour period preceding ED visit)	20.4
Positive DW5S[a]	7.8
ASSIST scores (moderate or high-risk)	
ASSIST–Cannabis	19.9
ASSIST–Cocaine	8.2
ASSIST–Opiates	4.8
ASSIST–Amphetamines	4.2
Use of alcohol and illicit drugs	
Self-report (six-hour period preceding ED visit)	6.2
Positive BAC and DW5S	2.4

[a] Percentages may not sum to 100% due to missing values.
[b] DrugWipe® 5S (DW5S saliva test (Securetec Detektions-Systeme AG, Neubiberg, Germany).

ASSIST scores over the study period (data not shown).

DISCUSSION

This chapter described the implementation of an ongoing surveillance system designed to monitor substance use and related harms of patients attending EDs at two sentinel sites in two cities in the Canadian province of British Columbia. Initial challenges were described as well as an evaluation of the objective tools used as part of the study. Descriptive results of different measures of substance use and related harms further illustrated the utility of monitoring EDs on an ongoing basis.

Some challenges identified during the initial stages of the study at the larger of the two sites were addressed satisfactorily once two separate strategies were employed. To increase the response rate at the Vancouver site, US$10 gift cards were introduced in November 2008 to compensate patients for their time and as an incentive to participate. In addition, the sampling strategy was revised in January 2009 to further increase the response rate and patients were followed for up to 45 minutes after the initial approach if the patient was unavailable. Together with the added incentive of the gift cards, the response rate increased significantly at the Vancouver ED, bringing it close to the response rate at the Victoria site.

There was excellent compliance with both of the objective tests, and the majority of patients consented to take both the breathalyzer and the saliva tests. The sensitivity of the breathalyzer test was superior to the saliva drug test; however, the specificity of the saliva test was comparable to the breathalyzer, with sensitivity for both tests close to 100%. There was a larger proportion of self-reports of alcohol use in the six hours before injury or illness than positive results from the breathalyzer test, which has been found in other ED studies, and attributed to the number of hours that may have lapsed between consumption of alcohol and the breathalyzer test (*38*). The breathalyzer results suggest about two-thirds of those who reported alcohol use in the six hours before injury or illness were identified by the breath test, and only a small proportion (3%) who were positive denying drinking during this time. Likewise, there was also a larger proportion of self-reports of illicit drug use during the six hours before illness or injury compared to positive saliva drug tests. The saliva test results support findings from previous studies indicating a lower sensitivity for cannabis compared to other drugs (*34*). Sensitivity for cocaine and amphetamines was also similar to that found previously (*28*). Sensitivity of the saliva tests proved to be low for each substance, with a larger proportion reporting substance use than indicated by positive saliva tests. The specificity of the saliva tests was high, and in nearly every case where patients reported no use of substances, the saliva tests were also negative. The data suggest saliva tests were not able to improve upon the accuracy of information provided by self-reports of substance use, indicating that they may not provide sufficient benefit to justify their cost. However, it is possible that patients being aware that an objective test would be conducted increased accuracy of their self-reported data (*37*).

The breathalyzer had stronger all-round performance in terms of sensitivity than the drug saliva test, although specificity was comparable between the two. While the breathalyzer test provides a reliable and cost-effective measure of recent alcohol use, given the lower sensitivity of the saliva test and the higher cost associated with it, data on illicit drug use may be sufficiently captured by the self-report questions included in the survey instrument.

Patterns of substance use during the study period indicated that self-reported use of alcohol in the past 30 days increased significantly over the duration of the study. Use of alcohol in the province as a whole showed a decline during this same period, likely due to the economic recession, but the increase in past-30-day alcohol use may suggest those who attend the ED late at night on the weekends have a slightly different pattern of use than the rest of the general population. Other studies of the effects of the recession on drinking patterns have also suggested increased binge drinking among young males, despite

a general decline in consumption (*39*). Reported use of illicit drugs in the past 30 days (excluding cannabis) also decreased significantly between 2008 and 2011, possibly a result of changes in availability of these substances or of the growing trend toward use of pharmaceutical drugs as a substitute for illicit drugs in this province. More than one-third of patients who attended the ED late at night on the weekends reported moderate or severe problems associated with their alcohol use, and 20% reported similar harms from use of cannabis. These patterns remained fairly steady over the study period, with no significant increases or decreases, suggesting that the harms associated with alcohol and cannabis use remain a consistent and ongoing concern. In addition, alcohol was the substance most commonly reported as contributing to a range of acute injuries bringing patients to the ED for treatment.

