



## Physician knowledge and perception of the need for drug disposal guidelines

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### KEYWORDS:

Drug disposal;  
Physician knowledge;  
Physician perception

**OBJECTIVES:** Improper medical disposal is a threat to both the environment and individual communities. The purpose of this study was to determine physician education, knowledge, and perceived need for drug disposal guidelines.

**METHODS:** An anonymous electronic 14-item survey eliciting year and state of graduation, current specialty, training, and knowledge (if any) about pharmaceutical disposal guidelines, was distributed to 369 faculty, resident trainees, and medical students at UMDNJ-SOM.

**RESULTS:** More than half of respondents recognized environmental implications of improper disposal practices and indicated that it influences their prescribing practices. However, almost two-thirds of respondents indicated no knowledge of any documented guidelines and three quarters of respondents indicated they had no training about disposal practices. Close to two-third of physicians have had patients inquire about disposal options and indicated interest in establishing a medication disposal program. Twenty-one percent of respondents who graduated after the year 2000 indicated some level of medical school training regarding disposal guidelines versus only four percent of respondents who graduated before 1999.

**CONCLUSION:** On the basis of our data, we recommend that learning opportunities for proper disposal programs and guidelines be offered throughout the medical education continuum, especially in continuing medical education programs, because age was a significant variable in knowledge and awareness of disposal practices.

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Prescription medications and the recommendation for use of over-the-counter (OTC) medications are commonly encountered in most ambulatory settings. According to 2006 statistics released by the Centers for Disease Control and Prevention, 2.6 billion prescriptions are written per year for walk-in patients in the United States alone.<sup>1</sup> Including refills on these prescriptions, approximately 3.54 billion

prescriptions are filled per year in the United States.<sup>2</sup> Ideally, patients will consider the recommendation of their physician and use said prescribed medication appropriately. However, many patients will experience at least one to two medication changes at one time or another, whether a change in dosage or the initiation of a new medication. In addition, patients either do not take the recommended full treatment regimen or choose not to use the medication after having the prescription filled. Arguably, it could be assumed that most of the prescription medications filled are used by the patient to whom they

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were prescribed.<sup>3</sup> However, research suggests that this may not occur in many cases.<sup>4</sup> Recent studies point to the levels and amounts of prescription and nonprescription pharmaceuticals being found in the water supply here in the United States and beyond.<sup>4,8,9-18</sup> “Twelve compounds (acetaminophen, caffeine, codeine, carbamazepine, cotinine, erythromycin-18, nicotine, paraxanthine, ranitidine, sulfamethoxazole, trimethoprim, and warfarin) were detected in a high school septic tank effluent. Three of the 12 compounds—carbamazepine, sulfamethoxazole, and nicotine—were detected in the underlying sand and gravel aquifer after effluent percolation through a 2.0-mm thick sand vadose zone.”<sup>5</sup> An Environmental Protection Agency study titled “Types and quantities of leftover drugs entering the environment via disposal to sewage—Revealed by coroner records” revealed that three of the more concerning drugs found in waste water include carbamazepine, furosemide, and a number of beta-blockers.<sup>4</sup> These same coroner records are being used to expose levels of pharmaceuticals found in deceased patients who were neither prescribed nor known to be taking these medications.<sup>4</sup>

Studies have found that conventional methods of water treatment have not been effective in removing traces of medications, namely antibiotics and anticonvulsants.<sup>6</sup> Water treatment facilities, ground water sources, as well as city sewer systems are all sources of potential contamination by inappropriate compounds.<sup>5,7</sup> Estrogen compounds were found in the sludge layer at sewage treatment plants, which is discharged into the receiving water after processing.<sup>8,19</sup> As increased awareness regarding the affects of improper disposal are highlighted, the need for responsible practices should be addressed.

The aim of this study was to determine the level of knowledge physicians possess regarding proper medication disposal guidelines. The study also assessed whether physicians perceive the actual need for regulated medication disposal both in southern New Jersey ambulatory offices as well as in the surrounding communities.

## Methods

### Setting and participants

An electronic, 14-item institutional review board–approved survey was distributed to 369 faculty physicians, affiliate volunteer physicians, resident physician trainees, and medical students affiliated with the departments of Family Medicine, Internal Medicine, Graduate Medical Education Training, and UMDNJ-SOM medical school. All participants were provided an introductory informed consent statement describing the study and benefits of participation. Survey questions included both year and state of graduation, current specialty, training and knowledge level regarding pharmaceutical disposal guidelines (during medical school as well as during postgraduate education), and interest level in the initiation of a formal, community-wide disposal program (Table 1).

**Table 1** List of electronic survey questionnaire

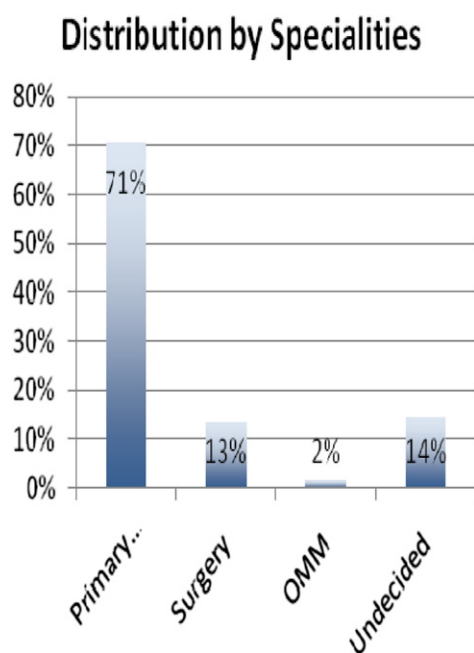
1. Year of postgraduate completion\_\_\_\_\_
2. State of postgraduate completion\_\_\_\_\_
3. Current specialt(y/ies)\_\_\_\_\_
4. Did you receive any training in medical school regarding proper disposal of prescription medications? (*Yes, No, Cannot Remember*)
5. Did you receive any training during your postgraduate education regarding disposal of prescription medications? (*Yes, No, Cannot Remember*)
6. Are you aware of or familiar with any state and/or federal guidelines for proper disposal of prescription medications in New Jersey? (*Yes, No, Cannot Remember*)
7. Have you encountered a patient seeking information regarding how and/or where to dispose of unused or expired medications? (*Yes, No, Cannot Remember*)
  - a. If so, what source of information did you provide? (*Pamphlet with Information, Internet Website, Toll-free Number, County/municipal Drop Site Address, Other*)
8. Are you aware of any environmental implications with improper medication disposal? (*Yes, No, Cannot Remember*)
  - a. If so, do you think this affects your prescribing practice in regards to certain medications (i.e., controlled substances, narcotics)? (*Yes, No, Unsure, No Opinion*)
9. If a secure disposal location were available, would you provide your patients with this information? (*Yes, No, Unsure at this Time*)
10. Would you be interested in the initiation of a regulated medication disposal program for unused prescription and OTC medications in southern New Jersey? (*Yes, No, Unsure*)
11. How willing do you think your patient population will be to participate in such a program? (*Very, Moderately, Neutral, Not very, Opposed*)
12. Do you see any potential barriers to the initiation of a medication disposal program? (*Please Select All That Apply*)
  - Time
  - Cost
  - Logistics of disposal site(s)
  - Safety
  - Interest level of consumers

### Measurements

All survey responses were submitted through Survey-Gizmo, an online survey program (<http://www.surveygizmo.com>). Each participant received an e-mail message with a link to the survey. All responses were submitted anonymously.

### Statistical analysis

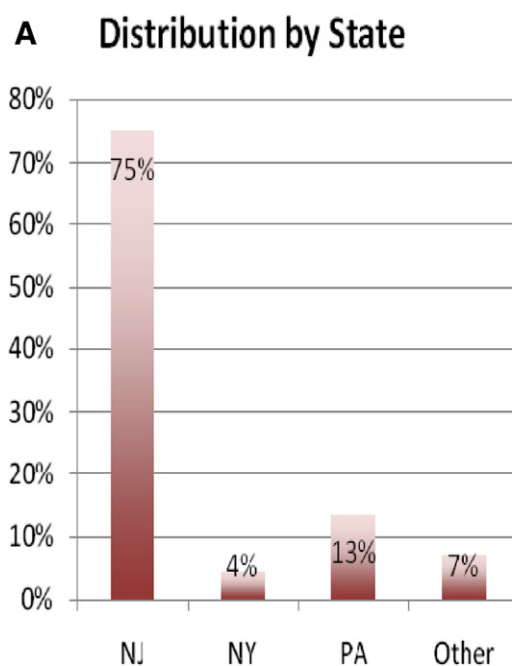
All survey responses were downloaded from Survey-Gizmo and analyzed using a spreadsheet for frequency distribution. Responses were correlated and analyzed according to year of graduation. The lower limit of acceptable participation was a response rate of 25%.