The purpose of this surveillance study was the routine collection of survey and objective test data that, over time, provided useful information on trends and prevalence of late-night use of alcohol and other drugs among respondents in an ED setting. While two objective measures were used, the breathalyzer test, which is designed to capture recent alcohol consumption, appeared to be more effective than the saliva test, which is designed to measure recent drug use. These late-night interviews, which primarily gathered data on high-risk ED attendances involving use of alcohol and other drugs, also recorded routinely-collected electronic data on attendees to the ED who might not necessarily be admitted as patients to the hospital. As a result, monitoring data was collected on substance use–related ED visits that would not normally be included in aggregate morbidity data. Standardized test scores of problems related to substance use also provided an ongoing snapshot of substance use patterns among those who attended the ED.

Ongoing monitoring and surveillance of ED presentations in multiple sites in BC and elsewhere in Canada can provide a means of complementing existing comprehensive monitoring systems as well as support for policy making, prevention responses, and evaluation of substance use interventions. More information on the ED surveillance study can be found at the BC AOD Monitoring Project website (*40*). ■

REFERENCES

1. Cherpitel CJ. Alcohol and injuries: a review of international emergency room studies. Addiction. 1993;88(7):923–37.
2. Cherpitel CJ, Martin G, Macdonald S, Brubacher JR, Stenstrom R. Alcohol and drug use as predictors of intentional injuries in two emergency departments in British Columbia. Am J Addict. 2013;22(2):87–92.
3. Rehm J, Greenfield TK, Rogers JD. Average volume of alcohol consumption, patterns of drinking, and all-cause mortality: results from the US National Alcohol Survey. Am J Epidemiol. 2001;153(1):64–71.
4. Rehm J, Monteiro M, Room R, Gmel G, Jernigan D, Frick U, et al. Steps towards constructing a global comparative risk analysis for alcohol consumption: determinin g indicators and empirical weights for patterns of drinking, deciding about theoretical minimum, and dealing with different consequences. Eur Addict Res. 2001;7(3):138–47.
5. Cherpitel CJ, Giesbrecht N, Macdonald S. Alcohol and injury: a comparison of emergency room populations in two Canadian provinces. Am J Drug Alcohol Abuse. 1999;25(4):743–59.
6. Borges G, Orozco R, Monteiro M, Cherpitel CJ, Then EP, López VA, et al. Risk of injury after alcohol consumption from case-crossover studies in five countries from the Americas. Addiction. 2013;108(1): 97–103.
7. Young DJ, Stockwell T, Cherpitel CJ, Ye Y, Macdonald S, Borges G, et al. Emergency room injury presentations as an indicator of alcohol-related problems in the community: a multilevel analysis of an international study. J Stud Alcohol. 2004;65(5):605–12.
8. Stockwell T, Macdonald S, Sturge J. Surveillance and monitoring of acute alcohol-related problems in the emergency room. In: Cherpitel C, Borges G, Giesbrecht N, Hungerford D, Peden M, Pozynyak V, et al., editors. Alcohol and injuries: emergency department studies in an international perspective. Geneva: WHO; 2009.

9. Rehm J, Taylor B, Room R. Global burden of disease from alcohol, illicit drugs and tobacco. Drug Alcohol Rev. 2006;25(6):503–13.

10. Collins DJ, Lapsley HM. The costs of tobacco, alcohol and illicit drug abuse to Australian society in 2004/05. Canberra: Commonwealth of Australia; 2008. (National Strategy Monograph Series No. 64).

11. World Health Organization. International guide for monitoring alcohol consumption and related harm. 2nd ed. Geneva: WHO Department of Mental Health and Substance Dependence; 2000. (WHO/MSD/MSB/00.4).

12. World Health Organization. Collaborative study on alcohol and injuries: final report. Geneva: WHO Department of Mental Health and Substance Abuse; 2007.

13. Hirshon JM. The rationale for developing public health surveillance systems based on emergency department data. Acad Emerg Med. 2000;7(12):1428–32.

14. Hirshon JM, Warner M, Irvin CB, Niska RW, Andersen DA, Smith GS, et al. Research using emergency department-related data sets: current status and future directions. Acad Emerg Med. 2009;16(11):1103–9.

15. Buxton JA, Tu AW, Stockwell T. Tracking trends of alcohol, illicit drugs and tobacco through morbidity data. Contemp Drug Probl. 2009;36(3-4):485–96.

16. Duff C, Michelow W, Chow C, Stockwell T. The Canadian Recreational Drug Use Survey (CRDUS): aims, methods and first results. Contemp Drug Probl. 2009;36(3-4):517–39.

17. Macdonald S, Zhao J, Pakula B, Stockwell T, Martens L. Unlocking patterns of alcohol consumption in British Columbia using alcohol sales data: a foundation for public health monitoring. Contemp Drug Probl. 2009;36(3-4):499–516.

18. Stockwell T, Buxton J, Duff C, Marsh D, Macdonald S, Michelow W, et al. The British Columbia alcohol and other drug monitoring system: overview and early progress. Contemp Drug Probl. 2009;36(3-4):459–84.