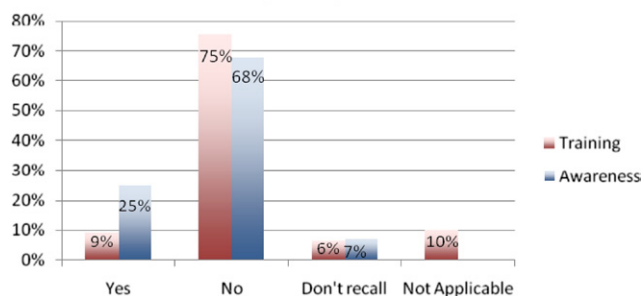
**Figure 1** Distribution of respondents by specialty.

## Results

Of the 369 survey invitations distributed, 164 were returned, with 112 accepted as completed (68%). Seventy-five percent of respondents were categorized as “Primary Care.” Other represented specialties included Surgery, family physicians specializing in Osteopathic Manipulative Medicine, and an “Undecided” category representing medical students and resident physicians (Fig. 1). Of note, 75% of all respondents graduated from a New Jersey medical school; 75% indicated they had no formal training regarding disposal guidelines and 67% of respondents indicated no knowledge of any current drug disposal guidelines (Fig. 2). Sixty-one percent reported that they recognized the environmental impact of improper disposal practices and, of those, 58% felt that this influenced their prescribing practices (Fig. 3). Data were also analyzed by year of medical school graduation. Respondents were categorized into two groups: those who graduated from medical school before 1999 and those who graduated after 2000. Twenty-one percent of respondents who graduated after 2000 indicated they received some training during medical school regarding disposal guidelines compared with only 4% of respondents who graduated before 1999. In terms of the establishment of a medication disposal program, 64% of respondents indicated some interest in such a program and 61% reported that they had encountered patients inquiring about drug disposal options (Fig. 4). Respondents indicated the following potential barriers to the initiation of a disposal program: Safety (15%), time (54%), logistics of disposal site (69%), cost (71%), and interest level of consumers (71%) (Fig. 5).



## B Training and Awareness of Disposal Guidelines (n=112)

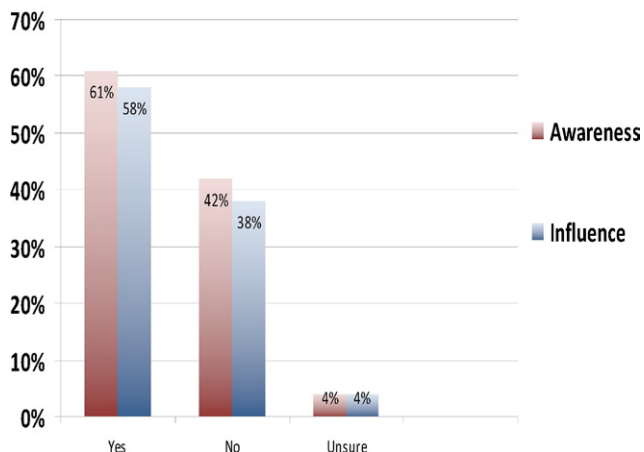


**Figure 2** (A) Distribution of respondents by state of postgraduate completion. (B) Reported knowledge of disposal guidelines during medical training versus personal awareness of current disposal guidelines.

## Discussion

Analysis of the results provides clear indicators that learning opportunities exist for the creation of proper medication disposal guidelines. Within a regional health care environment, potential opportunities exist for the creation of safe, community-based drug disposal programs. Utah has put into action a system for proper disposal of both prescription and OTC drugs.<sup>20</sup> The Salt Lake City Public Utilities and Police Departments together with the Salt Lake City Sheriff's Office established proper disposal programs for their residents by installing locked mounted steel collection bins in the lobbies of their stations. Each agency collects the unused products, and a contracted waste management group safely incinerates the unused medications for approximately \$0.05 per pound for disposal. The Utah Department of Environmental Quality offers a grant to interested law enforcement agencies anywhere within the state of Utah to establish a “Drug Collection for Proper Disposal” program of their

**Environmental Awareness and Influence on Prescribing Practices**

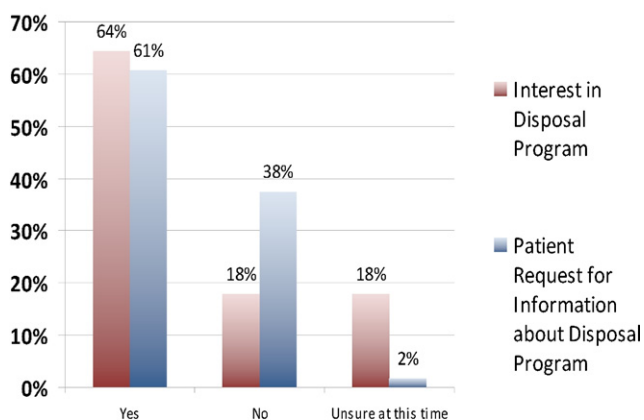


**Figure 3** Awareness of environmental implications with improper disposal versus potential influence on prescribing practices.

own. Information can be obtained at their referenced website.<sup>20</sup>

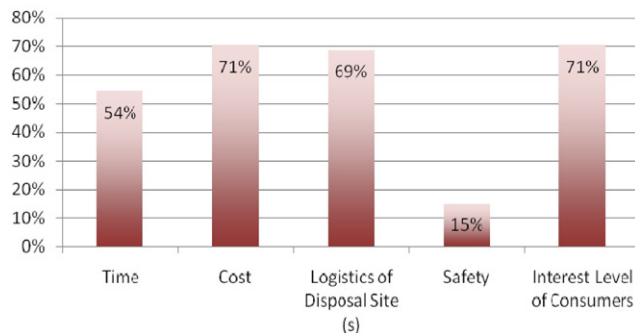
New Jersey, while stringent about their handling of regulated medical waste, is noticeably lacking in its guidelines for disposal of prescription and OTC medications.<sup>21</sup> The P2D2 program<sup>22</sup> (Pontiac, IL) was created by high school teachers Paul Ritter and Eric Bohm to challenge high school students in the local communities to advocate for safe places to dispose of unused and unwanted medications.<sup>21</sup> “The Prescription Pill and Drug Disposal Program is a collaborative effort between local pharmacies, police departments, officials, and students. The purpose of the program is to educate the public about the harm done to the environment due to the current prescription and non-prescription drug disposal practices and to provide them with an alternative way of disposal that ensures the quality of our water for future generations.”<sup>21</sup> The P2D2 program has been im-

**Interest and Patient Encounter about Disposal Program**



**Figure 4** Interest level in the initiation of a disposal program versus encounter with patients seeking information about proper drug disposal.

**Barriers to Disposal Programs**



**Figure 5** Distribution of potential barriers to initiating drug disposal programs.

mensely successful since its inception. To date, more than 95,000 pounds of drugs have been collected and have been properly and safely disposed of by the program administrators. The program’s site is full of helpful information on implementing one’s own program for drug disposal using their very impressive results as a ground model. More information is available at their referenced website (<http://www.p2d2program.org>).<sup>12</sup>

**Conclusion**

Age was identified as a significant variable in knowledge and awareness of disposal practices (defined in terms of year of medical school graduation: 2000 to present vs before 1999). Both medical school curricula and postgraduate continuing education programs should be enriched with training courses for both students and physicians. More communities across the United States are instituting disposal programs and, considering the findings of our study; we believe this same opportunity exists within many southern New Jersey communities and possibly many communities around the country. The greatest obstacle to its creation is education, awareness, cost, and advocacy. This is where physicians can play a leading role.

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