19. McLeod R, Stockwell T, Stevens MA, Phillips M. The influence of alcohol and drug use, setting and activity on the risk of injury—a case–control study. Perth: National Drug Research Institute, Curtin University of Technology; 2000.

20. Stockwell T, McLeod R, Stevens M, Phillips M, Webb M, Jelinek G. Alcohol consumption, setting, gender and activity as predictors of injury: a population-based case-control study. J Stud Alcohol. 2002;63(3):372–9.

21. Macdonald S, Cherpitel CJ, Borges G, Desouza A, Giesbrecht N, Stockwell T. The criteria for causation of alcohol in violent injuries based on emergency room data from six countries. Addict Behav. 2005;30(1):103–13.

22. Cherpitel CJ, Bond J, Ye Y, Borges G, MacDonald S, Stockwell T, et al. Alcohol-related injury in the ER: a cross-national meta-analysis from the Emergency Room Collaborative Alcohol Analysis Project. J Stud Alcohol. 2003;64(5):641–9.

23. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. AUDIT: the Alcohol Use Disorders Identification Test: guidelines for use in primary care. 2nd ed. Geneva: WHO; 2001. (WHO/MSD/MSB/01.6a).

24. Humeniuk R, Ali R. Validation of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) and Pilot Brief Intervention: a technical report of Phase II Findings of the WHO ASSIST Project. Geneva: World Health Organization, Management of Substance Abuse, Department of Mental Health and Substance Abuse; 2006. Available from: http://www.who.int/entity/substance_abuse/activities/assist_technicalreport_phase2_final.pdf

25. Cherpitel CJ, Ye Y, Bond J, Borges G, Macdonald S, Stockwell T, et al. Validity of self-reported drinking before injury compared with a physiological measure: cross-national analysis of emergency-department data from 16 countries. J Stud Alcohol Drugs. 2007;68(2):296–302.

26. Verstraete AG. Detection times of drugs of abuse in blood, urine, and oral fluid. Ther Drug Monit. 2004;26(2):200–5.

27. Cone EJ. Oral fluid testing: new technology enables drug testing without embarrassment. J Calif Dent Assoc. 2006;34(4):311–5.

28. Blencowe T, Pehrsson A, Lillsunde P, Vimpari K, Houwing S, Smink B, et al. An analytical evaluation of eight on-site oral fluid drug screening devices using laboratory confirmation results from oral fluid. Forensic Sci Int. 2011;208:173–9.

29. Barrett C, Good C, Moore C. Comparison of point-of-collection screening of drugs of abuse in oral fluid with laboratory-based urine screen. Forensic Sci Int. 2001;122(2-3):163–6.

30. Bennett JB, Lehman WEK. (eds.) 2003 Preventing workplace substance abuse: Beyond drug testing to wellness, American Psychological Association, Washington DC.

31. Wish ED, Yacoubian G. A comparison of the Intercept® Oral Specimen Collection Device to laboratory urinalysis among Baltimore City arrestees. Fed Probat. 2002;66(1):27–9.

32. Dyer KR, Wilkinson C. The detection of illicit drugs in oral fluid: another potential strategy to reduce illicit drug-related harm. Drug Alcohol Rev. 2008;27(1):99–107.

33. Yacoubian GS Jr, Wish ED. A comparison between instant and laboratory oral fluid analysis among arrestees. J Psychoactive Drugs. 2006;38(2):207–10.

34. Drummer OH, Gerostamoulos D, Chu M, Swann P, Boorman M, Cairns I. Drugs in oral fluid in randomly selected drivers. Forensic Sci Int. 2007;170(203):105–10.

35. Walsh JM, Flegel R, Crouch DJ, Cangianelli L, Baudys J. An evaluation of rapid point-of-collection oral fluid drug-testing devices. J Anal Toxicol. 2003;27(7):429–39.

36. Sheskin D. Handbook of parametric and nonparametric statistical procedures. 3rd ed. Boca Raton, FL: Chapman and Hall/CRC; 2004.37. Macdonald S, Cherpitel CJ, Stockwell T, Martin G, Ishiguro S, Vallance K, et al. Concordance of self-reported drug use and saliva drug tests in a sample of emergency department patients. J Subst Use. 2013. doi:10.3109/14659891.2012.760010.

38. Cherpitel CJ. Breath analysis and self-reports as measures of alcohol-related emergency room admissions. J Stud Alcohol. 1989;50(2):155–61.

39. Bor J, Basu S, Coutts A, McKee M, Stuckler D. Alcohol use during the Great Recession of 2008–2009. Alcohol Alcohol. 2013;48(3)343–8.

40. University of Victoria, Centre for Addictions Research of BC (CA). British Columbia Alcohol and Other Drug Monitoring Project: emergency departments [Internet]. Victoria, BC: UV, CARBC; 2013. Available from: http://carbc.ca/FactsStats/AODMonitoring/EmergencyDepartments.aspx. Accessed 28 March 2013.